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SHA

Sanborn, Head & Associates

Consulting Engineers & Scientists

January 14, 2000
File No. 1669.2

Ms. Melissa Taylor, Project Manager
United States Environmental Protection Agency, Region I
Office of Site Remediation & Restoration
1 Congress Street, Suite 1100 (HBO)
Boston, Massachusetts 02114-2023

Superfund Records Center
SITE: Blackburn
BREAK: 3.7
OTHER:

Re: Draft Submittal/Existing Data Review and Analysis Report
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Dear Ms. Taylor:

Attached please find a draft copy of a report prepared by Sanborn, Head & Associates, Inc. (SHA) entitled "Existing Data Review and Analysis Report". This report is being submitted to you pursuant to Section II.(A.)(1.) of the Statement of Work (SOW), Remedial Investigation and Feasibility Study (RI/FS), Blackburn and Union Privileges Superfund Site which serves as Attachment A to the Administrative Order by Consent for RI/FS, USEPA CERCLA Docket No. 1-99-0027. This report is being provided to you at the direction of Mr. Paul Bucens and Mr. Joseph Engels, Project Coordinators for the Respondents, W.R. Grace & Co.-Conn. and The Kendall Company, in accordance with Paragraph 36 of the Administrative Order by Consent. Pursuant to your letter of January 5, 2000, five bound copies, and one unbound original of this report are being provided for your review.

On behalf of the Respondents, thank you for the opportunity to submit this report. We are available to discuss questions or comments you have as you proceed with your review.

Very truly yours,
SANBORN, HEAD & ASSOCIATES, INC.

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Hydrogeologist

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cc: Nikki Korkatti, Massachusetts Department of Environmental Protection (2 copies)
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EXISTING DATA REVIEW AND ANALYSIS REPORT

Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

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Prepared for
W.R. Grace & Co.-Conn
and
The Kendall Company

Prepared by
Sanborn, Head & Associates, Inc.

File 1669
January 2000

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EXECUTIVE SUMMARY
EXISTING DATA REVIEW AND ANALYSIS REPORT

DISCLAIMER: THIS DOCUMENT IS A DRAFT DOCUMENT PREPARED BY THE RESPONDENTS 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 ARE THOSE OF THE AUTHORS AND NOT THOSE OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY.

This report summarizes a review and analysis of existing data and other relevant information pertaining to the Blackburn & Union Privileges Superfund Site (also referred to as the " South Street Site") in Walpole, Massachusetts (Site). This report has been prepared by Sanborn, Head & Associates, Inc. (SHA) on behalf of W.R. Grace & Co.-Conn. (Grace) and The Kendall Company (Kendall). Grace and Kendall are the sole Respondents to the Administrative Order by Consent for a Remedial Investigation/Feasibility Study (RI/FS) for the South Street Site (United States Environmental Protection Agency [USEPA] Comprehensive Environmental Response, Compensation and Liability Act [CERCLA] Docket No. 1-99-0027). This report has been prepared pursuant to requirements of the Statement of Work (SOW), which is an attachment to the Administrative Order by Consent.

The South Street 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. 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 Administrative Order by Consent, includes 21 parcels of land encompassing an area of approximately 22 acres. The Site consists of 7 "On-Facility" properties, and 14 "Off-Facility" properties, and "such other places where contamination has come to be located." The On-Facility properties are the locus of various industrial activities spanning several hundred years. The Off-Facility properties, have historically been undeveloped or residential, and remain so at the present time.

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. Cosmec, Inc., currently maintains foundry operations to the west of South Street.

A variety of chemicals have been used at the Site over the course of the Site history. In particular, various metals were used as additives in manufacturing processes, and acids and bases were used in the manufacturing of non-woven cotton products. Asbestos-containing products were manufactured at the Site between 1915 and 1935. Semi-volatile organic compounds (SVOCs), may be associated with certain aspects of manufacturing operations, in particular the use of dyes, coal burning, and fuel oils. The use of volatile organic compounds (VOCs) appears more limited at the Site, and associated primarily with fuel oils.

The geology of the Site generally includes approximately 2 to 14 feet of fill overlying very dense glacial till soils. Where encountered in the past, bedrock consisting of shale was measured at approximately 25 to 30 feet below grade. Groundwater flow at the Site is generally westerly, with discharge of groundwater anticipated along the Neponset River and in wetland areas adjacent to the Neponset River to the west of the Site.

Details of environmental investigations and subsequent Removal Actions (RA) to address the presence of asbestos in soils at the Site are summarized within this report. In general, extensive sampling of Site soils was carried out between 1986 and 1990 to delineate the extent of asbestos-contamination on a Site-wide basis. This investigatory effort was followed by design and, in 1992, implementation of an RA at the Site pursuant to an Administrative Order by USEPA. The RA included excavation of asbestos-containing soils and placement of these soils in an Area of Containment south of the former mill building located to the west of South Street. This area is currently deed-restricted to limit future uses of the Site in this area.

This report also documents a review of existing chemical data generated for the Site by various parties between approximately 1985 and 1996. Included in this review is a Data Usability Assessment, which indicates that while much of the existing data is useful for planning the RI/FS, most of the data is not of sufficient quality for use in a risk assessment. A review of available chemical data indicates that lead and zinc may be prevalent contaminants of concern (COCs) within On-Facility portions of the Site, with environmental contamination by other metals likely as well. SVOCs also appear to be prevalent within the subsurface of On-Facility portions of the Site. As noted above, current data do not suggest that VOCs are prevalent contaminants at the Site, but where VOCs exist, these contaminants appear primarily related to fuel oil releases. Notably, a portion of the Site west of South Street has been impacted historically by releases of fluids with pH in excess of 13 standard units.

The report concludes with the development of a Site Conceptual Model which discusses: land use; potential COCs; anticipated hydrogeologic conditions; potential source areas; and key data gaps. The Site Conceptual Model will be used as a basis for RI/FS Work Plan development in concert with the Statement of Work (SOW) attached to the above-referenced Administrative Order by Consent.

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EXISTING DATA REVIEW AND ANALYSIS REPORT

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1.0 INTRODUCTION

This report summarizes a review and analysis of existing data and other relevant information pertaining to the Blackburn & Union Privileges Superfund Site (also referred to as the " South Street Site") in Walpole, Massachusetts (Site). This report has been prepared by Sanborn, Head & Associates, Inc. (SHA) on behalf of W.R. Grace & Co.-Conn. (Grace) and The Kendall Company (Kendall). Grace and Kendall are the sole Respondents to the Administrative Order by Consent for a Remedial Investigation/Feasibility Study (RI/FS) for the South Street Site (United States Environmental Protection Agency [USEPA] Comprehensive Environmental Response, Compensation and Liability Act [CERCLA] Docket No. 1-99-0027). This report has been prepared pursuant to requirements of the Statement of Work (SOW), which is an attachment to the Administrative Order by Consent.

1.1 Objective of Report

In consideration of the previous investigatory work which has been completed at the South Street Site, the Respondents proposed, and the USEPA accepted, that this Existing Data Review and Analysis Report be prepared to compile data generated through past investigatory and removal actions conducted at the Site. In addition to providing a compilation of prior investigatory work, the usability of existing data for RI/FS and risk assessment decision making is assessed in this report. To the extent allowed by the existing data, the details of a preliminary Site conceptual model and conceptual human health and ecological risk assessment models are presented. Finally, key data gaps are identified in this report, providing a basis and focus for scoping the Phase I RI/FS.

A bibliography of sources used to develop the Existing Data Review and Analysis Report is included. The information summarized herein is based on our review of the referenced sources, and with few exceptions, not on additional independent research or data collection.

1.2 Site Location and Definition

The South Street 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. 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 Administrative Order by Consent (USEPA CERCLA Docket No. 1-99-0027), includes 21 parcels of land over an area of approximately 22 acres. This 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 the locus of various industrial activities spanning several hundred years, and consist of the following Walpole Tax Map parcels:

- On-Facility parcels located east of South Street: 1235-2A, 1235-2B, and 1235-3 (erroneously designated on the Walpole Tax Map as Lot 1275-3); and

- On-Facility parcels located west of South Street: 1235-1, 1235-4, 1235-8, and the northeastern portion of 1249.

The Off-Facility properties, which have historically been undeveloped or residential, include:

- Off-Facility parcels located east of South Street: 1232-1, 1232-2, 1232-3, 1232-4, 1232-1A, 1232-1B, 1235-5, 1235-6, 1235-7 and 1275-5; and

- Off-Facility parcels located west of South Street: 1240-13, 1240-14, 1245-8 and 1245-9.

A locus plan is provided as Figure 1, and a Site Plan showing the locations of the various On-Facility and Off-Facility properties[1] is included as Figure 2. A current On-Facility topography plan, including post-Removal Action topography, is included as Figure 3 and a Site plan showing pre-Removal Action topography is included as Figure 4.

[1] The definition of On- and Off-Facility portions of the Site under administrative orders which addressed the 1992 asbestos Removal Action differs slightly from that adopted by the USEPA under the Administrative Order by Consent for a RI/FS, USEPA CERCLA Docket No. 1-99-0027. Where these discrepancies are germane to this report, notes are provided at the appropriate locations within the text.

2.0 SITE BACKGROUND AND HISTORY

As noted above, On-Facility portions of the Site have been the locus of various industrial activities spanning several hundred years. Environmental investigations to review possible impacts to the Site engendered by historical industrial activities were initiated in 1985. Environmental data has also been generated as a result of historical above ground and underground storage tank (AST and UST) closure and removals (primarily in 1987), and an asbestos Removal Action (RA) conducted primarily in 1992 by Canonie Environmental Services Corporation (Canonie) under contract to Grace.

The Site history, physical Site development, historical chemical usage and storage, and the history of investigatory activities are summarized in Sections 2.1 through 2.4. A time line depiction of the general history of On-Facility portions of the Site is included as Figure 5. A time line depiction of the physical Site development, including UST and AST information, is included as Figure 6. A time line depiction of the history of key Site investigatory activities and regulatory milestones is presented as Figure 7.

2.1 General Industrial Site History[2]

The first commercial venture at the Site is reported to have been a sawmill powered from a dam built on the Neponset River, most likely at its junction with South Street (DeLue, 1925). CHIEE indicates this usage may date back to 1664; however, it is more likely that a sawmill dating to this time was actually constructed about 1/4 mile upstream of the Site, and that the establishment of sawmills at the Site occurred later (Larrabee and West, undated). Historical information previously compiled for the Site makes no additional mention of possible uses of the Site prior to circa 1800, with the exception of a general reference that "various mills occupied the Site" (Kendall, 1987). DeLue's "Story of Walpole, 1724-1924" (1925) indicates that prior to 1800 the Site was used as a forge by a Peter Lyon, and subsequently included a dwelling with a barn, a corn mill, and a sawmill.

In 1800, the land east of South Street was sold to Timothy Smith, a blacksmith, and then in 1802 to James Boyden and Samuel Mason who operated a grist mill and a sawmill (DeLue, 1925). In 1811, the "Blackburn Privilege" was reportedly established on the upstream portion of the Site, east of South Street, and in circa 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.

The Blackburn Privilege was apparently named after John Blackburn, who manufactured both machinery and cotton yarn beginning in 1811 in a building at the Site ("Blackburn's Cotton Factory"), until the building was eventually destroyed by fire (DeLue, 1925). In 1846 John Blackburn (son of the privilege founder) bought an iron foundry with Ollis Clap, and moved machinery to the Site to manufacture stoves, machinery, and iron castings until 1854 (DeLue, 1925). CHIEE reports other uses of the Blackburn Privilege prior to circa 1900 included a manufacturing facility for cotton batting and lamp wicks, and a woodworking shop.

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[2] Except where referenced, information in Subsection 2.1 was obtained from CHI Environmental Engineering Corporation (CHIEE, 1987b).

As noted above, the Union Privilege was reportedly established in 1812 and initially used as a snuff factory. Other reported uses include a "tan yard", a forge for iron nails, and cloth manufacturing (cotton and wool textiles). Beginning in circa 1851, Manning, Glover & Company, and subsequently Cram & Glover Company, manufactured curled hair mattresses and cotton batting and wicking until 1872 (DeLue, 1925; Kendall, 1987). A historical (undated) photograph of the Site included in the book "Images of America, Walpole" (Walpole Historical Society, 1998) indicates that Manning, Glover & Company may have occupied the Blackburn Privilege as well, which is consistent with the above reference to manufacture of cotton batting and lamp wicks at the Blackburn Privilege provided in CHIEE. CHIEE and DeLue (1925) assert that a fire destroyed the buildings on the Site in 1881.

In the early 1880s, portions of the Site (assumed by this time to include both the Blackburn and Union Privileges) were occupied by Union Carpet Lining Company, and from 1891 to 1915, portions of the On-Facility properties both east and west of South Street were used for manufacture of rubber goods, including insulated materials and tires (Walpole Historical Society, 1998; DeLue, 1925). According to CHIEE, and as indicated on the 1911 Sanborn Fire Insurance Map (Sanborn Map), the tire manufacturing reportedly included a "vulcanizing" process, which is typically a method of improving strength and resiliency of rubber by combining the rubber with sulfur and other additives (e.g., zinc) under heat and pressure. The Sanborn Maps are included in Appendix B.1.

In 1900, Massachusetts Chemical Company (MCC) assembled various land parcels which constitute the On-Facility portion of the Site and bought them under common ownership. In 1913 MCC conveyed its sixteen parcels to Walpole Tire and Rubber Company ("Walpole Tire"). In 1915, following bankruptcy of Walpole Tire, title was conveyed to various entities, the last of which was Standard Woven Fabric Company which took occupancy at the Site. According to the 1918 Sanborn Map, Standard Woven Fabric Company was a manufacturer of "multibestos and rubber specialities," and CHIEE indicates that the Site was used for the manufacture of asbestos clutch and brake linings.

In 1920, the company's name was changed to Multibestos Corporation and by 1925, 200 to 300 people were employed there (DeLue, 1925). Multibestos transferred four of the sixteen parcels to different individuals in the 1920s. Manufacturing activities at the Site continued until approximately 1935. The company name was changed to Walpole Factories, Inc. in 1934, which conveyed all the property it owned to Industrial Properties, Inc. (IPI) in 1935. In that same year, the brake lining and clutch-facing business was sold to Raybestos-Mahatten, Inc., and the assets were shipped out of state to that company.

The industrial facilities apparently remained vacant for several years following the liquidation of IPI in 1935. At that time, IPI sold the property to a variety of parties including, in 1937, The Kendall Company (Lots 1235-1 and 1235-4), and also, in 1937, the Shaffer Interests[3] (Lot 1235-2B). In 1941, Lot 1235-2A and Lot 1235-8 (essentially the banks and bed of the Neponset River west of South Street) were sold by IPI to an Edward Sheehan and later transferred to General Fiber

[3] "Shaffer Interests" refers to members of the Shaffer family either individually or collectively, and to entities where Shaffer family members serve as Principals, trustees, directors, or officers, including Shaffer Realty Corporation, Shaffer Realty Trust, BIM Corporation, and BIM Investment Corporation.

Company. Over time, all of the referenced On-Facility parcels have been transferred to and/or between various Shaffer Interests, and are currently owned by BIM Investment Corporation.

2.1.1 Post-Multibestos Usage: On-Facility Lots 1235-1 and 1235-4

While CHIEE indicates that Kendall purchased Lots 1235-1 and 1235-4 in 1937, Kendall reportedly did not initiate manufacturing activities on lot 1235-1 until circa 1947 (GZA, 1985; Dames & Moore, 1989; Cole, Personal Communication, 1999).[4] A review of the 1944 Sanborn Map indicates that the building on Lot 1235-1 was used at that time for "baled cotton stge," which is consistent with Mr. Charles Cole's memory that the building was used for storage of cotton (and also whaling artifacts) prior to initiation of Kendall's manufacturing operations (Cole, Personal Communication, 1999).[5] Beginning in circa 1947, Kendall operated a cotton mercerizing operation on the former Union Privilege Site until 1984. Mercerizing operations included treatment of cotton fibers with a 14 percent sodium hydroxide solution (approximately pH 14) which was chilled to a temperature of 36° Fahrenheit (°F) to entangle the fibers to form a non-woven cotton product.

In the 1960s, a washing and bleaching operation was added to prepare the cotton mercerizing process (Cole, Personal Communication, 1999).[6] Wastewater discharges from these 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 (a/k/a "lagoons" in various historical documents), prior to discharge to the Walpole sanitary sewer, which was constructed across the Site in the 1930s. Two attachments (A and B) to an August 5, 1987 letter from Mr. Cole to Massachusetts Department of Environmental Quality Engineering (MADEQE)[7] describe the bleaching and mercerizing operations, and are included in this document in Appendix B.2. A description of the Kendall processes provided to SHA in an interview with Mr. Cole on May 21, 1999 is also included in Appendix B.2. The locations of various USTs and ASTs used in Kendall's operations are noted on Figure 8; Kendall's operations are further noted on three figures from a report prepared by Weston & Sampson Engineers, Inc. (Weston & Sampson, 1990a), included in Appendix B.3.

Kendall terminated bleaching operations in 1982, and at that time took Settling Basin No. 1 out of service (Dames & Moore, 1989a). The remaining settling basin (No. 2) was used as a receptacle for non-contact cooling water until 1984, when Kendall terminated operations at the Site. Since that

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[4]According to an interview with Mr. Charles Cole on May 21, 1999, a pilot test mercerizing line was actually initiated in 1946, and represented the first non-laboratory application of the mercerizing process. Full operations were initiated in 1947.

[5]Mr. Charles Cole was a Kendall employee at the Walpole facility for 12 years and served as a project engineer for environmental and safety projects and moved to Kendall's Boston office where he became Manager of Regulatory Compliance for Kendall at the time of facility shutdown in 1984.

[6]Dames & Moore (1989a) reports that bleaching operations began in 1969. Mr. Cole recalls that bleaching operations began in approximately 1964.

[7]The Massachusetts Department of Environmental Quality Engineering (MADEQE) changed its name to the Massachusetts Department of Environmental Protection (MADEP) on July 1, 1989.

time, Kendall sold its interest in the property at the Site to the Shaffer Interests in 1985, the facility has remained vacant, with some limited storage of construction equipment in the rear yard area.

No manufacturing activities were performed on Lot 1235-4 by Kendall or by any other known previous owners.

2.1.2 Post-Multibestos Usage: On-Facility Lots 1235-2A and 1235-8

Less information is available regarding the post-Multibestos Corporation uses of Lot 1235-2A, located on the former Blackburn Privilege portion of the Site.[8] The 1944 Sanborn Map suggests that most buildings on Lot 1235-2A were used for "wool storage", and that a small building in the southeast portion of the lot was used for "cotton and rayon flock manufacturing." This comports with CHIEE's assertion that General Fiber manufactured dyed flocking which was subsequently used for such purposes as wallpaper and greeting cards. Review of the 1958 Sanborn Map indicates that General Fiber's "cotton and rayon flock" manufacturing had expanded to the building on Lot 1235-2A adjacent to South Street, and that cotton was stored in the building on the northwest portion of Lot 1235-2A.

Holiday Coffee Company, which also reportedly occupied a portion of Lot 1235-2A, manufactured crystalline flaked instant coffee, probably by vacuum evaporation or freeze drying. CHIEE also indicates "there is no information available at this time as to whether decaffination was done at this Site." Although CHIEE reports that a fire at the Site in 1957 apparently destroyed buildings occupied by Holiday Coffee Company, the 1958 Sanborn Map shows "coffee products manufacturing" as being located in the building adjacent to the former railroad tracks, along the eastern boundary of the lot.[9] CHIEE indicates that following the fire, the affected buildings remained derelict until they were razed in 1972, "with the debris being buried on-Site."

A building in the location of the former coffee manufacturing facility is currently used by Cosmec, Inc. (Cosmec), which operates a foundry on the Site. Stop & Shop, Inc. also reportedly used the building on Lot 1235-2A closest to South Street for warehousing in the 1980s and 1990s, but no longer occupies the Site. This building appears to currently also be used by Cosmec. The specific current use of this building has not been confirmed.

2.1.3 Post-Multibestos Usage: On-Facility Lot 1235-2B

After its purchase by L. Shaffer in 1937, CHIEE indicates that Lot 1235-2B was operated from 1939 to 1955 as a paper recycling plant, and from 1955 to 1957 for rag recycling, which is generally consistent with notations made on the 1944 and 1958 Sanborn Maps. CHIEE further indicates that

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[8] As noted previously, Lot 1235-8 which consists of the banks and bed of the Neponset River west of South Street, was sold to E. Sheehan in 1941 and later transferred to General Fiber Company with Lot 1235-2A. It is assumed from review of Sanborn Maps and other historical information that no manufacturing activities actually took place on Lot 1235-8.

[9] The 1957 Walpole Town Report shows several photographs of the building on Lot 1235-2B ("Shaffer Company") engulfed in fire; however, it is not indicated in the report whether the fire affected other buildings at the Site. The 1958 Sanborn Map shows "Fire Ruins" along the backside of residential properties on the south side of Gleason Court.

a large four-story building which previously occupied this parcel was destroyed by the above-referenced 1957 fire, which is consistent with photographs contained in the 1957 Walpole Town Report. The present building on this parcel was erected in 1958, and recycling activities resumed through the 1960s. Kendall briefly rented this building for use as a warehouse in the 1960s, and this building was subsequently occupied by Jacobson Brothers Movers who used it as a warehouse into the 1990s. SHA's observations at the Site on May 21 and November 23, 1999, indicate that the current tenant is Cosmec. The specific usage of the building by Cosmec could not be determined during these Site visits.

2.1.4 On-Facility Lots 1235-3 and 1249

Although the details of ownership of these lots is not explicitly called out in the referenced information, a review of available Sanborn Maps and other historical information indicates that Lot 1235-3 was the location of Lower Mill Pond from prior to 1911 (and possibly extending back several hundred years) to 1959. This lot is currently undeveloped.

The Sanborn Maps also indicate that the northeast portion of Lot 1249 historically consisted of undeveloped land adjacent to the Neponset River. This portion of this lot is also currently undeveloped. A new housing development is currently being built on the southern portion of Lot 1249, topographically upgradient of the Site.

2.1.5 Off-Facility Parcels

Available Sanborn Maps and current observations indicate that Off-Facility parcels along Gleason Court north of the former Blackburn Privilege have been and continue to be residential or undeveloped since at least 1911, and that Lot 1275-5 has been a railroad right-of-way since at least 1904. Portions of the remaining Off-Facility parcels which appear intermittently on historical Sanborn Maps, as well as current observations, suggest these lots are and have been residential or undeveloped.

2.2 Physical Site Development

As noted above, Site development may have been initiated as early as the mid-to-late 1600s, and information available in DeLue (1925) indicates that by the early 1800s, both the Blackburn and Union Privileges were developed for various manufacturing purposes. Additionally, it is likely that a dam was constructed at the junction of the Neponset River and South Street to supply water power for the Site (from early in the Site's industrial history); however, maps or other descriptive information detailing the early pre-1900 development of the Site were unavailable in the information reviewed in preparation of this report.

The Sanborn Maps provide a good synopsis of Site development beginning in the very early part of the 20th century. The Bionetics Corporation (Bionetics) of Warrenton, Virginia completed a historical Site analysis for USEPA, which included review of several Sanborn Maps and certain aerial photographs (Bionetics, 1989). Bionetics reviewed Sanborn Maps dated 1904, 1911, 1918, and 1926. SHA was able to obtain additional Sanborn Maps dated 1927, 1944, and 1958. As noted

previously, a copy of these Sanborn Maps is included as Appendix B.1; the Sanborn Maps have been composited on Figure 9.

A predominant site feature in place by 1904, and surviving through 1958, was Lower Mill Pond, created by a dam constructed at South Street on the Neponset River.[10] Water was diverted from the dam through a canal constructed just north of the Neponset River, through a power house and then a tail race before discharging back in the Neponset River west of the Site. Information included in CHIEE (1987b) indicates that the dam failed in 1959, from which time the tail race was no longer used.

In general, early building construction at the Site appears to have been focused on portions of both the Blackburn and Union Privileges just north of the Neponset River (and Lower Mill Pond), expanding northerly, and away from South Street over time. While the 1911 Sanborn Map indicates that northern portions of Lot 1235-1 were still being used for residential purposes as of 1911, On-Facility portions of the Site were fully developed for manufacturing purposes as of 1918.

Importantly, as noted above, the Sanborn Maps do not indicate that developed Off-Facility parcels have been used for anything other than residential purposes, with the exception of Lot 1235-3, on which Lower Mill Pond was located.

2.3 Chemical Usage and Storage

References reviewed by SHA in preparation of this Existing Data Review and Analysis Report do not provide any direct, non-speculative information regarding chemical uses and storage at the Site prior to 1911.[11] Various chemicals which may have been used , but not necessarily confirmed to be associated with the Site on the basis of historical Site usage, are summarized on Table 1. Included below is a description of chemical uses and storage on the basis of more direct information, including information provided on Sanborn Maps set forth in Appendix B.1 and presented in Figure 9; and documents describing more recent Site usage. The year 1960 is used as a date separating information derived from historical sources (generally Sanborn Maps) from information available from more direct documentation. A graphical summary of this information is included on Figure 6, and a composite map showing the historical locations of various USTs and ASTs, (many of which have been subsequently removed) is included as Figure 8. Various correspondence and permits referencing fuel oil releases at the Site, as well as USTs and ASTs at the Site, are included in Appendices B.3, B.4, and B.5.

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[10] A second pond, a short distance upstream of Lower Mill Pond, is shown on a May 6, 1957 aerial photograph and is presumed to be Upper Mill Pond. This pond no longer appears to exist.

[11] It was noted previously that the Site may have been used prior to 1851 as a "tan yard." Although chromium has been used in tanning, chromium tanning was not invented until 1858 (by Frederick Knapp) and was not developed into an industrial process until 1884 (by Augustus Schultz)(Corey, Personal Communication, 1999).

2.3.1 Chemical Usage and Storage Pre-1960

The first documented indication of chemical usage and storage at the Site is provided on the 1911 Sanborn Map. On that map, an 1,100-gallon naphtha UST is shown on the westerly portion of Lot 1235-1, and a 15,000-gallon naphtha UST is shown on the easterly portion of Lot 1235-2A.

The 1918 Sanborn Map no longer references either UST shown on the 1911 map. Instead, an 1,100-gallon gasoline UST and a nearby 11,000-gallon gasoline UST are shown on the west-central portion of Lot 1235-1, along the western Site boundary.

The 1926 Sanborn Map shows a single 11,000-gallon gasoline UST in the same approximate location and configuration as the 11,000-gallon gasoline UST shown on the 1918 Sanborn Map. The 1,100-gallon UST shown nearby on the 1918 map is not shown on the 1926 Sanborn Map. Two "oil" ASTs are located in the approximate area of where the 15,000-gallon naphtha UST was shown on Lot 1235-2A on the 1911 Sanborn Map. A 10,000-gallon UST and a 500-gallon UST are shown on the 1926 Sanborn Map immediately south of the ASTs. Both are depicted as storing fuel oil, and a notation indicates these USTs are not in use as of 1926. Lastly, a 1,000-gallon gasoline UST is shown off the southeast corner of the former four-story building located on Lot 1235-2B.

The 1927 Sanborn Map is not as detailed as the 1926 map. Of the tanks shown on the 1926 map, only the two oil ASTs on Lot 1235-2A are shown. A small circle with a notation of what appears to be "61" is shown in the location of the 11,000-gallon gasoline UST on Lot 1235-1. This notation likely reads "G.T.", which was used as a standard symbol for gasoline tanks, and we have assumed this to be the case.

The 11,000-gallon gasoline UST located along the western boundary of Lot 1235-1 on the 1918, 1926, and 1927 Sanborn Maps continues to be shown on the 1944 and 1958 maps, again with the symbol "G.T." There are no other references to ASTs or USTs shown on either of the 1944 or 1958 maps; however, in 1954 General Fiber Company obtained a permit for installation of a 5,000-gallon fuel oil storage tank (UST or AST not specified), presumably for installation on Lot 1235-2A (See Appendix B.5).

There is no additional reference in any documentation concerning the possible removal of the 11,000-gallon gasoline UST. In May 1990, Weston & Sampson uncovered an UST near a vacant garage structure off Clark Avenue on Lot 1235-1. Weston & Sampson (1990c) indicated that "during the test pit investigation, a tank measured at approximately 6-feet in diameter by 32-feet long was encountered approximately 3 feet below the ground surface. The inside of the tank was visually inspected through a top-mounted manhole. A small quantity of liquid was observed. Soils near the top of the tank did not appear to contain petroleum products." Weston & Sampson (1990c) further indicated that in the opinion of USEPA, the UST did not pose a threat to "navigable waters," and that this UST should be addressed under the jurisdiction of the Massachusetts Department of Environmental Protection (MADEP).

Little direct information exists with regard to other chemicals used prior to 1960. The types of manufacturing activities known to have taken place at the Site are listed below, along with the chemicals that may have been used:

- Manufacture of lamp wicks which may have occurred at the Site prior to circa 1900 and may have used lead;

- Rubber vulcanizing processes which may have occurred at the Site between approximately 1891 and 1915 and may have used sulfur and zinc, or other metal additives (i.e., such as nickel, lead, and/or arsenic) to improve the strength and resiliency of rubber;

- Manufacture of asbestos products for clutch and brake linings circa 1915 to 1935, where lead was used as an additive;

- Cotton mercerizing (which reportedly began at the Site in 1947) used caustic solutions to form non-woven cotton fabric as well as acids to neutralize the caustic waste; and

- Dying of various cloth textiles manufactured at the Site by various entities which may have used various metals and/or acid and base-neutral extractable compounds (semi-volatile organic compounds [SVOCs]).

Lastly, the Sanborn Maps prior to the 1940s, indicate that steam at the Site was likely generated by burning of coal. Both the combustion of coal, and the possible fallout and/or disposal of coal ash, may lead to the presence of various base-neutral extractable compounds at the Site, most notably polycyclic aromatic hydrocarbons (PAHs).

2.3.2 Chemical Usage and Storage Post-1960

In 1969, Kendall filed an application for license with the Walpole Fire Department for a 20,000-gallon No. 6 fuel oil UST which was installed about 60 feet west-southwest of the Kendall Boiler Room. Although not referenced in the application, NUS Corporation (NUS, 1991) indicates a second 10,000-gallon No. 6 oil UST was also installed by 1969, and CHIEE (1987b) indicates the No. 6 fuel oil USTs were installed adjacent to each other.

Proximate in time to the start of bleaching operations (approximately 1964), Kendall had installed:

- Two 3,500-gallon virgin sulfuric acid ASTs immediately west of the former wheelhouse (a/k/a former waterpower house) over the former tail race south of the bleachery; and

- One 9,000-gallon hydrogen peroxide AST also located immediately west of the former wheelhouse.

Two 9,500-gallon[12] spent sulfuric acid ASTs were installed around 1975 east of the former wheelhouse and adjacent to the south wall of the former mill building (CHIEE, 1987b; NUS, 1991; Cole Personal Communication, 1999). In 1980, all of these ASTs were moved to a new diked storage area south of and adjacent to the former wheelhouse (CHIEE, 1987b).

[12]CHIEE (1987b) first indicates these ASTs may have been 9,000-gallon capacity, but later indicates these ASTs were 5,000-gallon capacity. NUS (1991) indicates the ASTs were 5,000-gallon capacity. Mr. Cole indicated that he purchased two 9,500-gallon, used propane tanks for storage of spent sulfuric acid in 1975 (Cole, Personal Communication, 1999).

The virgin sulfuric acid and the hydrogen peroxide were used in bleaching operations. Spent sulfuric acid (approximately 71% solution) was obtained from Kendall's new owner, the Colgate Palmolive Company (Colgate) as a by-product of Colgate's soap manufacturing plant located in Jersey City, New Jersey and was used in caustic waste neutralization.[13]

In an interview on-Site on May 21, 1999, Mr. Charles Cole, former Manager of Regulatory Compliance for Kendall, recalled that one 10,000-gallon sodium hydroxide UST was installed around 1975 in the area north of the former boiler room. Historical facility plans included in CHIEE (1987b), as well as CHIEE's description of AST removal activities which they undertook (CHIEE, 1987) differ from Mr. Coles' recollection and indicate that two 20,000-gallon sodium hydroxide ASTs were located in the area noted on Figure 8.[14] These tanks reportedly replaced one 5,000-gallon caustic AST formerly located in the Boiler Room, because of settlement of the boiler room floor (CHIEE, 1987b).

In 1979, a new 10,000-gallon UST was installed in a concrete vault immediately north of the former bleachery, replacing the existing 10,000-gallon No. 6 oil UST which was known to be leaking (CHIEE, 1987b).[15] This tank was temporarily closed in 1987, maintained in an empty condition, and finally removed from the vault in 1992 (refer to copies of correspondence included in Appendix B.5).

It is noted that approximately three reported No. 6 fuel oil releases occurred in 1983, with the largest consisting of at least 1,000 gallons (GZA, 1985a; CHIEE, 1987a). These releases occurred not directly from the USTs, but rather were reportedly related to faulty valving. Approximately 200 cubic yards (cy) of oil-contaminated soils were stockpiled and eventually removed from the Site (GZA, 1985a).

In 1987, CHIEE was commissioned[16] by Shaffer Realty Corporation to remove various USTs and ASTs located at the Site. In April 1987, CHIEE reported that they cleaned and subsequently removed from the Site:

- One 20,000-gallon No. 6 fuel oil UST;

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[13] According to GZA (1985a), caustic wastes were discharged to a mixing basin (a/k/a neutralization tank) at the southwest corner of the former Kendall bleachery where these wastes were neutralized prior to discharge to one of two settling basins used to remove suspended cotton fibers prior to discharge to the Walpole Sanitary Sewer. As noted in CHIEE (1987b), facility plans included in CHIEE's report (1987b) suggest that, at least for some time, waste neutralization was actually carried out in Settling Basin No. 1 and that the "mixing basin" was actually used as a primary settling tank. Mr. Cole states that the "mixing basin" was never used as a settling tank. The mixing basin was equipped with a high-speed turbine mixer and therefore no settling could occur (Cole, Personal Communication, 1999).

[14] It is also noted that GZA (1985a) indicates that during their site visit on March 4, 1985: "Mr. Tulley (*sic*) [of Kendall Company] reported that two underground fuel storage capacities of 10,000- and 20,000-gallons, and *one* 20,000-gallon underground tank for caustic storage are present in the central portion of the Site" (emphasis added), which only adds to the uncertainty concerning the number of sodium hydroxide tank(s) on Lot 1235-1. According to Mr. Cole, GZA, CHIEE, and Mr. Tilley reported the types and sizes of these tanks incorrectly (Cole, Personal Communication, 1999).

[15] It is noted that the permit to maintain an empty UST, included in Appendix B.5 indicates that this UST may have been installed in 1982; however, a copy of the actual installation permit indicates that this UST was installed in 1979.

[16] Clean Harbors, Inc., a related company, actually performed the tank removals.

- Two 20,000-gallon caustic soda (sodium hydroxide) USTs;
- One 9,000-gallon hydrogen peroxide AST;
- Two 3,500-gallon sulfuric acid ASTs;
- Two 5,000-gallon spent sulfuric acid ASTs[17]; and
- Two 1,000-gallon diesel USTs.

All of the above USTs and ASTs were removed from Lot 1235-1 with the exception of the two 1,000-gallon diesel USTs which were removed from Lot 1235-2A. The approximate locations of these USTs and ASTs are noted on Figure 8.

Upon completion of UST and AST removal, CHIEE (1987b) noted that "during the cleaning of the 10,000-gallon oil tank, staining was detected on the side of the tank and inside of the vault, indicative of several spills and/or overfills." CHIEE (1987b) also noted ". . . a small puncture hole on the top of the [westerly caustic soda] tank which did not seem to have any environmental significance because the pH of the soil on the sides and bottom of the tank were neutral. . ." but "[a] small area . . . of soil underneath the tank had a pH of nine (9)." No unusual environmental conditions were reported by CHIEE (1987b) upon removal of the second caustic soda tank or the ASTs, with the exception that the 3,500-gallon sulfuric acid ASTs were noted to be "very rusty."

CHIEE (1987b) noted that upon removal of the 20,000-gallon No. 6 oil tank there was "visibly contaminated soil." It was further noted that "the groundwater in the excavation contained a thin film of oil." CHIEE stopped the excavation and "the proper authorities were notified of the oil contamination." An undocumented amount of contaminated soil was stockpiled during removal of the UST. Further excavation of contaminated soil (to the bottom of the cement vault) was performed on May 20, 1987. When it was determined that contaminated soil was present below and adjacent to the north wall of the cement vault, CHIEE excavated six test pits in the area of the UST to preliminarily evaluate the extent of contamination. Evidence of hydrocarbon contamination was noted in three of the test pits (TP-1, TP-4, and TP-5). Copies of the test pit logs are included in Appendix C; the locations of the test pits are shown on Figure 10.

The two 1,000-gallon diesel USTs were excavated from Lot 1235-2A on May 5, 1987. CHIEE (1987b) notes that "the integrity of the tanks were inspected and they were found to be in good condition. The area was then backfilled and regraded." The original purpose and date of installation of these USTs is not referenced in the CHIEE (1987b) report or other reports reviewed by SHA.

With regard to other chemicals used during Kendall's tenure at the western portion of the Site, sodium hypochlorite (bleach) was stored in the "chemical tank house", which had been converted from the former wheelhouse situated south of the bleachery. Other chemicals used by Kendall are referenced in Attachments A and B of Cole's letter to the MADEQE dated August 5, 1987; a copy of this correspondence is included in Appendix B.2. These chemicals generally include various surfactants, alcohols, and dyes, and are generally consistent with materials found by Weston & Sampson during a "vacant building inventory" conducted on January 12, 1990 pursuant to

[17] Again, according to Mr. Cole who purchased and installed the USTs, the volume was 9,500-gallons, not 5,000-gallons, as reported by CHIEE, 1987b.

requirements by USEPA (Weston & Sampson, 1990a). Weston & Sampson also noted the presence of machine and lubricating oils, boiler treatment chemicals, and other solid type wastes.

With regard to chemicals possibly in use on Lot 1235-2A, CHIEE (1987b) also notes that "chemicals related to pest control (rats) had been used by Stop & Shop (Records from the Walpole Board of Health). The foundry, Cosmec, uses some solvents (most likely methyl ethyl ketone) to clean their printing plates. The sand used to make the molds for casting the metals may contain some metals such as zirconium and titanium. . ."

It is also noted that on July 28, 1993, the MADEP issued a Notice of Responsibility (NOR) to Stop & Shop in response to "reports concerning the release/threat of release of about 400 gallons of hydraulic oil from one of [its] compaction machines" (MADEP, 1993). No information indicating that any response actions were taken by Stop & Shop was reviewed by SHA.

2.4 Summary of Prior Investigatory Activities and Removal Actions

Characterization of environmental and hydrogeologic conditions at the Site was initiated in March 1985, and was generally carried through 1990. Site characterization work was followed by design and implementation of a Removal Action to address the presence of asbestos in soils in both On- and Off-Facility portions of this Site in 1991 and 1992. Key investigatory and remedial work completed since 1985 is summarized briefly below. Results of analysis of asbestos samples collected in conjunction with a number of the following key investigations are discussed in Section 4; results of analysis of samples collected for chemical analyses are discussed in Section 5. These data are heretofore referred to as "existing data" in this report.

2.4.1 Goldberg-Zoino & Associates, Inc. (GZA), March and April 1985

Site characterization activities were initiated in March 1985 when Goldberg-Zoino & Associates, Inc. (now GZA GeoEnvironmental, Inc. [GZA]) completed two phases of Site assessment for Shaffer Realty Corporation, immediately prior to Shaffer's assuming ownership of the Kendall property. GZA's work was completed on portions of the Site located west of South Street, (Lots 1235-1 and 1235-4). GZA completed its work in two separate phases between March and April 1985. The first phase included drilling nine shallow test borings, with monitoring wells installed in each boring. GZA screened soil samples using a photoionization detector (PID), and screened groundwater samples for pH and specific conductance, as well as for the presence of total volatile organic compounds (VOCs), using a gas chromatograph (GC). A report of GC screening results in "relative retention times" rather than specific chemical concentrations was provided by GZA. A map showing former GZA well locations is included as Figure 10.

GZA found that several of the soil samples collected during the second phase investigation on Lots 1235-1 and 1235-4 exhibited elevated concentrations of VOCs. The groundwater samples generally exhibited elevated pH and conductivity values, especially at locations GZ-6, GZ-7 and W-1. VOCs believed to be indicative of the presence of oil in the groundwater at the Site were detected in several of the new observation wells. GZA attributed the presence of VOCs and elevated pH and conductivity levels to leakage from underground fuel tanks and the underground caustic storage tank located on the north side of the former mill building on Lot 1235-1. GZA did not note the presence

of asbestos in fill materials at the Site except for a reference to a gravel-covered "asbestos disposal area" on the south side of the former mill building and notes on boring logs.

2.4.2 Initial Asbestos Sampling, November 1986

A review of the Roy F. Weston, Inc., Oil and Hazardous Materials (OHM) Spill Prevention and Emergency Response Program Report (Weston-SPER, 1986), as well as historical information compiled by Bionetics in 1989 (see Section 2.4.4), and Shaffer (1986) indicates the following chronology associated with discovery and subsequent assessment of asbestos in soil at the Site.[18] On November 12, 1980, MADEQE notified the Kendall Company that asbestos was discovered in an excavation on the Company's South Street property. In response, Kendall covered the excavated material and a letter was received from MADEQE on December 9, 1980 indicating that the material did not pose a "threat to the public or environment."[19] Subsequently, on September 18, 1981, the Metropolitan District Commission (MDC) notified MADEQE that MDC personnel observed asbestos along the Neponset River, while working on the sewer line in that location. No specific actions were referenced in the material reviewed by SHA until October 29, 1986 when MADEQE received a complaint from a Walpole citizen regarding the presence of asbestos at the Site.

The following events subsequently took place as indicated in a letter from Kenneth A. Tarbell, P.E. to MADEQE (Shafffer, 1996) and in MADEQE correspondence (1987):

October 31, 1986	Shaffer Realty Corporation was first notified of the exposed asbestos matter;
November 1, 1986	MADEQE and Clean Harbors placed "caution" tape at the Site, and covered exposed asbestos with polyethylene;
November 4, 1986	MADEQE issued NOR to Shaffer Realty Corporation;
November 5, 1986	A chain link fence was installed;
November 7, 1986	New plastic warning signs were posted;
November 12, 1986	An on-Site meeting with MADEQE and Shaffer representative, Kenneth A. Tarbell, P.E. was held; and
November 13, 1986	A meeting with MADEQE and USEPA was held.

On November 17, 1986 Weston-SPER assisted USEPA and MADEQE representatives, pursuant to a Technical Assistance Team (TAT) contract at the Site, "to define the visual extent of asbestos waste at the South Street asbestos Site in Walpole, MA, and substantiate if a public health threat and environmental problem exists according to guidelines established under CERCLA." Weston-SPER's Technical Direction Document (TDD) is included in a report entitled "South Street Asbestos Site, Walpole, MA, Preliminary Investigation," dated November 17, 1986, and describes observations and sampling conducted by USEPA, MADEQE, and the Weston-SPER TAT. The conclusion of the TDD states that "from analytical results of samples collected by the MADEQE,

[18] Selected correspondence regarding the presence of asbestos at the Site is included in Appendix B.6.

[19] Note that the November 12, 1980 letter mistakenly references Kendall's West Street Property. SHA confirmed with Mr. Cole (Cole Personal Communication, 1999) that the material was in fact found on the South Street Property.

it is evident that asbestos exists at the South Street asbestos Site in amounts ranging from <1 percent to 80 percent."

2.4.3 CHIEE, February through September 1987

As noted above, following a preliminary investigation of asbestos at the Site, MADEQE sent a NOR letter to Shaffer Realty Corporation on November 4, 1986. Subsequently, the "Department received a copy of GZA's [1985 Site Assessment] reports on November 17, 1986 while gathering background information about an asbestos problem. . ." (MADEQE, 1987). A second NOR was issued from MADEQE to Shaffer Realty Corporation on January 14, 1987, which informed Shaffer Realty Corporation, among other things, that "the Department has determined that conditions at the Site constitute a release/threat of release of oil and hazardous materials." Shaffer was required to "immediately retain the services of a professional environmental engineering firm to conduct an investigation and assessment of Site conditions."

In response to the two NORs, Shaffer Realty Corporation retained CHIEE to complete a Site Characterization. CHIEE's work was summarized in two separate reports (CHIEE 1987a and 1987b). CHIEE's services included a review of file information and completion of a historical review of the Site; limited sampling of a mound of asbestos debris and soil sampling in an area behind the Cosmec building located in the southeast corner of Lot 1235-2A to determine asbestos content; excavation and on-Site stockpiling of approximately 240 cy of material from an unpaved roadway behind the Cosmec facility which was confirmed to be contaminated with asbestos material;[20] and cleaning and removal of five USTs and five ASTs from the Site. CHIEE also performed a limited follow up test pit assessment of an area of oil-contaminated soil in the vicinity of a former No. 6 fuel oil tank located in the rear yard area of the former mill building on Lot 1235-1. Lastly, CHIEE sampled groundwater from wells previously installed by GZA at the Site for VOCs by USEPA Method 624, oil and grease by American Petroleum Hydrocarbon Association (APHA) Method 503, and pH by USEPA Method 150.1 (refer to Section 5).

CHIEE concluded that "the past field work on this Site has identified several conditions which warrant further investigation on the property. These include asbestos, # 6 fuel oil, and elevated pH. The presence of these contaminants is a direct result of past industrial processes that have occurred on the Site." CHIEE also concluded that "the preliminary groundwater sampling and analysis performed in May. . . did not produce conclusive results. The laboratory reported that several of the samples extracted from the monitoring wells foamed during the volatile organics analysis, possibly indicating the presence of surfactant." (CHIEE, 1987b). CHIEE proposed additional subsurface investigations, but to our knowledge, CHIEE performed no additional work at the Site.

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[20] CHIEE 1987b does not include a map showing where the asbestos materials were removed or a well-documented description of the removal. However, CHIEE notes that the asbestos materials were excavated from "behind the small Cosmec Co. building. . .", and that the material "needed to be excavated behind the Cosmec building because it constituted an environmental hazard when trucks from Stop & Shop continually drove over it." On this basis, it appears that CHIEE removed the asbestos materials from an area south of the small building occupied by Cosmec in the southeast corner of Lot 1235-2A (this material was likely placed in the Area of Containment [AOC] during Canonie's RA actions). This building was located east of, and adjacent to the building formerly occupied by Stop & Shop, and trucks accessing Stop & Shop likely used the area south of the building to access a truck dock.

2.4.4 The Bionetics Corporation, January 1989

In January 1989, Bionetics was retained by USEPA to complete a historical Sanborn Map and aerial photograph analysis of the Site. Bionetics reviewed four Sanborn Maps dated 1904, 1911, 1918, and 1927. In addition, Bionetics reviewed four aerial photographs dated 1952, 1969, 1980, and 1981. Bionetics (1989) cataloged post-1903 development of the Site as evidenced from review of the Sanborn Maps and aerial photographs, and made notes of other physical site attributes such as possible fill areas, excavation areas, and alterations to Lower Mill Pond over time. No environmental samples were obtained or analyzed by Bionetics.

2.4.5 Dames & Moore, Inc., January 1989 through August 1990

On September 28, 1987, USEPA approved an Immediate Removal Action at the South Street Site (NUS, 1991). On December 15, 1988, the USEPA issued an Administrative Order for Removal Action (the "First Order") to Shaffer Nominee Trust and BIM Investment Trust which incorporated an approved work plan for a Site Assessment to "evaluate the vertical and horizontal distribution of asbestos at the Site; to assess the location of other known or suspected contaminant sources, and to provide a basis for planning a Removal Action at the Site. . ." (Dames & Moore, 1990). In approximately January 1989, Dames & Moore initiated a Site Assessment at both On- and Off-Facility portions of the Site.

To meet the stated objectives, Dames & Moore obtained samples of soils from 207 On-Facility shallow borings and 163 Off-Facility shallow borings (i.e., to depths of approximately 2 feet [ft] below the original ground surface [bgs]). In addition, Dames & Moore drilled fourteen deeper borings (i.e., to depths ranging up to 41 feet bgs) on the On-Facility portion of the Site and installed groundwater monitoring wells (MW-1 through MW-14) in each On-Facility deep boring. Deep soils were sampled at each boring location (except MW-14) and, subsequently, groundwater was sampled from each monitoring well. Samples of sediment from the Neponset River, the tail race area, and the former settling basins were also obtained. The results of sample analyses are summarized in Dames & Moore's "Site Assessment Report" (1989) which also included a Site Historical Review, a general discussion of regional and Site-specific geology and hydrogeology, and a discussion of Site conditions and physical characteristics. The results of a review of Dames & Moore's data are included in Sections 4.0 and 5.0 of this report. The locations of Dames & Moore's wells, of which only wells MW-1 and MW-13 are known to still be present at the Site, are shown on Figure 10.

On October 4, 1989, Dames & Moore issued a "Removal Plan, South Street Site, Walpole, Massachusetts." In response, USEPA issued a letter on December 20, 1989 with recommendations for further investigative activities. Specifically, among other things, USEPA required follow-up sampling at all Off-Facility locations where asbestos was detected at concentrations of one percent or greater in previously collected soil samples. Field work for the supplemental investigation began on June 7, 1990 and continued for five working days. An additional 58 shallow borings were advanced at three Off-Facility locations during the supplemental investigation. The results of the supplemental asbestos sampling and analysis, as well as recommendations for interim measures, are provided in Dames & Moore's report entitled "Supplemental Investigation Report, South Street Site, Walpole, Massachusetts" dated August 30, 1990. A review of these data is also included in Section 4.0 of this report.

2.4.6 Weston & Sampson Engineers, Inc., January through May 1990

The December 20, 1989 USEPA letter commenting on Dames & Moore's 1989 Removal Plan submittal also included requirements for a geophysical survey of areas of the Site, and an assessment of materials within the vacant building on Lot 1235-1. On the basis of documents reviewed by SHA, Weston & Sampson was retained to complete an electromagnetic (EM-31) survey and a magnetometry survey of two areas including an unpaved area located on Lot 1235-1, north of the former mill building, and in an area near an abandoned garage located at the rear of Lot 1235-1 adjacent to Clark Avenue. Weston & Sampson also subcontracted the services of Hager-Richter GeoScience, Inc. to complete a ground penetrating radar survey of an area approximately 50 feet by 50 feet in size immediately north of the building located in the southeast corner of Lot 1235-2A. Results of the electromagnetic and magnetometry survey indicated the presence of a large metallic object in the area adjacent to Clark Avenue (Weston & Sampson, 1990b). Results of the ground penetrating radar survey indicated that "no evidence for the presence of buried tanks was found in the ground penetrating radar (GPR) data. Three possible buried pipes were identified in the survey area." (Hager-Richter GeoScience, 1990).

On May 14, 1990, Weston & Sampson completed the UST investigation referenced in Section 2.3.1. As noted, an UST approximately 6 feet in diameter and 32 feet in length was uncovered during Weston & Sampson's test pit excavation program. On the basis that the UST did not appear to represent a direct threat to "navigable waters," Weston & Sampson's letter of May 30, 1990 implies (but does not explicitly state) that the UST was reburied, and left for future actions pursuant to the jurisdiction of the MADEP (Weston & Sampson, 1990c).

On January 12, 1990, Weston & Sampson conducted a walk-through of the former Kendall facility to perform an inventory of "all containers within the facility and the physical and chemical nature of the contents of each container" (Weston & Sampson, 1990a). Results of the survey were consistent with the building's former use for bleaching and mercerizing of cotton products. According to Weston & Sampson (1990a), "the facility inventory identified 103 different containers of which 26 were full or partially full. Samples were collected from 10 containers based on the quantity of material in each container and lack of documentation on the container." Weston & Sampson (1990a) further concluded that "the analytical program produced one sample which exhibited a pH reading exceeding the [Resource Conservation and Recovery Act] RCRA standard for corrosivity. This sample was collected from Container 17 which contains approximately 2 gallons of liquid." A letter to Campbell et al from the USEPA, dated July 31, 1990 (USEPA, 1990) indicates that based on Weston & Sampson's inventory report the USEPA was "satisfied with the status of the containers. No addition work is required at this time related to the containers or their contents." Observations made during SHA's May 21, 1999 Site visit suggest that containers described above within the former mill building have subsequently been removed.

No samples of soil, sediment, surface water or groundwater were obtained or analyzed by Weston & Sampson.

2.4.7 Canonie Environmental Services Corporation, 1990 through 1993

In 1990, Canonie initiated work on a revised removal plan to respond to the First Order (Section 2.4.5). Following analysis and engineering, Canonie produced a document entitled "Short-Term Measure Response Plan, Engineering Evaluation and Cost Analysis" in January, 1991, and a document entitled "Pre-Construction Design Sampling Work Plan" in February 1991. On January 31, 1992, USEPA issued a second Administrative Order for Removal Action ("Second Order") to Shaffer Realty Nominee Trust, BIM Investment Trust and Grace. Following additional USEPA review and response, the final "Removal Action Plan, South Street Site" was issued in August 1992.[21] Canonie indicates that RA activities were actually initiated in July 1992, and were completed in December 1992, with a small amount of additional work completed in May, 1993. The following work was completed as part of the RA:

- Clearing and grubbing activities on various portions of the Site;
- Relocation of the sanitary sewer formerly located south of the former mill building to an area just south of the Site;
- Limited demolition activities to address the presence of certain tank saddles and a former pipe bridge located south of the former bleachery;
- Temporary diversion of the Neponset River;
- Construction of a plate arch culvert approximately 400 feet in length along the original alignment of the Neponset River to prevent potential future erosion of asbestos-containing soils (ACS) from the banks of the Neponset River in this area;
- Excavation of ACS in areas where asbestos concentrations were found to be equal to or greater than 1 percent;[22]
- Consolidation of ACS excavated from various areas of the Site to the AOC located south of the former mill building on Lots 1235-1, 1235-8, 1235-4, and 1249 and subsequent coverage of these materials with 2 feet of clean soil and 6 inches of seeded topsoil;
- Excavation of ACS from the former mill tail race with consolidation of these materials in a high density polyethylene (HDPE)-lined containment cell constructed in former Settling Basin No. 2 (a/k/a Lagoon No. 2), and subsequent coverage of the HDPE liner with 2 feet of clean soil, and 6 inches of vegetated topsoil.

It is noted that while ACS placed in the general AOC south of the former mill building was stable, Canonie notes that "the Tail Race sediments had a high moisture content and exhibited very little bearing capacity. Stabilization of these sediments was necessary for incorporation into the Settling Basin No. 2 containment cell. A mixture of one part cement to two parts sand was utilized to stabilize the Tail Race sediments" (Canonie, 1993a). Canonie concluded that the "Removal Action is effective in mitigating the actual or potential release of asbestos from the South Street Site. Removal Action work was performed in accordance with the USEPA-approved work plans and met the project objectives as defined in the approved work plans" (Canonie, 1993a).

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[21] This plan included a number of related documents that are referenced in the attached Bibliographic Reference List.

[22] ACS removal areas are described further in Section 4.0, and shown on Figure 15.

2.4.8 NUS Corporation, December 1990 through January 1991

On January 11, 1991, NUS produced a report entitled "Final Screening Site Inspection, Shaffer Realty Trust, Walpole, Massachusetts" for the USEPA. NUS provided a review of existing documentation, and included within their report, a Site description; a review of Site activities/history; a review of storage tanks; a chronological history of previous work and investigation; a description of the environmental settings; and a summary of their review. No environmental samples were obtained or analyzed by NUS.

2.4.9 Normandeau Associates, Inc., 1990 through 1997

In 1990, Normandeau Associates, Inc. (Normandeau) was retained in connection with Canonie's Removal Action activities to delineate wetland areas surrounding the Site that were relevant to the Canonie work. Consequently, Normandeau's activities focused primarily on areas proximate to the Neponset River both east and west of South Street, and on areas proximate to the former Settling Basin and tail race area west of the former mill building. In January, 1992, Normandeau issued a report entitled "Assessment of Asbestos Removal Plan Effects on Wetland Resources of the South Street Site, Walpole, Massachusetts." Within that report, Normandeau summarized the results of wetland and wildlife delineation, and probable temporary and long-term impacts of the asbestos mitigation activity being planned by Canonie. Normandeau concluded that "the asbestos removal plan will have minor temporary and long-term effects to existing wetland resources on-Site" (Normandeau, 1992a).

In October, 1992, Normandeau issued a report entitled "Wetland Mitigation Design, South Street Site, Walpole, Massachusetts" (1992a) which described the plan for restoration and compensation for wetland disturbance during the RA. Normandeau noted that "approximately 0.49 acres of temporary impacts to wetlands from ACS removal, access road impacts, and sewer line relocation will be mitigated through in-place restoration of the impacted wetlands." Normandeau further noted that "permanent impacts to wetlands and their wildlife habitat, groundwater recharge/discharge, and shoreline protection functions will be compensated for in a newly created 0.30 acre forest to wetland. The total flood storage losses will be mitigated in the compensatory wetland. . . constructed between the former Tail Race and the Neponset River."

Also in 1992, Normandeau installed three piezometers (PZ-1 through PZ-3) to monitor groundwater levels prior to asbestos RA activities, although no logs for these explorations are included with Site documentation. Samples of groundwater from these piezometers were collected by Normandeau in June 1992 and submitted for chemical analyses for VOCs, selected metals, and water quality parameters (see Section 5.3). An additional three piezometers (PZ-4, PZ-5, and PZ-6) were installed by Normandeau in the newly created wetland area in December 1992 (Normandeau, 1993). No environmental samples were collected from piezometers PZ-4, PZ-5, and PZ-6. The locations of the PZ-series monitoring points are depicted on Figure 10.

Following completion of the RA, a 5-year wetland Maintenance and Monitoring Plan was initiated in July, 1993. The most recent wetlands monitoring report in possession of SHA was prepared by Normandeau in 1997 (Wetland Mitigation Monitoring Report No. 5, Final, October 1997). The report concludes "the objectives of restoring values to temporarily impacted wetlands and

compensating for permanent wetland impacts should be met as the plant communities develop. There are no problems currently identified to prevent this objective from being met. . ."

2.4.10 Massachusetts Department of Public Health/Agency for Toxic Substance and Disease Registry, December 1992 through February 1993[23]

In the late fall of 1992, the Bureau of Environmental Health Assessment of the Massachusetts Department of Public Health (MDPH) and the federal Agency for Toxic Substance and Disease Registry (ATSDR) initiated a Preliminary Public Health Assessment of the South Street Site. The Assessment included a Site visit by MDPH and ATSDR representatives on December 3, 1992, as well as an assessment of demographics, land use, and natural resource use; an assessment of community health concerns; an assessment of environmental contamination and other hazards; a pathway analysis; an assessment of public health implications; and conclusions and recommendations.

Initial release of the Preliminary Public Health Assessment Report was made in February, 1993, and on August 22, 1994, a release for public comment was made. On September 29, 1995, the final Preliminary Health Assessment Report for the Site was released (United States Department of Health & Human Services, 1995). Recommendations were made in the report "to further characterize the contamination of various on-Site environmental media and determine the usage and quality of private groundwater in the area." No environmental samples were collected or analyzed by MDPH or ATSDR as a component of this work.

[23]The final Preliminary Health Assessment Report produced as a result of this work was not released until September 29, 1995; however, most of the work referenced in this report was completed by February, 1993.

3.0 GEOLOGY AND HYDROLOGY

The most thorough review of geology and hydrogeology at the Site to date was completed by Dames & Moore (1989a). Unless otherwise noted, this report constitutes the key reference for the summary of Site geology and hydrology provided below. A summary of previously completed borings and monitoring wells at the Site is included as Table 2.

3.1 Geology

The surficial geology of Walpole is characterized by highly varied glacial and post-glacial deposits, and an irregular bedrock surface. Regionally, a Wisconsin-age glacial till exists as a veneer over the bedrock surface. Richard P. Volckmann (1975) reports that till thicknesses are typically up to 15 feet, with thicknesses up to about 40 feet in bedrock valleys. The till reportedly consists of a poorly graded mixture of silt, sand, gravel and cobbles, with the presence of boulders (Volckmann 1975).

Referencing Volckmann (1975), Dames & Moore reports the presence of two water-lain deposits in the vicinity of the South Street Site that overlie the glacial till, both deposits being related to glacial Lake Medfield. These deposits are:

- The Mill Brook Deposits, located north of the Neponset River; and
- The Neponset River Deposits, located south of the Neponset River.

These deposits reportedly consist of sand and gravel with minor amounts of silt formed as kames and kame deltas.[24] Dames & Moore, again referencing Volckmann (1975), indicates that the boundary between these deposits crosses the Site coincident with the Neponset River.

During field activities completed in 1989, Dames & Moore reports that predominant soils at the Site include fill overlying "glacial soils and gravels." The presence of organic silts is noted in two borings and the presence of loess (wind blown deposits) is reported in a third. Dames & Moore comments that "the On-Facility stratigraphy corresponds with regional geology in which glacial sands and gravels deposited in kames and deltas in proximity to the glacial front and standing water are reported."

An independent review by SHA of boring logs included in Dames & Moore's 1989 report does not corroborate Dames & Moore's conclusions about Site geology. On the basis of observations of anthropogenically-derived materials in soil samples retrieved during soil boring activities, it is clear that fill is predominant throughout much of the Site area, and that the thickness of the fill, while variable, is generally significant, reaching a depth of at least 7 feet at boring GZ-6. While SHA's interpretation of fill materials at the Site is generally consistent with Dames & Moore's, with the possible exception of northerly portions of the Site (GZ-4 and MW-1), there appears to be little evidence that either the Mill Brook or the Neponset River Deposits are currently present at the Site,

[24] Kames and kame deltas are glacial ice-contact and outwash deposits. Because these deposits are formed by fluvial processes, kames and kame deltas tend to be relatively coarse-grained (with limited silt and clay content) and permeable to groundwater flow.

or for that matter, that there is any significant presence of glacially-derived fluvial or lacustrine deposits, or that loess is present. Instead, we believe it more likely that the natural soils encountered below the fill consist primarily of glacial till which Volckmann (1975) references as being present throughout the Walpole area above bedrock. We base this conclusion on the following:

- Soils below the fill materials are described by Dames & Moore (1989a) and GZA (1987a; 1987b) as consisting largely of gravelly sands with a high silt content. The presence of clay and/or cobbles is noted on occasion as well. This gradation is more characteristic of glacial till soils than of glacial-fluvial or glacial-lacustrine soils, and consistent with Volckmann's (1975) description of glacial till soils in the Walpole area.

- Dames & Moore's boring logs contain very few references to stratification or "lenses" which would indicate a fluvial or lacustrine depositional environment. Instead, descriptions such as "medium to coarse sand, little silt, little fine gravel" or "sand and silt, little fine to coarse gravel" or "silt, clay and fine to coarse sand, trace fine gravel" are prevalent.

- Reported "N-values" (relative density of soils as determined during standard split spoon sampling) of soils below the fill are generally higher than 50 and commonly, at depth, higher than 100.[25] In SHA's experience, these N-values reflect densities more commonly associated with a basal till (densified by an overriding glacier), and not what would commonly be expected for a water-lain soil deposit.

The geologic cross-sections set forth in Figures 11 and 12 represent SHA's interpretation of Site geology on the basis of existing information. GZA's and Dames & Moore's boring logs are included in Appendix C.

It is noted that during a walking reconnaissance by SHA November 23, 1999, exposed sand and gravel was observed in a cut bank south of the Site (a portion of Lot 1249 not included as part of the Site). This material was observed to have limited silt content, and to be similar to soils described by Volckmann (1975) as the Neponset River Deposits. The topographic relief of this area was observed to be approximately 10 feet (or more) above the general grade of the Site, suggesting that the Neponset River Deposits may have been removed from, or were never present, at the Site.

Possible bedrock was encountered in three Dames & Moore borings (MW-8, MW-10 and MW-12) but in none of the GZA borings (1987a; 1987b). Dames & Moore's logs indicate that shale or weathered shale was encountered between 25 and 28 feet below grade in the three instances noted; but that boring depths as great as 41 feet below grade (MW-5) were drilled without encountering bedrock. The presence of shale is consistent with regional bedrock, a 10,000-foot sequence of sandstone, shale and conglomerate identified as the Wamsutta Formation, on maps of this region (Volckmann, 1977).

Although not explicitly called out in Dames & Moore's 1989 report, an area of exposed rock was observed by SHA in the paved area immediately north of the west end of the former mill building.

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[25] In two instances a 300-pound hammer was noted as being used to advance the split spoon in lieu of the standard 140-pound hammer.

The rock consists of conglomerate, also consistent with the Wamsutta Formation. While appearances suggest this to be a bedrock outcrop, a boring (MW-2) drilled by Dames & Moore approximately 30 feet to the south of this apparent outcrop reached a depth of 32 feet (through approximately 10 feet of fill) without encountering refusal. This suggests the rock may actually be a large boulder, again consistent with the interpretation of soils at the Site as fill or glacial till.

3.2 Surface Water Hydrology

The Neponset River is the primary surface water feature in the vicinity of the Site. The Neponset River flows northerly through Walpole, beginning at its head waters at the Neponset Reservoir in Foxboro, and discharging to Dorchester Bay approximately 20 miles from Walpole. Dames & Moore notes a number of key tributaries to the Neponset River, and further notes that all tributaries with the exception of School Meadow Brook enter the Neponset downgradient of the South Street Site. Dames & Moore reports that surface water in the Neponset River drainage basin has been classified as Class B Inland Waters, which are designated for the uses of protection and propagation of fish and other aquatic life and wildlife, and for primary and secondary contact recreation. While Dames & Moore does not report flow data for the Neponset River, a 10-year peak discharge for the Neponset at South Street of 261 cubic feet per second (cfs) is reported by Canonie (1992d).

3.3 Groundwater Hydrology

As noted above, Dames & Moore indicates that glacially derived sediments in the vicinity of the Site include the Mill Brook Deposits and the Neponset River Deposits, both water-lain soils associated with glacial Lake Medfield. Dames & Moore also notes that glacially-derived water-lain deposits in the Walpole area and "in the immediate Site vicinity" are characterized by transmissivities of less than 10,000 gallons per day per foot (1,300 square feet per day), with average well yields of less than 100 gallons per minute (gpm). Higher yields are reported in thicker coarse-grained outwash deposits in the Walpole area.

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," on December 12, 1988. This is reflected on the MADEP Site Scoring Map included as Appendix D. A key consideration in making the Sole Source Aquifer designation was that USEPA estimated 68 percent of the subject area's drinking water was provided by groundwater supplies, and further, that viable water supply alternatives reportedly do not exist. The area covered by the Sole Source Aquifer designation includes the towns of Foxboro, Medfield, and Walpole, as well as portions of Dover, Norwood, Sharon, and Westwood.

Information summarized by Dames & Moore indicates that the Town of Walpole derives its public drinking water from two distinct wellfields. The Washington Street Wellfield is located approximately 1 mile south of the South Street Site, and includes five active wells along the headwaters of School Meadow Brook on both sides of Washington Street. Well depths are reported from 30 to 73 feet below grade, and the deposits from which groundwater is derived are collectively referred to as the School Meadow Brook Aquifer.

Dames & Moore also notes that four additional municipal supply wells are maintained approximately 1.5 to 2 miles north-northwest of the South Street Site. At this location, Dames & Moore reports that four municipal supply wells with depths of approximately 37 to 57 feet below grade are located within glacio-fluvial and lacustrine unconsolidated deposits referred to as the "Mine Brook Aquifer."

It is noted that the MADEP Site Scoring Map included as Appendix D to this report does not indicate that the Site is within the Wellhead Protection Area for either wellfield. Furthermore, consistent with SHA's interpretation of Site hydrogeology, the Scoring Map does not indicate that the Site is situated within the bounds of a Potentially Productive Aquifer.

Quantification of groundwater hydraulics is not provided in Dames & Moore's 1989 report; however, Dames & Moore notes qualitatively that groundwater flow "enters the property on the east boundary of Lot 1235-2A and flows primarily west from this location throughout the Site. Groundwater flow along the Neponset River diverges (*sic*) toward the River." Dames & Moore concludes that "the net flow of groundwater in this area On-Facility is believed to discharge to the Neponset River which acts as a groundwater receptor." Discharge of groundwater to a regional sink such as the Neponset River is consistent with the common base flow condition for most streams and rivers throughout New England; however, the significant head drop within the Neponset River is anticipated to result in groundwater flow at a more oblique angle to the flow of the river than perpendicular to the River, at least in the vicinity of the Site. Nevertheless, it is expected that, except during short periods of temporary weather-related river stage increase, groundwater from the Site will discharge to the Neponset River in the vicinity of the Site, and that in this regard, groundwater from the Site does not flow to either wellfield referenced above. A groundwater contour map developed from Dames & Moore's April 27, 1989 groundwater elevation data is included as Figure 13. A summary of historical groundwater elevation measurements at the Site is included as Table 3.

Although quantification of groundwater flow is not provided in Dames & Moore, a review of the qualitative soil gradation observations reported in the boring logs provided by Dames & Moore and GZA (1987a; 1987b) indicates a relatively high percentage of silt and occasional clay within the gravelly sand soils. Furthermore, these soils are generally dense to very dense. For such unconsolidated deposits, hydraulic conductivities (K) on the order of one foot per day (ft/day) or less are preliminarily anticipated on the basis of SHA's experience. In contrast with the higher hydraulic conductivities expected for glacio-fluvial or lacustrine sediments such as those described for the Neponset River and Mill Brook Deposits, groundwater within soils such as those described at the Site would not typically be exploited as a groundwater resource, because well yields would typically be very low.

In addition to low well yields, soils of the types described at the Site would be expected to engender low groundwater seepage velocities and corresponding low rates of contaminant transport. As a preliminary estimate assuming hydraulic conductivities of less than 1 ft/day, and a hydraulic gradient of approximately 3 percent as indicated on the "Ground Water Elevation Contour Map, April 27, 1989" as provided in Dames & Moore (1989a), as well as Figure 13 of this report, seepage velocities on the order of 0.1 ft/day (40 feet per year [ft/yr]) or less are anticipated.

4.0 SUMMARY OF ASBESTOS-CONTAINING SOILS INVESTIGATIONS AND REMOVAL ACTIONS

A summary of ACS investigations and removal actions is provided below. It is noted that maps summarizing discussions below are included as Figures 14, 15, and 16.

4.1 History of Regulatory Actions

Previous asbestos-related investigations performed at the Site through 1990 are summarized in Section 2.4.2, above. Following submission of Dames & Moore's 1990 Supplemental Investigation to the USEPA, on August 31, 1990, Canonie submitted a draft removal action plan to the USEPA for a remedial solution to the presence of ACS at the Site; a revised plan was submitted to the USEPA on January 24, 1991. This revised plan was approved by the USEPA on September 6, 1991. On January 31, 1992, the USEPA issued a second Administrative Order (the Second Order) requiring submission to the USEPA of a detailed removal plan, and upon approval, implementation of the plan. In accordance with the Second Order, Canonie initiated ACS removal at the Site in July 1992 following USEPA's June 30, 1992 conditional approval of the Removal Action Plan (RAP), which was submitted in final form in August 1992 (Canonie, 1992c).

4.2 On-Facility Distribution of ACS

4.2.1 Shallow On-Facility Soils

During their 1989 Site Assessment, Dames & Moore drilled 207 investigatory shallow (to 2 ft bgs) soil borings on the On-Facility portion of the Site.[26] Two samples were collected from each boring, one from a depth of 0 to 6 inches below the ground surface and the second from a depth of approximately 24 to 30 inches below the ground surface. Eighty-eight of the shallow borings were drilled on a 25-foot grid across the east section of the Site (comprised of Lots 1235-2A and 1235-2B); and 119 of the shallow borings were completed on a 25- to 50-foot grid across the west section of the Site (Lots 1235-1, 1235-4, 1235-8, and 1249). Soil samples were submitted to Hygeia Laboratories, Inc. of Waltham, Massachusetts (Hygeia) for analysis of asbestos content by polarized light microscopy (PLM). A limited number of soil samples from these shallow borings were also submitted for chemical analyses, the results of which are described further in Section 5.2.

Of the 207 sampling locations within On-Facility properties, no asbestos was detected in approximately 31% of the total number of borings (64 borings); 50% (104 borings) of the samples contained asbestos (measured as a percent by weight of the total weight of the sample) at levels below 1%; asbestos was detected in approximately 14% of the borings (29 samples) at levels greater than 1%; and approximately 5% of the samples were not analyzed by PLM but were found upon visual examination in the field to contain obvious asbestos contamination. Asbestos concentrations in soil samples ranged from non-detected up to 80% of the total weight of the sample. The highest levels of asbestos were detected in samples from borings drilled on Lots 1235-4 and 1249.

[26] The portion of Lot 1235-3 south of the Neponset River was excluded from Dames & Moore's definition of On-Facility properties.

4.2.2 Deep On-Facility Soils

Fourteen deep (to 41 ft bgs) soil borings were drilled in On-Facility portions of the Site by Dames & Moore in March 1989. Previously, nine deep (to 17 ft bgs) soil borings were drilled by GZA in March and April, 1985. Although no deep soil samples were collected for laboratory analysis of asbestos, asbestos and woven fibrous material were visually observed in fill from six of the fourteen Dames & Moore borings, and in three of the nine GZA borings at depths ranging up to approximately 15 feet below the ground surface. In addition, asbestos-like fibrous material was observed at depths up to 6.5 feet below the ground surface in two of the six exploratory test pits completed by CHIEE in May 1987 (CHIEE, 1987b). The thickness of ACS fill was most significant in the area between the former mill building on Lot 1235-1 and the Neponset River.

4.2.3 On-Facility Groundwater

Groundwater samples were collected by Dames & Moore during their 1989 Site Assessment and submitted to Hygeia, for analysis of asbestos content. Asbestos was detected in groundwater samples from all of the monitoring wells at the Site, except for well MW-11, which was likely installed upgradient of asbestos-containing fill. The highest concentrations of asbestos in groundwater samples from the Site (11,324 to 198,167 million structures per liter [MS/L]) were found in monitoring wells MW-2, MW-3, MW-4, MW-5, MW-7, and MW-8 located west and south of the former mill building on Lot 1235-1.

The presence of asbestos in groundwater samples taken from the Site is likely an artifact of the fact that the monitoring wells were installed through and screened across asbestos-containing fill. Moreover, it is unlikely that asbestos would migrate in the groundwater since it exists as a solid not as a dissolved constituent, and thus would not be transported in porous media.[27]

4.3 Off-Facility Distribution of ACS

4.3.1 Shallow Off-Facility Soils

Dames & Moore also drilled 163 shallow (to depths of approximately 2 ft bgs) investigatory borings on a 50- by 150-foot grid at Off-Facility properties[28] in 1989. In each of the Off-Facility borings, two samples were collected, one from a depth of 0 to 6 inches below the ground surface, and the second from a depth of approximately 24 to 30 inches. Off-Facility shallow sampling locations were established. Subsequently, 58 additional shallow (to depths of approximately 2 ft bgs) soil borings were drilled during Dames & Moore's 1990 Supplemental Investigation in areas where the asbestos content of soil samples collected during the 1989 Site Assessment was found to be 1% or greater.

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[27] Given sufficiently large pore diameter, asbestos could be transported in groundwater as a suspended constituent. However, on the basis of available Site-specific geologic information, it seems unlikely that such transport would occur.

[28] The portion of Lot 1235-3 south of the Neponset River was included in Dames and Moore's definition of Off-Facility properties. Other Off-Facility properties investigated by Dames & Moore are shown on Figure 15, and include properties currently defined as Off-Facility, and several properties where no asbestos was detected, and which are currently excluded from the Site per the Administrative Order by Consent for a RI/FS, USEPA CERCLA Docket No. 1-99-0027.

Similar to the approach used in 1989, two samples were collected from each of these additional borings. Shallow soil samples collected by Dames & Moore were submitted to Hygeia for analysis of asbestos content by PLM.

Investigatory shallow soil samples were collected by Canonie in April 1991 and April 1992 (Canonie, 1992b) from Lots 1245-8, 1245-9, 1232-2, and the western portion of the former mill tail race (Lots 1240-13 and 1240-14) to determine the asbestos content. In addition, in October 1992, four soil samples were collected from lot 1250-1-2 for asbestos analysis by Canonie in accordance with a request from the USEPA (Canonie, 1993a).

Just a few soil samples collected during the original Dames & Moore 1989 Site Assessment from locations in Off-Facility lots at the Site were found to contain actionable levels of asbestos. Only 11 of the original 163 soil borings completed by Dames & Moore on four of the Off-Facility Properties (Lots 1232-1A, 1232-2, 1235-3, and 1245-8) had an asbestos content greater than or equal to 1%.

No asbestos was detected in samples from 12 of the 58 soil borings collected during the Dames & Moore 1990 Supplemental Investigation on Off–Facility Lots 1232-2, 1260, 1261, 1275-5, 1275-6, 1245-8, and 1245-9. Asbestos was detected at concentrations less than 1% in samples from 16 of the supplemental soil borings; samples from 30 of the additional borings exhibited asbestos concentrations of 1% or greater.

Asbestos was not detected in the western portion of the mill tail race or in the four samples collected by Canonie in 1992 on Lot 1250-1-2 (Canonie, 1993a; refer to Figure 15 for sampling locations).

4.3.2 Deep Off-Facility Soils

Although deep soil borings were not completed in Off-Facility portions of the Site, confirmatory soil samples were collected by Canonie from the bottom and sides of asbestos removal excavations during asbestos removal activities in 1992. These excavations were expanded until samples from the side walls and bottom did not indicate the presence of asbestos at levels equal to or exceeding 1%. Samples collected by Canonie during asbestos removal activities were analyzed at an on-Site mobile laboratory by Certified Engineering & Testing Co. (Certified) of Weymouth, Massachusetts. In general, soils with non-detectable asbestos results were encountered at depths ranging from approximately 0.5 to 3.5 feet below the ground surface on Off-Facility properties (Table 4).

4.4 Distribution of ACS in Sediments

Dames & Moore (1989a) also collected samples of sediment from three On-Facility manholes (depicted on Figure 4), Settling Basin No. 2, and the mill tail race. Results of sample analysis indicated that sediment from two of the three manholes contained asbestos. Sediment from a storm sewer manhole located adjacent to well MW-3 exhibited an asbestos content of 1%; sediment from a sanitary sewer manhole adjacent to well MW-8 exhibited asbestos content of less than 1%; no asbestos was detected in sediment from a sanitary drain manhole adjacent to Settling Basin No. 2.

Four of the five sediment samples collected by Dames & Moore from within Settling Basin No. 2 contained asbestos at a content of less than 1%. One sample located on the south side of Settling Basin No. 2 exhibited an asbestos content of 50%. All five of the sediment samples collected from the mill tail race exhibited asbestos content ranging from 2 to 5%. Sediment from the tail race was subsequently excavated during RA activities and placed in a HDPE-containment cell, capping the sediments at the former Settling Basin No. 2 location (see Section 4.6.5).

Dames & Moore (1989a) collected 48 sediment samples from the Neponset River, extending to Lewis Pond generally over a depth of 0 to 6 inches. Five of these sediment samples (NU-1 through NU-5) were collected upstream of South Street (i.e., east of South Street for a distance of approximately 1,200 feet); the remaining sediment samples (ND-1 through ND-43) were collected "downstream" in the Neponset River ("downstream" was defined by Dames & Moore as the 4,100 feet of river between [and west of] South Street and West Street, including all of Lewis Pond). One sediment sample, ND-1 exhibited an asbestos concentration of 5%; samples collected at several other locations had levels equal to 1% asbestos. These results are included in Figure 16.

4.5 Occurrence of ACS in Surface Water

Dames & Moore collected surface water samples from one location in Settling Basin No. 2, from one location in the mixing area, and from two locations in the mill tail race (Dames & Moore, 1989a). Asbestos was detected in the surface water sample from the mixing area, at 89.4 MS/L. Analysis of the surface water sample from Settling Basin No. 2 indicated that asbestos was present in surface water in this location at a concentration of 983 MS/L. Concentrations of asbestos in the two surface water samples from the mill tail race ranged from 346 MS/L for the sample collected at the beginning of the tail race to 4,917 MS/L for the sample collected closest to the confluence of the tail race with the Neponset River. Settling Basin No. 2 and the mixing area were capped and the mill tail race sediments were excavated during the RA.

In addition, Dames & Moore (1989a) collected nine surface water samples from the Neponset River; two of these, NU-1-SW and NU-2-SW, were collected upstream of the Site. The remaining samples were collected sidegradient or downgradient of the Site. Six of the downgradient surface water samples (ND-2-SW through ND-7-SW) exhibited asbestos concentrations ranging from 0.36 to 2,324 MS/L. These results are depicted on Figure 16.

4.6 ACS Removal Activities

The RA completed by Canonie at the Site in response to the Second Order issued by the USEPA is summarized in the July 1993, "Draft Completion of Work Report, Removal Action, South Street Site, Walpole, Massachusetts" (Canonie, 1993a). Canonie consolidated known ACS from On- and Off-Facility portions of the Site in a single On-Facility AOC located south and west of the former mill building, adjacent to the Neponset River on Lots 1235-1, 1235-4, 1235-8, and approximately 0.5 acres of Lot 1249. In order to minimize ACS removal and transfer, the AOC was located in the area having the most significant level of ACS.

The major work activities that occurred at the Site were briefly outlined in Section 2.4.7, and are summarized below. For additional details regarding ACS removal and AOC construction activities, the reader is referred to the Canonie report referenced above.

4.6.1 Site Clearing/Demolition

Where necessary, vegetation in On- and Off-Facility portions of the Site was removed as close to the ground as possible prior to the start of removal activities in 1992. Vegetation exhibiting in-grown asbestos or that which was suspected to contain asbestos was separated and placed in the AOC.

Tank saddles located south of the vacant building on Lot 1235-1 were demolished prior to ACS removal activities. In addition, fencing was removed from the AOC, and a pipe bridge running over the Neponset River was demolished. Demolition debris was then placed in the AOC.

4.6.2 Sanitary Sewer and Storm Drain Relocation

To address concern about future erosion due to the AOC's proximity to the Neponset River, the river was channelized through an aluminum plate arch culvert (15 feet 7 inches wide, by 10 feet 2 inches high). This culvert was constructed in the river bed and bisected the AOC, extending west from the South Street bridge for approximately 400 feet. Prior to construction of the culvert, a sanitary sewer, which originally crossed the Neponset River on the west side of the South Street bridge via a pipe bridge, was rerouted around the AOC. The former sewer was abandoned in place; openings at all manholes were grouted following initiation of use of the new sewer system. Upon completion of the new system, there were no active sanitary sewer lines remaining beneath the AOC.

Prior to construction of the AOC, storm water drain lines in an area which became part of the AOC discharged to the Neponset River on the west side of South Street. In order to accommodate placement of the river diversion culvert, the existing storm water discharge pipes were relocated to the east side of South Street.

4.6.3 River Diversion and Plate Arch Culvert Construction

During construction of the plate arch culvert through the AOC, the Neponset River was diverted around the AOC by damming the river at the east side of the South Street bridge, pumping the river water from the upstream side of the dam through temporary piping placed at the ground surface on the northern river bank, and discharging the water at a location downstream of the culvert construction. Following completion of the plate arch culvert, the river dam was removed and the river was allowed to flow through the culvert. The river diversion occurred between September 3 and October 2, 1992.

According to Canonie (1993a), placement of the aluminum culvert likely increased the 100-year flood plain elevation from 160.29 feet (according to the Federal Emergency Management Agency [FEMA] Flood Insurance Study) to 161.29 feet in the area between the South Street bridge and the railroad bridge located approximately 300 feet upstream.

Prior to placement of the plate arch culvert, boulders which appeared to interfere with placement of the culvert were removed from the river bed. In addition, approximately 8 to 10 inches of sediment were removed from the river bed and engineered backfill and geotextile material was placed and compacted in the river bed area prior to placement of the culvert sections. Materials excavated from the river bed were included in the AOC.

Upon completion of the culvert, imported backfill material was placed and compacted on each side of the culvert. Geotextile fabric was laid on the river banks and backfill was placed in lifts between the banks and the culvert.

4.6.4 General ACS Excavation and Consolidation

ACS from On- and Off-Facility Portions of the Site which contained asbestos at concentrations equal to or exceeding 1%, or material containing visual evidence of asbestos, was excavated during removal activities in 1992, and was placed within the On-Facility AOC. The 1% criterion was selected as follows (Dames & Moore, 1990):

> "The 1% criterion used to identify soils as 'asbestos containing materials' (ACM), is based on the criterion used by the Massachusetts Department of Labor and Industry for asbestos-containing material and, assuming the material can be broken by hand, is the criterion cited by the U.S. Army Corps of Engineers December 15, 1987 report, 'EPA Asbestos Abatement Work, New England Division, Position Paper' to define friable asbestos-containing materials. This criterion is also referenced in the EPA document [entitled] 'Guidance for Controlling Asbestos Containing Material in Buildings,' EPA560/5-85-024."

In addition, the 1% criterion is in accordance with the definition of ACM contained in 453 Code of Massachusetts Regulations (CMR) 6.02, which regulates ACM and defines ACM as "any material containing more than 1% asbestos."

The vertical and horizontal limits of the asbestos removal excavations were estimated on the basis of existing data, primarily those collected by Dames & Moore (1989a, 1990). The horizontal and vertical limits of ACS were subsequently confirmed by analysis of soil samples collected by Canonie. According to Canonie (1993a), if confirmatory samples indicated an exceedance of the 1% cleanup criterion, the excavation was expanded until confirmatory samples indicated an asbestos content of less than 1%.

On- and Off-Facility areas from which ACS was removed were backfilled with imported clean fill and were then overlain with topsoil, seeded or sodded, and/or re-paved to be compatible with surrounding ground cover. Several samples of the backfill material were analyzed by National Environmental Testing, Inc. for metals, VOCs, and SVOCs. The results of the sample analyses did not indicate the presence of any analytes of concern.

Excavated ACS was transported in polyethylene-lined dump trucks to the AOC between October 9 and November 30, 1992. During placement and grading of ACS in the AOC and until it was covered by clean soil. ACS dust was controlled via wetting. Following placement, grading, and compaction of ACS within the AOC, a final cap of imported clean fill was placed over the entire

area. The cap was comprised of six inches of clean topsoil, placed over 24 inches of clean sand. The cap was constructed to promote surface drainage to the river at the west end of the culvert and non-pavement areas of the cap were vegetated to limit erosion. An eight-foot high barbed-wire security fence was constructed around the perimeter of the AOC in December 1992.

Samples of the clean fill used in construction of the AOC cap were submitted to National Environmental Testing, Inc. to test for the presence of USEPA Contract Laboratory Program Target Compound List (TCL) organics and Target Analyte List (TAL) inorganics. Analysis of fill samples used in construction of the AOC cap did not indicate the presence of any analytes of concern. The results of these analyses are summarized in Table 11.

A total of approximately 6,665 cy of ACS was transported from On- and Off-Facility properties and placed within the AOC. This total does not include material excavated from the mill tail race, which is discussed separately in Section 4.6.5 below.

Table 4 summarizes the amount of ACS removed from each On- and Off-Facility property, and the approximate depth of each excavated area. Figures 14 and 15 depict the location, extent and approximate thickness of the AOC. In addition, Figure 15 depicts the location and extent of the excavated areas and summary information regarding confirmatory sampling location.

4.6.5 Mill Tail Race ACS

Approximately 1,085 cy of soils/sediments from the mill tail race were excavated and placed in a HDPE-lined containment cell constructed within the limits of Settling Basin No. 2. ACS from the tail race was placed in a HDPE-containment cell rather than in the AOC due to the presence of additional contaminants, namely SVOCs, previously detected by Dames & Moore in the soils/sediment from this area.

The average depth of the excavation within the tail race was approximately 4.4 feet. Confirmatory samples were collected from the bottom and walls of the tail race excavation for asbestos analysis.

Prior to construction of the HDPE-lined containment cell, Settling Basin No. 2 was cleared of vegetation and graded. A 10-inch sand layer was placed on the bottom of the basin, and a 60-mil thick HDPE-liner was installed. Due to their high moisture content and low bearing capacity, the tail race sediments were stabilized with cement and sand and then placed within the HDPE containment cell within Settling Basin No. 2. A 6-inch layer of clean sand was then placed over the contaminated material, followed by 60-mil HDPE cap. The HDPE cap and bottom liner were then seamed together. According to Canonie, the roughly 88-foot long and 68-foot wide rectangular containment cell was covered with clean fill, and the fill was seeded. Although the thickness of the containment cell is not reported in Canonie (1993a), SHA estimates the cell to be up to approximately 17 feet thick (including approximately 2.5 ft of "clean" sand and/or topsoil placed on top of the HDPE) in the central portion of the cell based on a comparison of pre- and post-1992 topography. Figures 14 and 15 depict the location of the Settling Basin No. 2 containment area.

4.6.6 Wetland Mitigation

As noted in Section 2.4.9, Normandeau prepared a mitigation plan to satisfy state and federal wetlands-related ARARs during the RA. Following wetlands delineation and prior to ACS removal activities, Normandeau determined that the removal action would likely result in the permanent loss of approximately 0.25 acres of bordering vegetated wetlands and federal jurisdictional wetlands located on Lots 1249 and 1235-1. In addition, Normandeau estimated that approximately 0.49 acres of wetlands on Lots 1235-1, 1240-13, 1240-14, 1245-8, 1245-9, and 1249 would be temporarily impacted. Based on this assessment, Normandeau submitted their "Wetland Mitigation Design" plan to the USEPA in August 1992 (1992b); the USEPA approved this plan on November 20, 1992.

The approximately 0.49 acres of temporarily impacted wetlands were restored by backfilling with clean sandy substratum soils and at least 8 inches of topsoil, and subsequently re-vegetating with native wetland species to match surrounding vegetative cover. The permanent loss of approximately 0.25 acres of bordering vegetated wetlands and federal jurisdictional wetlands located on Lots 1249 and 1235-1 was compensated by creating new bordering vegetated wetland on Lots 1235-1 and 1235-8, in the area between the former tail race and the Neponset River.

4.7 Deed Restriction

Following creation of the AOC and the Settling Basin No. 2 Containment Cell, a "Notification and Grant of Use Restrictions and Easement" was recorded with the Norfolk County Registry of Deeds (Book 7382, Page 267), by the owners of the Site (Shaffer Realty Nominee Trust) in December 1993. This deed restriction prohibits "any activity which may disturb or disrupt the integrity of the Cap or the Culvert" within the designated "Restriction Area." A copy of the Notification is provided as Appendix B.8. The area covered by the deed restriction is depicted on Figures 3, 15, and 27.

5.0 EXISTING CHEMICAL DATA REVIEW

This section summarizes data gathered primarily by Dames & Moore during their 1989 Site Assessment activities. In addition, chemical data gathered by GZA (1985a, 1985b); CHIEE (1987b), Canonie (1992b and 1993a), and Normandeau (1992b) are discussed herein. The following discussion includes SHA's interpretation of the nature, distribution, and extent of contamination in On-Facility[29] soil, groundwater, and surface water[30] given the limitations of existing data discussed below. This section also summarizes the results of analyses of soil and sediment that was excavated and placed within the On-Facility AOC, and in the Settling Basin No. 2 containment area.

To initiate a review of existing chemical data, SHA and its subconsultant, New Environmental Horizons, Inc. (NEH), performed a data usability assessment, the results of which are described in detail in Appendix E and summarized below in Section 5.1. Only data determined to be "usable" by the data usability assessment are discussed herein; the reader is referred to Appendix E and Tables 5 through 11 for a detailed discussion of the quality and the expected bias of the analytical data.

The following discussion considers the occurrence and distribution of chemical contaminants at the Site. In this discussion benchmark chemical concentrations are compared to concentrations of chemicals previously detected at the Site. The purpose of comparisons to these benchmarks is to establish an initial relative indicator of the degree of chemical contamination present at the Site. These preliminary benchmark concentration values include Method 1 Soil and Groundwater Standards[31] promulgated pursuant to the Massachusetts Contingency Plan (MCP) 310 CMR 40.0000; federally promulgated Maximum Contaminant Levels (MCLs) and secondary MCLs (SMCLs); and published background concentrations for various metals in soils (MADEP, 1995).

Due, in part, to uncertainty in identification and quantification (discussed in Section 5.1 and Appendix E), tentatively identified compounds (TICs) are not discussed herein.

5.1 Data Usability Assessment

A Data Usability Assessment was performed by NEH to identify uncertainties in the results of previous chemical analyses and the resulting usability of this data. The primary data quality objective (DQO) defined for this usability assessment was to determine the utility of the existing data in human health and ecological risk assessments. A secondary DQO was to determine the utility of existing data in planning the Site Remedial Investigation (RI). In addition to technical judgements, the quality of the existing data was compared to that needed to support a risk assessment, under EPA's *Guidance for Data Usability in Risk Assessment (April 1992), EPA's Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses*

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[29] With only a limited number of exceptions noted in Section 5.5, no Off-Facility chemical data were obtained as part of prior investigatory activities.

[30] Sediment data is not explicitly discussed herein because all areas where sediment data had been collected were excavated during RA activities.

[31] For soil, the most conservative Method 1 standard (S-1/GW-1) is used, and for groundwater, the more conservative of the Method 1 GW-1, GW-2, and GW-3 standards is used (generally GW-1, but in some cases, the GW-3 standard is more conservative).

(December 1996). The Data Usability Assessment included an evaluation of the available data in terms of the standard data quality indices of accuracy, precision, representativeness, sensitivity, and comparability.

This evaluation indicates that, in general, a majority of the existing data can be used for planning the Site RI; however, much of the existing data can not be used in human health or ecological risk assessment because the quality of the data do not support this use and because significant data gaps exist for some compounds (e.g., VOC) due to rejection of results based on the usability assessment. Additionally, non-comparability of methods used to generate the existing data compared to current analytical methods adds to the uncertainty in the existing data. The potential that estimated non-detected results (qualified UJ) may be false-negatives renders these results inadequate for use in risk assessment. Some of the existing data were rejected as unusable and should not be considered in either risk assessment or Site RI planning. A summary of the key usability issues is set forth below. Details are presented in the body of the Data Usability Assessment technical memorandum included as Appendix E. The sources reviewed in the Data Usability Assessment (reports and tabulated data) are listed in Table E1, also included in Appendix E.

- ***VOC Data*** - Much of the VOC data are unusable for both risk assessment and RI planning. All non-detected results for VOCs in soil, sediment, and TCLP samples fall in this category and are "rejected" as unusable due to lack of preservation. Recent USEPA method updates (USEPA SW846 Method 5035) require preservation of VOCs to prevent losses from the field collection until laboratory analysis can be completed. Detected VOC concentrations in soil and sediment were "estimated" (qualified J) and are considered usable as biased low results. All non-detected results for VOCs in caustic groundwater samples, i.e., samples with pH ≥ 9, are unusable (qualified R) due to the expected loss of VOCs when the caustic groundwater was placed in a vial containing an acid preservative. Foaming of samples was anecdotally described in some of the data reports (CHIEE, 1987b). The detected VOCs in these groundwater samples were estimated (qualified J), and such estimates are considered usable as biased low results. Detected and non-detected VOC results in other groundwaters and in surface waters are considered usable for risk assessment and RI planning, with qualifications for specific VOCs based on quality issues uncovered during the data usability assessment. Non-detected results for VOCs in groundwater or surface water where the sample reporting limit is not recorded in SHA's database have limited usability for risk assessment but may be usable for planning the Site RI.

- ***SVOC Data*** - In general, SVOC chemical results in soil, sediment, groundwater, surface water, and TCLP samples are usable, with the following exceptions. Sampling results for acid extractable compounds for several soil and sediment samples and for individual compounds in groundwaters were rejected (qualified R) as unusable where the Dames & Moore (1989a) data validation review identified severe quality control (QC) exceedances. Additionally, all sediment SVOC results are considered estimated (qualified J and UJ) due to suspected sediment matrix effects. Thus, these estimated results are usable with the understanding that the accuracy, precision, and representativeness of the results may have been adversely affected by the sample matrix. Non-detected results for SVOCs where the sample reporting limit is not recorded in SHA's database have limited usability for risk assessment but may be usable for planning the Site RI.

- ***TIC Data*** - VOC and SVOC data for TICs that were not previously rejected due to the usability issues stated above (soil/sediment preservation issues and high pH in groundwater), are considered estimated results (qualified J and UJ). There is uncertainty in the estimated SVOC and VOC TIC data in terms of both identification and the quantitation issues. TIC results are screening-level data and are not definitive. Though they may indicate the presence of some classes of compounds, they cannot be used to confirm the presence, absence, or amount of specific substance.

- ***Metals Data*** - In general, metals results in soil, sediment, groundwater, surface water, and TCLP samples are usable for Site RI planning, with the addition of qualifications added for specific metals due to the potential bias in the results. A sub-set of these results are usable for risk assessment. All results for metals in caustic groundwater samples (pH $\geq$ 9) were estimated (qualified J and UJ) because the accuracy is uncertain in such a basic matrix. While some metals may precipitate out at high pH, other metals may still be soluble. Because the bias is unknown with the EPA methods used, the non-detected results may be false-negatives. Risk assessors are cautioned about employing potential false-negative metals results (i.e., non-detected results that have been estimated, qualified UJ). Additionally, all sediment results for metals are considered estimated (qualified J and UJ) due to suspected sediment matrix effects. These estimated results are usable with the understanding that the accuracy, precision, and representativeness of the results may have been adversely affected by the sample matrix. Non-detected results for metals where the sample reporting limits are not recorded in SHA's database have limited usability for risk assessment but may be usable for planning the Site RI.

- ***Cyanide Data*** - In general, cyanide results for soil, sediment, groundwater, and surface water samples are usable for risk assessment and RI planning. Non-detected results for cyanide where the sample reporting limit is not recorded in SHA's database have limited usability for risk assessment but may be usable for planning the Site RI.

- ***Asbestos Data*** - In general, the asbestos results in soil, groundwater, and air are usable with the following exceptions and qualifications. Air monitoring results for asbestos from CHIEE (1987b) are unusable (qualified R) in a risk assessment due to the cumulative effects of quality and sampling method issues. All detected asbestos results in groundwaters reported by Dames & Moore (1989a) are biased low (qualified J) due to the method-modification of counting "structures" rather than individual "fibers" of asbestos. The different asbestos methods used in the existing data set are non-comparable and have different potential method biases. For example, the phase contrast microscopy method is less accurate and may produce a high bias compared to polarized light microscopy or transmission electron microscopy methods.

- ***Total Petroleum Hydrocarbons (TPH)*** - All TPH data are considered estimated (qualified J and UJ) and are usable as screening-level results only due to method limitations that will affect the accuracy of the results. These estimated results are usable for planning the Site RI but are unusable for risk assessment purposes.

- ***pH*** - The accuracy and sensitivity of some pH results were compromised based on the use of pH paper as the measurement procedure. All pH results that were measured by pH paper were estimated (J) due to inaccuracies of this method compared to the more definitive electrode/probe/meter method. The pH paper method is also less sensitive than the electrode method. The bias in these estimated pH results is unknown.

  A variety of methods were used to measure pH in various media. Some measurements were performed using USEPA Method 209; other measurements were made with either pH paper, as discussed above, or with an electrode/meter device. It is unclear what the level of calibration of the pH meter would have been for those analyses that were not performed using the standard USEPA method. Therefore, the pH results in the existing data may be non-comparable, as different results (on the order of 0.1 to 2 pH units) can be obtained by these different methods.

- ***Historical Documentation and Transcription Errors*** – The Dames & Moore data initially entered into SHA's database was obtained from Tables 6-11 through 6-40 of the 1989 Dames & Moore Site Assessment report (1989a). These tables did not include reporting levels for all non-detected results and lacked percent solids results for all soil and sediment samples. Additionally, the Dames & Moore tabulated data indicated that 22 metals were analyzed for all media. A number of these metals were reported by Dames & Moore as non-detected but were actually not analyzed.

  Subsequently, SHA received Certified Laboratory Program (CLP) analytical data packages for the 1989 Dames & Moore Site Assessment Report and performed a 100% transcription check of the Dames & Moore data from the laboratory data report forms. The SHA database was modified as necessary to reflect the concentrations of analytes reported on the CLP analytical forms. For example, based on this transcription review, SHA determined that 13, not 22, metals had been analyzed per media.

  Data users should note that the reporting limits for non-detected results and the percent solids can be found in the CLP analytical data packages for the Dames & Moore data (1989a). However, these limits were not entered into the existing data database as the utility of the data effected had already been determined to be limited by NEH for other reasons and the level-of-effort required to hand-enter this information was determined to exceed any potential benefit.

  The laboratory data reports supporting the Dames & Moore data from 1989 were complete CLP-type data packages containing sample-specific reporting limits, percent solids for soils and sediments, sample results, and some associated QC results. A comprehensive validation of these data was not undertaken due to the level-of-effort that would have been required. However, the laboratory data reports were spot-checked and found to be method-compliant in reporting levels (sensitivity) and QC results, with some observations of bias and imprecision due to the sample matrix.

5.2 Distribution of Contaminants in On-Facility Soil

The discussion of contaminant distribution in On-Facility soil is based primarily on data obtained by Dames & Moore in 1989. As part of their assessment activities at that time, Dames & Moore sampled shallow soil generally from 0 to 2 feet below grade at a number of locations across the Site, and deeper soil at varying depths in 13 of the 14 borings that were made (no soil samples were collected from MW-14). The distribution of selected contaminants in Site soils is shown in Figures 17 through 22.

5.2.1 VOCs

As indicated in Section 5.1, VOC soil data are of limited quantitative value, with all non-detectable concentrations considered unusable, and much of the remaining concentrations considered to be potentially biased low particularly in view of the soil sampling and preservation methodologies employed. Additionally, field and laboratory contamination by acetone and methylene chloride is considered probable. Nevertheless, the prior detection of VOCs in soils (and other media discussed below) is taken as a preliminary indicator of at least a subset of VOCs which may be detected during RI activities. The VOCs detected in soil are identified in Tables 5 and 7. With the caveats noted, most exceedances of Method 1 S-1/GW-1 standards were noted in analysis of samples obtained from deep soils on Lot 1235-1 south and west of the former mill building.

5.2.2 SVOCs

The principal SVOCs detected in On-Facility soil were PAHs. Seven PAHs, namely, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene, exceeded respective S-1/GW-1 soil standards in a number of shallow and deep soil samples. Bis(2-ethylhexyl)phthalate and dimethylphthalate, both possible laboratory contaminants, are the most commonly detected non-PAH SVOCs, being detected in most deep soil samples and in at least eight of the nineteen shallow soil samples. No exceedances of S-1/GW-1 soil standards for non-PAH SVOCs were recorded in shallow or deep On-Facility soil samples. The SVOCs detected in soil samples are identified in Tables 5 and 7.

Data plotted in Figures 17 and 18 indicate that the highest concentrations of PAHs in shallow soils were generally detected in samples of surficial soil fill obtained on the east side of South Street, in the southeastern portion of On-Facility Lot 1235-2A. The highest concentrations of PAHs in deep soils were detected in samples obtained from deep fill materials on Lot 1235-1, south of the former mill building. No PAHs were detected in exceedance of S-1/GW-1 soil standards in samples obtained from the northerly portions of Lots 1235-1 and 1235-2A, or from Lot 1235-2B.

5.2.3 Metals

On the basis of historical information, certain metals are expected to be present at the Site and will likely be a focus of upcoming RI activities. Generally, prior investigations at the Site identified five

metals - arsenic, chromium, copper, lead and zinc in all shallow and deep soil samples.[32] The metals detected in soil samples are identified in Tables 5 and 7; the distribution of metals in shallow and deep On-Facility soils above preliminary benchmark concentrations are depicted in Figures 19 and 20, respectively. More detailed information is set forth below.

- In general, **arsenic** concentrations ranged from 0.71 to 15.5 milligram per kilogram (mg/kg) in shallow soil samples and from approximately 0.67 to 16.4 mg/kg in deep soil samples. These concentrations are similar to the expected background soil concentration for arsenic in Massachusetts soils of 17 mg/kg (MADEP, 1995).[33] Elevated concentrations of arsenic (ranging from approximately 32 to 68 mg/kg in shallow soil and 50.5 to 54 mg/kg in deep soil) were detected in two general locations at the Site. These locations included the area south of the former mill building and the area proximate to one shallow soil sample (L-5.5) collected from the western portion of Lot 1235-2A on the east side of South Street.

- None of the soil samples collected at the Site exceeded the S-1/GW-1 soil standard of 1,000 mg/kg for trivalent **chromium**.[34] With the exception of the area south and west of the former mill building and a limited area in the northern portion of Lot 1235-2B, chromium was generally detected in the range of the expected background soil concentration of 29 mg/kg (MADEP, 1995).

- The general range of **copper** concentrations (8 to 47 mg/kg) detected across the Site in shallow and deep soils from is similar to the level of 38 mg/kg which is considered typical for background Massachusetts soils (MADEP, 1995). Elevated copper concentrations of up to 3,180 mg/kg in shallow soil and 39,900 mg/kg in deep soil were detected on Lots 1235-1 and 1235-4 south and west of the former mill building. In addition, elevated copper concentrations of up to 2,850 mg/kg were detected in shallow soil samples from the southern portion of Lot 1235-2A. However, relatively low concentrations of copper from this same area in deep soil borings at MW-12 and MW-13 preliminarily indicate that elevated copper concentrations may be limited to the surficial fill.

- The concentration typical for **lead** in background soil samples for Massachusetts is 99 mg/kg (MADEP, 1995). The detected concentrations of lead in shallow soil from a number of locations are below this background concentration, ranging from 4.3 to 96.2 mg/kg. Similarly, lead concentrations ranged from 11.1 to 124 mg/kg in a number of deep soil samples. However, elevated lead concentrations from 163 to 51,000 mg/kg in shallow soil and from 176 to 12,700 mg/kg in deep soil were also detected. Like other metals described above, the highest concentrations of lead were detected on Lots 1235-1 and 1235-4 in shallow and deep soil samples taken south and west of the former mill building. In addition, shallow soil samples from the southeastern portion of Lot 1235-2A also exhibited elevated lead

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[32] Arsenic was not detected in the deep soil sample from MW-4.

[33] The "Background MADEP Soil Concentrations" represent the 90th percentile soil values provided in (MADEP, 1995).

[34] Refer to Footnote 11.

concentrations. However, the relatively low lead concentrations in the two deep soil samples from borings MW-12 and MW-13 preliminarily suggest that the elevated concentrations of lead may be limited to surficial fill soils in this area.

- **Zinc** was detected in each of the shallow and deep soil samples collected from the On-Facility portion of the Site. Concentrations of zinc in shallow soils ranged from 22.2 to 140 mg/kg, and from 17.5 to 110 mg/kg in deep soils across most of the Site. These concentrations are similar to or below 116 mg/kg expected for typical background soils in Massachusetts (MADEP, 1995). Elevated concentrations of zinc (up to 55,700 mg/kg), however, were detected in shallow and deep soil samples primarily from Lots 1235-1 and 1235-4 south and west of the former mill building. Elevated zinc concentrations were also detected just north of the former mill building on Lot 1235-1. In addition, zinc concentrations above the expected background concentration but below the S-1/GW-1 soil standard were detected in shallow soil samples from the southeastern portion of Lot 1235-2A like the other metals described above, analysis of the deep soil samples from this area did not indicate the presence of zinc above typical background concentrations.

Several additional metals, antimony, beryllium, mercury and nickel, were also detected in the shallow and deep soil samples from the Site. These other metals are discussed below.

- Concentrations of **antimony** ranging from 10.6 to 164 mg/kg were detected in two shallow samples (E-11 and MW-10) and one deep soil sample (MW-7). These concentrations exceeded the S-1/GW-1 soil standard of 10 mg/kg for antimony. In addition, these concentrations are elevated with respect to the MADEP background soil concentration of 1.4 mg/kg (MADEP, 1995). The samples were collected on Lots 1235-1 and 1235-4, south of the former mill building and on both sides of the Neponset River.

- Where detected, **beryllium** ranged from 0.23 to 0.55 mg/kg in shallow soil and 0.25 to 0.52 mg/kg in deep soil samples from the Site. These concentrations are within the range considered typical of background soil conditions in Massachusetts (0.4 mg/kg, MADEP, 1995). The concentration of beryllium in one shallow sample (E-11) and three deep samples (MW-6, MW-9, and MW-11) were elevated, ranging from approximately 0.73 to 1.5 mg/kg and exceeded the S-1/GW-1 soil standard of 0.7 mg/kg for beryllium.

- **Mercury** was detected in a number of samples from shallow and deep sampling locations at the Site. Concentrations of mercury generally ranged from 0.2 to 2 mg/kg in shallow soils and from 0.1 to 1 mg/kg in deep soils, generally reflecting concentrations within the range expected from background soils in Massachusetts (0.3 mg/kg, MADEP, 1995). Elevated mercury concentrations ranging from 7.2 to 37 mg/kg were detected in soil from three shallow locations south of the former mill building and from one location east of South Street on Lot 1235-2A (Location HA-2.5). The concentration in two samples, those from borings MW-10 and HA-2.5, exceeded the S-1/GW-1 soil standard of 20 mg/kg.

- Concentrations of **nickel** detected in shallow and deep soil samples from the Site generally ranged from 0.1 to 26.7 mg/kg, similar to the typical Massachusetts background concentration of 17 mg/kg (MADEP, 1995). Elevated concentrations of nickel, up to 449 mg/kg, were

detected in a number of samples, primarily from areas on Lots 1235-1 and 1235-4 south and west of the former mill building. The results of analysis of two shallow soil samples from borings MW-5 and G-10, located west and south of the former mill building on Lot 1235-1 respectively, exceeded the S-1/GW-1 soil standard of 300 mg/kg for nickel.

5.2.4 Other Parameters

5.2.4.1 pH

pH was measured in numerous shallow soil samples (from 0 to 6 inches below the original ground surface in numerous shallow borings and from 1 to 2 feet below the original ground surface in two deep borings, MW-5 and MW-10) during Dames & Moore's 1989 Site Assessment. In addition, soil pH was measured in soil samples from each of the Dames & Moore deep borings at depths ranging from 4 to 21 feet below the original ground surface. pH data collected from the Site soil are summarized in Tables 6 and 7. Shallow pH soil data are depicted on Figure 21; Figure 22 depicts the results of pH readings for deeper soils from the On-Facility portion of the Site.

In general, pH measured in soil samples from approximately 0.5 to 2 ft bgs at Lots 1235-1 and 1235-8 ranged from approximately 4.5 to 7.2 standard units (SUs). Typically, pH values measured in soil samples from Lots 1235-2A and 1235-2B ranged from approximately 4.6 to 8.5. Consistently more alkaline pH measurements, ranging up to approximately 9.3 SUs were measured for many surficial soil samples collected along the northern, southern, and western side of the former mill building on Lot 1235-1.

The pH range measured for soil samples collected from depths from 4 to 21 feet below the original ground surface on Lot 1235-1 was generally similar to the range detected in shallow samples, typically between about 5.9 to 7.0 SUs. A number of the deeper soil samples, however, exhibited significantly more alkaline pHs ranging up to 13.0. The highest pH measurement of 13.0 was for the Site's deepest soil sample, which was collected 21 feet below the ground surface in boring MW-7. Other significantly alkaline pH measurements were for samples collected from deep soil borings taken along the northern, southern, and western sides of the former mill building on Lot 1235-1, at 8 ft bgs in boring MW-2 (pH of 9.4), 6 ft bgs in boring MW-4 (pH of 10.9), and 6 ft bgs in boring MW-8 (pH of 8.0).

5.2.4.2 TPH

TPH concentrations of up to 14,000 mg/kg were detected in several shallow soil samples from the On-Facility portion of the Site. Typically, the highest observed concentrations were detected in surficial soil samples from the southeastern portion of On-Facility Lot 1235-2A. A summary of TPH concentrations measured in soil is included in Tables 5 and 7.

TPH concentrations of up to 1,700 mg/kg were detected in several deep soil samples from the On-Facility portion of the Site. The distribution of TPH in deep soil suggests a heterogeneous distribution of petroleum-related contamination. The highest TPH reading in deep soil was detected in a soil sample collected 6 feet ft bgs at soil boring MW-8, located south of the former mill building on Lot 1235-1.

As indicated in Section 5.1, the concentrations of TPH measured by Dames & Moore (1989) should be used with caution, as TPH (infrared [IR] absorption - USEPA Method 418.1) analysis is commonly affected by interferences from non-petroleum hydrocarbons and often provides results which are biased high (George, 1992).

5.2.4.3 Total Cyanide

Total cyanide was detected in three shallow soil samples (two from the southern portion of Lot 1235-2A, at Locations HA-1.5 and HA-2.5, and one from Lot 1235-4 at MW-10) at concentrations of 2.9, 35.6 and 4.2 mg/kg, respectively. Total cyanide was also detected in seven deep soil samples from across the On-Facility portion of the Site at levels ranging from 0.66 to 5.9 mg/kg.

5.2.4.4 Pesticides/Polychlorinated Biphenyls

Two soil samples were obtained by Dames & Moore (1989) from the transformer area located south of the former mill building on Lot 1235-1. These two samples were analyzed for pesticides and polychlorinated biphenyls (PCBs). One pesticide (dieldrin) was detected in one of the two soil samples at a concentration of 58 micrograms per kilogram (μg/kg). No PCBs were detected in either of the two samples from the former transformer area.

5.3 Distribution of Contaminants in Groundwater

The groundwater contaminant parameters considered in this review include those detected in samples taken from monitoring wells GZ-1 through GZ-9 and W-1 by CHIEE (1987b); MW-1 through MW-14 installed and sampled by Dames & Moore (1989a); and well points PZ-1 through PZ-3 installed and sampled by Normandeau (1992b). Monitoring wells GZ-1 through GZ-9 and W-1 were sampled by CHIEE (1987b) in May 1987 and submitted to Clean Harbors Analytical Services of Braintree, Massachusetts for chemical analyses, including VOCs by USEPA Method 624 and Oil and Grease by USEPA Method 503B. Dames & Moore collected samples from the MW-series groundwater monitoring wells and submitted the samples to Enseco Laboratories (Enseco) of Cambridge, Massachusetts for analysis, including VOCs by USEPA SW846 Method 8240, SVOCs by USEPA SW846 Method 8270, TPH by USEPA Method 418.1, and metals by USEPA Method 600. Normandeau collected groundwater samples from piezometers PZ-1 through PZ-3 in 1992 and submitted those samples to Thermo Analytical Inc. of Waltham, Massachusetts for analysis, including VOCs by USEPA SW846 Method 8240, metals by USEPA 200.7, TPH by USEPA Method 418.1, and various other water quality parameters by various USEPA Methods. The distribution of selected constituents in groundwater is depicted on Figures 23 through 26. Groundwater analytical data are summarized in Tables 8 and 9.

5.3.1 VOCs

With the caveats noted in Section 5.1, a number of aromatic VOCs (AVOCs) were detected in samples collected by Dames & Moore (1989) from On-Facility groundwater monitoring wells located on Lot 1235-1 south and west of the former mill building. Specifically,

- Benzene was detected at concentrations ranging up to 4,400 micrograms per liter (μg/l). Results of analyses of samples obtained from three monitoring wells, MW-4, MW-5, and MW-7, indicated that benzene exceeded the MCL and GW-1 standard of 5 μg/l.

- Toluene was detected in a groundwater sample from well MW-7 at a concentration of 3,200 μg/l, exceeding the MCL and GW-1 standard for toluene of 1,000 μg/l. Detectable concentrations of toluene were also present in groundwater from wells MW-2, MW-3, MW-4, and MW-5.

- Relatively low concentrations (i.e., below the MCL and GW-1 standard) of ethylbenzene were also detected in groundwater samples obtained from monitoring wells MW-2, MW-5, and MW-7.

- 2-Hexanone (a/k/a methyl butyl ketone [MBK]) was detected in groundwater from one well, MW-5, at a concentration of 21 μg/l; there is no MCL or GW-1 standard for 2-hexanone.

Several additional VOCs were detected in samples of groundwater from the Site.[35] Specifically,

- Methylene chloride, a common laboratory artifact, was detected in samples obtained from fourteen of the Site groundwater monitoring wells and piezometers. On the basis of information presented in Section 5.1, methylene chloride probably represents laboratory contamination.

- Styrene was detected in a sample from one groundwater monitoring well, MW-7, at a concentration of 1,100 μg/l. This level exceeds the MCL and GW-1 standard of 100 μg/l for styrene.

No VOCs were detected in groundwater collected by CHIEE (1987b) from the GZ-series monitoring wells; however, these data are suspect for the reasons noted in Section 5.1. In addition, no VOCs (except for methylene chloride in one piezometer, PZ-1) were detected in groundwater collected by Normandeau from the PZ-series wells in 1992. The distribution of AVOCs in groundwater at the Site is shown in Figure 23.

5.3.2 SVOCs

The principal SVOCs detected in groundwater samples from the Site are PAHs, including fluorene (up to 180 μg/l), 2-methylnaphthalene (up to 1,300 μg/l), naphthalene (up to 9,900 μg/l) and phenanthrene (up to 300 μg/l). One non-PAH SVOC, dimethylphthalate (up to 7 μg/l), was also detected in a number of groundwater samples. Although SVOCs were detected at varying

[35] Dames & Moore (1989b) indicated that two chlorinated VOCs (CVOCs), tetrachloroethene (PCE) and total 1,2-dichloroethene (1,2-DCE) were detected in groundwater from wells MW-5 and MW-9, respectively. However, during SHA's 100% transcription check of the data, these findings were found to be in error. The concentration reported for PCE by Dames & Moore in the groundwater sample from well MW-5 (21 μg/l) was a transcription error; 2-hexanone was actually detected at a concentration of 21 μg/l in the sample from well MW-5. The concentration reported for 1,2-DCE for well MW-9 was also incorrect; the only VOC detected in the groundwater sample obtained from well MW-9 was methylene chloride.

concentrations in groundwater samples obtained from a number of monitoring wells across the Site, the occurrence of the greatest numbers and highest concentrations of SVOCs occurred in groundwater samples obtained from monitoring wells on Lot 1235-1, between the former mill building and the Neponset River, and in portions of the Site downgradient of that area. A number of exceedances of the MCL and GW-1 standards are noted in that area. Figure 24 shows the distribution of SVOCs which exceed federal MCLs and/or Method 1 GW-1 or GW-3 groundwater standards.

5.3.3 Metals

Arsenic, chromium, copper, lead, mercury, nickel, selenium, and zinc were detected in one or more groundwater samples collected by Dames & Moore in March and April 1989, and by Normandeau in June, 1992. Antimony, beryllium, cadmium, silver, and thallium, were not detected in any of the groundwater samples collected by Dames & Moore (1989a) or Normandeau (1992b).

Groundwater samples collected by Dames & Moore (1989a) were filtered in the laboratory using 0.45 micron (μm) filters.[36] Therefore, the results represent dissolved metals concentrations.

Metals concentrations in several samples of groundwater collected from the monitoring wells located immediately north and west of the former mill building on Lot 1235-1 exceeded MCLs or GW-1 standards, as did the groundwater collected from monitoring wells located on Lots 1235-1 and 1235-4, south and west of the former mill building. Specifically,

- **Arsenic** was detected in groundwater samples from eleven monitoring wells at concentrations ranging from 2.6 to 517 μg/l. Concentrations of arsenic in groundwater samples obtained from wells MW-2, MW-4, and MW-5 in the western portion of Lot 1235-1 exceeded the MCL and GW-1 standard for arsenic (50 μg/l). All other arsenic concentrations were well below the MCL and GW-1 standard.

- **Lead** was detected in groundwater samples obtained from ten monitoring wells. Concentrations of lead in samples from six of the ten wells (PZ-1, MW-2, MW-3, MW-4, MW-7, and MW-9) exceeded the MCL and GW-1 standard (15 μg/l) and ranged from 33.4 to 599 μg/l. All of these monitoring wells are located on western portions of Lot 1235-1.

- The concentration of **mercury** in one well, MW-5 (1.4 μg/l), exceeded the GW-3 standard of 1.0 μg/l; however, this concentration was below the MCL/GW-1 standard of 2.0 μg/l. All other detections of mercury in groundwater were below GW-3 and MCL:/GW-1 standards.

- **Nickel** was detected in groundwater samples from eight monitoring wells, ranging in concentration from 15.2 to 466 μg/l. Concentrations of nickel in samples from four monitoring wells, MW-2, MW-4, MW-5, and MW-7, located in western portions of Lot 1235-1, exceeded

[36] It is assumed herein, that all groundwater samples submitted to Enseco by Dames & Moore were filtered in the laboratory using a 0.45 μm filter. This assumption is based on NEH's spot-check of the CLP analytical data packages and their familiarity with typical laboratory procedures at the time of these analyses.

the MCL (100 μg/l) and GW-3 standard (80 μg/l). All other concentrations of nickel were below the MCL and GW-3 standards.

- **Zinc** was detected in all but two of the groundwater samples collected from the Site. Concentrations of zinc in groundwater ranged from 10.1 to 5,580 μg/l. The concentration in two wells, MW-7 and MW-10, located south of the former mill building and south of the Neponset River on Lot 1235-1 and Lot 1235-4, exceeded the SMCL (5,000 μg/l) and GW-3 (900 μg/l) standards for zinc.

The remaining metals detected in groundwater samples, including chromium, copper, and selenium, were detected in samples at concentrations below MCLs or GW-1/GW-3 standards.[37] Although there are exceptions, most of the metals detected above the screening levels used herein were in samples from wells located in western portions of Lot 1235-1.

5.3.4 Other Parameters

5.3.4.1 pH

pH was periodically measured in groundwater from the On-Facility portion of the Site from 1985 to 1994 by GZA (1985a, 1985b), Dames & Moore (1989a), Canonie (1991c), and Normandeau (1992b, undated). Figure 26 depicts the distribution of pH measurements made during this period of about seven years. Groundwater pH data are summarized on Table 9.

In general, the pH of groundwater across much of northern and eastern portions of the Site has been measured from approximately 6 to 7.5 SUs, and has been relatively consistent throughout the data collection period. However, in groundwater samples obtained from monitoring wells located west and south of the former mill building on Lot 1235-1, alkaline conditions, as indicated by pH measurements between approximately 9 to 13.5 SUs were recorded. The highest pH value (13.5) was recorded in 1985 in groundwater samples from three wells, GZ-6, GZ-7, and GZ-9, located immediately south of the former mill building. Two years later in 1987, pH measurements of 11.4, 10.3, and 12.2, respectively, were measured for groundwater samples from these wells. Apparently decreasing trends in standard pH units were observed in groundwater from a number of (but not all) other locations south of the former mill building; for example, the pH measured in groundwater from monitoring well MW-4 was 12.4 SUs in 1989 and 7.4 SUs in 1991.

In 1992 an elevated pH value (9.9) was measured in groundwater from one piezometer, PZ-1, located downgradient of the Site in the vicinity of the confluence of the former mill tail race with the Neponset River. The pH of groundwater from other piezometers downgradient of the Site suggested slightly acidic conditions, more typical of New England groundwater, with pH measurements of 5.6 and 6.2 in 1992 (Normandeau, 1992). Canonie (1992c) measured pH in the range of 6 to 7 in piezometers RS-1, RS-2, RS-3, and RS-4, downgradient of the Site along the Neponset River.

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[37] The MCL for total chromium is 100 μg/l; the GW-1 standard for trivalent chromium in groundwater is also 100 μg/l. The SMCL for copper is 1,000 μg/l; there is no GW-1/GW-3 standard for copper. The MCL and GW-1 standards for selenium are 50 μg/l.

5.3.4.2 TPH

TPH was not detected in groundwater samples taken from the PZ-series wells. Detectable concentrations of TPH, 2.6, 3.3, and 2.4 milligram per liter (mg/l), were observed in groundwater samples taken from wells, MW-2, MW-5, and MW-7, respectively. These concentrations are above the GW-1 groundwater standard of 0.2 mg/l but should be considered only in the context of the data usability issues discussed in Section 5.1.

5.3.4.3 Cyanide

Cyanide was detected in only one groundwater sample collected from the Site, that from monitoring well MW-7, at a concentration of 40 μg/l. This concentration is above the Method 1 GW-3 groundwater standard for cyanide (10 μg/l), but well below the federal MCL for cyanide (200 μg/l).

5.3.4.4 Water Quality Parameters

Four water quality parameters, including: alkalinity by USEPA Method 2320B, chloride by USEPA Method 4500C1, hardness by USEPA Method 2340C, and turbidity by USEPA Method 2130B, were measured by Normandeau in the PZ-series piezometers (1992b). Alkalinity ranged from 83 to 521 mg/l; chloride ranged from 3.2 to 34 mg/l; hardness ranged from 42 to 55 mg/l; and turbidity ranged from 44 to 120 nephelometric turbidity units (NTUs).

5.4 Distribution of Contaminants in Surface Water

Dames & Moore (1989a) collected four surface water samples from the On-Facility portion of the Site for chemical analysis. Two of these samples were collected from the former mill tail race, one sample was collected from water in the "mixing area" located at the southwestern corner of the former mill building on Lot 1235-1, and one sample was collected from former Settling Basin No. 2. These data are summarized in Table 8 and are discussed below.

5.4.1 VOCs

Only one VOC, the probable laboratory contaminant methylene chloride, was detected in any of the surface water samples. The reported concentration of methylene chloride ranged from 3 to 9 μg/l.

5.4.2 SVOCs

One SVOC, di-n-butyl phthalate, also a common laboratory contaminant, was detected at a concentration of 5 μg/l in surface water from Settling Basin No. 2. Bis(2-ethylhexyl)phthalate was detected in the surface water sample from the mixing area (concentration of 3 μg/l). Two PAHs, naphthalene and phenanthrene, were detected in surface water from Station 1 in the mill tail race (located furthest upstream) at concentrations of 7 and 3 μg/l.

5.4.3 Metals

Arsenic, copper, lead, and zinc were detected in each of the four surface water samples. Arsenic concentrations ranged from 2 μg/l in the sample obtained from the mixing area to 7.8 μg/l in the sample obtained from Station 2 in the mill tail race. Copper concentrations ranged from 6.1 μg/l in the sample obtained from Station 2 in the mill tail race (located midstream between Settling Basin No. 2 and the Neponset River) to 29.2 μg/l in the sample obtained from Settling Basin No. 2. Lead concentrations ranged from 5.9 to 24 μg/l; concentrations of zinc ranged from 13.9 to 62.9 μg/l. In addition, barium was detected in the surface water from the mixing area at a concentration of 21.3 μg/l, and barium and nickel were detected in the surface water from Settling Basin No. 2 at concentrations of 19.7 and 18.7 μg/l, respectively.

5.4.4 pH

In 1991 Canonie measured the pH in the Neponset River adjacent to four groundwater piezometers RS-1, RS-2, RS-3, and RS-4 (1991c). Normandeau measured the pH in the river in 1992 (1992b) and measured the pH in surface water in the former mill tail race in 1996 and 1997. Figure 26 depicts the distribution of pH measurements made in the Neponset River and the former mill tail race, along with those made in Site-wide groundwater. The locations of the surface water monitoring points within the former mill tail race monitored in 1996 and 1997 were not provided by Normandeau and are therefore not depicted on Figure 26.

pH measurements ranging from 5.8 to 6.3 SUs were made in 1991 and 1992 at the Neponset River, upgradient, side gradient, and just downgradient of Lots 1235-1 and 1235-4 (RS-1, RS-2, RS-3, RS-4, and S-2). A surface water sample collected in 1992 from the wetland downstream of the Site in the vicinity of the confluence of the former mill tail race with the Neponset River (S-1) exhibited an alkaline pH of 11.4. Sampling point S-1 is located in the vicinity of groundwater sampling point PZ-1, which also exhibited are elevated pH level in 1992.

pH measurements made by Normandeau in surface water in the former mill tail race in 1996 and 1997 indicate elevated pH conditions at 9.3 and 10.0, and 9,5, respectively. Normandeau also recorded pH measurements of 7.6 in surface water in the Neponset River in 1996 and 1997.

5.5 Nature of Contamination Within the AOC and Settling Basin No. 2 Containment Cell

Dames & Moore (1989a) and Canonie (1992b) collected chemical data on soil which was subsequently excavated and placed within the AOC or Settling Basin No. 2 containment cell during asbestos removal activities in 1992. Therefore, the chemical analyses associated with these samples are considered historically representative of the material currently contained within these features, rather than in the original locations. The results of chemical analyses performed on soils placed within the AOC or Settling Basin No. 2 containment cell are summarized in Tables 10A and 10B.

5.5.1 AOC

Nine soil samples collected prior to asbestos removal activities by Canonie (1992b) from three Off-Facility properties, Lots 1232-2 and 1245-8/1245-9, were submitted to National Environmental Testing Atlantic, Inc. (Net Atlantic), of Bedford, Massachusetts for analysis of VOCs by USEPA SW846 Method 8240, SVOCs by USEPA SW846 Method 8270, and metals by USEPA SW846 Methods. Three of these soil samples, GCL-1, GCL-2, and GCL-3, were collected from depths of approximately 1 to 2 feet below the original ground surface from Off-Facility Lot 1232-2. The remaining six soil samples were collected from zero to two feet below the ground surface from Off-Facility Lots 1245-8 and 1249-9. In addition, two Off-Facility soil samples (one from Lot 1232-2 and one from Lot 1245-8) were submitted to Net Atlantic for organic and metals analysis, utilizing the Toxicity Characteristic Leaching Procedure (TCLP).

In addition, one On-Facility investigatory shallow soil sample, NA-4.5, collected by Dames & Moore (1989a) was obtained from an area of soils excavated during asbestos removal activities in 1992; therefore, it also serves to characterize the materials placed within the AOC. This sample was submitted, along with other investigatory On-Facility shallow soil samples, to Enseco for chemical analyses.

One VOC, the probable laboratory contaminant, methylene chloride, was detected in one of the soil samples placed within the AOC. No VOCs were detected in the remaining eight Off-Facility soil samples and the one On-Facility soil sample; however, a number of SVOCs, primarily PAHs, were detected in soil from both On- and Off-Facility properties. Concentrations of two PAHs, benzo(a)anthracene and benzo(a)pyrene, exceeded the respective S-1/GW-1 soil standards in two Off-Facility samples. The concentration of a third PAH, benzo(b)fluoranthene, exceeded the S-1/GW-1 soil standard in one sample.

A number of metals, namely antimony, arsenic, cadmium, chromium, copper, lead, nickel, and zinc, were also detected in the On-Facility, and in most of the Off-Facility soil samples. The concentrations of antimony (up to 72 mg/kg), copper (up to 270 mg/kg), lead (up to 330 mg/kg), and zinc (up to 327 mg/kg) were generally greater than concentrations expected within typical background soils (MADEP, 1995). The concentrations of antimony in five Off-Facility samples, and the concentration of lead in one Off-Facility sample exceeded S-1/GW-1 soil standards.

Results of TCLP analyses for the two Off-Facility soil samples indicated that the concentrations of all TCLP metals were below the threshold concentration for the toxicity characteristic. In addition, no VOCs or SVOCs were present above the analytical detection limit.

A soil stockpile described by CHIEE (1987b), and located north of the former mill building on Lot 1235-1, was sampled by CHIEE in 1987 during removal of USTs from the Site. This sample was submitted to Clean Harbors Analytical Services for analysis of metals by USEPA SW846 Methods 3050/6010, TCLP metals, and polychlorinated biphenyls (PCBs) by USEPA SW846 Methods 3540/8080. According to Canonie (1993), the soil stockpile was removed from an area north of the former mill building on Lot 1235-1 during asbestos removal activities and placed within the On-Facility AOC.

The stockpile sample had detectable concentrations of arsenic, barium, cadmium, chromium, and lead; the concentrations of barium and lead were above background levels for Massachusetts soils (MADEP, 1995). The concentration of lead (980 mg/kg) was also above the S-1/GW-1 soil standard of 300 mg/kg. However, the TCLP metals were all below the threshold concentration for the toxicity characteristic. PCBs were not detected in the soil stockpile sample.

5.5.2 Settling Basin No. 2 Containment Cell

Six samples were collected from the sediments within Settling Basin No. 2 by Dames & Moore (1989a) prior to construction of the Settling Basin No. 2 containment cell. The analytical results for these sediments represent the historical quality of the soil underlying the Settling Basin No. 2 containment area, since these sediments were left in place, and covered by the Settling Basin No. 2 containment area.

The chemical analyses for metals, including arsenic, chromium, mercury, and thallium (in two samples), identified concentrations similar to those expected for background soils in Massachusetts (MADEP, 1995). Concentrations of barium (up to 73.2 mg/kg), copper (up to 399 mg/kg), lead (up to 197 mg/kg), nickel (up to 32.1 mg/kg), and zinc (up to 322 mg/kg) are elevated relative to background concentrations of these metals in Massachusetts soils (MADEP, 1995), but do not exceed S-1/GW-1 soil standards. The pH of the sediments within Settling Basin No. 2 measured by Dames & Moore (1989) ranged from approximately 7.2 to 11 SUs. A number of SVOCs, including benzo(a)anthracene (up to 2.9 mg/kg), benzo(a)pyrene (up to 4 mg/kg), benzo(b)fluoranthene (up to 6 mg/kg), benzo(k)fluoranthene (up to 6 mg/kg), chrysene (up to 4.5 mg/kg), dibenz(a,h)anthracene (up to 0.85 mg/kg), fluoranthene (up to 5.3 mg/kg), indeno(1,2,3-c,d)pyrene (up to 3.4 mg/kg), phenanthrene (up to 5.4 mg/kg), and pyrene (up to 8.2 mg/kg) were detected in these sediments.

Dames & Moore (1989a) and Canonie (1992b) collected sediment samples from locations within the mill tail race. These sediments were removed from the tail race, stabilized using Portland cement, and placed within the Settling Basin No. 2 containment cell during the 1992 removal activities. Therefore, the analytical results for the mill tail race sediments are used herein to describe the composition of chemical constituents currently present within the Settling Basin No. 2 containment cell. These data are summarized in Table 10B.

The results of chemical analyses performed on sediments collected by Dames & Moore (1989) from the mill tail race indicated the presence of a number of SVOCs, including benzo(a)anthracene (up to 5.5 mg/kg), benzo(a)pyrene (up to 6 mg/kg), benzo(b)fluoranthene (up to 7.3 mg/kg), benzo(k)fluoranthene (up to 7.3 mg/kg), chrysene (up to 11 mg/kg), dibenz(a,h)anthracene (up to 0.96 mg/kg), fluoranthene (up to 7 mg/kg), indeno(1,2,3-c,d)pyrene (up to 3 mg/kg), phenanthrene (up to 12 mg/kg), and pyrene (up to 17 mg/kg). In addition, sediments from the mill tail race exhibited detectable concentrations of metals, including arsenic, chromium, copper, lead, nickel, and zinc. The pH of sediments placed within the Settling Basin No. 2 containment cell (which were stabilized with cement prior to placement) were neutral to alkaline, ranging from approximately 7.5 to 11.2 SUs.

One composite sample (MTR1) was collected by Canonie (1992b) from the mill tail race prior to initiation of asbestos removal activities in that area. This sample was submitted for TCLP organic and metals analyses. The analytical results for this sample indicated a lead concentration (13 mg/l) which exceeded the threshold concentration for the lead toxicity characteristic. The concentrations of all TCLP, VOCs, and SVOCs were below the analytical detection limit.

6.0 SITE CONCEPTUAL MODEL

This section summarizes development of the conceptual model for geoenvironmental conditions at the Site. Described herein is a synthesis of the existing historical, geological, and chemical data and other information. This conceptual model will be used as a basis for development of the RI Work Plan.

6.1 Land Use

Figure 27 provides a graphical summary of the findings of the existing data review and analysis. On this figure, the Site is apportioned into a number of areas, with the probability of environmental impact noted qualitatively for each area. These areas include the following:

- ***Manufacturing Areas with Current Evidence of Chemical Impact*** - This includes two areas identified by the pink and orange hatched colors on Figure 27. The first area is located west of South Street in the vicinity of the former mill building, and includes the AOC. The second area, includes Lots 1235-2A, and 1235-2B. Both areas have an extensive industrial history, and data obtained as part of pre-RA investigations indicates 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 a protective cap and culvert are not disturbed. The area east of South Street is currently used for manufacturing operations.

- ***Lower Mill Pond*** - Historical information indicates that the Lower Mill Pond (identified by the blue color on Figure 27) covered Lot 1235-3 and portions of Lots 1235-5 and 1235-6 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. Prior to the 1992 RA, asbestos was detected at a concentration of less than 1% in only a small percentage of soil samples obtained from these lots, providing further evidence of only limited historical environmental impacts.

- ***Peripheral Off- and On-Facility Land*** - Both historical information and existing chemical data indicate that areas shown in yellow on Figure 27 were peripheral to manufacturing activities, and thus have a low potential for significant levels of chemical constituents. These include the northern portion of Lot 1235-1, 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; and portions of Lots 1235-8, 1249, 1240-13, and 1240-14 at the westerly edge of the Site, upon which manufacturing activities have not occurred.

- ***Historically Residential or Undeveloped Properties*** - Historical information indicates that properties shown in green on Figure 27 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 1232-1A, 1232-2, 1245-8, and 1245-9, the 1992 RA was effective in excavating ACS. All asbestos concentrations detected in soil samples from Lots 1232-1, 1232-3, 1232-4, 1232-1B were less than 1%, and thus no further action was required. At the remainder of the lots, including Lots 1235-6 and 1235-7, only a very limited presence of asbestos was suggested

by the detection of asbestos at concentrations of less than 1% in a small percentage of soil samples obtained from these lots.

The Manufacturing Areas with Current Evidence of Chemical Impact, are expected to be a focus of RI activities.

6.2 Potential COCs

Historical data collectively indicate that metals are likely to be the primary potential COCs present at the Site. Metals are likely correlated with the long history of manufacturing operations at the Site (spanning back over more than 100 years). Existing data indicate that lead and zinc may be the most prevalent metal contaminants at the Site, with other potential metal contaminants including arsenic, chromium, copper, and to a lesser degree, mercury, nickel, beryllium, and antimony.

SVOCs, and in particular, PAHs, are also anticipated to be potential COCs at the Site. The presence of coal burning facilities at the Site and underground storage of fuel oil provide two potential sources of PAH contamination. Fuel oil releases and releases from other historical uses of petroleum at the Site also appear to have engendered petroleum hydrocarbon contamination. In consideration of the types of petroleum hydrocarbons in use at the Site, the extractable petroleum hydrocarbon fraction, rather than the volatile fraction, is anticipated to be predominant.

While existing data indicate only a limited amount of VOCs may be present in the environment, the data may have been compromised (specifically the potential for "false negatives") as indicated in Section 5.1. There are only limited historical grounds for anticipating that VOCs will be potential COCs at the Site, especially since historical manufacturing operations were typically "dry" or made use of aqueous solutions which typically did not contain organic chemicals. Additionally, no historical information is available to suggest use of large quantities of degreasing chemicals or organic solvents, with the possible exception of historical use of naphtha. As indicated by current data, VOCs present at the Site appear to be largely associated with fuel oil releases.

The introduction of high pH fluids to the subsurface has a potential to impact environmental quality by enhancing the mobility of other contaminants, most notably metals (it may also cause the precipitation, out of solution, of some metals). Because sodium hydroxide is highly soluble in water, it can impact the pH of water. However, if released to the subsurface as an aqueous solution, the resultant high pH condition would normally attenuate over time by natural buffering and flushing (mixing) within the groundwater flow system. Nevertheless, the following two factors could prolong the existence of high pH conditions at the Site:

- If released as a highly concentrated solution of sodium hydroxide, the solution would have both a density and viscosity significantly greater than that of groundwater. This may cause the high pH solution to sink in the groundwater system, and thereby limit mixing with surrounding groundwater (dense aqueous phase liquid).

- Review of existing boring logs indicates that the hydraulic conductivity of Site soils is likely to be low, as is the corresponding seepage velocity. This suggests that the rate of attenuation

of high pH by natural flushing may be less than what would be expected in a more conductive hydrogeologic setting.

Finally, it appears from historical data that there is a very low potential for other chemicals to be present at the Site, including PCBs, pesticides, and herbicides.

6.3 Anticipated Hydrogeologic Condition

The Neponset River is anticipated to be a key hydrologic feature for the Site, acting as the principal sink for groundwater flow, at and in the vicinity of the Site. Consequently, the river forms the focal point of the following conceptual hydrogeologic model:

- ***Horizontal Groundwater Flow*** - Horizontal groundwater flow over much of the Site is anticipated to be northwesterly. While groundwater discharge to the Neponset River is probable, the relatively steep head drop of the Neponset River across the Site, and the 400 foot plate arch culvert installed during the 1992 RA, should have a limiting effect on the volume of groundwater discharged to the Neponset River at the Site. In this regard, groundwater discharge to the Neponset River is anticipated to occur primarily in wetland areas at the westerly extent of the Site, and possibly to the west of the Site.

- ***Vertical Groundwater Flow*** - Available data indicate the presence of only a single overburden groundwater flow system at the Site. There is no evidence of distinct and hydraulically separate overburden hydrogeologic units, and overburden saturated thickness is limited, generally on the order of 10 to 20 feet across most of the Site. Under these conditions, and with the presence of the Neponset River, vertical flow gradients at the Site are anticipated to be generally upward near the river, but limited in magnitude. Away from the river, horizontal groundwater flow is anticipated to predominate.

- ***Hydrogeologic Boundaries*** - The anticipated upgradient Site boundary is indicated on Figure 27, and essentially runs parallel to the former railroad tracks occupying Lot 1275-5. Review of the limited groundwater flow information graphically depicted on Figure 13 suggests that the southerly and northeasterly boundaries of the Site are largely side gradient to groundwater flow. The downgradient boundary of the Site is anticipated to extend along the Neponset River, and westerly portions of Lots 1249, 1240-13, 1240-14, and possibly 1235-1.

- ***Vertical Boundaries*** - Preliminary geologic information suggests that the groundwater at the Site exists in a phreatic condition, and as noted above, that the saturated thickness of overburden soils is relatively limited. While the very dense glacial till soils directly overlying bedrock on much of the Site are saturated with groundwater, the density of these soils, and the comparatively high silt content, will have a limiting effect on groundwater flux through the subsurface. Preliminary data from Dames & Moore (1989a) suggests that shale bedrock may underlie the Site. Based on relatively low hydraulic conductivities associated with typical shale bedrock, the bedrock surface could effectively represent a lower bound to the Site groundwater flow system.

6.4 Source Areas

Review and analysis of the existing data indicate that, with the possible exception of current manufacturing operations east of South Street and an abandoned UST near the rear of Lot 1235-1, the original sources of contamination to the subsurface are no longer present, and that the term "source" at this Site must be viewed in the context of residual contamination remaining in the subsurface. In this regard, the greatest potential for contaminant sources resides within the areas described above as Manufacturing Areas with Current Evidence of Chemical Impact.

It is unlikely that the mixing area and the settling basins at the Site which were utilized by Kendall represent significant historical sources of potential COCs residing in the subsurface, other than possible sources of high pH fluids. Instead, the original source of these potential COCs is anticipated to be older. Based on the limited nature of historical documentation, the specific original sources of this material may not be determined.

Petroleum USTs and ASTs represent more definable potential source areas. On the basis of historical documentation referenced in this report, a number of potential UST and AST source areas may be reasonably well located, and these areas are shown on Figure 27.

6.5 Key Data Gaps

The elements of the RI are identified in Section 3 of the SOW, and these elements will be incorporated into the RI Work Plan. While each of the RI elements identified in the SOW could in effect be defined as a "data gap," selected key data gaps are outlined below to help bring focus to the RI Work Plan.

- ***Site Survey*** - Existing topography survey information shown in Figure 3 was composited from several referenced plans developed over six or more years ago. However, information contained in various plans used to create Figure 3 are not in full agreement. Lastly, no existing topography exists for Off-Facility areas. A new survey will be completed as part of early RI activities. This survey will include updated topography, and site features, as well as an updated review of Site boundaries.

- ***Site History*** - The industrial history of this Site spans over 300 years, with multiple Site uses documented over that time. Several tasks are recommended as part of RI activities to help confirm the current understanding of the Site history:

  - Completion of chain of title research for both On- and Off-Facility portions of the Site;
  - Review of available records regarding manufacturing operations at the Site;
  - Completing an updated search for historical aerial photographs and review of the updated materials;
  - Review of information on the 1957 fire and the fate of impacted structures;
  - Review of the operations of more recent occupants of the Site, including the Shaffer Company (Lot 1235-2B) and Stop & Shop (Lot 1235-2A); and
  - Review of Cosmec's current and recent Site operations (Lots 1235-2A and 1235-2B).

- ***Site Geology and Hydrogeology*** - Existing Site data can be used in a preliminary assessment of subsurface conditions at the Site. The data can also be used to provide initial qualitative information regarding groundwater flow, which is typically a key contaminant transport pathway. In this regard, the following are considered key geologic and hydrogeologic data gaps:

  - Confirmation of the depth and characteristics of Site fills;
  - Confirmation of the depositional history and geotechnical characteristics of natural Site soils, and the ensuing implications with regard to the direction, rate, and volumetric flux of groundwater flow;
  - Definition of possible boundaries of Site soils with other more permeable soils (i.e., Neponset River Deposits) which may exist in the vicinity of the Site;
  - Identification of the nature and hydraulic characteristics of bedrock underlying the Site, including communication between overburden soils and bedrock; and
  - Identification of zones of groundwater recharge and discharge.

- ***Groundwater Use*** - As indicated in the text of the report, it is unlikely that environmental conditions at the Site pose a threat to either of the Walpole wellfields referenced in Section 3.0. This requires confirmation. An updated review of other possible groundwater wells in the vicinity of the Site is recommended.

- ***Neponset River*** - As indicated above, the Neponset River is the primary Site surface water hydrologic feature, and is a potential migration pathway for COC migration to areas downgradient of the Site. Further quantification of the fluvial characteristics of the Neponset River is required, including:

  - Normal and low volumetric flows;
  - Stream bed composition and hydraulic characteristics;
  - Peak discharge flows, potential for flooding, both currently and historically; and
  - Possible change in stream bed morphology at and downgradient of the Site with time.

- ***Current pH Conditions*** - The current pH of Site soils and groundwater is anticipated to have important implications with regard not only to geochemical conditions at the Site, but also to the execution of RI field tasks. In particular, high pH conditions may:

  - Preclude standard approaches to sample collection and preservation; and
  - Require revisions to standard chemical laboratory analytical methodologies.

  Initial screening of Site pH conditions is expected to be a key component of the RI.

- ***COC Distribution*** - The existing Site data provide a reasonable basis to make judgments about the scope of RI activities; however, the quality of much of these data does not permit their use for risk assessment purposes. Additional data sufficient to quantify potential human health and ecological risks at the Site will be collected as part of the RI. Updated land use information, potential COCs, anticipated hydrogeologic conditions, and information about the source areas

referenced above will be used as a basis for selection of appropriate sampling techniques, sample density, vertical extent of sampling, and media to be sampled.

The scope of RI activities will focus on a sound, risk-based outcome which is protective of human health and the environment. A preliminary ecological and human health conceptual model was prepared by Menzie-Cura & Associates, Inc. (MCA) to augment the Site conceptual model. MCA's risk assessment conceptual model is attached as Appendix F, and will aid in directing RI Work Plan development.

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LIST OF ACRONYMS

LIST OF ACRONYMS

ACS	Asbestos-containing soils
ACM	Asbestos-containing material
AVOC	Aromatic volatile organic compound
AOC	Area of Containment
ARAR	Applicable or Relevant and Appropriate Requirements
AST	Above ground storage tank
ATSDR	Agency for Toxic Substance and Disease Registry
bgs	Below the original ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	Cubic feet per second
CHIEE	CHI Environmental Engineering Corporation
CMR	Code of Massachusetts Regulations
COC	Chemicals of Concern
COPC	Chemicals of potential concern
CVOC	Chlorinated volatile organic compound
cy	cubic yards
1,2-DCE	Total 1,2-dichloroethene
DQO	Data quality objective
EPH	Extractable petroleum hydrocarbon
FEMA	Federal Emergency Management Agency
FS	Feasibility Study
ft	feet
ft/day	Feet per day
ft/yr	Feet per year
GC	Gas chromatograph
gpm	Gallons per minute
HDPE	High density polyethylene
MADEQE	Massachusetts Department of Environmental Quality Engineering
MADEP	Massachusetts Department of Environmental Protection
MC	Methylene chloride
MCA	Menzie-Cura & Associates, Inc.
MCC	Massachusetts Chemical Company
MCP	Massachusetts Contingency Plan
MCL	Maximum contaminant levels
MDC	Metropolitan District Commission
MDPH	Massachusetts Department of Public Health
μg/kg	Micrograms per kilogram

μg/l	Micrograms per liter
μm	Micron
mg/kg	Milligram per kilogram
mg/l	Milligram per liter
ml	Millimeter
MSL	Million structures per liter
NEH	New Environmental Horizons, Inc.
NTU	Nephelometry turbidity unit
OHM	Oil and Hazardous Materials
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
PHC	Petroleum hydrocarbon
PID	Photoionization detector
PLM	Polarized light microscopy
ppb	Parts per billion
ppm	Parts per million
QA	Quality assurance
QC	Quality control
RA	Removal Action
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
SHA	Sanborn, Head & Associates, Inc.
SMCL	Secondary maximum contaminant levels
SOW	Statement of Work
SU	Standard pH unit
SVOC	Semi-volatile organic compound
TAL	Target Analyte List
TAT	Technical Assistance Team
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TDD	Technical Direction Document
TPH	Total Petroleum Hydrocarbons
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound
VPH	Volatile petroleum hydrocarbon

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TABLES

TABLE 1
Preliminary Evaluation of Chemicals of Potential Concern (COPCs)
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Parameter	Potential Sources Based on Historical Site Use	Range of Concentrations Present in Shallow Soil at Site	Range of Concentrations Present in Deep Soil at Site	Range of Concentrations Present in Groundwater at Site	Range of Concentrations Present in Surface Water at Site	MADEP Background Soil Concentrations*	Human Health Risk Information	Ecological Risk Information
Metals / Total Cyanide / pH								
Antimony	Dyeing process; alloy with lead to increase hardness.	57 to 164 mg/kg	9.5 to 51.6 mg/kg	ND	ND	1.4 mg/kg	Affects blood chemistry; possible reproductive toxin; carcinogenicity undetermined	High persistence, low bioaccumulation, high ecological toxicity
Arsenic	Tanning; dyeing processes; coal combustion; alloy with lead to increase hardness; rodent poison.	0.71 to 68 mg/kg	0.67 to 53.9 mg/kg	2.6 to 517 µg/l	5.4 to 7.8 µg/l	17 mg/kg	Affects skin, known potent carcinogen	High persistence, bioavailable, low bioaccumulation, toxicity depends on chemical form, beneficial to some plants and animals at trace levels.
Barium	-	NA	NA	NA	19.7 to 21.3 µg/l	45 mg/kg	Kidney toxin; not likely to be a carcinogen	High persistence, low bioaccumulation, high ecological toxicity.
Beryllium	-	0.23 to 1.3 mg/kg	0.25 to 1.5 mg/kg	ND	ND	0.4 mg/kg	Possible reproductive toxin; Probable carcinogen	High persistence, low bioaccumulation, high ecological toxicity.
Cadmium	Dyeing processes.	2 to 20.9 mg/kg	1.3 to 5.9 mg/kg	ND	ND	2 mg/kg	Reproductive toxin; probable carcinogen	High persistence, bioavailable, bioaccumulative, more bioavailable and more toxic at higher pH, freshwater organisms most sensitive to cadmium toxicity.
Chromium	Dyeing processes.	3.4 to 506 mg/kg	7.3 to 298 mg/kg	7.9 to 55 µg/l	ND	29 mg/kg	Toxicity depends on form. Cr III has low toxicity (see footnote 9 of the text for additional discussion).	High persistence, bioavailable, bioaccumulative, toxicity depends on chemical form (e.g., most common forms Cr III and Cr VI).
Cobalt	Dyeing processes.	1 sample - 7.4 mg/kg	NA	NA	NA	4.4 mg/kg	Affects blood chemistry; sensitizer	High persistence, high bioaccumulation, high ecological toxicity
Copper	-	7.9 to 3,180 mg/kg	12.3 to 39,900 mg/kg	6.4 to 99.2 µg/l	6.1 to 29.2 µg/l	38 mg/kg	Low toxicity; not classifiable as a carcinogen	High persistence, low bioaccumulation, high ecological toxicity
Lead	Manufacturing of lamp wicks, asbestos clutch/brake linings.	4.3 to 51,000 mg/kg	11.1 to 12,700 mg/kg	2.1 to 599 µg/l	19.3 to 24 µg/l	99 mg/kg	Multiple system effects at low levels in children, primarily neurotoxicity; probable human carcinogen	High persistence, bioavailable, bioaccumulative, more bioavailable at low pH, high ecological toxicity.
Mercury	Tanning; textile preservative; dyeing processes.	0.2 to 37 mg/kg	0.1 to 1 mg/kg	0.3 to 1.4 µg/l	ND	0.3 mg/kg	Toxicity depends on form. In soil and water, primarily inorganic mercury, which is less toxic than methylmercury, if consumed in fish. Neurological and developmental toxin. Possible human carcinogen.	High persistence, bioaccumulative, biomagnifiable, bioavailability and toxicity depend on chemical form (methylmercury highly toxic).
Nickel	Dyeing processes.	0.1 to 449 mg/kg	4.2 to 264 mg/kg	15.2 to 466 µg/l	1 sample - 18.7 µg/l	17 mg/kg	Causes systemic, teratogenic, and dermatological effects. Ingested nickel is a possible carcinogen. Inhaled nickel dust is a known human carcinogen.	High persistence, low bioaccumulation, high ecological toxicity
pH	Sodium hydroxide and sulfuric acid used in textile manufacturing.	4.5 to 9.3 s.u.	5.9 to 13.0 s.u.	5.6 to 13.5 s.u.	5.8 to 11.2 s.u.	-	Affects migration and solubility of compounds (e.g. metals that speciate will be in different forms).	Affects migration and solubility of compounds (e.g. metals that speciate will be in different forms).
Selenium	-	0.52 to 5.7 mg/kg	0.67 to 1.5 mg/kg	2 to 3.7 µg/l	ND	0.5 mg/kg	Affects blood enzymes, nails, and hair loss; not classifiable for carcinogenicity	Acutely toxic at high concentrations, essential nutrient at trace levels, high persistence, bioaccumulative, bioavailability and toxicity depend on chemical form, more bioavailable at high pH.

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Silver	-	1.1 to 3.6 mg/kg	2.3 - 23.5 mg/kg	ND	ND	0.6 mg/kg	Causes skin discoloration; not classifiable for carcinogenicity	High persistence, low bioaccumulation, high ecological toxicity
Thallium	-	ND	0.73 to 0.76 mg/kg	ND	ND	0.6 mg/kg	Causes hair loss; not classifiable as a carcinogen	High persistence, low bioaccumulation, high ecological toxicity.
Total Cyanide	-	2.9 to 35.6 mgkg	0.66 to 5.9 mg/kg	1 sample - 40 µg/l	ND	-	Affects thyroid and muscle tissue; not classifiable for carcinogenicity	Low persistence, low bioaccumulation, high ecological toxicity.
Zinc	Vulcanizing and rubber/tire manufacturing operations; dyeing processes.	22.2 to 55,700 mg/kg	17.5 to 12,000 mg/kg	10.1 to 5,580 µg/l	13.9 to 62.9 µg/l	116 mg/kg	Essential nutrient; high doses affect blood enzyme levels; not classifiable for human carcinogenicity	Acutely toxic at high concentrations, essential nutrient at trace levels, high persistence, bioavailability and toxicity depend on chemical form, more bioavailable and toxic at low pH.
Acid Extractable Compounds								
Benzoic Acid	-	ND	ND	1 sample - 120 µg/l	ND	N/A	No observed adverse effects	Low persistence, low bioaccumulation, low ecological toxicity.
Dimethylphenol (2,4-)	Solvents; rubber manufacturing; lubricant/gasoline.	100 to 200 µg/kg	ND	32 to 250 µg/l	ND	N/A	Hematological changes; carcinogenicity undetermined	Low persistence, low bioacccumulation, moderate ecological toxicity.
Methylphenol (2-)	Dyes; surfactants; textile scouring agent.	44 to 210 µg/kg	1 sample - 46 µg/kg	5 to 20 µg/l	ND	N/A	Neurotoxin; possible carcinogen	-
Methylphenol (4-)	Surfactants; textile scouring agent.	45 to 140 µg/kg	ND	5 to 110 µg/l	ND	N/A	Possible carcinogen	-
Pentachlorophenol	Wood preservative.	1 sample - 600 µg/kg	ND	ND	ND	N/A	Liver and kidney toxins; probable carcinogen	High persistence, high bioaccumulation, high ecological toxicity
Phenol	Use of dyes; disinfectants.	46 to 130 µg/kg	ND	6 to 130 µg/l	ND	N/A	Reproductive toxin; carcinogenicity not classifiable	Low persistence, low bioaccumulation, high ecological toxicity.
Other Acid Extractable Compounds	None expected based on historical use of Site.	ND	ND	ND	ND	N/A	-	-
Base/Neutral Extractable Compounds								
Acenaphthene	Dyeing processes; Coal/Fuel Oil usage.	73 to 940 µg/kg	220 to 21,000 µg/kg	4 to 28 µg/l	ND	N/A	Liver toxin	Moderate persistence, moderate bioaccumulation, high ecological toxicity
Acenaphthylene	Coal/Fuel Oil usage.	53 to 3,900 µg/kg	140 to 5,100 µg/kg	21 to 550 µg/l	ND	N/A	Carcinogenicity not classifiable	Low persistence, moderate bioaccumulation, moderate ecological toxicity.
Anthracene	Coal/Fuel Oil usage.	59 to 15,000 µg/kg	37 to 60,000 µg/kg	1 sample - 8 µg/l	ND	N/A	Toxicity not observed; carcinogenicity not classifiable	Moderate persistence, moderate bioaccumulation, high ecological toxicity.
Benzo(a)anthracene	Coal/Fuel Oil usage.	44 to 64,000 µg/kg	170 to 57,000 µg/kg	1 sample - 5 µg/l	ND	N/A	Probable carcinogen, carcinogenic by numerous routes, genotoxic, 10% potency relative to benzo(a)pyrene toxicity.	High persistence, high bioaccumulation, high ecological toxicity.
Benzo(a)pyrene	Coal/Fuel Oil usage.	67 to 21,000 µg/kg	140 to 49,000 µg/kg	1 sample - 3 µg/l	ND	N/A	Probable carcinogen, carcinogenic by numerous routes, genotoxic.	High persistence, high bioaccumulation, high ecological toxicity.
Benzo(b)fluoranthene	Coal/Fuel Oil usage.	73 to 50,000 µg/kg	200 to 93,000 µg/kg	1 sample - 3 µg/l	ND	N/A	Probable carcinogen, carcinogenic by numerous routes, 10% potency relative to benzo(a)pyrene toxicity.	High persistence, high bioaccumulation, high ecological toxicity
Benzo(g,h,i)perylene	Coal/Fuel Oil usage.	48 to 7,600 µg/kg	750 to 22,000 µg/kg	ND	ND	N/A	Not classifiable as a carcinogen	High persistence, high bioaccumulation, high ecological toxicity

TABLE 1
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Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Parameter	Potential Sources Based on Historical Site Use	Range of Concentrations Present in Shallow Soil at Site	Range of Concentrations Present in Deep Soil at Site	Range of Concentrations Present in Groundwater at Site	Range of Concentrations Present in Surface Water at Site	MADEP Background Soil Concentrations*	Human Health Risk Information	Ecological Risk Information
Benzo(k)fluoranthene	Coal/Fuel Oil usage.	73 to 50,000 µg/kg	200 to 93,000 µg/kg	1 sample - 3 µg/l	ND	N/A	Probable carcinogen, carcinogenic by numerous routes, mutagenic in bacteria, 1% potency relative to benzo(a)pyrene toxicity.	High persistence, high bioaccumulation, high ecological toxicity
Bis(2-ethylhexyl)phthalate	-	44 to 590 µg/kg	1 sample - 130 µg/kg	6 to 15 µg/l	ND	N/A	Affects liver; probable human carcinogen.	Low persistence, high bioaccumulation, high ecological toxicity.
Butylbenzylphthalate	-	46 to 370 µg/kg	ND	ND	ND	N/A	Affects liver; possible carcinogen	Low persistence, moderate bioaccumulation, high ecological toxicity.
Chrysene	Coal/Fuel Oil usage.	54 to 73,000 µg/kg	180 to 57,000 µg/kg	1 sample - 4 µg/l	ND	N/A	Probable carcinogen, carcinogenic by numerous routes, genotoxic, 0.1% potency relative to benzo(a)pyrene toxicity.	High persistence, high bioaccumulation, moderate ecological toxicity
Dibenz(a,h)anthracene	Coal/Fuel Oil usage.	54 to 2,900 µg/kg	200 to 11,000 µg/kg	ND	ND	N/A	Probable carcinogen, carcinogenic by numerous routes, genotoxic, same relative potency as benzo(a)pyrene.	High persistence, high bioaccumulation, high ecological toxicity
Dibenzofuran	Coal/Fuel Oil usage.	55 to 1,000 µg/kg	78 to 21,000 µg/kg	5 to 12 µg/l	ND	N/A	Kidney toxin; carcinogenicity undetermined	Low persistence, moderate bioaccumulation, high ecological toxicity.
Diethylphthalate	Dyeing processes.	59 to 230 µg/kg	61 to 700 µg/kg	3 to 6 µg/l	ND	N/A	Systemic toxin; carcinogenicity not classifiable	Low persistence, low bioaccumulation, moderate ecological toxicity.
Dimethylphthalate	Plasticizer for rubber.	40 to 1,900 µg/kg	78 to 250 µg/kg	2 to 7 µg/l	ND	N/A	Carcinogenicity not classifiable	Low persistence, low bioaccumulation, low ecological toxicity.
Di-n-butylphthalate	-	40 to 1,200 µg/kg	46 to 85 µg/kg	4 to 25 µg/l	1 sample - 5 µg/l	N/A	Reproductive toxin; carcinogenicity not classifiable	Low persistence, moderate bioaccumulation, high ecological toxicity.
Dinitrotoluene (2,4-)	-	79 to 570 µg/kg	ND	ND	ND	N/A	Neurological, hematological, reproductive toxin; carcinogenicity undetermined	Moderate persistence, low bioaccumulation, high ecological toxicity.
Dinitrotoluene (2,6-)	Dyeing processes.	ND	ND	ND	ND	N/A	Systemic toxicity may be similar to 2,4-Dinitrotoluene; carcinogenicity undetermined	Moderate persistence, low bioaccumulation, moderate ecological toxicity.
Di-n-octylphthalate	Solvents; textile processes.	ND	ND	ND	ND	N/A	Kidney, liver toxin	Low persistence, high bioaccumulation, low ecological toxicity.
Fluoranthene	Coal/No.6 Oil usage.	46 to 96,000 µg/kg	210 to 150,000 µg/kg	4 to 9 µg/l	ND	N/A	Kidney and liver toxin, hematological effects; carcinogenicity not classifiable	High persistence, high bioaccumulation, high ecological toxicity
Fluorene	Use of dyes; Coal/Fuel Oil usage.	43 to 2,700 µg/kg	2,400 to 23,000 µg/kg	4 to 180 µg/l	ND	N/A	Hematological effects; carcinogenicity not classifiable	Moderate persistence, moderate bioaccumulation, high ecological toxicity.
Indeno(1,2,3-cd)pyrene	Coal/Fuel Oil usage.	44 to 9,900 µg/kg	85 to 23,000 µg/kg	ND	ND	N/A	Probable carcinogen, carcinogenic by numerous routes, mutagenic in bacteria, 10% potency relative to benzo(a)pyrene toxicity	High persistence, high bioaccumulation, high ecological toxicity
Methylnaphthalene (2-)	Coal/Fuel Oil usage.	42 to 1,400 µg/kg	81 to 34,000 µg/kg	2.9 to 1300 µg/l	ND	N/A	Circulatory system toxin (hemolytic anemia); carcinogenicity undetermined	Moderate persistence, moderate bioaccumulation, high ecological toxicity.
Naphthalene	Use of dyes; detergents; lubricants; textile chemicals; coal/fuel oil.	35 to 3,600 µg/kg	65 to 43,000 µg/kg	15 to 9,900 µg/l	1 sample - 7 µg/l	N/A	Circulatory system (hemolytic anemia) by oral route, affects respiratory and olfactory epithelium by inhalation route; carcinogenicity undetermined	Moderate persistence, low bioaccumulation, high ecological toxicity.
Nitroaniline (4-)	Use of dyes.	1 sample - 490 µg/kg	1 sample - 230 µg/kg	ND	ND	N/A	-	-

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Nitrosodiphenylamine (N-)	Rubber manufacturing; solvents.	ND	43 to 61 µg/kg	ND	ND	N/A	Probable carcinogen	Moderate persistence, low bioaccumulation, moderate ecological toxicity.
Phenanthrene	Dyeing processes; coal/fuel oil usage.	47 to 63,000 µg/kg	150 to 220,000 µg/kg	7 to 300 µg/l	1 sample - 3 µg/l	N/A	Carcinogenicity not classifiable	-
Pyrene	Coal/Fuel Oil usage.	53 to 120,000 µg/kg	330 to 120,000 µg/kg	4 to 85 µg/l	ND	N/A	Kidney effects; carcinogenicity not classifiable	High persistence, moderate bioaccumulation, high ecological toxicity
Pesticides/Herbicides - Not generally expected due to historical Site usage.								
Polychlorinated Biphenyls (PCBs) - Transformers on Site reportedly did not contain PCB-laden oil.								
Total Petroleum Hydrocarbons (TPH)								
TPH	Fuel oil storage/use.	110 to 14,000 µg/kg	55 to 1,700 mg/kg	2.4 to 3.3 µg/l	1.7 to 3.3 µg/l	N/A	Non-cancer toxicity varies with fractions from neurotoxicity to very low toxicity; carcinogenic compounds in petroleum products classified separately.	Persistence, bioaccumulation, and toxicity varies with fractions.
Volatile Organic Compounds (VOCs)								
Acetone	Vulcanizing manufacturing operations.	14 to 29 µg/kg	40 to 220 µg/kg	ND	ND	N/A	Kidney toxin; carcinogenicity not classifiable	Low persistence, low bioaccumulation, low ecological toxicity.
Benzene	Tanning; dyeing processes; solvent for rubber; fuel oil/gasoline.	ND	2 to 110 µg/kg	1 to 4,400 µg/l	ND	N/A	Neurotoxin; known human carcinogen	Moderate persistence, low bioaccumulation, high ecological toxicity
Butanone (2-)	Cleaning fluids.	ND	14 to 520 µg/kg	1 sample - 30 µg/l	ND	N/A	Developmental toxin; carcinogenicity not classifiable	Low persistence, low bioaccumulation, low ecological toxicity.
Carbon Disulfide	Manufacture of textiles, solvent for rubber, petroleum and coal.	ND	10 to 43 µg/kg	ND	ND	N/A	Developmental toxin; Carcinogenicity undetermined	Low persistence, low bioaccumulation, low ecological toxicity.
Chloroform		1 sample - 97 µg/kg	ND	ND	ND	N/A	Liver toxin; probable carcinogen	Moderate persistence, low bioaccumulation, moderate ecological toxicity.
Dichloroethene (Total 1,2-)	Solvents (including solvent for caffeine); biodegradation product of trichloroethene and tetrachloroethene.	ND	ND	ND	ND	N/A	Causes sytemic toxicity; possible immunotoxin; carcinogenicity under review	Moderate persistence, low bioaccumulation, high ecological toxicity
Ethylbenzene	Solvents, fuel oil/gasoline.	ND	1 sample - 2,400 µg/kg	3 to 150 µg/l	ND	N/A	Developmental and liver toxin; carcinogenicity not classifiable	Moderate persistence, low bioaccumulation, moderate ecological toxicity.
Methyl-2-pentanone (4-)	Hydraulic fluid; solvents.	ND	1 sample - 17 µg/kg	ND	ND	N/A	Liver and kidney toxin; carcinogenicity undetermined	Low persistence, low bioaccumulation, low ecological toxicity.
Methylene Chloride	Solvents.	4 to 310 µg/kg	2 to 460 µg/kg	5 to 500 µg/l	3 to 9 µg/l	N/A	Liver toxin; probable carcinogen	-
Styrene	Preparation of rubber, protective coatings, and insulators.	ND	1 sample - 350 µg/kg	1 sample - 1,100 µg/l	ND	N/A	Neurological, blood and liver toxin; *Carcinogenicity undetermined*	Moderate persistence, low bioaccumulation, *moderate ecological toxicity.*
Tetrachloroethene	Degreaser/Solvents.	ND	ND	ND	ND	N/A	Liver, kidney and brain toxin; potential human carcinogen	Moderate persistence, low bioaccumulation, moderate ecological toxicity.

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Toluene	Manufacture of dyes; solvents; fuel oil/gasoline.	4 to 12 µg/kg	3 to 650 µg/kg	2 to 3,200 µg/l	ND	N/A	Neurological, kidney and liver toxin; cacinogenicity not classifiable	Moderate persistence, low bioaccumulation, moderate ecological toxicity.
Trichloroethane (1,1,1-)	-	5 to 60 µg/kg	ND	ND	ND	N/A	Liver and neurological toxin; carcinogenicity not classifiable	Moderate persistence, low bioaccumulation, high ecological toxicity
Trichloroethene	Solvents; degreasers; removing caffeine from coffee; textile processing.	ND	1 sample - 600 µg/kg	ND	ND	N/A	Noncancer toxicity under review; possible human carcinogen	Moderate persistence, low bioaccumulation, moderate ecological toxicity.
Xylene (Total)	Solvents; dyes; fuel oil/gasoline.	3 to 170 µg/kg	5 to 3,800 µg/kg	3 to 1,500 µg/l	ND	N/A	Neurotoxin; carcinogenicity not classifiable	Moderate persistence, low bioaccumulation, moderate ecological toxicity.

Notes:

1. This table summarizes compounds historically detected at the Site, specifically during soil, groundwater, and surface water sampling performed in conjunction with Dames & Moore's 1989 Site Assessment. The ranges of concentrations provided in the above table are based on the historical Site data presented in Tables 5 through 9 of this report. In general, if a specific compound was not detected, it is not included in the table, unless strong, specific evidence suggesting its likely presence at the Site based on historical use of the Site is available.

2. Sediment data reported in Dames & Moores' 1989 Site Assessment report are not included herein because as part of the asbestos Removal Action Plan (RAP) the sediment represented by these samples was removed and placed within a high-density polyethylene (HDPE) liner within Lagoon 2 and no longer represents in-situ conditions.

3. "-" indicates that a potential source was not identified or human health and/or ecological information is not available for the compound; "ND" indicates that the compound was not detected; "NA" indicates the sample was not analyzed for this parameter; and "N/A" indicates that a background MADEP soil concentration is not available. Refer to Appendix F for a list of references for the Human Health and Ecological Risk Information.

4. "*" indicates the "Background MADEP Soil Concentrations" represent the 90th percentile soil values provided in the Massachusetts Department of Environmental Protection (MA DEP) 1995 "Guidance for Disposal Site Risk Characterization", Interim Final Policy #WSC/ORS-95-141. These background concentrations are provided for comparative purposes only.

5. Potential sources based on historical data are assessed using the following sources which provide information on typical chemical use based on particular industrial processes:

- United States Environmental Protection Agency (USEPA), 1997, "Profile of the Fossil Fuel Electric Power Generation Industry", USEPA Office of Compliance Sector Notebook Project, USEPA Publication EPA/310-R-97-007, September 1997.
- USEPA, 1997, "Profile of the Textile Industry", USEPA Office of Compliance Sector Notebook Project, USEPA Publication EPA/310-R-97-009, September 1997.
- USEPA, 1995, "Profile of the Rubber and Plastics Industry", USEPA Office of Compliance Sector Notebook Project, USEPA Publication EPA/310-R-95-016, September 1995.
- Montgomery, J.H., 1996, Groundwater Chemicals, Desk Reference, CRC Press, Inc., Boca Raton, Florida, 1345 pp.

6. Additional references for the Human Health and Ecological Risk Information columns are provided in Appendix E.

TABLE 2
Summary of Previously Installed Monitoring Well / Piezometer Construction
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Well Designation	Ground Surface Elevation (ft)	Top of PVC Elevation (ft)	Depth of Boring	Screened Interval (ft)	Elevation of Screen	Elevation of Bedrock (ft)	Date of Installation	Source	Comments
GZ-1	162*	NA	12.5	7.5 to 12.5	149.5 to 154.5	NE	03/13/85	GZA SAR	
GZ-2	151*	NA	11	3 to 8	143 to 148	NE	03/13/85	GZA SAR	0 to 1.5 and 4.5 to 6.5 foot samples (fill) described as having "slight organic odor".
GZ-3	164*	NA	11.4	6.4 to 11.4	152.6 to 157.6	NE	03/13/85	GZA SAR	9.5 to 11 foot sample (sand) described as having a "oil odor".
GZ-4	163*	NA	16	8.8 to 13.8	149 to 154	NE	03/13/85	GZA SAR	
GZ-5	165*	NA	16	8.9 to 13.9	151.5 to 156.5	NE	03/13/85	GZA SAR	
GZ-6	162*	NA	17	7 to 17	145 to 155	NE	04/01/85	GZA AWR	Fill encountered to bottom of boring.
GZ-7	159*	NA	12	1.5 to 11.5	147.5 to 157.5	NE	04/01/85	GZA AWR	Fill encountered to bottom of boring. "Oil sheen" noted from 4 to 12 feet. "Strong, unidentifiable odor" noted on 10 to 12 foot sample.
GZ-8	160*	NA	17	4 to 14	146 to 156	NE	04/01/85	GZA AWR	
GZ-9	154*	NA	8	3 to 8	146 to 151	NE	04/01/85	GZA AWR	Fill encountered to bottom of boring.
MW-1	171.82	173.64	32.8	13 to 28	143.8 to 158.8	NE	01/24/89	D & M SAR	Petroleum odor noted 19 to 22 feet (sand).
MW-2	161.36	164.48	32	3 to 18	143.4 to 158.4	NE	01/26/89	D & M SAR	8 foot sample (fill) described as "wet with dark liquid, no odor". 20 foot sample (sand) described as having "slight odor".
MW-3	156.35	158.69	17	5 to 15	141.4 to 151.4	NE	01/26/89	D & M SAR	
MW-4	153.63	156.21	20.5	2 to 17	136.6 to 151.6	NE	01/30/89	D & M SAR	3 and 8 foot samples (fill) described as having "slight odor" and "petroleum odor", respectively.
MW-5	150.93	153.90	41	2 to 17	133.9 to 148.9	NE	02/02/89	D & M SAR	
MW-6	164.60	166.51	24	8 to 23	141.6 to 156.6	NE	02/01/89	D & M SAR	
MW-7	161.98	164.43	32	6 to 21	141 to 156	NE	02/07/89	D & M SAR	Starting at 18 feet (to bottom of boring, sand/till), samples are described as having "strong moth ball odor"; purple staining noted; samples are described as "corrosive".
MW-8	166.33	169.27	34	5 to 20	146.3 to 161.3	138.3	02/03/89	D & M SAR	
MW-9	163.64	165.93	23	7 to 22	141.6 to 156.6	NE	02/08/89	D & M SAR	Note at 21 feet (sand): "Drilling fluid foams with pH of 12 - 13."
MW-10	165.07	167.22	31	4 to 19	146.1 to 161.1	138.1	02/14/89	D & M SAR	
MW-11	168.24	170.61	23	8 to 23	145.2 to 160.2	NE	02/15/89	D & M SAR	15 foot sample (fill) described as having a "slight odor".
MW-12	166.54	168.90	29	3 to 18	148.5 to 163.5	151.5 / weathered	02/10/89	D & M SAR	From 5 feet (fill) to 18 feet (sand), samples described as having "slight" to "strong petroluem odor".
MW-13	169.89	172.82	27	5 to 20	148.9 to 164.9	NE	02/14/89	D & M SAR	
MW-14	148.97	151.95	11	1 to 11	138 to 148	NE	04/05/89	D & M SAR	
PZ-1	NA	NA	5	NA	NA	NE	04/16/92	Normandeau	"Tailrace side" - mitgation area.
PZ-2	NA	NA	5	NA	NA	NE	04/16/92	Normandeau	"River side" - mitgation area.

TABLE 2
Summary of Previously Installed Monitoring Well / Piezometer Construction
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Well Designation	Ground Surface Elevation (ft)	Top of PVC Elevation (ft)	Depth of Boring	Screened Interval (ft)	Elevation of Screen	Elevation of Bedrock (ft)	Date of Installation	Source	Comments
PZ-3	NA	NA	5	NA	NA	NE	04/16/92	Normandeau	"Central" - mitgation area.
PZ-4	NA	148.50	NA	NA	NA	NE	12/01/92	Normandeau #1	Within emergent wetland adjacent to tailrace.
PZ-5	NA	145.34	NA	NA	NA	NE	12/01/92	Normandeau #1	Within forested/shrub portion of the created wetland.
PZ-6	NA	150.48	NA	NA	NA	NE	12/01/92	Normandeau #1	Within forested/shrub portion of the created wetland.

Notes:

1. "*" Indicates that elevation data are not available. The ground elevation in the vicinity of the GZ-series wells is estimated based on surface topography shown on a plan prepared by Canonie Environmental, entitled "Existing Site Topography, On-Site Facility Areas, South Street Site, Walpole, MA", dated February 7, 1992. The elevation of the screened interval is also based on this inferred surface elevation.

2. "NA" indicates the information is not available.

3. "NE" indicates that bedrock was not encountered.

4. Sources:

"GZA SAR" indicates the source of the information is a report entitled "Site Assessment Report, South Street, Walpole, Massachusetts", prepared by GZA GeoEnvironmental Associates, Inc. (GZA), dated March 1985.

"GZA AWR" indicates the source of the information is a report entitled "Kendall Company, Additional Work, Walpole, Massachusetts", prepared by GZA, dated April 1985.

"D&M SAR" indicates the source of the information is a report entitled "Site Assessment Report, South Street Site, Walpole, Massachusetts", prepared by Dames & Moore, dated August 18, 1989.

"Normandeau" indicates that the source of the data is a report entitled "Normandeau Wetland Mitigation Design Report", prepared by Normandeau Associates, Inc. (Normandeau), dated October 1992.

"Normandeau #1" indicates the source of the data is a report entitled "Normandeau Wetland Mitigation Monitoring Report #1", prepared by Normandeau, dated October 1993.

TABLE 3
Summary of Historical Groundwater Elevation Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Well Designation	Top of PVC Elevation (ft)	Groundwater Elevation (in ft MSL)																			
		03/22/89 (D&M SAR)	03/30/89 (D&M SAR)	04/11/89 (D&M SAR)	04/27/89 (D&M SAR)	04/16/92 (N WMD)	06/02/92 (N WMD)	06/23/92 (N WMD)	10/03/92 (N WMD)	12/21/92 (N WMR#1)	01/29/93 (N WMR#1)	03/08/93 (N WMR#1)	04/13/93 (N WMR#1)	05/07/93 (N WMR#1)	05/10/93 (N WMR#1)	06/07/93 (N WMR#1)	07/19/93 (N WMR#1)	09/02/93 (N WMR#1)	05/20/94 (N WMR#2)	08/11/94 (N WMR#2)	08/10/95 (N WMR#3)
MW-1	173.64	153.27	153.54	154.69	155.58	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
MW-2	164.48	151.61	152.54	153.12	152.66	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
MW-3	158.69	150.20	150.89	151.31	150.94	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
MW-4	156.21	150.78	151.02	151.22	150.98	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-5	153.90	146.87	146.94	147.05	146.77	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-6	166.51	153.35	153.66	154.01	153.66	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-7	164.43	152.22	152.92	158.13	152.93	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-8	169.27	155.82	155.89	155.97	155.82	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-9	165.93	152.02	152.52	152.79	152.53	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-10	167.22	155.45	155.56	155.58	155.47	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-11	170.61	155.16	155.48	155.66	155.42	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-12	168.90	160.35	160.52	160.77	160.70	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
MW-13	172.82	160.74	161.24	161.54	161.46	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
MW-14	151.95	NM	NM	NM	148.1	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
GZ-1	NM	NM	NM	NM	NM	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
GZ-2	NM	NM	NM	NM	NM	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
GZ-3	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
GZ-4	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
GZ-5	NM	NM	NM	NM	NM	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
GZ-6	NM	NM	NM	NM	NM	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
GZ-7	NM	NM	NM	NM	NM	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
GZ-8	NM	NM	NM	NM	NM	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
GZ-9	NM	NM	NM	NM	NM	NM	NM	NM	NM	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB	AB
PZ-1	NM	NM	NM	NM	NM	145.0	145.9	145.2	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
PZ-2	NM	NM	NM	NM	NM	146.8	147.0	145.9	147.3	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
PZ-3	NM	NM	NM	NM	NM	145.4	146.3	146.2	146.2	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
PZ-4	148.5	NM	NM	NM	NM	NM	NM	NM	NM	148.50	148.32	NM	148.50	148.25	147.87	148.14	146.95	146.89	147.97	147.06	148.20
PZ-5	145.34	NM	NM	NM	NM	NM	NM	NM	NM	145.34	143.80	143.76	145.29	145.01	143.51	144.80	<142.47	142.97	145.15	143.05	<142.46
PZ-6	150.48	NM	NM	NM	NM	NM	NM	NM	NM	150.42	149.98	NM	150.44	148.84	148.63	148.84	<147.34	<147.34	150.18	<147.6	148.57

Notes:

1. Groundwater elevations are given in feet above mean sea level (MSL), relative to an United States Geological Survey (USGS) datum.

2. "NM" indicates no measurement was taken.

3. "AB" indicates that the well was abandoned in place according to MA DEP's "Standard References for Monitoring Wells, Section 4.6 - Decommissioning of Monitoring Wells", during construction of the On-Facility area of containment (AOC), according to the July 1993 "Draft Completion of Work Report", prepared by Canonie Environmental Services Corp. The report does not specify that the wells indicated above were abandoned (with the excpetion of MW-12); however, the text of the Canonie report indicates that "sixteen wells within the AOC were abandoned". The wells indicated as "abandoned" in the above table are based on SHA's overlay of the approximate location of the AOC and the previous locations of these wells.

4. "D&M SAR" indicates that the source of the data was the Dames & Moore Site Assessment Report, dated August 18, 1989. "N WMD" indicates that the source of the data was the Normandeau Wetland Mitigation Design Report, dated October 1992. "N WMR#1" indicates the source of the data was the Normandeau Wetland Mitigation Monitoring Report #1, dated October 1993; "N WMR#2" indicates the source of the data was the Normandeau Wetland Mitigation Monitoring Report #2, dated October 1994; and "N WMR#3" indicates the source of the data was the Normandeau Wetland Mitigation Monitoring Report #3, dated

TABLE 4
Summary of Asbestos Removal Activities
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

1/11/00
****DRAFT****

Lot Number/ Location	Average Depth of Excavation (feet)	Amount of ACS Excavated (yards^3)	Confirmatory Samples - Number/Location
LOT 1235-1			
Parking lot	>1	721	2 - side wall; 2 - duplicate
LA-7	1.5	1.5	2 - bottom; 1 - side wall; 1 - duplicate
M-12	1	1	1 - bottom; 4 - side wall
MW-1	4	3.5	1 - bottom; 4 side wall
LOT 1235-2A			
Soil stockpile		300	7 - bottom; 3 side wall
MW-13	4.5	7.5	1 - bottom; 5 - side wall
HA-3.5	1.5	1.5	1 - bottom; 4 - side wall; 1 - duplicate
L-1.5	3	2	1 - bottom; 4 - side wall; 1 - duplicate
H-4 *(MW-12)*	7.5	111	6 - bottom; 19 - side wall; 1 - other; 5 - duplicate
LOT 1235-2B			
NA-4.5	4.5	11	1 - bottom; 5 - side wall
Q-4.5	1.5	2.5	1 - bottom; 5 - side wall
R-6	2	2	1 - bottom; 5 - side wall
LA-6.5	3	3	2 - bottom; 5 - side wall
Lot 1249	3.5	17.5	2 - bottom; 7 - side wall

TABLE 4
Summary of Asbestos Removal Activities
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

1/11/00
****DRAFT****

Lot Number/ Location	Average Depth of Excavation (feet)	Amount of ACS Excavated (yards^3)	Confirmatory Samples - Number/Location
Vacant Lot (1232-1A)	3.6	335	2 - bottom; 4 - side wall; 1 - composite; 1 - duplicate
Orlando Properties (1245-8 / 1245-9)	3.1	2,619	13 - bottom; 21 - side wall; 6 - others; 3 - duplicates
Gleason Ct. (1232-2)	0.5 to 5	321	4 - bottom; 8 - side wall
Railroad Easement (1275-5)	3.3	2,022	11 - bottom; 12 - side wall; 2 - pre-excavation
1235-3	3.2	183	2 - bottom; 8 - side wall; 9 - duplicate
Total amount of ACS placed in AOC = 6,665 yards^3			
Mill Tail Race (1235-1, 1240-13, 1240-14)	4.4	1,085	8 - bottom; 15 - side wall; 8 - other
Total amount of Tail Race material placed in the Settling Basin No. 2 Containment Cell = 1,085 yards^3			

Notes:

1. The information presented above is a compilation of information from Canonie (1993a). In some cases, the information regarding the depth of each excavation, the amount of asbestos-containing soils (ACS) removed, and/or the number of confirmatory samples collected is not consistent between the text, figures, and tables included in Canonie's report. Where discrepancies were noted, SHA relied primarily on the text and figures of Canonie (1993a).

2. The ACS excavation areas, and approximate confirmatory sampling locations are depicted on Figure 15 of this report.

S:\DATA\1669\existing data report\Tables\Table04-AsbSum.wpd

TABLE 5
Summary of Historical On-Facility Shallow Soil Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	D-13.0 / 1.5'			D-13.0 / 1.5' Dup.			E-11.0 / 1.5'			G-7.0 / 1.5'			G-10.0 / 1.5'			G-12.0 / 1.5'			H-9.0 / 1.5'			H-15.0 / 1.5'			H-16.0 / 1.5'			HA-1.5 / 1.5'			HA-2.5 / 1.5'		
Sample Date	03/31/89			03/31/89			03/29/89			03/29/89			03/31/89			03/30/89			03/31/89			03/30/89			03/30/89			03/28/89			03/28/89		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)																																	
Acetone		R			R			R			R			R			R			R			R		14	J	high		R			R	
Chloroform		R			R			R			R			R			R			R			R			R			R			R	
Methylene Chloride	180	J		29	J		45	J		11	J	high	37	J	high	20	J		84	J		90	J		9	J		83			49	J	
Toluene		R			R			R			R			R			R			R			R			R		4	J	low	5	J	low
Trichloroethane (1,1,1-)		R			R			R			R			R			R			R			R			R		5	J	low	5	J	low
Xylene (Total)		R			R			R			R		6	J	low		R			R			R		3	J			R			R	
SVOCs (ug/kg)																																	
Acenaphthene		U			U			U			U			U		210	J		73	J			U			U			UJ		940	J	
Acenaphthylene		U			U			U			U			U		170	J		64	J			U		98	J		3600	J	high	3900	J	high
Anthracene		U			U		140	J			U		74	J		820			230	J			U		120	J		15000			4300	J	
Benzo(a)anthracene	44	J			U		210	J		79	J		190	J		4500			760				U		370	J		64000			12000		
Benzo(a)pyrene		U			U		1300			92	J		110	J		2700			610				U		390			21000			10000		
Benzo(b)fluoranthene	73	J			U		1500	J		290	J		210	J		5600	J		920	J			U		260	J		50000	J		18000	J	
Benzo(g,h,i)perylene		U			U		630			91	J		85	J		1400			260	J			U		180	J		7600	J		3500		
Benzo(k)fluoranthene	73	J			U		1500	J		290	J		210	J		5600	J		920	J			U		300	J		50000	J		18000	J	
Bis(2-ethylhexyl)phthalate		U			U			U			U			U			U			U		94	J		150	J			UJ			UJ	
Butylbenzylphthalate		U			U			U			U			U			U			U			U			U			UJ			UJ	
Chrysene	54	J	high		U		890			170	J		240	J	high	6400			1100				U		420			73000			13000		
Dibenz(a,h)anthracene		U			U		230	J			U			U		520	J		92	J			U		54	J		2900	J		1100		
Dibenzofuran		U			U		55	J			U			U		130	J			U			U			U			UJ		1000	J	
Diethylphthalate		U			U			U		59	J			U			U			U			U			U			UJ			UJ	
Dimethylphenol (2,4-)		U			U			U			U		200	J		190	J			U			U			U			UJ			UJ	
Dimethylphthalate		U			U			U			U			U		99	J	high		U		40	J	high	50	J	high	1900	J			UJ	
Di-n-butylphthalate		U			U			U			U		54	J			U		40	J			U			U		1200	J	high	700	J	high
Dinitrotoluene (2,4-)		U			U			U			U			U			U			U			U			U			UJ			UJ	
Fluoranthene	76	J			U		460	J		150	J		270	J		7400			770				U		650			96000			19000		
Fluorene		U			U			U			U		57	J		230	J		78	J			U		59	J		2200	J		2700	J	
Indeno(1,2,3-cd)pyrene		U			U		530			100	J		110	J		1600			320	J			U		210	J		9900	J		4800		
Methylnaphthalene (2-)		U			U		94	J			U			U		82	J		42	J			U			U		1200	J		1400	J	
Methylphenol (2-)		U			U			U			U			U			U			U			U			U			UJ			UJ	
Methylphenol (4-)		U			U			U			U		110	J			U			U			U			U			UJ			UJ	
Naphthalene		U			U		120	J			U			U		150	J		62	J			U		110	J		1900	J		1800	J	
Nitroaniline (4-)		UJ			UJ			UJ			UJ			UJ			UJ		490	J			UJ			UJ			UJ			UJ	
Pentachlorophenol		UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ	
Phenanthrene	76	J			U		520			170	J		460	J		4900			950				U		650			63000			20000		
Phenol		U			U			U			U			U			U			U			U			U			UJ			UJ	
Pyrene	99	J			U		280	J		130	J		410	J		7900			1400				U		780			120000			23000		
Metals/Cyanide (mg/kg)																																	
Antimony		U			U		57				U			U			U			U			U			U			U			U	
Arsenic	1.3	J		3.7			68			10.5			32.2			10.3			5.8			1.4	J		3.7			12.2			2.9		
Beryllium	0.33	J		0.35	J		1.3	J		0.34	J			U			U		0.29	J			U			U		0.25	J			U	
Cadmium		U			U		20.9			4.9				U			U			U			U			U			U			U	
Chromium	14.2			18.4			12.3			8.8			280			44.4			36.2			8.8			24.8			46.4			16.9		
Cobalt		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Copper	46.5			898			85			25.2			3180			1650			649			7.9			31.7			2850			457		
Cyanide (Total)		U			U			U			U			U			U			U			U			U		2.9			35.6		
Lead	7.8			95.8			28900			8750			28000			4990			327			13.8			417			2850			179		
Mercury		U		0.2			7.2			1			18				U		0.9				U			U		2			37		
Nickel	5.7	J		17.9			16.8	J		8.9	J		449			92.6			97.1			5.3	J		74			5.4	J		19.1		
Selenium	0.52	J			U		3.7			1.5				U		0.76	J			U			U			U		0.94	J			U	
Silver	1.6	J		1.5	J		3.6	J			U		2	J			U			U			U			U			U			U	
Zinc	192			578			35100			8580			1260			2300			799			29.7			140			1700			80.5		
Total Petroleum Hydrocarbons (mg/kg)																																	
TPH	120	J			UJ		330	J		170	J		230	J		110	J		130	J			UJ			UJ		14000	J		5700	J	

TABLE 5
Summary of Historical On-Facility Shallow Soil Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	I-6.5 / 1.5'			IA-3.5 / 1.5'			J-2.0 / 1.5'			K-10.0 / 1.5'			K-14.0 / 1.5'			K-15.0 / 1.5'			KA-6.5 / 1.5'			L-0.5 / 1.5'			L-3.0 / 1.5'			L-5.5 / 1.5'			L-14.0 / 1.5'		
Sample Date	03/27/89			03/29/89			03/29/89			03/30/89			03/30/89			03/30/89			03/27/89			04/03/89			03/28/89			03/29/89			03/31/89		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)																																	
Acetone		R			R			R			R			R			R			R			R			R			R			R	
Chloroform		R			R			R			R			R			R			R			R			R			R			R	
Methylene Chloride	34	J		69	J	high	14	J		11	J		140	J		80	J		57	J		46	J	high	12	J		32	J	high	64	J	high
Toluene		R		12	J	low		R			R			R			R			R			R			R			R			R	
Trichloroethane (1,1,1-)		R			R			R			R			R			R			R			R			R			R			R	
Xylene (Total)		R		170	J	low		R			R			R			R			R			R			R			R			R	
SVOCs (ug/kg)																																	
Acenaphthene		U			UJ			U			U		270	J		650	J			U			U		490	J			U			U	
Acenaphthylene	79	J			UJ			U			U		53	J		450	J			U			U		250	J	high		U			U	
Anthracene		U			UJ			U			U		730			1500			670	J			U		520	J		59	J			U	
Benzo(a)anthracene	530				UJ			U		210	J		2000			3700			2000	J			U		1200				U			U	
Benzo(a)pyrene	490				UJ			U		260	J		1600			2800			1800	J			U		830			180	J			U	
Benzo(b)fluoranthene	870	J			UJ			U		430	J		1800	J		3300	J		2900	J			U		1500	J		320	J			U	
Benzo(g,h,i)perylene	390				UJ			U		110	J		550			1200			980	J			U		310	J		120	J			U	
Benzo(k)fluoranthene	870	J			UJ			U		430	J		1800	J		3300	J		2900	J			U		1500	J		320	J			U	
Bis(2-ethylhexyl)phthalate	590	J	high		UJ			U			U		44	J			U			U		120	J		83	J	high	290	J			U	
Butylbenzylphthalate	46	J			UJ			U			U			U			U			U			U			U		370	J			U	
Chrysene	620				UJ			U		320	J		2100			3500			2200	J	high		U		1200			200	J			U	
Dibenz(a,h)anthracene		U			UJ			U			U		54	J		590	J			U			U		99	J		57	J			U	
Dibenzofuran		U			UJ			U			U			U			U			U		100	J			U			U			U	
Diethylphthalate		U			UJ		63	J			U			U			U			U			U			U		68	J			U	
Dimethylphenol (2,4-)		U			UJ			U		110	J		100	J		130	J			U			U			U			U			U	
Dimethylphthalate		U			UJ			U			U		49	J	high	110	J	high		U			U		74	J			U			U	
Di-n-butylphthalate		U			UJ			U			U			U			U			U		64	J			U			U			U	
Dinitrotoluene (2,4-)		U			UJ			U			U		79	J		220	J			U			U		570	J			U			U	
Fluoranthene	1100				UJ			U		370	J		2500			5800			4000				U		2300				U			U	
Fluorene	43	J			UJ			U			U		230	J		840	J			U			U		540	J			U			U	
Indeno(1,2,3-cd)pyrene	260	J			UJ			U		110	J		560			1300			1000	J			U		420	J		120	J			U	
Methylnaphthalene (2-)		U			UJ			U			U		170	J		280	J			U		76	J		800			52	J			U	
Methylphenol (2-)		U			UJ			U			U		44	J			U			U		210	J			U			U			U	
Methylphenol (4-)		U			UJ			U			U		140	J		140	J			U		45	J			U			U			U	
Naphthalene		U			UJ			U			U		240	J		350	J			U		390	J		3600			58	J			U	
Nitroaniline (4-)		UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ	
Pentachlorophenol	600				UJ			UJ			UJ			U			UJ			UJ			UJ			UJ			UJ			UJ	
Phenanthrene	110	J			UJ			U		430	J		2800			6900			3000	J		63	J		2100			280	J		47	J	
Phenol		U			UJ			U			U		46	J			U			U		130	J			U			U			U	
Pyrene	1000				UJ			U		370	J		3800			7900			3900	J			U		1900			380	J			U	
Metals/Cyanide (mg/kg)																																	
Antimony		U			U			U			U			U			U			U			U			U			U			U	
Arsenic	1.8	J		4.1			1.1	J		15.5			4.6			8.2			2.3			1.3	J		4			43			10.4	
Beryllium	0.29	J		0.45	J		0.31	J		0.4	J		0.26	J		0.35	J		0.31	J			U		0.4	J		0.47	J		0.32	J	
Cadmium		U			U			U		2				U			U			U		2.6				U			U			U	
Chromium	7.7			11.8			9.5			7.4			16			27			10.1			3.4			11.2			16			10.3		
Cobalt		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Copper	15.6			91.5			11.3			44.8			68.6			104			66.3			1850			38.4			221			19.7		
Cyanide (Total)		U			U			U			U			U			U			U			U			U			U			U	
Lead	46.8			439			32.8			3080			1040			1420			63.6			206			92.7			277			30.4		
Mercury		U		0.2				U			U		0.3			0.7			0.2				U		0.2			0.3				U	
Nickel	0.1			8.8	J		5.8	J		9	J		23.7			36.6			6.2	J			U		6.3	J		16.4			7.5	J	
Selenium		U		1.1	J		0.61	J		0.55	J			U			U			U			U		0.55	J		5.7				U	
Silver		U			U		1.1	J			U			U			U			U			U			U			U		1.4	J	
Zinc	40.8			641			62.4			29600			1230			1540			106			585			191			132			50.1		
Total Petroleum Hydrocarbons (mg/kg)																																	
TPH		UJ		890	J			UJ		3400	J		340	J		630	J		2400	J			UJ		520	J			UJ			UJ	

TABLE 5
Summary of Historical On-Facility Shallow Soil Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Name	LA-7.0 / 1.5'			M-10.0 / 1.5'			M-12.0 / 1.5'			P-9.0 / 1.5'			PA-6.0 / 1.5'			Q-7.0 / 1.5'			Q-7.0 / 1.5' Dup.			R-5.0 / 1.5'			MW-5 / 1'			MW-10 / 2'		
Sample Date	03/29/89			03/31/89			04/03/89			03/31/89			03/27/89			03/29/89			03/29/89			03/27/89			03/03/89			03/01/89		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)																														
Acetone		R		29	J	high		R			R			R			R			R			R			R			R	
Chloroform		R		97	J	low		R			R			R			R			R			R			R			R	
Methylene Chloride	110	J		310	J	high	57	J		180	J		19	J		17	J		30	J		15	J		4	J		19	J	high
Toluene		R			R			R			R			R			R			R			R			R			R	
Trichloroethane (1,1,1-)		R		60	J	low		R			R			R			R			R			R			R			R	
Xylene (Total)		R			R			R			R			R			R			R			R			R			R	
SVOCs (ug/kg)																														
Acenaphthene		U		170	J			U		76	J			U			U			U			U		180	J			UJ	
Acenaphthylene		U		310	J			U		130	J			U			U			U			U		270	J			UJ	
Anthracene		U		530				U		280	J			U			U			U			U		410	J			UJ	
Benzo(a)anthracene		U		820			95	J		360				U			U		84	J		65	J		1200				UJ	
Benzo(a)pyrene		U		600			67	J		250	J			U			U		74	J			U		1300				UJ	
Benzo(b)fluoranthene		U		760	J		160	J		360	J		120	J			U		140	J		140	J		2200	J		1700	J	
Benzo(g,h,i)perylene		U		300	J		48	J		110	J			U			U			U			U		1300				UJ	
Benzo(k)fluoranthene		U		760	J		160	J		360	J		120	J			U		140	J		140	J		2200	J		1700	J	
Bis(2-ethylhexyl)phthalate		U			U		200	J			U		87	J	high		U			U		290	J	high	430				UJ	
Butylbenzylphthalate		U			U			U			U			U			U			U			U			U			UJ	
Chrysene		U		840			180	J	high	380			57	J	high		U		100	J		180	J	high	1400			1200	J	
Dibenz(a,h)anthracene		U		68	J			U			U			U			U			U			U			U			UJ	
Dibenzofuran		U		140	J			U		75	J			U			U			U			U		100	J			UJ	
Diethylphthalate		U			U			U			U			U			U			U			U		230	J	high		UJ	
Dimethylphenol (2,4-)		U			U			U			U			U			U			U			U			U			UJ	
Dimethylphthalate		U		94	J			U			U			U			U			U			U		130	J	high		UJ	
Di-n-butylphthalate		U		45	J		52	J			U			U			U			U			U			U			UJ	
Dinitrotoluene (2,4-)		U			U			U			U			U			U			U			U			U			UJ	
Fluoranthene		U		1500			190	J		710			64	J		56	J		180	J		150	J		2300			1600	J	
Fluorene		U		580				U		260	J			U			U			U			U		260	J			UJ	
Indeno(1,2,3-cd)pyrene		U		300	J		44	J		140	J			U			U			U			U		1100				UJ	
Methylnaphthalene (2-)		U		370	J			U		45	J			U			U			U			U		170	J			UJ	
Methylphenol (2-)		U			U			U			U			U			U			U			U			U			UJ	
Methylphenol (4-)		U			U			U			U			U			U			U			U			U			UJ	
Naphthalene		U		590				U		35	J			U			U			U			U		470				UJ	
Nitroaniline (4-)		UJ			U			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ	
Pentachlorophenol		UJ			U			UJ			U			UJ			UJ			UJ			UJ			UJ			UJ	
Phenanthrene		U		3100			190	J		1500			69	J			U		150	J		150	J		2700			2200	J	
Phenol		U			U			U			U			U			U			U			U			U			UJ	
Pyrene		U		2400			180	J		1100			62	J		53	J		180	J		180	J		2300			1400	J	
Metals/Cyanide (mg/kg)																														
Antimony		U			U			U			U			U			U			U			U			U		164		
Arsenic	1.3	J		7.2			6.4			0.71	J		0.87	J		2.1	J		1.5	J		0.83	J		7.6			50.5		
Beryllium	0.33	J		0.55	J		0.46	J			U		0.23	J		0.42	J		0.33	J			U			U			U	
Cadmium		U			U			U			U			U			U			U			U			U		18.9		
Chromium	11			12.9			11.7			6.9			5.7			16.2			9			506			92			10.3		
Cobalt		NA			NA			NA			NA			NA			NA			NA			NA			NA		7.4	J	
Copper	20.7			26			23			12.9			7.9			13.3			10.2			51.3			119			168		
Cyanide (Total)		U			U			U			U			U			U			U			U			U		4.2		
Lead	29.2			31.4			218			4.3			4.3			53.8			36			96.2			1970			51000		
Mercury		U			U		0.7				U			U			U			U			U		0.3			22		
Nickel	6.5	J		5.8	J		8.4	J		5.1	J			U		8.4	J		6.3	J		99.8			387			14.1	J	
Selenium		U		0.76	J		0.71	J			U			U			U			U			U			U		2.8		
Silver		U		1.4	J			U			U			U		1.5	J			U			U			U			U	
Zinc	38.2			42.7			506			22.9			22.2			74.9			54.9			40.3			754			55700		
Total Petroleum Hydrocarbons (mg/kg)																														
TPH		UJ			UJ			UJ			UJ		570	J			UJ			UJ		4900	J		1900	J		1200	J	

TABLE 5
Summary of Historical On-Facility Shallow Soil Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

1/11/00
****DRAFT****

Notes:

1. This table summarizes the results of historical chemical analyses performed on shallow soil samples (i.e., samples collected between zero and two feet below the original ground surface) collected from On-Facility portions of the Site by Dames & Moore of Cranford, New Jersey on the dates indicated, in conjunction with their 1989 Site Assessment Report (1989a). Samples were submitted to Enseco Laboratories (Enseco) of Cambridge, Massachusetts and analyzed for:
   Volatile Organic Compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8240;
   Semi-Volatile Organic Compounds (SVOCs) by USEPA Method 8270;
   Metals by USEPA SW-846 Methods; and
   Total Petroleum Hydrocarbons (TPH) by USEPA Method 418.1.
   All results are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb) for VOCs and SVOCs, and milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm) for metals and TPH.

2. A blank space in the "Result" column indicates that the analyte was not detected. Only analytes detected in one or more of the On-Facility shallow soil samples are included in the table.

3. Qualifiers have been assigned by New Environmental Horizons, Inc. (NEH) based on a data usability assessment (refer to Section 5 and Appendix E of the text for additional details regarding the usability assessment).
   "J" indicates the associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project decisions as an estimated result.
   "U" indicates the compound was analyzed for, but was not detected.
   "UJ" indicates the compound was analyzed for, but was not detected. Data users are cautioned that data qualified UJ may not be usable in risk assessment if the bias is either low or unknown due to the potential for false negatives.
   "R" indicates the data have been rejected due to severe or cumulative exceedance of quality control criteria.
   "NA" indicates the sample was not analyzed for this analyte.

4. In addition to the data qualifiers, in some cases, NEH applied a bias ("high" or "low") on a chemical-by-chemical basis, for all estimated results for which a bias could be determined. For those estimated results for which the bias could not be determined, the "bias" column was left blank. Data users are cautioned that for those sample results that are non-detected and estimated (qualified UJ), and where the bias is indicated as either undetermined (left blank) or "low," the potential exists for false negatives. In general, "high" bias estimated results are usable in assessment of risk, as this would be protective of human health and the environment. Estimated results that may be false negatives may be unusable for risk assessment purposes (based on EPA guidance, April 1992).

TABLE 6
Summary of Historical On-Facility Shallow Soil pH Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Location	Sample Date	Result
D13.0 / 1.5'	03/31/89	6.0 *
D13.0 / 1.5' Dup.	03/31/89	6.0 *
E11.0 / 1.5'	03/29/89	6.1 *
G7.0 / 1.5'	03/29/89	6.4 *
G8.0 / 0.5'	03/30/89	4.8
G10.0 / 0.5'	03/30/89	5.7
G10.0 / 1.5'	03/31/89	5.0 *
G11.0 / 0.5'	02/21/89	6.9
G12.0 / 0.5'	02/22/89	6.4
G12.0 / 1.5'	03/30/89	6.0 *
G14.0 / 0.5'	03/10/89	7.1
G15.0 / 0.5'	03/10/89	5.3
G16.0 / 0.5'	03/10/89	5.2
G17.0 / 0.5'	03/10/89	4.9
G18.0 / 0.5'	03/10/89	5.2
H9.0 / 0.5'	02/21/89	7.4
H9.0 / 1.5'	03/31/89	7.1 *
H12.0 / 0.5'	02/21/89	7.9
H13.0 / 0.5'	02/21/89	7.9
H14.0 / 0.5'	02/21/89	7.9
H15.0 / 0.5'	02/21/89	6.8
H15.0 / 1.5'	03/30/89	6.0 *
H16.0 / 0.5'	03/10/89	6.9
H16.0 / 1.5'	03/30/89	5.8 *
H17.0 / 0.5'	03/10/89	4.8
H18.0 / 0.5'	03/10/89	4.5
HA1.5 / 1.5'	03/28/89	7.9 *
HA2.5 / 1.5'	03/28/89	6.1 *
I6.5 / 1.5'	03/27/89	6.6 *
I7.0 / 0.5'	02/24/89	6.2
I14.0 / 0.5'	02/21/89	8.1
I15.0 / 0.5'	02/21/89	7.9
IA3.5 / 1.5'	03/29/89	4.6 *
J2.0 / 1.5'	03/29/89	5.9 *
J7.0 / 0.5'	02/24/89	6.0

Location	Sample Date	Result
J14.0 / 0.5'	02/21/89	8.1
J15.0 / 0.5'	02/21/89	7.0
J16.0 / 0.5'	03/08/89	5.6
J17.0 / 0.5'	03/08/89	7.0
J18.0 / 0.5'	03/08/89	5.2
K7.0 / 0.5'	02/24/89	5.2
K10.0 / 0.5'	02/17/89	7.4
K10.0 / 1.5'	03/30/89	6.7 *
K11.0 / 0.5'	02/17/89	7.7
K12.0 / 0.5'	02/17/89	9.3
K13.0 / 0.5'	02/17/89	7.8
K14.0 / 0.5'	02/17/89	7.8
K14.0 / 1.5'	03/30/89	7.0 *
K15.0 / 0.5'	02/21/89	6.9
K15.0 / 1.5'	03/30/89	6.4 *
K16.0 / 0.5'	03/09/89	6.1
K17.0 / 0.5'	03/09/89	5.4
K18.0 / 0.5'	03/10/89	5.8
KA6.5 / 1.5'	03/27/89	8.3 *
KA7.0 / 0.5'	02/24/89	5.0
L0.5 / 1.5'	04/03/89	8.5 *
L3.0 / 1.5'	03/28/89	6.3 *
L5.5 / 1.5'	03/29/89	4.6 *
L9.0 / 0.5'	02/17/89	8.0
L10.0 / 0.5'	02/17/89	7.9
L11.0 / 0.5'	02/17/89	6.4
L13.0 / 0.5'	02/22/89	6.3
L14.0 / 0.5'	02/22/89	5.4
L14.0 / 1.5'	03/31/89	6.3 *
L15.0 / 0.5'	03/09/89	4.9
L16.0 / 0.5'	03/09/89	5.7
L17.0 / 0.5'	03/09/89	6.9
LA7.0 / 1.5'	03/29/89	6.2 *
M7.0 / 0.5'	02/24/89	5.6

Location	Sample Date	Result
M9.0 / 0.5'	02/22/89	7.2
M10.0 / 0.5'	02/17/89	5.8
M10.0 / 1.5'	03/31/89	5.4 *
M11.0 / 0.5'	02/17/89	5.8
M12.0 / 0.5'	02/22/89	5.8
M12.0 / 1.5'	04/03/89	5.1 *
M13.0 / 0.5'	02/22/89	7.3
M14.0 / 0.5'	02/22/89	7.4
N7.0 / 0.5'	02/24/89	5.9
N9.0 / 0.5'	02/16/89	7.0
N10.0 / 0.5'	02/16/89	5.2
N11.0 / 0.5'	02/17/89	5.4
O7.0 / 0.5'	02/22/89	5.6
O9.0 / 0.5'	02/16/89	7.2
O10.0 / 0.5'	02/16/89	5.8
O11.0 / 0.5'	02/16/89	5.9
P7.0 / 0.5'	02/22/89	6.3
P8.0 / 0.5'	02/16/89	6.9
P9.0 / 0.5'	02/16/89	7.2
P9.0 / 1.5'	03/31/89	5.7 *
P10.0 / 0.5'	02/16/89	6.4
PA6.0 / 1.5'	03/27/89	6.9 *
Q7.0 / 0.5'	02/22/89	6.5
Q7.0 / 1.5'	03/29/89	6.6 *
Q7.0 / 1.5' Dup.	03/29/89	6.2 *
Q8.0 / 0.5'	02/16/89	7.2
Q9.0 / 0.5'	02/16/89	7.0
Q10.0 / 0.5'	02/16/89	6.1
R5.0 / 1.5'	03/27/89	7.5 *
R7.0 / 0.5'	02/16/89	7.8
R8.0 / 0.5'	02/16/89	5.6
S8.0 / 0.5'	02/16/89	6.4
MW-5 / 1'	03/03/89	7.6 *
MW-10 / 2'	03/01/89	6.75 *

Notes:

1. This table summarizes historical pH values measured for shallow soil samples (i.e., samples collected between zero and two feet below the original ground surface) from On-Facility portions of the Site by Dames & Moore of Cranford, New Jersey, between February 16 and March 30, 1989, in conjunction with their 1989 Site Assessment Report (1989a). Samples were submitted to Enseco Laboratories (Enseco) of Cambridge, Massachusetts; no analysis method was provided in the documentation. These sample results are summarized in Table 6-16 of Dames & Moore's 1989 Site Assessment Report.

Additional shallow soil samples were collected by Dames & Moore between March 27 and April 3, 1989, for chemical analyses, also in conjunction with Dames & Moore's Site Assessment Report. The results of these analyses were not summarized by Dames & Moore, but are presented in Enseco's analytical data packages. The samples were analyzed by Enseco using USEPA Method 9045, and are denoted by an "*" next to the result.

2. Results are presented in standard pH units (SUs).

TABLE 7
Summary of Historical On-Facility Deep Soil Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	MW-1 / 4'			MW-2 / 8'			MW-3 / 5'			MW-4 / 6'			MW-6 / 7'			MW-6 / 11'			MW-7 / 6'			MW-7 / 21'			MW-8 / 6'			MW-9 / 5'		
Sample Date	03/01/89			03/01/89			03/02/89			03/03/89			03/06/89			03/07/89			03/07/89			03/07/89			03/07/89			03/07/89		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)																														
Acetone		R			R		40	J			R		220	J			R			R			R			R			R	
Benzene		R			R		2	J	low		R			R			R			R		110	J	low		R			R	
Butanone (2-)	32	J	low		R		14	J	low	270	J	low	47	J	low		R			R		520	J	low		R			R	
Carbon Disulfide		R			R			R			R			R		10	J	low	39	J	low		R		13	J	low	43	J	low
Ethylbenzene		R			R			R			R			R			R			R		2400	J	low		R			R	
Methyl-2-pentanone (4-)		R			R			R			R		17	J	low		R			R			R			R			R	
Methylene Chloride	2	J	high	14	J	high	19	J	high	110	J	high	4	J	high	23	J		57	J		460	J	high	31	J		35	J	high
Styrene		R			R			R			R			R			R			R		350	J	low		R			R	
Toluene		R		3	J	low	3	J	low		R		3	J	low		R			R		650	J	low	290	J	low		R	
Trichloroethene		R			R			R		600	J	low		R			R			R			R			R			R	
Xylene (Total)		R		5	J	low		R			R			R			R			R		3800	J	low		R			R	
SVOCs (ug/kg)																														
Acenaphthene		U			U		220	J			U			U			UJ			UJ		12000	J		2300	J		21000		
Acenaphthylene		U			U		140	J			U			U			UJ			UJ		5100	J			UJ			UJ	
Anthracene		U		37	J		420				U		88	J			UJ			UJ		8600	J		4900			60000		
Benzo(a)anthracene		U		170	J		1300				U		220	J		2000	J		4200			4400	J		8900			57000		
Benzo(a)pyrene		U		140	J		1300				U		230	J		1900	J		5300			3000	J		6200			49000		
Benzo(b)fluoranthene		U		200	J		1900	J			U		320	J		3100	J		10000	J		3000	J		8400	J		93000	J	
Benzo(g,h,i)perylene		U			U		750				U			U			UJ		2400	J		830	J		2100	J		22000		
Benzo(k)fluoranthene		U		200	J		1900	J			U		320	J		3100	J		10000	J		3000	J		8400	J		93000	J	
Bis(2-ethylhexyl)phthalate		U			U			U			U			U			UJ			UJ			UJ			UJ			UJ	
Chrysene		U		180	J		1400				U		270	J		2300	J		13000			4100	J		9000			57000		
Dibenz(a,h)anthracene		U			U		200	J			U			U			UJ		700	J			U		1000	J		11000	J	
Dibenzofuran		U			U		78	J			U			U			UJ			UJ		1700	J		760	J		21000		
Diethylphthalate	70	J	high	95	J	high	86	J	high	230	J	high		U			UJ			UJ			UJ			UJ			UJ	
Dimethylphthalate		U		78	J	high		U		140	J	high		U			UJ			UJ			UJ			UJ			UJ	
Di-n-butylphthalate	46	J	high	85	J	high		U			U			U			UJ			UJ			U			UJ			UJ	
Fluoranthene		U		210	J		2000				U		320	J		2400	J		8600			6900	J		11000			150000		
Fluorene		U			U			U			U			U			UJ			UJ		12000	J		2400	J		23000		
Indeno(1,2,3-cd)pyrene		U			U		740				U		85	J			UJ		1500	J		890	J		2400	J		23000		
Methylnaphthalene (2-)		U			U		100	J			U		81	J			UJ		550	J		34000			1600	J		8600	J	
Methylphenol (2-)		U		46	J			U			U			U			UJ			UJ			R			UJ			UJ	
Naphthalene		U			U		250	J			U		65	J			UJ		1300	J		43000			910	J		21000		
Nitroaniline (4-)		UJ			UJ		230	J			UJ			UJ			UJ			UJ			UJ			UJ			UJ	
Nitrosodiphenylamine (N-)		U			U		61	J			U			U			UJ			UJ			UJ			UJ			UJ	
Phenanthrene		U		150	J		1700				U		420			2200	J		12000			31000	J		23000			220000		
Pyrene		U		330	J		3300				U		450			3800			9000			13000	J		16000			120000		
Metals/Cyanide (mg/kg)																														
Antimony		U			U		9.5	J			U			U			U		10.6	J			U			U			U	
Arsenic	1.1	J		2.3			2.9				U		4.6			10			16.4			0.67	J		5.3			52.2		
Beryllium	0.52	J		0.25	J		0.31	J		0.32	J		0.29	J		1.5	J			U			U			U		0.71	J	
Cadmium		U			U		1.3				U			U			U			U			U		1.3			5.2		
Chromium	14.6			54.8			16.2			10.3			11.9			25.2			128			8.6			34.5			98.5		
Copper	43.1			80.9			194			23.2			158			240			3720			99.2			2250			16600		
Cyanide (Total)	1.6			5.9				U			U		1.4			0.89				U			U			U		1		
Lead	11.1			587			1150			40			124			106			12700			176			402			2360		
Mercury		U		0.6			0.9			0.1			0.7			0.3			0.4				U		0.3			1		
Nickel	11.6			264			26.7			9.7			13.8			13.1	J		188			6.5	J		60.4			259		
Selenium		U			U			U			U			U			U		0.67	J			U			U		1.5		
Silver		U			U			U			U			U			U			U			U			U		2.3	J	
Thallium		U			U			U			U			U			U			U			U			U		0.76	J	
Zinc	64.3			330			1150			89.5			215			433			2310			110			1460			12000		
pH (s.u.)																														
pH	5.9			9.4			7.8			11.1			7.8			7.6			6.7			13.0			8.0			6.9		
Total Petroleum Hydrocarbons (mg/kg)																														
TPH		UJ		200	J		250	J		69	J		55	J		120	J		100	J		430	J		1400	J		960	J	

TABLE 7
Summary of Historical On-Facility Deep Soil Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	MW-9 / 5' Dup.			MW-11 / 10'			MW-12 / 10'			MW-13 / 6'		
Sample Date	03/07/89			03/03/89			03/03/89			03/03/89		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)												
Acetone		R			R			R			R	
Benzene		R			R			R			R	
Butanone (2-)		R			R			R			R	
Carbon Disulfide	30	J	low		R			R			R	
Ethylbenzene		R			R			R			R	
Methyl-2-pentanone (4-)		R			R			R			R	
Methylene Chloride	42	J			R			R		2	J	
Styrene		R			R			R			R	
Toluene		R			R			R			R	
Trichloroethene		R			R			R			R	
Xylene (Total)		R			R			R			R	
SVOCs (ug/kg)												
Acenaphthene	6700	J			U		1300	J			U	
Acenaphthylene		UJ			U		570	J			U	
Anthracene	13000	J			U		2700				U	
Benzo(a)anthracene	21000				U		3400				U	
Benzo(a)pyrene	18000				U		3200				U	
Benzo(b)fluoranthene	26000	J			U		5500	J			U	
Benzo(g,h,i)perylene	8900	J			U			UJ			U	
Benzo(k)fluoranthene	26000	J			U		5500	J			U	
Bis(2-ethylhexyl)phthalate		UJ		130	J			UJ			U	
Chrysene	22000				U		3500				U	
Dibenz(a,h)anthracene	2800	J			U			UJ			U	
Dibenzofuran	8400	J			U		1500	J			U	
Diethylphthalate		UJ		61	J	high	700	J	high	430		
Dimethylphthalate		UJ			U			UJ		250	J	
Di-n-butylphthalate		UJ			U			UJ			U	
Fluoranthene	44000				U		9600				U	
Fluorene	7500	J			U		2400				U	
Indeno(1,2,3-cd)pyrene	11000	J			U			UJ			U	
Methylnaphthalene (2-)	3000	J			U		980	J			U	
Methylphenol (2-)		UJ			U			UJ			U	
Naphthalene	6900	J			U		3300				U	
Nitroaniline (4-)		UJ			UJ			UJ			UJ	
Nitrosodiphenylamine (N-)		UJ		43	J			UJ			U	
Phenanthrene	69000				U		14000				U	
Pyrene	46000				U		6800				U	
Metals/Cyanide (mg/kg)												
Antimony	51.6				U			U			U	
Arsenic	53.9			2.7			1.5	J		3.9		
Beryllium	0.74	J		0.91	J			U			U	
Cadmium	5.9				U			U			U	
Chromium	298			10.8			8.4			7.3		
Copper	39900			47.4			12.3			31.6		
Cyanide (Total)	0.66				U		0.78				U	
Lead	4490			179			15			38.8		
Mercury	0.9				U			U		0.3		
Nickel	198			8	J		4.2	J		15.9		
Selenium	1.1	J			U			U			U	
Silver	23.5				U			U			U	
Thallium	0.73	J			U			U			U	
Zinc	8360			2240			29.2			17.5		
pH (s.u.)												
pH	6.8			5.98			6.98			6.91		
Total Petroleum Hydrocarbons (mg/kg)												
TPH	1700	J			UJ		500	J			UJ	

Notes:

1. This table summarizes the results of historical chemical analyses performed on deep soil samples (i.e., samples collected between 4 and 21 feet below the original ground surface) collected from On-Facility portions of the Site by Dames & Moore of Cranford, New Jersey on the dates indicated, in conjunction with their 1989 Site Assessment Report (1989a). Samples were submitted to Enseco Laboratories (Enseco) of Cambridge, Massachusetts and analyzed for:

Volatile Organic Compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 8240;
Semi-Volatile Organic Compounds (SVOCs) by USEPA Method 8270;
Metals by USEPA SW-846 Methods;
pH by USEPA Method 9045;
Total Petroleum Hydrocarbons (TPH) by USEPA Method 418.1.

Results of VOCs and SVOC analyses are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb); results metals and TPH analyses are presented in milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm); pH results are presented in standard pH units (SUs).

2. A blank space in the "Result" column indicates that the analyte was not detected. Only analytes detected in one or more of the On-Facility deep soil samples are included in the table.

3. Qualifiers have been assigned by New Environmental Horizons, Inc. (NEH) based on a data usability assessment (refer to Section 5 and Appendix E of the text for additional details regarding the usability assessment).

"J" indicates the associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project decisions as an estimated result.

"U" indicates the compound was analyzed for, but was not detected.

"UJ" indicates the compound was analyzed for, but was not detected. Data users are cautioned that data qualified "UJ" may not be usable in risk assessment if the bias is either low or unknown due to the potential for false negatives.

"R" indicates the data have been rejected due to severe or cumulative exceedance of quality control criteria. The value is unusable (compound may or may not be present) for risk assessment decisions. Re-sampling and reanalysis is recommended for verification.

4. In addition to the data qualifiers, in some cases, NEH applied a bias ("high" or "low") on a chemical-by-chemical basis, for all estimated results for which a bias could be determined. For those estimated results for which the bias could not be determined, the "bias" column was left blank. Data users are cautioned that for those sample results that are non-detected and estimated (qualified "UJ"), and where the bias is indicated as either undetermined (left blank) or "low," the potential exists for false negatives. In general, "high" bias estimated results are usable in assessment of risk, as this would be protective of human health and the environment. Estimated results that may be false negatives may be unusable for risk assessment purposes (based on EPA guidance, April 1992).

5. As indicated in the table, antimony was detected in the duplicate sample (MW-9 / 5' Dup.) from location MW-9, but not in the primary sample (MW-9 / 5'). This suggests poor quality assurance/quality control (QA/QC) for this sample In light of these potential QA/QC issues, the antimony concentration in soil from MW-9 is suspect and is therefore not discussed in the text or displayed on the figure.

TABLE 8
Summary of Historical On-Facility Groundwater and Surface Water Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Matrix	Groundwater																													
Sample Location	MW-01			MW-02			MW-03			MW-04			MW-05			MW-06			MW-07			MW-08			MW-09			MW-10		
Sample Date	03/22/89			03/22/89			03/24/89			03/23/89			03/24/89			03/22/89			03/24/89			03/23/89			03/23/89			03/22/89		
Sampled By	Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/l)																														
Benzene		U		1	J	low		R		170	J	low	11	J	low		U		4400				U			R			U	
Butanone (2-)		U			R			R			R		30	J	low		U			R			U			R			U	
Ethylbenzene		U		3	J	low		R			R		6	J	low		U		150	J			U			R			U	
Hexanone (2-)		U			R			R			R		21	J			U			U			U			R			U	
Methylene Chloride	5	J	high	11	J	high	6	J	high	210	J	high	10	J	high	12	J	high	500	J	high	26	J	high	13	J	high	24	J	high
Styrene		U			R			R			R			R			U		1100				U			R			U	
Toluene		U		2	J		4	J	low	77	J	low	11	J	low		U		3200				U			R			U	
Xylene (Total)		U		17	J	low	3	J	low	100	J	low	37	J	low		U		1500				U			R			U	
SVOCs (ug/l)																														
Acenaphthene		U			U			U		28			8	J			U			U			U		22				U	
Acenaphthylene		U			U			U		21				U			U		550				U			U			U	
Anthracene		U			U			U		8	J			U			U			U			U			U			U	
Benzo(a)anthracene		U			U			U		5	J			U			U			U			U			U			U	
Benzo(a)pyrene		U			U			U		3	J			U			U			U			U			U			U	
Benzo(b)fluoranthene		U			U			U		3	J			U			U			U			U			U			U	
Benzo(k)fluoranthene		U			U			U		3	J			U			U			U			U			U			U	
Benzoic Acid		U			U			U			U		120	J			U			UJ			U			U			U	
Bis(2-ethylhexyl)phthalate		U		6	J		6	J			U		6	J			U			U			U		15				U	
Chrysene		U			U			U		4	J			U			U			U			U			U			U	
Dibenzofuran		U			U			U		5	J			U			U			U			U		12				U	
Diethylphthalate	3	J	high		U		6	J			U		4	J			U			U			U			U			U	
Dimethylphenol (2,4-)		U			U			U		120			32				U		250	J			U			U			U	
Dimethylphthalate	3	J	high		U			U		2	J	high		U			U			U			U		2	J	high		U	
Di-n-butylphthalate		U			U			U		4	J			U			U			U			U		25				U	
Fluoranthene		U			U		4	J		9	J		7	J			U			U			U			U			U	
Fluorene		U			U			U		27	J	high	9	J			U		180	J			U		10	J	high		U	
Methylnaphthalene (2-)		U		8	J			U		190			12	J			U		1300				U		23				U	
Methylphenol (2-)		U			U			U		20			5	J			U			U			U			U			U	
Methylphenol (4-)		U		5	J			U		110			38				U			U			U			U			U	
Naphthalene		U		49				U		750	J	low	69				U		9900				U		61				U	
Phenanthrene		U			U		7	J		47			25				U		300	J			U		7	J			U	
Phenol		U		6	J			U		45			130				U			U			U			U			U	
Pyrene		U			U		4	J		13			8	J			U		85	J			U			U			U	
Petroleum Hydrocarbons (mg/l)																														
Oil & Grease		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Total Petroleum Hydrocarbons		UJ		2.6				UJ			UJ		3.3				UJ		2.4				UJ			UJ			UJ	
Dissolved Metals/Cyanide (ug/l)																														
Arsenic (Dissolved)		U		257	J		8.4	J		154	J		517	J		3.6	J		25.2	J		2.6	J		31.8	J			U	
Barium (Dissolved)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Chromium (Dissolved)		U		7.9	J		14.4	J		20.2	J			UJ			U			UJ			UJ			UJ			U	
Copper (Dissolved)		U		36.1	J		11.9	J			UJ			UJ			U			UJ		6.8	J		10.2	J		17.8	J	
Cyanide (Total)		U			U			U			U			U			U		40				U			U			U	
Lead (Dissolved)		U		599	J		184	J		44	J		13.5	J			U		60.5	J		2.1	J		33.4	J		12.7		
Mercury (Dissolved)		U			UJ			UJ		0.9	J		1.4	J			U		0.3	J			UJ			UJ			U	
Nickel (Dissolved)		U		92	J		19.4	J		200	J		466	J		38.3	J		335	J			UJ			UJ		39.8	J	
Selenium (Dissolved)	3.7	J			UJ			UJ			UJ			UJ			U			UJ		2.1	J		2	J			U	
Zinc (Dissolved)	19.2	J	high	130	J	high	328	J		85.6	J	high		UJ		250			1690	J		10.1	J	high	83.7	J	high	5580		
Water Quality Parameters (units as indicated)																														
Alkalinity (mg/l)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Chloride (mg/l)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Hardness (mg/l)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Turbidity (NTU)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	

TABLE 8
Summary of Historical On-Facility Groundwater and Surface Water Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Matrix	Groundwater (cont.)																													
Sample Location	MW-11			MW-12			MW-13			MW-14			PZ-1			PZ-2			PZ-3			GZ-1			GZ-2			GZ-4		
Sample Date	03/22/89			03/22/89			03/22/89			04/27/89			06/03/92			06/03/92			06/03/92			05/15/87			05/15/87			05/15/87		
Sampled By	Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Normandeau			Normandeau			Normandeau			CHIEE			CHIEE			CHIEE		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/l)																														
Benzene		U			U			U			U			UJ	low		U			U			U			U			U	
Butanone (2-)		U			U			U			U			UJ	low		U			U			U			U			U	
Ethylbenzene		U			U			U			U			UJ	low		U			U			U			U			U	
Hexanone (2-)		U			U			U			U			UJ	low		U			U			U			U			U	
Methylene Chloride	25	J	high	26	J	high	9	J	high		U		8.8	J	low		U			U			U			U			U	
Styrene		U			U			U			U			UJ	low		U			U			U			U			U	
Toluene		U			U			U			U			UJ	low		U			U			U			U			U	
Xylene (Total)		U			U			U			U			NA			NA			NA			U			U			U	
SVOCs (ug/l)																														
Acenaphthene		U		4	J			U			U			NA			NA			NA			NA			NA			NA	
Acenaphthylene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Anthracene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Benzo(a)anthracene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Benzo(a)pyrene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Benzo(b)fluoranthene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Benzo(k)fluoranthene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Benzoic Acid		U			U			U			U			NA			NA			NA			NA			NA			NA	
Bis(2-ethylhexyl)phthalate		U			U			U			U			NA			NA			NA			NA			NA			NA	
Chrysene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Dibenzofuran		U			U			U			U			NA			NA			NA			NA			NA			NA	
Diethylphthalate		U			U			U			U			NA			NA			NA			NA			NA			NA	
Dimethylphenol (2,4-)		U			U			U			U			NA			NA			NA			NA			NA			NA	
Dimethylphthalate		U			U		7	J	high		U			NA			NA			NA			NA			NA			NA	
Di-n-butylphthalate	5	J		4	J			U			U			NA			NA			NA			NA			NA			NA	
Fluoranthene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Fluorene		U		4	J			U			U			NA			NA			NA			NA			NA			NA	
Methylnaphthalene (2-)		U			U			U		2.9	J			NA			NA			NA			NA			NA			NA	
Methylphenol (2-)		U			U			U			U			NA			NA			NA			NA			NA			NA	
Methylphenol (4-)		U			U			U			U			NA			NA			NA			NA			NA			NA	
Naphthalene		U			U			U		15				NA			NA			NA			NA			NA			NA	
Phenanthrene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Phenol		U			U			U			U			NA			NA			NA			NA			NA			NA	
Pyrene		U			U			U			U			NA			NA			NA			NA			NA			NA	
Petroleum Hydrocarbons (mg/l)																														
Oil & Grease		NA			NA			NA			NA			NA			NA			NA		3.5			0.8			7.2		
Total Petroleum Hydrocarbons		UJ			UJ			UJ			UJ			UJ			UJ			R			NA			NA			NA	
Dissolved Metals/Cyanide (ug/l)																														
Arsenic (Dissolved)	2.7	J			U			U			U		14.5			8.5				U			NA			NA			NA	
Barium (Dissolved)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Chromium (Dissolved)		U			U			U			U		55				U			U			NA			NA			NA	
Copper (Dissolved)		U		6.4	J			U			U		99.2				U			U			NA			NA			NA	
Cyanide (Total)		U			U			U			U			NA			NA			NA			NA			NA			NA	
Lead (Dissolved)		U		6.4				U			U		303				U			U			NA			NA			NA	
Mercury (Dissolved)		U			U			U			U			U			U			U			NA			NA			NA	
Nickel (Dissolved)		U		15.2	J			U			U			NA			NA			NA			NA			NA			NA	
Selenium (Dissolved)		U			U		2	J			U			U			U			U			NA			NA			NA	
Zinc (Dissolved)	81.3	J	high	32.3	J	high	100	J	high		U		104			61.9			82.5				NA			NA			NA	
Water Quality Parameters (units as indicated)																														
Alkalinity (mg/l)		NA			NA			NA			NA		521			83				R			NA			NA			NA	
Chloride (mg/l)		NA			NA			NA			NA		34			13			3.2				NA			NA			NA	
Hardness (mg/l)		NA			NA			NA			NA		50			42			55				NA			NA			NA	
Turbidity (NTU)		NA			NA			NA			NA		44			120			79				NA			NA			NA	

TABLE 8
Summary of Historical On-Facility Groundwater and Surface Water Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Matrix	Groundwater (cont.)																		Surface Water											
Sample Location	GZ-5			GZ-6			GZ-7			GZ-8			GZ-9			W-1			Lagoon 2			Mixing Area			Tail Race Sta. 1			Tail Race Sta. 2		
Sample Date	05/15/87			05/15/87			05/15/87			05/15/87			05/15/87			05/15/87			03/14/89			03/14/89			03/15/89			03/15/89		
Sampled By	CHIEE			CHIEE			CHIEE			CHIEE			CHIEE			CHIEE			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/l)																														
Benzene		U			R			R			U			R			R			U			U			U			U	
Butanone (2-)		U			R			R			U			R			R			U			U			R			R	
Ethylbenzene		U			R			R			U			R			R			U			U			U			U	
Hexanone (2-)		U			R			R			U			R			R			U			U			U			U	
Methylene Chloride		U			R			R			U			R			R		4	J		5			9	J	high	3	J	
Styrene		U			R			R			U			R			R			U			U			U			U	
Toluene		U			R			R			U			R			R			U			U			U			U	
Xylene (Total)		U			R			R			U			R			R			U			U			U			U	
SVOCs (ug/l)																														
Acenaphthene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Acenaphthylene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Anthracene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Benzo(a)anthracene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Benzo(a)pyrene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Benzo(b)fluoranthene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Benzo(k)fluoranthene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Benzoic Acid		NA			NA			NA			NA			NA			NA			U			U			U			U	
Bis(2-ethylhexyl)phthalate		NA			NA			NA			NA			NA			NA			U		3	J			U			U	
Chrysene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Dibenzofuran		NA			NA			NA			NA			NA			NA			U			U			U			U	
Diethylphthalate		NA			NA			NA			NA			NA			NA			U			U			U			U	
Dimethylphenol (2,4-)		NA			NA			NA			NA			NA			NA			U			U			U			U	
Dimethylphthalate		NA			NA			NA			NA			NA			NA			U			U			U			U	
Di-n-butylphthalate		NA			NA			NA			NA			NA			NA		5	J	high	4	J	high		U			U	
Fluoranthene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Fluorene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Methylnaphthalene (2-)		NA			NA			NA			NA			NA			NA			U			U			U			U	
Methylphenol (2-)		NA			NA			NA			NA			NA			NA			U			U			U			U	
Methylphenol (4-)		NA			NA			NA			NA			NA			NA			U			U			U			U	
Naphthalene		NA			NA			NA			NA			NA			NA			U			U		7	J			U	
Phenanthrene		NA			NA			NA			NA			NA			NA			U			U		3	J			U	
Phenol		NA			NA			NA			NA			NA			NA			U			U			U			U	
Pyrene		NA			NA			NA			NA			NA			NA			U			U			U			U	
Petroleum Hydrocarbons (mg/l)																														
Oil & Grease	1			5.5			3.3			2			17			6.8				NA						NA			NA	
Total Petroleum Hydrocarbons		NA			NA			NA			NA			NA			NA		1.7	J		4.9			3.3	J			UJ	
Dissolved Metals/Cyanide (ug/l)																														
Arsenic (Dissolved)		NA			NA			NA			NA			NA			NA		5.4	J		2	J		5.8	J		7.8	J	
Barium (Dissolved)		NA			NA			NA			NA			NA			NA		19.7	J		21.3	J			NA			NA	
Chromium (Dissolved)		NA			NA			NA			NA			NA			NA			U			U			U			U	
Copper (Dissolved)		NA			NA			NA			NA			NA			NA		29.2			14.5	J		6.7	J		6.1	J	
Cyanide (Total)		NA			NA			NA			NA			NA			NA			U			U			U			UJ	
Lead (Dissolved)		NA			NA			NA			NA			NA			NA		19.3			5.9			24			19.5		
Mercury (Dissolved)		NA			NA			NA			NA			NA			NA			U			U			U			U	
Nickel (Dissolved)		NA			NA			NA			NA			NA			NA		18.7	J			U			U			U	
Selenium (Dissolved)		NA			NA			NA			NA			NA			NA			U			U			U			U	
Zinc (Dissolved)		NA			NA			NA			NA			NA			NA		62.9			24.9			27.6			13.9	J	
Water Quality Parameters (units as indicated)																														
Alkalinity (mg/l)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Chloride (mg/l)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Hardness (mg/l)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Turbidity (NTU)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	

TABLE 8
Summary of Historical On-Facility Groundwater and Surface Water Analytical Data ***DRAFT***
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. This table summarizes the results of historical chemical analyses performed on groundwater and surface water samples from On-Facility portions of the Site presented in several previous investigations, including:

   - "Phase I Submittal/Phase II Proposal, Asbestos and Hazardous Materials", prepared by Clean Harbors Environmental Engineering Corporation (CHIEE), dated September 1987. Samples collected by CHIEE were submitted to Clean Harbors Analytical Services of Braintree, Massachusetts for chemical analyses including Volatile Organic Compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method 624; Oil & Grease by USEPA Method 503B; and pH by USEPA Method 209F.
   - "Site Investigation Report", performed by Dames & Moore of Cranford, New Jersey, dated August 18, 1989 (Dames & Moore, 1989a). Samples collected by Dames & Moore were submitted to Enseco Laboratories (Enseco) of Cambridge, Massachusetts for analyses, including VOCs by USEPA Method 8240; semi-volatile organic compounds (SVOCs) by USEPA Method 8270; metals by analysis method 600/4-79-020; pH by USEPA Method 150.1; and Total Petroleum Hydrocarbons (TPH) by USEPA Method 418.1.
   - "Wetland Mitigation Design", performed by Normandeau Associates, Inc. (Normandeau) of Bedford, New Hampshire, dated October, 1992. Samples collected by Normandeau were submitted to Thermo Analytical Inc. of Waltham, Massachusetts for analyses, including VOCs by USEPA Method 8240; metals by USEPA Methods 200.7 (cadmium, chromium, copper, and zinc), 239.2 (lead), 245.1 (mercury), and 270.2 (selenium); TPH by USEPA Method 418.1; alkalinity by USEPA Method 2320B; chloride by USEPA Method 4500C1; hardness by USEPA Method 2340C; and turbidity by USEPA Method 2130B.

   Results of analyses are indicated in the table.

2. A blank space in the "Result" column indicates that the analyte was not detected. Only analytes detected in one or more of the On-Facility groundwater and/or surface water samples are included in the table.

3. "NA" indicates the analysis was not performed.

4. Qualifiers have been assigned by New Environmental Horizons, Inc. (NEH) based on a data usability assessment (refer to Section 5 and Appendix E of the text for additional details regarding the usability assessment).
   "J" indicates the associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project decisions as an estimated result.
   "U" indicates the compound was analyzed for, but was not detected.
   "UJ" indicates the compound was analyzed for, but was not detected. Data users are cautioned that data qualified UJ may not be usable in risk assessment if the bias is either low or unknown due to the potential for false negatives.
   "R" indicates the data have been rejected due to severe or cumulative exceedance of quality control criteria. The value is unusable (compound may or may not be present) for risk assessment decisions.

5. In addition to the data qualifiers, in some cases, NEH applied a bias ("high" or "low") on a chemical-by-chemical basis, for all estimated results for which a bias could be determined. For those estimated results for which the bias could not be determined, the "bias" column was left blank. Data users are cautioned that for those sample results that are non-detected and estimated (qualified UJ), and where the bias is indicated as either undetermined (left blank) or "low," the potential exists for false negatives. In general, "high" bias estimated results are usable in assessment of risk, as this would be protective of human health and the environment. Estimated results that may be false negatives may be unusable for risk assessment purposes (based on EPA guidance, April 1992).

TABLE 9
Summary of Historical On-Facility Groundwater and Surface Water pH Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

	Sampled By	GZA[1]		GZA[2]		CHIEE[3]		Dames & Moore[4]		Dames & Moore[4]		Dames & Moore[4]		Canonie[5]		Canonie[5]		Normandeau[6]		Normandeau[7]		Normandeau[7]	
	Date	Mar-85		Apr-85		05/15/87		03/22/89		03/23/89		03/24/89		04/02/91		04/09/91		06/03/92		05/20/94		08/11/94	
Location	Matrix	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier	pH	Qualifier
GZ-1	Groundwater	7.1				7.2																	
GZ-2	Groundwater	6.7				6.9								7.6	J								
GZ-3	Groundwater	6.6																					
GZ-4	Groundwater	6.3				6.2																	
GZ-5	Groundwater	6.1				6.1																	
GZ-6	Groundwater			13.5	J	11.4																	
GZ-7	Groundwater			13.5	J	10.3																	
GZ-8	Groundwater			7.6		7.4																	
GZ-9	Groundwater			13.5		12.2																	
MW-01	Groundwater							6.3															
MW-02	Groundwater							10.81															
MW-03	Groundwater											9.48											
MW-04	Groundwater									12.4				7.4	J								
MW-05	Groundwater											12.98											
MW-06	Groundwater							6.24						12.4	J								
MW-07	Groundwater											12.9											
MW-08	Groundwater									9.74													
MW-09	Groundwater									11.46													
MW-10	Groundwater							7.33															
MW-11	Groundwater							6.35															
MW-12	Groundwater							7.02															
MW-13	Groundwater							7.74															
PZ-1	Groundwater																	9.9					
PZ-2	Groundwater																	6.2					
PZ-3	Groundwater																	5.6					
RS-1	Groundwater													6	J								
RS-2	Groundwater													6	J								
RS-3	Groundwater													7	J								
RS-4	Groundwater															6.8	J						
W-1	Groundwater			9	J	9.1																	
River	Surface Water																			6.8		7.9	
RS-1	Surface Water													6	J								
RS-2	Surface Water													6	J								
RS-3	Surface Water													6	J								
RS-4	Surface Water															5.8	J						
S-1	Surface Water																	11.4					
S-2	Surface Water																	6.3					
Seepage	Surface Water																			6.9			
SW-1	Surface Water	7.6				9.4																	
SW-2	Surface Water	11.2		10.9		8.8																	
SW-3	Surface Water	7.5				7.2																	
SW-4	Surface Water					7																	
SW-5	Surface Water					7.1																	
Tail race	Surface Water																			11		9.7	

TABLE 9
Summary of Historical On-Facility Groundwater and Surface Water pH Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. This table summarizes historical pH values measured for groundwater and surface water samples collected at the Site in conjunction with the above-referenced documents. pH results are presented in standard pH units (SUs). The method of analysis varied:

GZA[1] - GZA (1985a): Orion Research Model 701A digital ionalyzer - field measurement of pH;
GZA[2] - GZA (1985b): Orion Research Model 701A digital ionalyzer and pH Paper - field measurement of pH;
CHIEE[3] - CHIEE (1987b): United States Environmental Protection (USEPA) Method 209F - laboratory measurement of pH;
Dames & Moore[4] - Dames & Moore (1989a): Analysis method not provided in documentation - laboratory measurement of pH;
Canonie[5] - Canonie (1991c): pH paper - field measurement of pH;
Normandeau[6] - Normandeau (1992b): Analysis method not provided in documentation - field measurement of pH; and
Normandeau[7] - Normandeau (undated): Analysis method not provided in documentation - field measurement of pH.

2 A blank space in the "Result" column indicates that no measurement was taken at that location on that date.

3. Two pH measurements of 7.6 SUs were recorded in the Neponset River by Normandeau in 1996 and 1997 (1996; 1997). In addition, two pH measurements of 9.3 and 10.0 were recorded in 1996 and a measurement of 9.5 SUs was recorded in 1997 the tailrace by Normandeau. Sampling locations in the Neponset River and tailrace referenced by Normandeau were not described or depicted on figures provided in Normandeau, 1996 or 1997.

TABLE 10A
Summary of Analytical Data on Soils Placed within the Area of Containment (AOC)
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	NA-4.5 / 1.5'			Lot 1232-2 GCL-1			Lot 1232-2 GCL-2			Lot 1232-2 GCL-3			Lot 1232-2 GCL-4 Comp.			Lot 1245-9 OL-1		
Sample Date	03/28/89			04/15/92			04/15/92			04/15/92			04/15/92			04/15/92		
Sampled By	Dames & Moore			Canonie			Canonie			Canonie			Canonie			Canonie		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)																		
Methylene Chloride	24	J			R			R			R			NA			R	
SVOCs (ug/kg)																		
Acenaphthene		U		50	J			UJ		90	J			NA			UJ	
Acenaphthylene		U			UJ			UJ		90	J			NA			UJ	
Anthracene		U		100	J		50	J		300	J			NA			UJ	
Benzo(a)anthracene	54	J		300	J		100	J		1100	J			NA		50	J	
Benzo(a)pyrene	54	J		300	J		100	J		900	J			NA			UJ	
Benzo(b)fluoranthene	88	J		380	J			UJ		790	J			NA			UJ	
Benzo(g,h,i)perylene	58	J			UJ			UJ		460	J			NA			UJ	
Benzo(k)fluoranthene	88	J		300	J			UJ		810	J			NA			UJ	
Bis(2-ethylhexyl)phthalate		U		60	J			UJ		100	J			NA			UJ	
Chrysene	63	J	high	440	J			UJ		1200	J			NA		90	J	
Dimethylphthalate	50	J			UJ			UJ			UJ			NA			UJ	
Di-n-butylphthalate		U			UJ		200	J			UJ			NA			UJ	
Fluoranthene	100	J		820	J		300	J		1700	J			NA		70	J	
Fluorene		U		60	J			UJ		100	J			NA			UJ	
Indeno(1,2,3-cd)pyrene	51	J			UJ			UJ		480	J			NA			UJ	
Naphthalene		U		70	J			UJ		60	J			NA			UJ	
Phenanthrene	74	J		800	J		300	J		1300	J			NA		200	J	
Pyrene	98	J		810	J		300	J		2700	J			NA		100	J	
Metals (mg/kg)																		
Antimony		U			U		9.8				U			NA		27		
Arsenic	5.2			4			4			5				NA		5.7		
Beryllium	0.31	J			U			U			U			NA			U	
Cadmium		U		2.3			2.8			3				NA		7.8		
Chromium	12.4			14			13			16				NA		12		
Copper	31.6			36			15			69				NA		270		
Lead	163			200			76			280				NA		55		
Mercury	0.7				U			U		1.7				NA			U	
Nickel	5.3	J		14			8.9			12				NA		7.4		
Thallium		U			U			U			U			NA			U	
Zinc	327			220			62			230				NA		55		
TCLP Metals (mg/l)																		
Barium (TCLP)		NA			NA			NA			NA		0.65				NA	

TABLE 10A
Summary of Analytical Data on Soils Placed within the Area of Containment (AOC)
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Lot 1245-9 OL-2			Lot 1245-8 OL-3			Lot 1245-8 OL-4			Lot 1245-8 OL-5			Lot 1245-8 OL-6			Lot 1245-8 OL-7 Comp.		
Sample Date	04/15/92			04/15/92			04/15/92			04/15/92			04/15/92			04/15/92		
Sampled By	Canonie			Canonie			Canonie			Canonie			Canonie			Canonie		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)																		
Methylene Chloride		R			R			R			R			R			NA	
SVOCs (ug/kg)																		
Acenaphthene		UJ		100	J			UJ			UJ			UJ			NA	
Acenaphthylene		UJ		200	J			UJ			UJ		40	J			NA	
Anthracene		UJ		300	J			UJ			UJ			UJ			NA	
Benzo(a)anthracene		UJ		900	J			UJ			UJ		80	J			NA	
Benzo(a)pyrene		UJ		940	J			UJ			UJ		100	J			NA	
Benzo(b)fluoranthene		UJ		690	J			UJ			UJ		70	J			NA	
Benzo(g,h,i)perylene		UJ		500	J			UJ			UJ			UJ			NA	
Benzo(k)fluoranthene		UJ		690	J			UJ			UJ		80	J			NA	
Bis(2-ethylhexyl)phthalate		UJ		100	J			UJ			UJ			UJ			NA	
Chrysene		UJ		960	J			UJ			UJ		100	J			NA	
Dimethylphthalate		UJ			UJ			UJ			UJ			UJ			NA	
Di-n-butylphthalate		UJ			UJ			UJ			UJ			UJ			NA	
Fluoranthene		UJ		1200	J			UJ			UJ		100	J			NA	
Fluorene		UJ		100	J			UJ			UJ			UJ			NA	
Indeno(1,2,3-cd)pyrene		UJ			UJ			UJ			UJ			UJ			NA	
Naphthalene		UJ		100	J			UJ			UJ			UJ			NA	
Phenanthrene		UJ		1400	J			UJ			UJ		70	J			NA	
Pyrene		UJ		2400	J		40	J			UJ		200	J			NA	
Metals (mg/kg)																		
Antimony	34			18			72				U		14				NA	
Arsenic	8.1			11			7.4			0.92			2.4				NA	
Beryllium		U			U			U			U			U			NA	
Cadmium	9.4			3.2			3.4			2.3			3.2				NA	
Chromium	14			23			10			14			20				NA	
Copper	3.6	J	high	50			8.4			2.9	J	high	8.8				NA	
Lead	30			330			64			26			29				NA	
Mercury		U			U			U			U			U			NA	
Nickel	6			15			5.4			5.4			10				NA	
Thallium		U			U			U			U		0.5				NA	
Zinc	37			220			62			39			45				NA	
TCLP Metals (mg/l)																		
Barium (TCLP)		NA			NA			NA			NA			NA		0.64		

TABLE 10A
Summary of Analytical Data on Soils Placed within the Area of Containment (AOC)
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Notes:

1. This table summarizes the results of historical chemical analyses performed on soil samples collected from On- and Off-Facility portions of the Site which were subsequently removed and placed within the Area of Containment (AOC) during activities associated with the asbestos Removal Action (RA). These results were presented in several previous investigations, including:

   - "Site Investigation Report", performed by Dames & Moore of Cranford, New Jersey, dated August 18, 1989 (Dames & Moore, 1989a). Samples collected by Dames & Moore were submitted to Enseco Laboratories (Enseco) of Cambridge, Massachusetts for analyses, including semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270; metals by USEPA SW-846 Methods; and total petroleum hydrocarbons (TPH) by USEPA Method 418.1.

   - "Transmittal, Soil Analytical Data", performed by Canonie Environmental Services Corp. (Canonie) of Porter, Indiana dated May 20, 1992 (Canonie, 1992b). Soil samples collected by Canonie were submitted to National Environmental Testing Atlantic, Inc. (Net Atlantic), of Bedford, Massachusetts for analyses, including VOCs by USEPA Method 8240, SVOCs by USEPA Method 8270, and metals by USEPA SW-846 Methods. Several samples were submitted to Net Atlantic for Toxicity Characteristic Leaching Procedure (TCLP) organic and metals analyses.

   Results of SVOCs analyses are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb); results of metals (total) analyses are presented in milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm), and results of metals (TCLP) analyses are presented in milligrams per liter (mg/l).

2. A blank space in the "Result" column indicates that the analyte was not detected. Only analytes detected in one or more of the On- or Off-Facility shallow soil samples presented herein are included in the table.

3. "NA" indicates the analysis was not performed for that sample.

4. Qualifiers have been assigned by New Environmental Horizons, Inc. (NEH) based on a data usability assessment (refer to Section 5 and Appendix E of the text for additional details regarding the usability assessment).
   "J" indicates the associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project decisions as an estimated result.
   "U" indicates the compound was analyzed for, but was not detected.
   "UJ" indicates the compound was analyzed for, but was not detected. Data users are cautioned that data qualified "UJ" may not be usable in risk assessment if the bias is either low or unknown due to the potential for false negatives.
   "R" indicates the data have been rejected due to severe or cumulative exceedance of quality control criteria. The value is unusable (compound may or may not be present) for risk assessment decisions.

5. In addition to the data qualifiers, in some cases, NEH applied a bias ("high" or "low") on a chemical-by-chemical basis, for all estimated results for which a bias could be determined. For those estimated results for which the bias could not be determined, the "bias" column was left blank. Data users are cautioned that for those sample results that are non-detected and estimated (qualified "UJ"), and where the bias is indicated as either undetermined (left blank) or "low," the potential exists for false negatives. In general, "high" bias estimated results are usable in assessment of risk, as this would be protective of human health and the environment. Estimated results that may be false negatives may be unusable for risk assessment purposes (based on EPA guidance, April 1992).

TABLE 10B
Summary of Analytical Data on Soils and Sediments Placed Within the Settling Basin No. 2 Containment Cell
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Lagoon 2 MH West			Lagoon 2 Sta. 1			Lagoon 2 Sta. 2			Lagoon 2 Sta. 3			Lagoon 2 Sta. 4			Lagoon 2 Sta. 5			Tail Race Sta. 1			Tail Race Sta. 2			Tail Race Sta. 3			Tail Race Sta. 3 Dup.		
Sample Date	03/09/89			03/10/89			03/10/89			03/10/89			03/10/89			03/10/89			03/15/89			03/15/89			03/15/89			03/15/89		
Sampled By	Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore			Dames & Moore		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)																														
Butanone (2-)	8	J	low		R			R			R		6	J	low		R			R			R			R			R	
Carbon Disulfide		R			R			R			R			R			R			R			R			R			R	
Dibromochloromethane	2	J	low		R			R			R		2	J	high	2	J	high		R			R			R			R	
Ethylbenzene		R			R			R			R			R			R			R			R			R			R	
Methylene Chloride	18	J	high	27	J	high	57	J	high	20	J	high		R		4	J	high	46	J	high	9	J	high	4	J	high	95	J	high
Styrene		R			R			R			R			R			R			R			R			R			R	
Toluene	3	J	low		R			R			R			R			R			R			R			R			R	
Xylene (Total)	3	J			R			R			R			R			R			R			R			R			R	
SVOCs (ug/kg)																														
Acenaphthene		UJ			UJ		84	J			UJ		340	J		140	J		190	J			UJ		120	J		1400	J	
Acenaphthylene	94	J			UJ		300	J			UJ		920	J		380	J		310	J		49	J		82	J		870	J	
Anthracene	110	J			UJ		360	J			UJ		970	J		630	J		430	J		64	J		150	J		1500	J	
Benzo(a)anthracene	300	J		110	J		1100	J			UJ		2900	J		1300	J		1300	J		240	J		550	J		5500	J	
Benzo(a)pyrene	300	J		79	J		1400	J		36	J		4000	J		1700	J		1400	J		270	J		520	J		6000	J	
Benzo(b)fluoranthene	510	J		150	J		2200	J		63	J		6000	J		2000	J		2000	J		360	J		630	J		7300	J	
Benzo(g,h,i)perylene	40	J			UJ		1800	J			UJ		4600	J		1600	J		1100	J		130	J			UJ		4100	J	
Benzo(k)fluoranthene	510	J		150	J		2200	J			UJ		6000	J		2000	J		2000	J		360	J		630	J		7300	J	
Benzyl Alcohol		UJ			UJ			UJ			UJ			UJ			UJ			R			UJ			UJ			UJ	
Bis(2-ethylhexyl)phthalate	670	J			UJ		240	J			UJ		600	J			UJ		590	J	high	140	J	high	70	J	high		UJ	
Chrysene	400	J		150	J		1600	J			UJ		4500	J		1600	J		1600	J		440	J		950	J		11000	J	
Dibenz(a,h)anthracene		UJ			UJ		270	J			UJ		850	J		270	J		270	J			UJ			UJ		960	J	
Dibenzofuran		UJ			UJ			UJ			UJ		180	J		110	J		67	J			UJ		74	J		730	J	
Fluoranthene	510	J		210	J		1900	J		72	J		5300	J		1900	J		2500	J		400	J		680	J		7000	J	
Fluorene	37	J			UJ		160	J			UJ		500	J		400	J		400	J		57	J		200	J		2100	J	
Indeno(1,2,3-cd)pyrene	57	J			UJ		1200	J			UJ		3400	J		1200	J		1000	J			UJ		280	J		3000	J	
Methylnaphthalene (2-)		UJ			UJ		58	J			UJ		240	J		300	J		340	J		120	J		430	J		4100	J	
Naphthalene		UJ			UJ		150	J			UJ		640	J		420	J		630	J		100	J			UJ		970	J	
Nitrosodiphenylamine (N-)		UJ			UJ			UJ			UJ			UJ			UJ		46	J	high	71	J	high		UJ			UJ	
Phenanthrene	540	J		180	J		2000	J		61	J		5400	J		2900	J		3500	J		510	J		1000	J		12000	J	
Phenol		UJ			UJ			UJ			UJ			UJ			UJ			R			UJ			UJ			UJ	
Pyrene	730	J		280	J		2900	J		120	J		8200	J		3800	J		3900	J		680	J		1600	J		17000	J	
Metals (mg/kg)																														
Arsenic	0.78	J		2.2	J		2.3	J		0.75	J		1.8	J		1.4	J		1.1	J		2.3	J		6.8	J		5.2	J	
Barium		UJ		43.3	J		73.2	J		33.3	J		61.5	J		48.2	J			UJ			UJ			UJ			UJ	
Chromium	7.2	J		15.6	J		23.4	J		9.8	J		9.8	J		14.2	J		5.5	J		14	J		39	J		32.4	J	
Copper	399	J		76.8	J		114	J		17.8	J		19.9	J		30	J		9.7	J		18.5	J		47.5	J		29.9	J	
Lead	81.9			197	J		100	J		52.6	J		79.2	J		176	J		72.6	J		146	J		1270	J		779	J	
Mercury	0.3	J		0.5	J		0.4	J			UJ		0.5	J		0.2	J			UJ			UJ			UJ			UJ	
Nickel	6.3	J		22.2	J		32.1	J		13.1	J		7.1	J		25.1	J		9.9	J		20.5	J		90.9	J		84.8	J	
Silver	82.9	J			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ			UJ	
Thallium		UJ			UJ		0.99	J			UJ		0.81	J			UJ			UJ			UJ			UJ			UJ	
Zinc	123	J		322	J		137	J		55	J		49.8	J		147	J		128	J		47.8	J		125	J		105	J	
pH (s.u.)																														
pH	10.98			7.2			7.58			8.62			8.28			8.87			9.58			10.69			9.55			9.66		
Total Petroleum Hydrocarbons (mg/kg)																														
TPH	310	J		21	J		250	J		56	J		210	J		44	J		260	J		720	J		980	J		3700	J	
TCLP Metals (mg/l)																														
Barium (TCLP)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	
Lead (TCLP)		NA			NA			NA			NA			NA			NA			NA			NA			NA			NA	

TABLE 10B
Summary of Analytical Data on Soils and Sediments Placed Within the Settling Basin No. 2 Containment Cell
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Location	Tail Race Sta. 4			Tail Race Sta. 5			CMTR-1 Comp.		
Sample Date	03/15/89			03/15/89			04/15/92		
Sampled By	Dames & Moore			Dames & Moore			Canonie		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (ug/kg)									
Butanone (2-)		R			R			NA	
Carbon Disulfide	4	J	low		R			NA	
Dibromochloromethane		R			R			NA	
Ethylbenzene	45	J	low		R			NA	
Methylene Chloride	29	J	high	50	J	high		NA	
Styrene		R			R			NA	
Toluene		R			R			NA	
Xylene (Total)	260	J	low		R			NA	
SVOCs (ug/kg)									
Acenaphthene		UJ			UJ			NA	
Acenaphthylene	89	J		200	J			NA	
Anthracene	88	J		200	J			NA	
Benzo(a)anthracene	330	J		770	J			NA	
Benzo(a)pyrene	390	J		920	J			NA	
Benzo(b)fluoranthene	540	J		1400	J			NA	
Benzo(g,h,i)perylene	300	J		590	J			NA	
Benzo(k)fluoranthene	540	J		1400	J			NA	
Benzyl Alcohol	120	J			UJ			NA	
Bis(2-ethylhexyl)phthalate	210	J	high	230	J	high		NA	
Chrysene	640	J		1100	J			NA	
Dibenz(a,h)anthracene		UJ			UJ			NA	
Dibenzofuran		UJ			UJ			NA	
Fluoranthene	680	J		1400	J			NA	
Fluorene		UJ			UJ			NA	
Indeno(1,2,3-cd)pyrene		UJ		550	J			NA	
Methylnaphthalene (2-)	92	J			UJ			NA	
Naphthalene	190	J			UJ			NA	
Nitrosodiphenylamine (N-)		UJ		110	J	high		NA	
Phenanthrene	710	J		1600	J			NA	
Phenol	260	J			UJ			NA	
Pyrene	1400	J		2500	J			NA	
Metals (mg/kg)									
Arsenic	3.7	J		5.2	J			NA	
Barium		UJ			UJ			NA	
Chromium	33.7	J		20.3	J			NA	
Copper	15	J		37.3	J			NA	
Lead	268	J		433	J			NA	
Mercury		UJ			UJ			NA	
Nickel	36.5	J		29.1	J			NA	
Silver		UJ			UJ			NA	
Thallium		UJ			UJ			NA	
Zinc	104	J		214	J			NA	
pH (s.u.)									
pH	11.24			7.48				NA	
Total Petroleum Hydrocarbons (mg/kg)									
TPH	540	J		930	J			NA	
TCLP Metals (mg/l)									
Barium (TCLP)		NA			NA		0.69		
Lead (TCLP)		NA			NA		13		

Notes:

1. This table summarizes the results of historical chemical analyses performed on soil and sediment samples collected from On-Facility portions of the Site which were subsequently removed and placed within the Settling Basin No. 2 (a/k/a Lagoon No. 2) Containment Cell during activities associated with the asbestos Removal Action (RA). These results were presented in several previous investigations, including:

• "Site Investigation Report", performed by Dames & Moore of Cranford, New Jersey, dated August 18, 1989 (Dames & Moore, 1989a). Samples collected by Dames & Moore were submitted to Enseco Laboratories (Enseco) of Cambridge, Massachusetts for analyses, including semi-volatile organic compounds (SVOCs) by United States Environmental Protection Agency (USEPA) Method 8270; metals by USEPA SW-846 Methods; and total petroleum hydrocarbons (TPH) by USEPA Method 418.1.

• "Transmittal, Soil Analytical Data", performed by Canonie Environmental Services Corp. (Canonie) of Porter, Indiana dated May 20, 1992 (Canonie, 1992b). Soil samples collected by Canonie were submitted to National Environmental Testing Atlantic, Inc. (Net Atlantic), of Bedford, Massachusetts for analyses, including VOCs by USEPA Method 8240, SVOCs by USEPA Method 8270, and metals by USEPA SW-846 Methods. Several samples were submitted to Net Atlantic for Toxicity Characteristic Leaching Procedure (TCLP) organic and metals analyses. Results of SVOCs analyses are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb); results of metals analyses are presented in milligrams per kilogram (mg/kg), which are equivalen parts per million (ppm).

2. Samples from "Lagoon 2" (i.e., Lagoon 2 MH West, Lagoon 2 Sta.1, Lagoon 2 Sta.2, Lagoon 2 Sta.3, Lagoon 2 Sta.4, and Lagoon 2 Sta.5) represent the historical quality of the soil underlying the Settling Basin No. 2 containment area. These sediments were left in place, essentially "covered" by the Settling Basin No. 2 containment area.

3. Location "Lagoon 2 MW West" was denoted as "Lagoon 2 East" in the Dames & Moore tables, but "Lagoon 2 MW West" on the Dames & Moore figures. The figure denoted the sampling location as a manhole symbol to the west of Lagoon 2.

4. A blank space in the "Result" column indicates that the analyte was not detected. Only analytes detected in one or more of the samples presented herein are included in the table.

5. "NA" indicates the analysis was not performed for that sample.

6. Qualifiers have been assigned by New Environmental Horizons, Inc. (NEH) based on a data usability assessment (refer to Section 5 and Appendix E of the text for additional details regarding the usability assessment).

"J" indicates the associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project decisions as an estimated result.

"U" indicates the compound was analyzed for, but was not detected.

"UJ" indicates the compound was analyzed for, but was not detected. Data users are cautioned that data qualified "UJ" may not be usable in risk assessment if the bias is either low or unknown due to the potential for false negatives.

"R" indicates the data have been rejected due to severe or cumulative exceedance of quality control criteria. The value is unusable (compound may or may not be present) for risk assessment decisions. Re-sampling and reanalysis is recommended for verification.

7. In addition to the data qualifiers, in some cases, NEH applied a bias ("high" or "low") on a chemical-by-chemical basis, for all estimated results for which a bias could be determined. For those estimated results for which the bias could not be determined , the "bias" column was left blank. Data users are cautioned that for those sample results that are non-detected and estimated (qualified "UJ"), and where the bias is indicated as either undetermined (left blank) or "low," the potential exists for false negatives. In general, "high" bias estimated results are usable in assessment of risk, as this would be protective of human health and the environment. Estimated results that may be false negatives may be unusable for risk assessment purposes (based on EPA guidance, April 1992).

TABLE 11
Summary of Backfill Analytical Data
Blackburn & Union Privileges Superfund Site
Walpole, Massachusetts

Sample Source	McIntyre Sand Sample 2			McIntyre Sand Sample 3			DiPlacido Loam		
Sample Date	08/11/92			08/17/92			08/18/92		
Analyte	Result	Qualifier	Bias	Result	Qualifier	Bias	Result	Qualifier	Bias
VOCs (µg/kg)									
Acetone	4.1	J	high		R			R	
Methylene Chloride	13	J	high	1.7	J	high	1.4	J	
Metals (mg/kg)									
Aluminum	2,500			3,300			2,400		
Arsenic	2.4			1.3			1		
Calcium	530			620			160		
Chromium	3.4			5.7			4.8		
Cobalt	2.4			3.8			3.6		
Copper	4.9			6.5			5.2		
Iron	5,500			4,800			5,600		
Lead	4.5			3.1			4.7		
Magnesium	950			1,400			700		
Manganese	97			84			110		
Nickel	4.5			5.2			4.4		
Potassium	240			760			270		
Sodium	99			100	UJ		100	UJ	
Vanadium	5.7			8			8		
Zinc	13			8.4			7.8		

Notes:

1. This table summarizes the results of historical chemical analyses performed on backfill materials placed at the Site to construct the cap over the Area of Containment (AOC) on Lots 1235-1, 1235-4, 1235-8, and 1249, during the 1993 Removal Action (RA) performed by Canonie Environmental Canonie Environmental Services Corporation (Canonie). Backfill sand was provided by McIntyre Loam Company of Hopkinton, Massachusetts. Topsoil was provided by both McIntyre and Thomas DiPlacido Corp. of Wrentham, Massachusetts. Due to detections of semi-volatile organic compounds (SVOCs) in a topsoil sample from McIntyre (not presented in this table), only topsoil from DiPlacido was used in construction of the AOC cap.

2. Samples were analyzed by National Environmental Testing of Thorofare, New Jersey for volatile organic compounds (VOCs) by Method 8240, semi-volatile organic compounds (SVOCs) by Method 8270, and selected metals by Method 6010. Results are presented in micrograms per kilogram (µg/kg), which are equivalent to parts per billion (ppb) for VOCs and SVOCs, and milligrams per kilogram (mg/kg), which are equivalent to parts per million (ppm) for metals.

2. A blank space in the "Result" column indicates that the analyte was not detected. Only analytes detected in one or more of the samples presented in this table are included.

3. Qualifiers have been assigned by New Environmental Horizons, Inc. (NEH) based on a data usability assessment (refer to Section 5 and Appendix E of the text for additional details regarding the usability assessment).

"J" indicates the associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project decisions as an estimated result.

"U" indicates the compound was analyzed for, but was not detected.

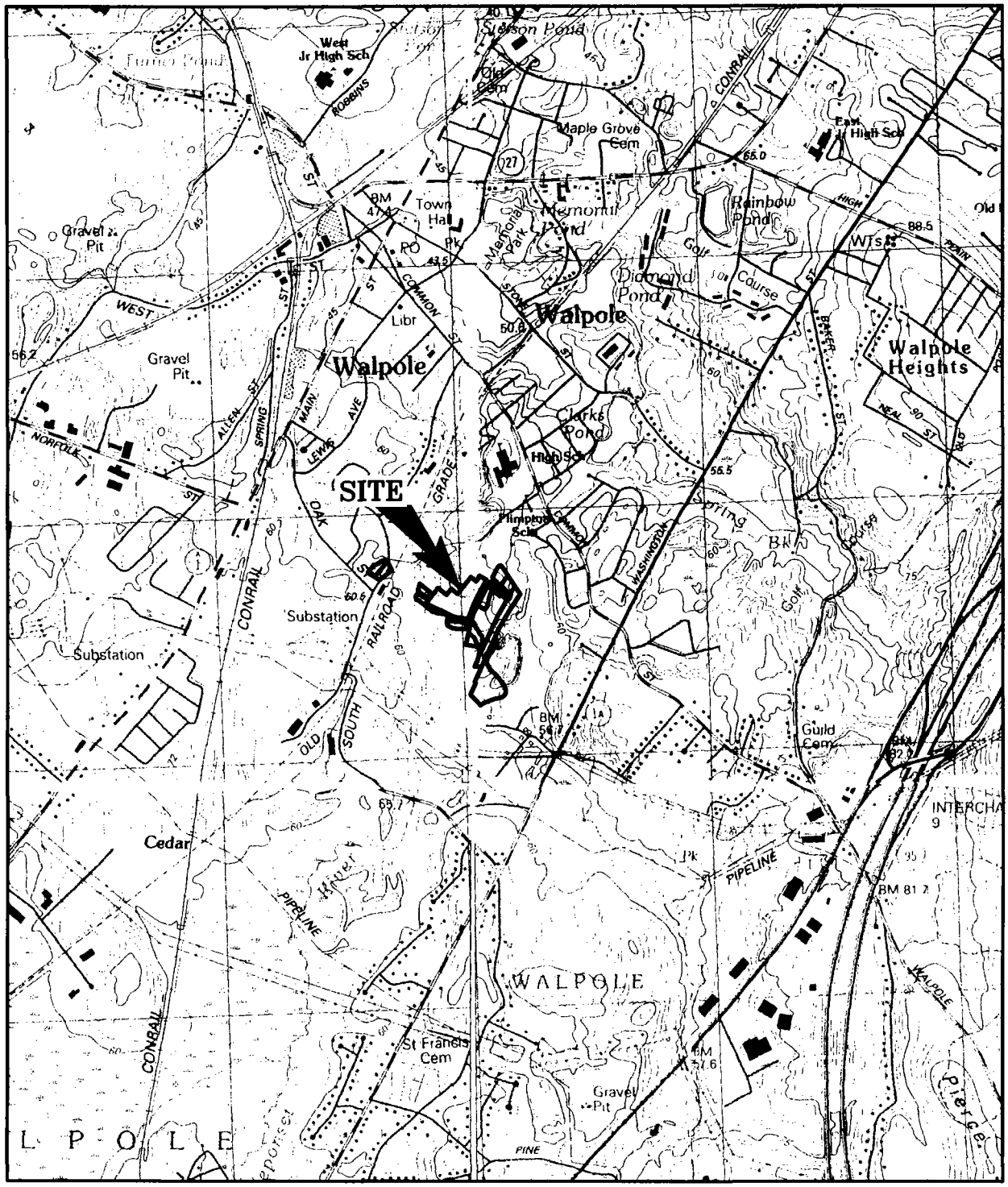
"UJ" indicates the compound was analyzed for, but was not detected. Data users are cautioned that data qualified UJ may not be usable in risk assessment if the bias is either low or unknown due to the potential for false negatives.

"R" indicates the data have been rejected due to severe or cumulative exceedance of quality control criteria.

4. In addition to the data qualifiers, in some cases, NEH applied a bias ("high" or "low") on a chemical-by-chemical basis, for all estimated results for which a bias could be determined. For those estimated results for which the bias could not be determined, the "bias" column was left blank. Data users are cautioned that for those sample results that are non-detected and estimated (qualified UJ), and where the bias is indicated as either undetermined (left blank) or "low," the potential exists for false negatives. In general, "high" bias estimated results are usable in assessment of risk, as this would be protective of human health and the environment. Estimated results that may be false negatives may be unusable for risk assessment purposes (based on EPA guidance, April 1992).

FIGURES

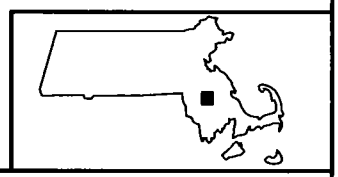
PCP FILE: SHA-STD.PCP
AUTOFILL FILE: NONE
PLOT DATE: 01-07-00
XREFS: \DRIVE\JOB NO. \FILE NAME
PLOT VIEW: PLTT: PLOT SCALE: 1=1



NOTES:

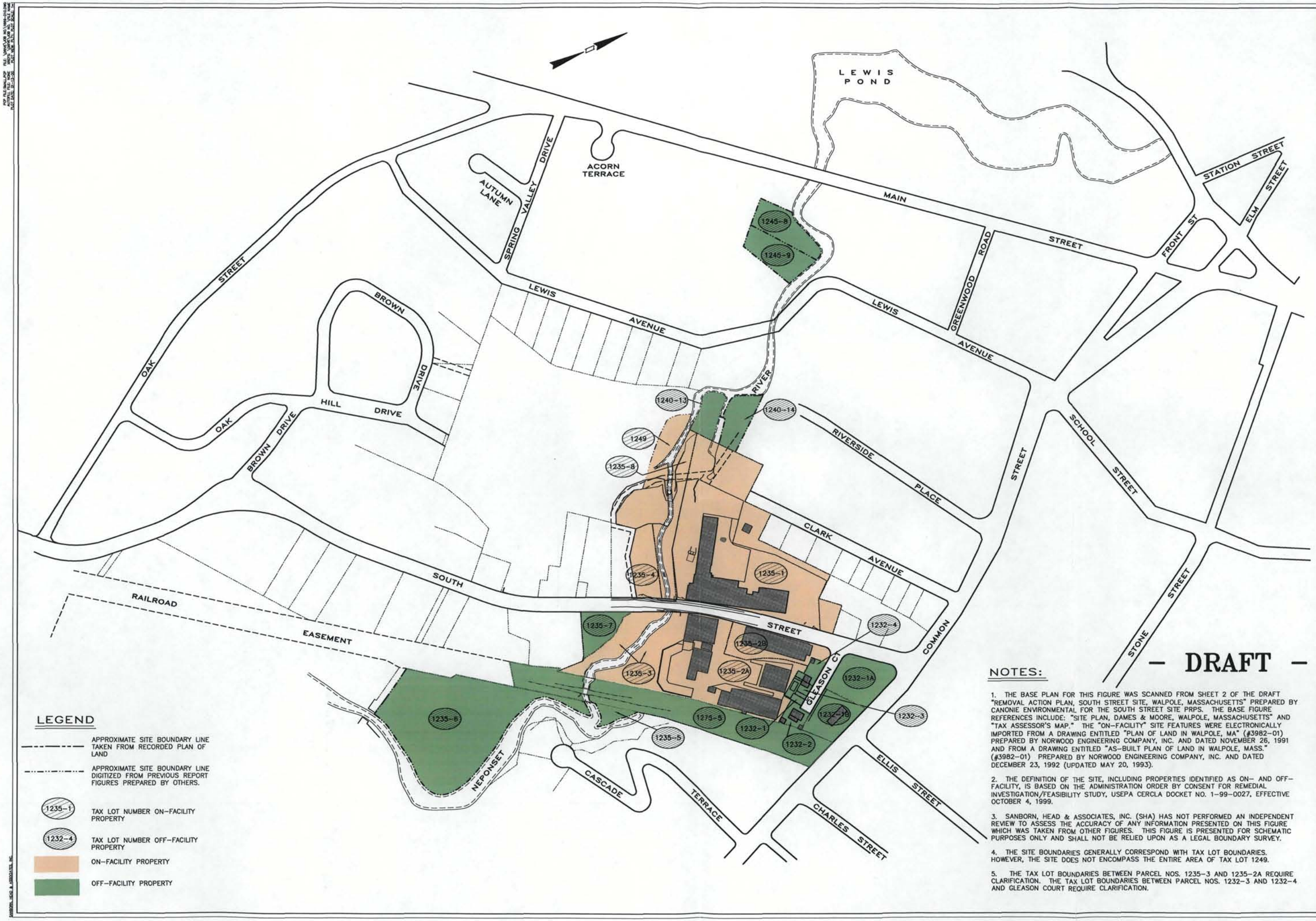
BASE MAP TAKEN FROM 7.5 MINUTE USGS QUADRANGLE MAP:
MEDFIELD, MASSACHUSETTS (1987)
NORWOOD, MASSACHUSETTS (1985)

– DRAFT –



BLACKBURN & UNION PRIVILEGES SUPERFUND SITE WALPOLE, MASSACHUSETTS	**LOCUS PLAN**		
SHA Sanborn, Head & Associates *Consulting Engineers & Scientists*	SCALE: 1"=2000'	DRAWN BY: PGP	FILE NO.1669.2
	DATE: JAN 00	CHECKED BY: CLH	FIGURE NO.1

SANBORN, HEAD & ASSOCIATES, INC.



LEGEND

- APPROXIMATE SITE BOUNDARY LINE TAKEN FROM RECORDED PLAN OF LAND
- APPROXIMATE SITE BOUNDARY LINE DIGITIZED FROM PREVIOUS REPORT FIGURES PREPARED BY OTHERS.
- 1235-1 — TAX LOT NUMBER ON-FACILITY PROPERTY
- 1232-4 — TAX LOT NUMBER OFF-FACILITY PROPERTY
- ON-FACILITY PROPERTY
- OFF-FACILITY PROPERTY

NOTES:

1. THE BASE PLAN FOR THIS FIGURE WAS SCANNED FROM SHEET 2 OF THE DRAFT "REMOVAL ACTION PLAN, SOUTH STREET SITE, WALPOLE, MASSACHUSETTS" PREPARED BY CANONIE ENVIRONMENTAL FOR THE SOUTH STREET SITE PRPS. THE BASE FIGURE REFERENCES INCLUDE: "SITE PLAN, DAMES & MOORE, WALPOLE, MASSACHUSETTS" AND "TAX ASSESSOR'S MAP." THE "ON-FACILITY" SITE FEATURES WERE ELECTRONICALLY IMPORTED FROM A DRAWING ENTITLED "PLAN OF LAND IN WALPOLE, MA" (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED NOVEMBER 26, 1991 AND FROM A DRAWING ENTITLED "AS-BUILT PLAN OF LAND IN WALPOLE, MASS." (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED DECEMBER 23, 1992 (UPDATED MAY 20, 1993).

2. THE DEFINITION OF THE SITE, INCLUDING PROPERTIES IDENTIFIED AS ON- AND OFF-FACILITY, IS BASED ON THE ADMINISTRATION ORDER BY CONSENT FOR REMEDIAL INVESTIGATION/FEASIBILITY STUDY, USEPA CERCLA DOCKET NO. 1-99-0027, EFFECTIVE OCTOBER 4, 1999.

3. SANBORN, HEAD & ASSOCIATES, INC. (SHA) HAS NOT PERFORMED AN INDEPENDENT REVIEW TO ASSESS THE ACCURACY OF ANY INFORMATION PRESENTED ON THIS FIGURE WHICH WAS TAKEN FROM OTHER FIGURES. THIS FIGURE IS PRESENTED FOR SCHEMATIC PURPOSES ONLY AND SHALL NOT BE RELIED UPON AS A LEGAL BOUNDARY SURVEY.

4. THE SITE BOUNDARIES GENERALLY CORRESPOND WITH TAX LOT BOUNDARIES. HOWEVER, THE SITE DOES NOT ENCOMPASS THE ENTIRE AREA OF TAX LOT 1249.

5. THE TAX LOT BOUNDARIES BETWEEN PARCEL NOS. 1235-3 AND 1235-2A REQUIRE CLARIFICATION. THE TAX LOT BOUNDARIES BETWEEN PARCEL NOS. 1232-3 AND 1232-4 AND GLEASON COURT REQUIRE CLARIFICATION.

— DRAFT —

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE: 0' 75' 150' 300' 450'

SHA Sanborn, Head & Associates
Consulting Engineers & Scientists

DRAWN BY: NMV
DESIGNED BY: JO
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES
SUPERFUND SITE
WALPOLE, MASSACHUSETTS

SITE PLAN

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 2

SEE DETAIL A

NEPONSET RIVER

SOUTH STREET

FORMER RAILROAD RIGHT OF WAY

SEWER EASEMENT

1249

1240-13

1240-14

CONCRETE DAM

1235-8

END OF CULVERT

SWALE

ALUMINUM PLATE ARCH CULVERT

1235-4

SHED

EXPOSED ROCK

GARAGE

1235-6

1235-7

1275-5

TOP OF BANK

TOP OF SLOPE

1235-3

1235-5

CONCRETE DECK

1235-1

1235-2B

1235-2A

1275-5

CASCADE

TERRACE

CLARK AVENUE

SOUTH STREET

GLEASON COURT

COMMON STREET

1232-3

1232-4

1232-1

1232-2

1232-1A

1232-1B

1245-8

1245-9

NEPONSET RIVER

DETAIL A

LOTS LOCATED ON THE NEPONSET RIVER IN BETWEEN LEWIS AVENUE AND MAIN STREET

GRAPHICAL SCALE

0' 30' 60' 120' 180'

NOTES:

1. THE BASE PLAN FOR THIS FIGURE IS A COMPILATION OF A DRAWING ENTITLED "PLAN OF LAND IN WALPOLE, MA" (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED NOVEMBER 28, 1991 AND A DRAWING ENTITLED "AS-BUILT PLAN OF LAND IN WALPOLE, MASS." (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED DECEMBER 23, 1992 (UPDATED MAY 20, 1993). IN SEVERAL LOCATIONS IDENTIFIED ON THE FIGURE, THE APPROXIMATE LOCATION OF SITE BOUNDARIES WERE DIGITIZED FROM PREVIOUS REPORT FIGURES PREPARED BY OTHERS.

2. SANBORN, HEAD & ASSOCIATES, INC. (SHA) HAS NOT PERFORMED AN INDEPENDENT REVIEW TO ASSESS THE ACCURACY OF ANY INFORMATION PRESENTED ON THIS FIGURE WHICH WAS TAKEN FROM OTHER FIGURES. THIS FIGURE IS PRESENTED FOR SCHEMATIC PURPOSES ONLY AND SHALL NOT BE RELIED UPON AS A LEGAL BOUNDARY SURVEY.

LEGEND

1235-3 TAX LOT NUMBER

APPROXIMATE SITE BOUNDARY LINE TAKEN FROM RECORDED PLAN OF LAND

APPROXIMATE SITE BOUNDARY LINE DIGITIZED FROM PREVIOUS REPORT FIGURES BY OTHERS

EXISTING TOPOGRAPHY

AREA OF CONTAINMENT (RESTRICTED AREA). NOTE THAT AN AREA OF EXPOSED ROCK IN THE NORTHWESTERN PORTION OF THIS AREA, A CONCRETE VAULT NORTH OF THE OLD MILL BUILDING, AND THE "BRICK" BUILDING" SOUTH OF THE OLD MILL BUILDING ARE NOT INCLUDED IN THE AOC.

— DRAFT —

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

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DESIGNED BY: JO
CHECKED BY: CLH
REVIEWED BY: CAC
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PIC: PMS
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BLACKBURN & UNION PRIVILEGES
SUPERFUND SITE
WALPOLE, MASSACHUSETTS

POST-RA SITE
CONDITIONS PLAN

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 3

NOTES:

1. THE BASE PLAN FOR THIS FIGURE IS A COMPILATION OF A DRAWING ENTITLED "PLAN OF LAND IN WALPOLE, MA" (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED NOVEMBER 26, 1991 AND A DRAWING ENTITLED "AS-BUILT PLAN OF LAND IN WALPOLE, MASS." (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED DECEMBER 23, 1992 (UPDATED MAY 20, 1993). IN SEVERAL LOCATIONS IDENTIFIED ON THE FIGURE, THE APPROXIMATE LOCATION OF SITE BOUNDARIES WERE DIGITIZED FROM PREVIOUS REPORT FIGURES PREPARED BY OTHERS. GROUND SURFACE TOPOGRAPHY SHOWN ON THIS PLAN WAS SCANNED FROM SHEET 3 OF THE DRAFT "REMOVAL ACTION PLAN, SOUTH STREET SITE, WALPOLE, MASSACHUSETTS" PREPARED BY CANONIE ENVIRONMENTAL FOR THE SOUTH STREET SITE POTENTIALLY RESPONSIBLE PARTIES (PRPS).

2. SANBORN, HEAD & ASSOCIATES, INC. (SHA) HAS NOT PERFORMED AN INDEPENDENT REVIEW TO ASSESS THE ACCURACY OF ANY INFORMATION PRESENTED ON THIS FIGURE WHICH WAS TAKEN FROM OTHER FIGURES. THIS FIGURE IS PRESENTED FOR SCHEMATIC PURPOSES ONLY AND SHALL NOT BE RELIED UPON AS A LEGAL BOUNDARY SURVEY.

3. THE LOCATION OF THE SEWER AND DRAIN MANHOLES ARE BASED ON A DRAWING ENTITLED, "RESULTS OF ASBESTOS ANALYSIS, ON-FACILITY SEDIMENT AND SURFACE WATER SAMPLING, SOUTH STREET SITE, WALPOLE, MASSACHUSETTS", PREPARED BY DAMES & MOORE AND DATED AUGUST 14, 1989.

LEGEND

(1235-3) TAX LOT NUMBER

APPROXIMATE SITE BOUNDARY LINE DIGITIZED FROM PREVIOUS REPORT FIGURES PREPARED BY OTHERS

SMH SEWER MANHOLE SEDIMENT LOCATION

DMH DRAIN MANHOLE SEDIMENT LOCATION

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE
0' 30' 60' 120' 180'

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BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

PRE-ASBESTOS REMOVAL SITE PLAN

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 4

NOTES:

1. THIS FIGURE IS INTENDED TO CONVEY GENERAL SITE OWNERSHIP/OCCUPANCY AND SITE HISTORY, TO AID IN PLACING HISTORICAL ACTIVITIES AT THE SITE IN CONTEXT, AND SOME DETAILS HAVE BEEN OMITTED FOR CLARITY. THIS INFORMATION IS NOT INTENDED TO BE EQUIVALENT TO A CHAIN-OF-TITLE OR OTHER TYPE OF DEED RESEARCH. PLEASE REFER TO FIGURE 2 FOR THE LOCATIONS OF VARIOUS LOT NUMBERS. PLEASE REFER TO SECTION 2.1 OF THE TEXT FOR SITE HISTORY DETAILS.

2. THE SITE MAY HAVE BEEN USED FOR A SAWMILL AS EARLY AS 1664 (CHEE, 1987B).

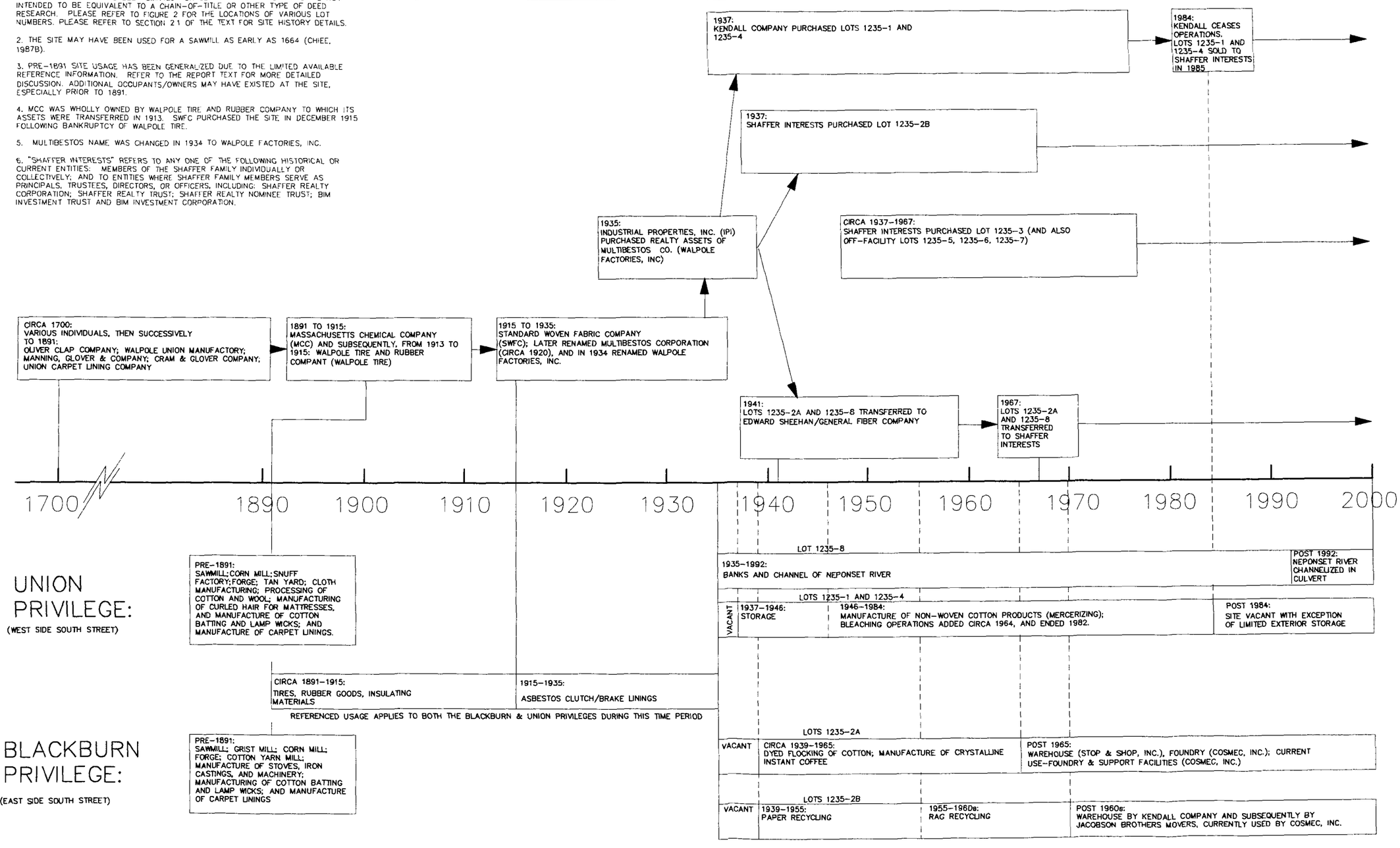
3. PRE-1891 SITE USAGE HAS BEEN GENERALIZED DUE TO THE LIMITED AVAILABLE REFERENCE INFORMATION. REFER TO THE REPORT TEXT FOR MORE DETAILED DISCUSSION. ADDITIONAL OCCUPANTS/OWNERS MAY HAVE EXISTED AT THE SITE, ESPECIALLY PRIOR TO 1891.

4. MCC WAS WHOLLY OWNED BY WALPOLE TIRE AND RUBBER COMPANY TO WHICH ITS ASSETS WERE TRANSFERRED IN 1913. SWFC PURCHASED THE SITE IN DECEMBER 1915 FOLLOWING BANKRUPTCY OF WALPOLE TIRE.

5. MULTIBESTOS NAME WAS CHANGED IN 1934 TO WALPOLE FACTORIES, INC.

6. "SHAFFER INTERESTS" REFERS TO ANY ONE OF THE FOLLOWING HISTORICAL OR CURRENT ENTITIES: MEMBERS OF THE SHAFFER FAMILY INDIVIDUALLY OR COLLECTIVELY; AND TO ENTITIES WHERE SHAFFER FAMILY MEMBERS SERVE AS PRINCIPALS, TRUSTEES, DIRECTORS, OR OFFICERS, INCLUDING: SHAFFER REALTY CORPORATION; SHAFFER REALTY TRUST; SHAFFER REALTY NOMINEE TRUST; BIM INVESTMENT TRUST AND BIM INVESTMENT CORPORATION.

GENERAL ON-FACILITY SITE OWNERSHIP/OCCUPANCY



GENERAL SITE USAGE

— DRAFT —

NO.	DATE	DESCRIPTION	BY

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PIC: PMS
DATE JAN. 00

BLACKBURN & UNION PRIVILEGES
SUPERFUND SITE
WALPOLE, MASSACHUSETTS

GENERAL ON-FACILITY SITE HISTORY

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 5

SELECTED SITE MODIFICATIONS

REFER TO SANBORN FIRE INSURANCE MAPS–FIGURE 9 FOR SITE MODIFICATIONS PRIOR TO 1959

REFER TO FIGURES 8 AND 9 FOR UST/AST INFORMATION PRIOR TO 1959

1954:
PERMIT FOR 5,000 GAL. FUEL OIL STORAGE TANK FILED WITH WALPOLE FIRE DEPT. FOR GENERAL FIBER COMPANY (LOT 1235–2A)[3]

1957:
SITE FIRE DESTROYED BUILDING ON LOT 1235–2B AND POSSIBLY BUILDINGS ON LOT 1235–2A [2]

1958:
BUILDING ON LOT 1235–2B REBUILT

1959:
DAM ON NEPONSET RIVER AT SOUTH STREET FAILS, DRAINING LOWER MILL POND.
UPPER TAIL RACE NO LONGER USED FOLLOWING DAM FAILURE

CIRCA 1964:
2, 3,500–GALLON VIRGIN SULFURIC ACID ASTs AND 1, 9,000–GALLON HYDROGEN PEROXIDE AST INSTALLED–KENDALL COMPANY

1969:
APPLICATION FOR LICENSE–#6 FUEL OIL 20,000–GAL. UST–KENDALL COMPANY

1972:
REMAINING BUILDINGS DESTROYED BY FIRE IN 1957 RAZED AND BURIED ON–SITE [2]

CIRCA 1975:
2, 9,500–GAL. "SPENT" SULFURIC ACID ASTs [4].
CAUSTIC SODA (SODIUM HYDROXIDE) UST(s) INSTALLED [5].
REPLACED 5,000–GAL. CAUSTIC SODA AST IN BOILER ROOM–KENDALL COMPANY

1979:
10,000–GAL. #6 FUEL OIL UST INSTALLED (VAULT) REPLACING EXISTING FUEL OIL 10,000–GAL. UST (LEAKING)–KENDALL COMPANY

1980:
SULFURIC ACID, SPENT SULFURIC ACID, AND HYDROGEN PEROXIDE ASTs RELOCATED TO DIKED AREA ADJACENT TO FORMER WHEEL (POWER) HOUSE–KENDALL COMPANY

1982:
ACTIVE USE OF SETTLING BASIN NO.1 DISCONTINUED WITH END OF BLEACHING OPERATIONS; SETTLING BASIN NO.2 USED FOR NON–CONTACT COOLING WATER

1983:
~60 GALs. OF # 6 FUEL OIL SPILLED INTO SITE STORM DRAINS ON AT LEAST 2 OCCASIONS (MAY, JULY);
~1,000 GALs OF # 6 OIL SPILLED (OCTOBER);
200 YARDS OF CONTAMINATED SOIL STOCKPILED, THEN REMOVED IN 1984–KENDALL COMPANY

1984:
USE OF SETTLING BASIN NO.2 AND LOWER TAIL RACE DISCONTINUED

1987:
PERMIT ISSUED TO MAINTAIN EMPTY 10,000 GAL. #6 FUEL OIL TANK.

TANKS REMOVED BY CHIEE FROM LOT 1235–1: [6]

1, 20,000–GAL. # 6 FUEL OIL UST
2, 20,000–GAL. CAUSTIC SODA USTs [5]
1, 9,000–GAL. HYDROGEN PEROXIDE AST
2, 3,500–GAL. SULFURIC ACID ASTs
2, 5,000–GAL. SPENT SULFURIC ACID ASTs

TANKS REMOVED BY CHIEE ON LOT 1235–2A:

2, 1,000 GAL. DIESEL USTs

1990:
ABANDONED UST (32' LONG) FOUND BY USEPA IN WEST–CENTRAL PORTION OF LOT 1235–1; LIKELY REMAINS ON–SITE

1992:
MILL BUILDING FIRE; REMOVAL ACTIONS OCCUR AT SITE

1992:
10,000 GAL. FUEL OIL TANK EMPTY SINCE 1987 REMOVED; FUEL OIL AND WATER REMOVED FROM VAULT; VAULT CLEANED

1900 1950 1955 1960 1965 1970 1975 1980 1985 1990 1995 2000

NOTES:

1. THIS FIGURE IS INTENDED TO CONVEY SELECTED SUMMARY INFORMATION FOR GENERAL REFERENCE PURPOSES REGARDING PHYSICAL SITE MODIFICATIONS AND UNDERGROUND STORAGE TANK (UST)/ ABOVE–GROUND STORAGE TANK (AST)–RELATED INFORMATION ON THE BASIS OF EXISTING SITE DOCUMENTATION.

2. CHIEE (1987B) IMPLIES THAT A FIRE AT THE SITE IN 1957 DESTROYED A NUMBER OF BUILDINGS, INCLUDING THE BUILDING ON LOT 1235–2B, AND BUILDINGS LOCATED ON LOT 1235–2A. THE 1957 WALPOLE TOWN REPORT SHOWS SEVERAL PHOTOGRAPHS OF THE BUILDING ON LOT 1235–2B ("SHAFFER COMPANY") ENGULFED IN FIRE; HOWEVER, IT IS NOT INDICATED IN THE REPORT WHETHER THE FIRE AFFECTED OTHER BUILDINGS AT THE SITE. THE 1958 SANBORN MAP DOES NOT SUGGEST THAT OTHER BUILDINGS WERE IMPACTED DURING THE 1957 FIRE; HOWEVER, THIS CANNOT BE CONFIRMED BY THE SANBORN MAP ALONE.

3. THE PERMIT REFERENCES THE LOCATION OF THE 5,000–GALLON FUEL OIL TANK AS "OUTSIDE OF BUILDING," AND AN ACCOMPANYING "OIL BURNER RECORD" INDICATES THAT TANK WAS LOCATED NEAR THE BOILER ROOM. THERE IS NO REFERENCE TO WHETHER THE TANK WAS ABOVE OR BELOW GROUND.

4. ALTHOUGH SEVERAL DOCUMENTS REVIEWED INDICATE THESE ASTs MAY HAVE BEEN SMALLER THAN 9,500 GALLONS, CHARLES COLE, MANAGER OF REGULATORY COMPLIANCE FOR KENDALL RECALLS PURCHASING AND INSTALLING TWO 9,500 GALLON TANKS (C. COLE, PERSONAL COMMUNICATION, 1999).

5. REFER TO REPORT SECTION 2.3.2 REGARDING UNCERTAINTIES RELATIVE TO THE SIZE, NUMBER, AND LOCATION OF THE CAUSTIC SODA UST(s).

6 A LETTER DATED OCTOBER 30, 1972 FROM BSC ENGINEERING, INC. TO THE DIVISION OF WATER POLLUTION CONTROL REFERENCES LEAKAGE FROM SIX USTS IN THE "MAIN STORAGE YARD." ALTHOUGH THESE SIX USTS ARE NOTED IN CHIEE (1987B) TO BE LOCATED AT THE FORMER KENDALL PROPERTY ON SOUTH STREET, THESE SIX USTS WERE ACTUALLY LOCATED AT A SECOND KENDALL COMPANY FACILITY ON WEST STREET IN WALPOLE AND, AS SUCH, THIS INFORMATION IS NOT RELEVANT TO THE SUBJECT SITE.

SELECTED UST/AST–RELATED INFORMATION

– DRAFT –

NO.	DATE	DESCRIPTION

Sanborn, Head & Associates
Consulting Engineers & Scientists

DRAWN BY: PGP
DESIGNED BY: NAD
CHECKED BY: PMS
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

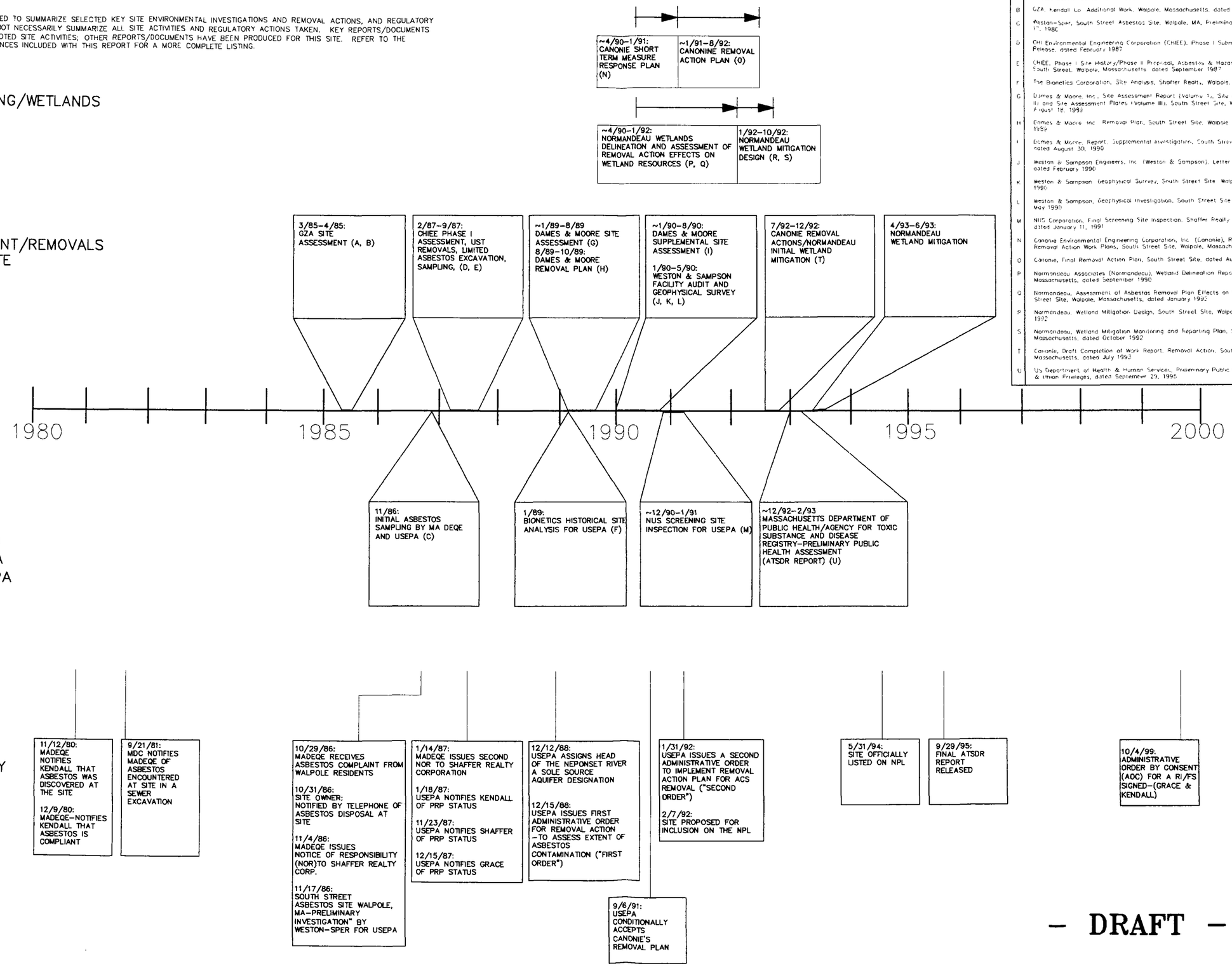
SELECTED SITE MODIFICATIONS AND UST/AST–RELATED INFORMATION

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 6

NOTES:

1. THIS FIGURE IS INTENDED TO SUMMARIZE SELECTED KEY SITE ENVIRONMENTAL INVESTIGATIONS AND REMOVAL ACTIONS, AND REGULATORY MILESTONES, AND DOES NOT NECESSARILY SUMMARIZE ALL SITE ACTIVITIES AND REGULATORY ACTIONS TAKEN. KEY REPORTS/DOCUMENTS ARE CORRELATED WITH NOTED SITE ACTIVITIES; OTHER REPORTS/DOCUMENTS HAVE BEEN PRODUCED FOR THIS SITE. REFER TO THE BIBLIOGRAPHY OF REFERENCES INCLUDED WITH THIS REPORT FOR A MORE COMPLETE LISTING.



Reference Letter Document

A	Goldberg, Zoino & Associates, Inc. (GZA), Site Assessment Report, South Street, Walpole, Massachusetts dated March 1985
B	GZA, Kendall Co. Additional Work, Walpole, Massachusetts, dated April 1985
C	Weston–Sper, South Street Asbestos Site, Walpole, MA, Preliminary Investigation, dated November 17, 1986
D	CHI Environmental Engineering Corporation (CHIEE), Phase I Submittal/Phase II Proposal, Fuel Oil Release, dated February 1987
E	CHIEE, Phase I Site History/Phase II Proposal, Asbestos & Hazardous Material, Shaffer Realty, South Street, Walpole, Massachusetts dated September 1987
F	The Bionetics Corporation, Site Analysis, Shaffer Realty, Walpole, Massachusetts, January 1989
G	Dames & Moore, Inc., Site Assessment Report (Volume 1), Site Assessment Appendices (Volume II) and Site Assessment Plates (Volume III), South Street Site, Walpole, Massachusetts, dated August 18, 1989
H	Dames & Moore, Inc. Removal Plan, South Street Site, Walpole Massachusetts, dated October 4, 1989
I	Dames & Moore, Report, Supplemental Investigation, South Street Site, Walpole, Massachusetts, dated August 30, 1990
J	Weston & Sampson Engineers, Inc. (Weston & Sampson), Letter Re: Vacant Building Inventory dated February 1990
K	Weston & Sampson Geophysical Survey, South Street Site Walpole, Massachusetts, dated April 1990
L	Weston & Sampson, Geophysical Investigation, South Street Site Walpole, Massachusetts dated May 1990
M	NUS Corporation, Final Screening Site Inspection, Shaffer Realty Trust, Walpole, Massachusetts, dated January 11, 1991
N	Canonie Environmental Engineering Corporation, Inc. (Canonie), Revised Response to Comments Removal Action Work Plans, South Street Site, Walpole, Massachusetts, dated January 24, 1991
O	Canonie, Final Removal Action Plan, South Street Site, dated August 28, 1992
P	Normandeau Associates (Normandeau), Wetland Delineation Report, Multibestos Site, Walpole, Massachusetts, dated September 1990
Q	Normandeau, Assessment of Asbestos Removal Plan Effects on Wetland Resources of the South Street Site, Walpole, Massachusetts, dated January 1992
R	Normandeau, Wetland Mitigation Design, South Street Site, Walpole, Massachusetts, dated October 1992
S	Normandeau, Wetland Mitigation Monitoring and Reporting Plan, South Street Site, Walpole, Massachusetts, dated October 1992
T	Canonie, Draft Completion of Work Report, Removal Action, South Street Site, Walpole, Massachusetts, dated July 1993
U	US Department of Health & Human Services, Preliminary Public Health Assessment for Blackburn & Union Privileges, dated September 29, 1995

NO.	DATE	DESCRIPTION	BY

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DESIGNED BY: CLH
CHECKED BY: PMS
REVIEWED BY: CAC
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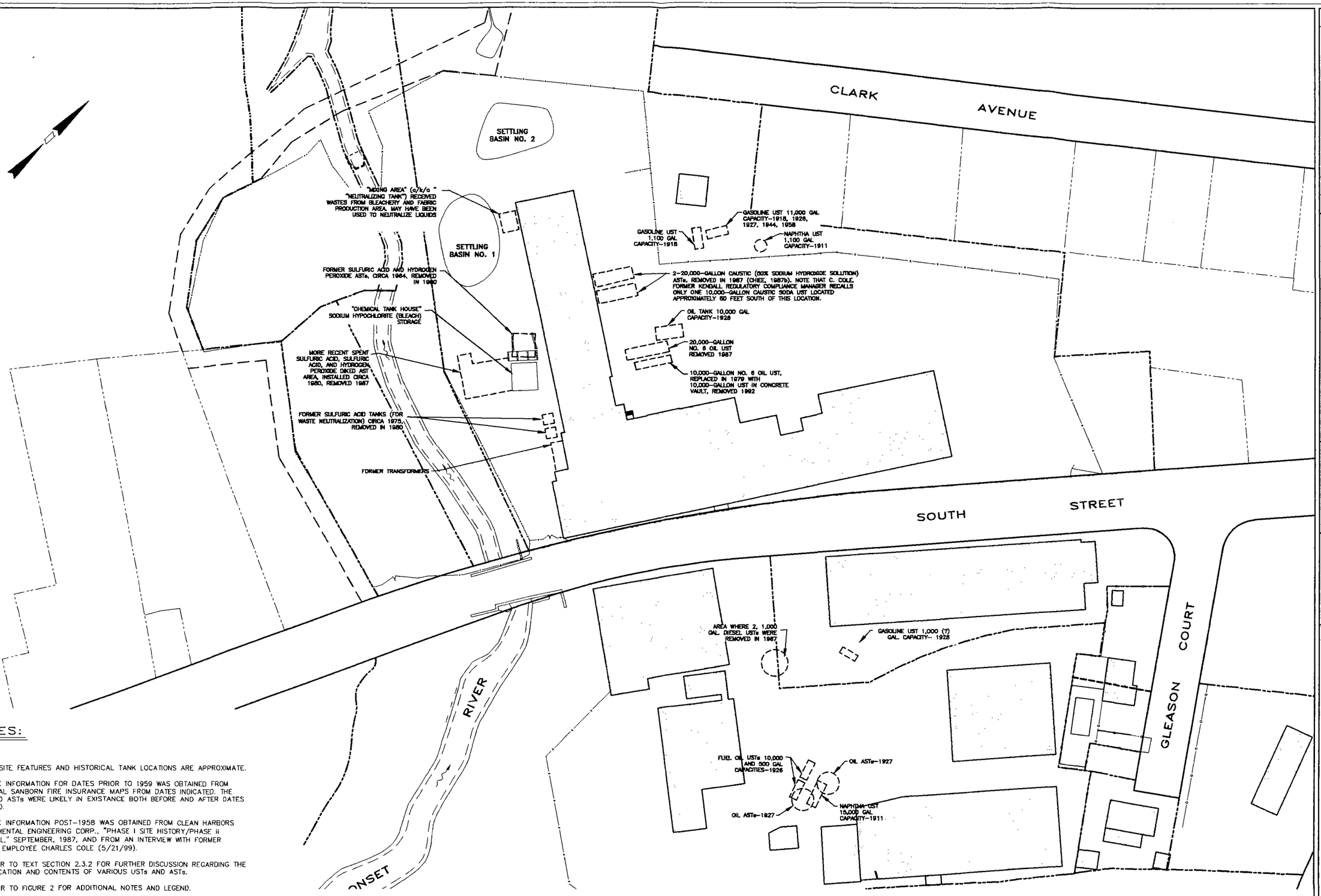
BLACKBURN & UNION PRIVILEGES
SUPERFUND SITE
WALPOLE, MASSACHUSETTS

ENVIRONMENTALLY–RELATED WORK PERFORMED AT THE SITE /KEY REGULATORY MILESTONES

PROJECT NUMBER
1669.2

FIGURE NUMBER
7



NOTES:

1) ALL SITE FEATURES AND HISTORICAL TANK LOCATIONS ARE APPROXIMATE.

2) TANK INFORMATION FOR DATES PRIOR TO 1959 WAS OBTAINED FROM HISTORICAL SANBORN FIRE INSURANCE MAPS FROM DATES INDICATED. THE USTs AND ASTs WERE LIKELY IN EXISTANCE BOTH BEFORE AND AFTER DATES INDICATED.

3) TANK INFORMATION POST-1958 WAS OBTAINED FROM CLEAN HARBORS ENVIRONMENTAL ENGINEERING CORP., "PHASE I SITE HISTORY/PHASE ii PROPOSAL," SEPTEMBER, 1987, AND FROM AN INTERVIEW WITH FORMER KENDALL EMPLOYEE CHARLES COLE (5/21/99).

4) REFER TO TEXT SECTION 2.3.2 FOR FURTHER DISCUSSION REGARDING THE SIZE, LOCATION AND CONTENTS OF VARIOUS USTs AND ASTs.

5) REFER TO FIGURE 2 FOR ADDITIONAL NOTES AND LEGEND.

6) REFER TO FIGURE 9 FOR ADDITIONAL SANBORN FIRE INSURANCE MAP INFORMATION.

7) TANKS ARE INDICATED AS UNDERGROUND STORAGE TANKS (USTs) OR ABOVE GROUND (ASTs) BASED ON AVAILABLE INFORMATION.

- DRAFT -

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 20' 40' 80' 120'

SHA Sanborn, Head & Associates
Consulting Engineers & Scientists

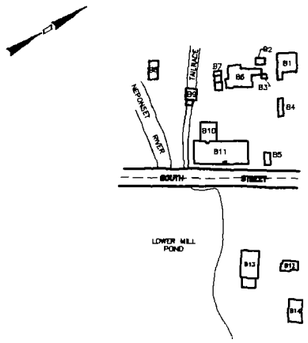
DRAWN BY: NMV
DESIGNED BY: NAD/CLH
CHECKED BY: CLH
REVIEWED BY: PMS
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

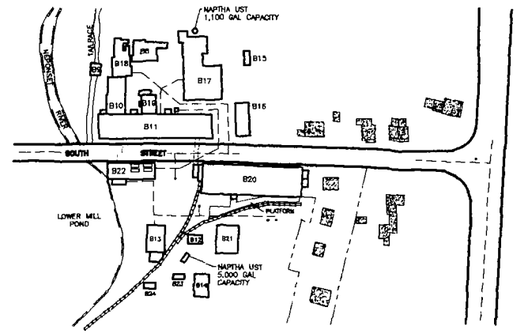
HISTORICAL UST/AST LOCATIONS AT SITE

PROJECT NUMBER: 1669.2

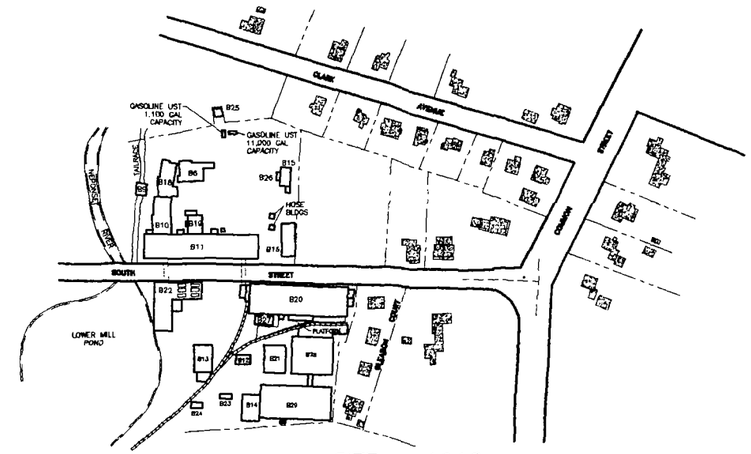
FIGURE NUMBER: 8



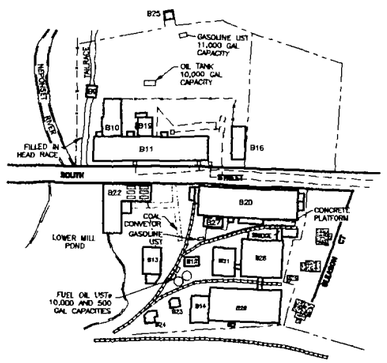
SITE – 1904



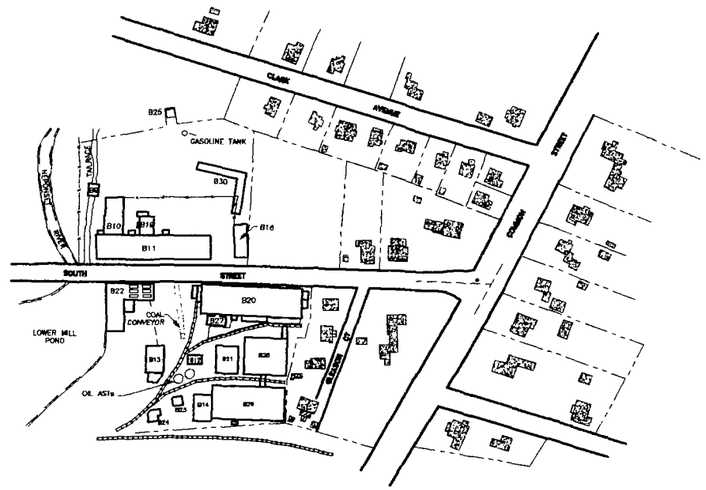
SITE – 1911



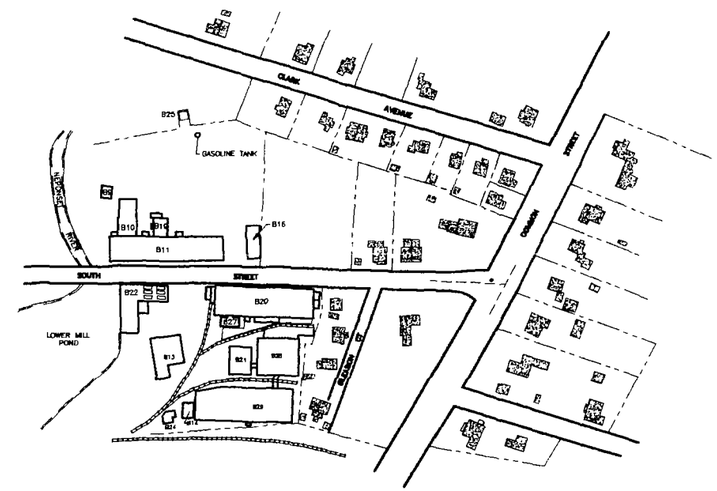
SITE – 1918



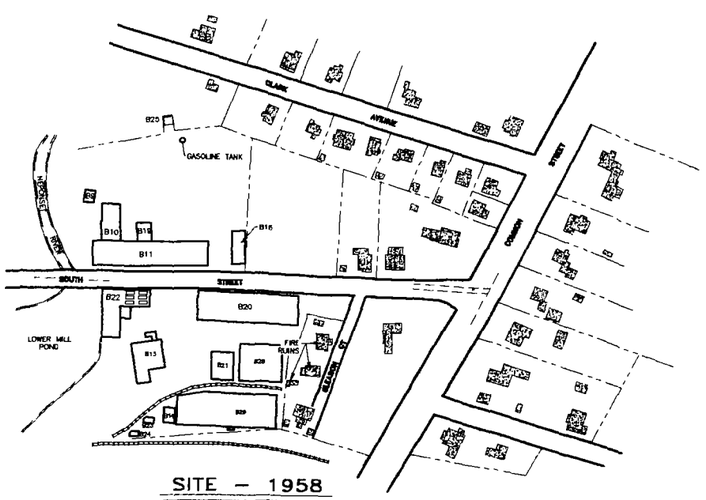
SITE – 1926



SITE – 1927



SITE – 1944



SITE – 1958

– DRAFT –

LEGEND

- RESIDENTIAL PROPERTY
- PROPERTY LINE AS SHOWN ON THE SANBORN FIRE INSURANCE MAP
- WATER PIPELINE
- RAILROAD

SUMMARY OF HISTORICAL SITE USAGE TO 1958

(ACCORDING TO REVIEW OF HISTORICAL SANBORN FIRE INSURANCE MAPS OBTAINED BY SHA)

BUILDING NUMBER	DATE	USE
B1	PRE–1904 TO PRE–1911	SIZING.
B2	PRE–1904 TO PRE–1911	UNKNOWN.
B3	PRE–1904 TO PRE–1911	UNKNOWN.
B4	PRE–1904 TO PRE–1911	STORAGE.
B5	PRE–1904 TO PRE–1911	OFFICE.
B6	PRE–1904 TO PRE–1927	COAL SHED, MACHINE SHOP AND VULCANIZING OPERATIONS; (1904), DEVULCANIZING (1911); STORAGE (1918).
B7	PRE–1904 TO PRE–1911	GRINDING.
B8	PRE–1904 TO PRE–1911	STORAGE.
B9	PRE–1904 TO 1958	POWER HOUSE (1904 AND 1911); MACHINE SHOP (1918); VACANT (1927).
B10	PRE–1904 TO 1958	STORAGE (1904); STEAM MILLS AND COMPOUNDING (1911, EXPANDED); DRYING AND COMPOUNDING (1918); DRYING BUILDING (1926); STORAGE (1927).
B11	PRE–1904 TO 1958	MILL (1904); MILLS AND SPREADING (1911, EXPANDED); CALENDAR MILLS AND HEEL PRESS, HEEL TRIMMING AND SPREADING (1918); OLD MILL (1926, 1927) BALED COTTON STORAGE (1944); MILL (1958).
B12	PRE–1904 TO PRE–1952	MANUFACTURING OF LIQUID COMPOUNDS (1904, 1911); METAL STORAGE (1918); COTTON STORAGE (1927)
B13	PRE–1904 TO 1958	SHIPPING (1904); SHIPPING AND STORAGE (1911); TREATING (1918, 1926 AND 1927); COTTON AND RAYON MANUFACTURING (1944, EXPANDED); EXPANDED (1958).
B14	PRE–1904 TO 1958	STORAGE (1904); STORAGE OF NAPTHA ALCOHOL AND TAR (1911); PICKER HOUSE (1918); UNKNOWN (1927); WOOL STORAGE (1944); UNKNOWN (1958).
B15	1911 TO PRE–1927	GARAGE (1911); UNKNOWN (1918, EXPANDED).
B16	1911 TO 1958	OFFICE (1911, 1918, 1926, 1927); GENERAL STORAGE (1944, 1958).
B17	1911 TO PRE–1918	STORAGE, EXCELSIOR AND PACKING CASES, CRUDE RUBBER AND DRY ROOM.
B18	1911 TO PRE–1926	RECLAIMING (1911); WASH HOUSE (1918).
B19	1911 TO 1958	MACHINE SHOP (1911); PIPE HOUSE, RUBBER MOLDING AND CHURN ROOM (1918); UNKNOWN (1927, 1944, 1958).
B20	1911 TO 1958	RUBBER MANUFACTURING (1911); CLUTCH DEPARTMENT, CALENDAR & DRYING, TAPE CUTTING, SHIPPING AND PACKING, YARN FINISHING AND WEAVING (1918, EXPANDED); MAIN MILL (1926 AND 1927); WASTE PAPER STORAGE (1944); WASTE PAPER AND RAG STORAGE (1958).
B21	1911 TO 1958	UNDER CONSTRUCTION (1911); RECLAIMING (1918); PICKING AND MIXING (1926); PICKER HOUSE (1927); WOOL STORAGE (1944); VACANT (1958).
B22	1911 TO 1958	BOILER HOUSE (1911, 1918 1926, 1927); WOOL STORAGE (1944); COTTON AND RAYON FLOCK MANUFACTURING (1958). MELTING HOUSE (1911, 1918 AND 1926); UNKNOWN (1927).
B23	1911 TO PRE–1944	BOILING HOUSE (1911); STORAGE (1918 AND 1926); UNKNOWN (1927, 1944); STORAGE (1958)
B24	1911 TO 1958	GARAGE (1918); AUTO HOUSE (1926); UNKNOWN (1927, 1944 AND 1958).
B25	1918 TO 1958	UNKNOWN (1918).
B26	1918 TO PRE–1926	OVEN ROOM (1918 AND 1927).
B27	1918 TO 1958	STORAGE (1918, 1926 AND 1927); WOOL STORAGE (1944); COTTON STORAGE (1958);
B28	1918 TO 1958	SPINNING AND CARDING, PICKER (1918, 1926 AND 1927); WOOL STORAGE (1944); COFFEE PRODUCTS MANUFACTURING (1958).
B29	1918 TO 1958	GARAGE (1927).
B30	1927 TO PRE–1944	

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE
0' 40' 80' 160' 240'

SHA
Sanborn, Head & Associates
Consulting Engineers & Scientists

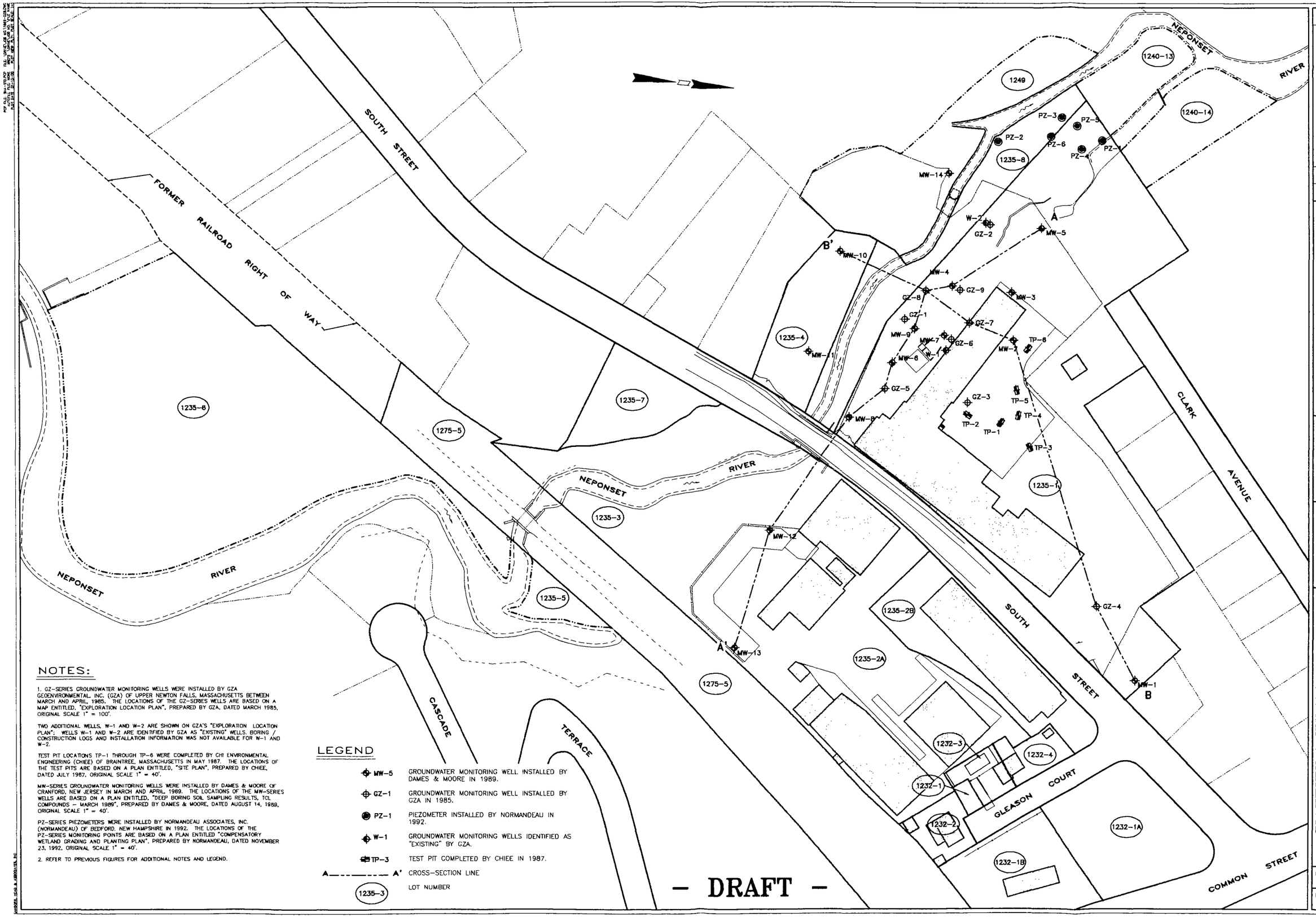
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES
SUPERFUND SITE
WALPOLE, MASSACHUSETTS

HISTORICAL MAP – 1904, 1911, 1918, 1926, 1927, 1944, 1958

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 9



NOTES:

1. GZ-SERIES GROUNDWATER MONITORING WELLS WERE INSTALLED BY GZA GEOENVIRONMENTAL, INC. (GZA) OF UPPER NEWTON FALLS, MASSACHUSETTS BETWEEN MARCH AND APRIL, 1985. THE LOCATIONS OF THE GZ-SERIES WELLS ARE BASED ON A MAP ENTITLED, "EXPLORATION LOCATION PLAN", PREPARED BY GZA, DATED MARCH 1985, ORIGINAL SCALE 1" = 100'.

TWO ADDITIONAL WELLS, W-1 AND W-2 ARE SHOWN ON GZA'S "EXPLORATION LOCATION PLAN". WELLS W-1 AND W-2 ARE IDENTIFIED BY GZA AS "EXISTING" WELLS. BORING / CONSTRUCTION LOGS AND INSTALLATION INFORMATION WAS NOT AVAILABLE FOR W-1 AND W-2.

TEST PIT LOCATIONS TP-1 THROUGH TP-6 WERE COMPLETED BY CHI ENVIRONMENTAL ENGINEERING (CHIEE) OF BRAINTREE, MASSACHUSETTS IN MAY 1987. THE LOCATIONS OF THE TEST PITS ARE BASED ON A PLAN ENTITLED, "SITE PLAN", PREPARED BY CHIEE, DATED JULY 1987, ORIGINAL SCALE 1" = 40'.

MW-SERIES GROUNDWATER MONITORING WELLS WERE INSTALLED BY DAMES & MOORE OF CRANFORD, NEW JERSEY IN MARCH AND APRIL, 1989. THE LOCATIONS OF THE MW-SERIES WELLS ARE BASED ON A PLAN ENTITLED, "DEEP BORING SOIL SAMPLING RESULTS, TCL COMPOUNDS – MARCH 1989", PREPARED BY DAMES & MOORE, DATED AUGUST 14, 1989, ORIGINAL SCALE 1" = 40'.

PZ-SERIES PIEZOMETERS WERE INSTALLED BY NORMANDEAU ASSOCIATES, INC. (NORMANDEAU) OF BEDFORD, NEW HAMPSHIRE IN 1992. THE LOCATIONS OF THE PZ-SERIES MONITORING POINTS ARE BASED ON A PLAN ENTITLED "COMPENSATORY WETLAND GRADING AND PLANTING PLAN", PREPARED BY NORMANDEAU, DATED NOVEMBER 23, 1992, ORIGINAL SCALE 1" = 40'.

2. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

MW-5	GROUNDWATER MONITORING WELL INSTALLED BY DAMES & MOORE IN 1989.
GZ-1	GROUNDWATER MONITORING WELL INSTALLED BY GZA IN 1985.
PZ-1	PIEZOMETER INSTALLED BY NORMANDEAU IN 1992.
W-1	GROUNDWATER MONITORING WELLS IDENTIFIED AS "EXISTING" BY GZA.
TP-3	TEST PIT COMPLETED BY CHIEE IN 1987.
A — — — A'	CROSS-SECTION LINE
1235-3	LOT NUMBER

– DRAFT –

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE
0' 30' 60' 120' 180'

Sanborn, Head & Associates
Consulting Engineers & Scientists

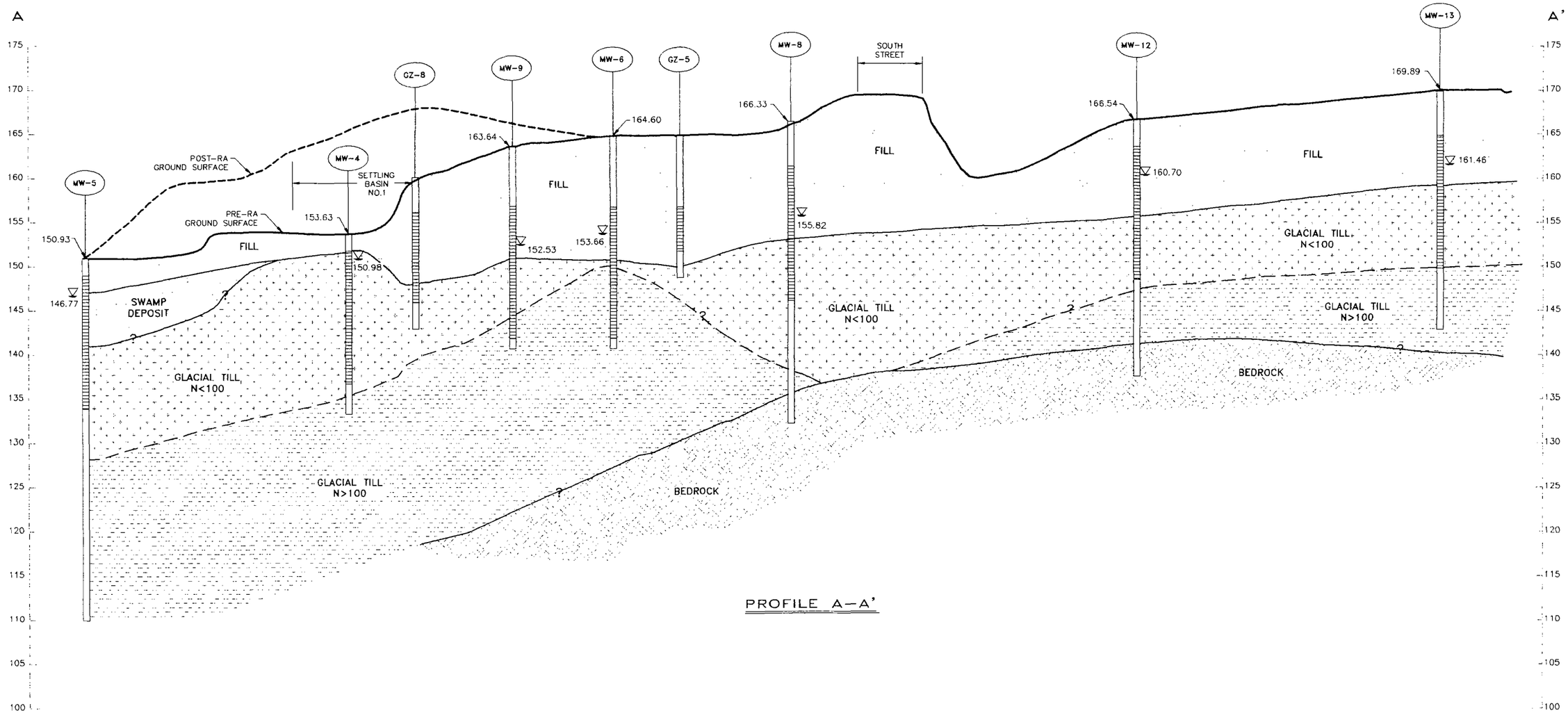
DRAWN BY: PGP
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

SUBSURFACE EXPLORATION LOCATION PLAN

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 10

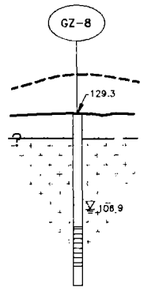


PROFILE A–A'

NOTES

1. REFER TO FIGURE 10 FOR CROSS-SECTION LOCATIONS.
2. THE STRATIFICATION LINES PRESENTED HEREIN ARE APPROXIMATE, BASED ON DATA FROM A LIMITED NUMBER OF EXPLORATIONS PERFORMED BY GZA GEOENVIRONMENTAL, INC. (GZ-SERIES WELLS) BETWEEN MARCH AND APRIL 1985 AND DAMES & MOORE (MW-SERIES WELLS) BETWEEN JANUARY AND APRIL 1989 AND THUS REPRESENT APPROXIMATE BOUNDARIES BETWEEN STRATUM TYPES. THE ACTUAL TRANSITIONS ARE EXPECTED TO BE MORE GRADUAL AND TO VARY FROM THOSE SHOWN.
3. GROUNDWATER LEVEL MEASUREMENTS (▽) WERE COLLECTED BY DAMES & MOORE ON APRIL 27, 1989.
4. ALL GROUNDWATER LEVELS AND SURFACE ELEVATIONS ARE LISTED IN FEET ABOVE MEAN SEA LEVEL.
5. N<100 REFERS TO STANDARD PENETRATION TEST BLOW COUNTS LESS THAN 100 BLOWS PER FOOT.
6. N>100 REFERS TO STANDARD PENETRATION TEST BLOW COUNTS GREATER THAN 100 BLOWS PER FOOT.
7. RA - REFERS TO 1992 ASBESTOS REMOVAL ACTION.

LEGEND



MONITORING POINT DESIGNATION

POST-RA GROUND SURFACE ELEVATION (FT.)

PRE-RA GROUND SURFACE ELEVATION (FT.)

APPROXIMATE STRATUM CHANGE. (DASHED AND/OR "?" WHERE LESS CONSTRAINED)

GROUNDWATER SURFACE ELEVATION (FT.) MEASURED ON APRIL 27, 1989

WELL SCREEN

BOTTOM OF BORING

– DRAFT –

NO.	DATE	DESCRIPTION	BY

0' 3' 6' 12' 18' VERTICAL
0' 15' 30' 60' 90' HORIZONTAL

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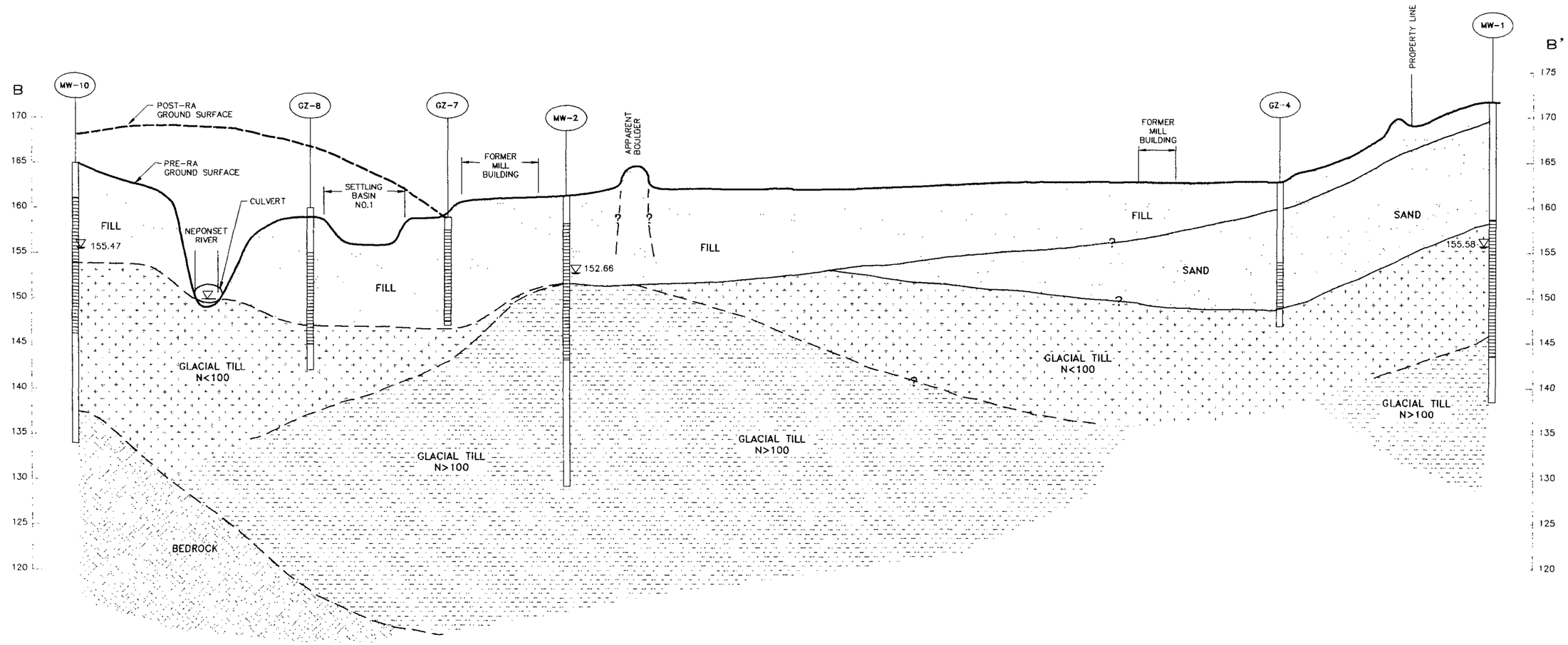
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

SUBSURFACE PROFILE A–A'

PROJECT NUMBER: 1669.2

FIGURE: 11

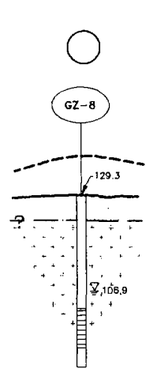


PROFILE B–B'

NOTES

1. REFER TO FIGURE 10 FOR CROSS-SECTION LOCATIONS.
2. THE STRATIFICATION LINES PRESENTED HEREIN ARE APPROXIMATE, BASED ON DATA FROM A LIMITED NUMBER OF EXPLORATIONS PERFORMED BY GZA GEOENVIRONMENTAL, INC. (GZ-SERIES WELLS) BETWEEN MARCH AND APRIL 1985 AND DAMES & MOORE (MW-SERIES WELLS) BETWEEN JANUARY AND APRIL 1989 AND THUS REPRESENT APPROXIMATE BOUNDARIES BETWEEN STRATUM TYPES. THE ACTUAL TRANSITIONS ARE EXPECTED TO BE MORE GRADUAL AND TO VARY FROM THOSE SHOWN.
3. GROUNDWATER LEVEL MEASUREMENTS (▽) WERE COLLECTED BY DAMES & MOORE ON APRIL 27, 1989.
4. ALL GROUNDWATER LEVELS AND SURFACE ELEVATIONS ARE LISTED IN FEET ABOVE MEAN SEA LEVEL.
5. N<100 REFERS TO STANDARD PENETRATION TEST BLOW COUNTS LESS THAN 100 BLOWS PER FOOT.
6. N>100 REFERS TO STANDARD PENETRATION TEST BLOW COUNTS GREATER THAN 100 BLOWS PER FOOT.
7. RA – REFERS TO 1992 ASBESTOS REMOVAL ACTION.

LEGEND



- ALUMINIUM PLATE AND CULVERT INSTALLED DURING THE RA.
- MONITORING POINT DESIGNATION
- POST-RA GROUND SURFACE ELEVATION (FT.)
- PRE-RA GROUND SURFACE ELEVATION (FT.)
- APPROXIMATE STRATUM CHANGE. (DASHED AND/OR "?" WHERE LESS CONSTRAINED)
- GROUNDWATER SURFACE ELEVATION (FT.) MEASURED ON APRIL 27, 1989
- WELL SCREEN
- BOTTOM OF BORING

– DRAFT –

NO.	DATE	DESCRIPTION	BY

VERTICAL 0' 3' 6' 12' 18'
HORIZONTAL 0' 15' 30' 60' 90'

Sanborn, Head & Associates
Consulting Engineers & Scientists

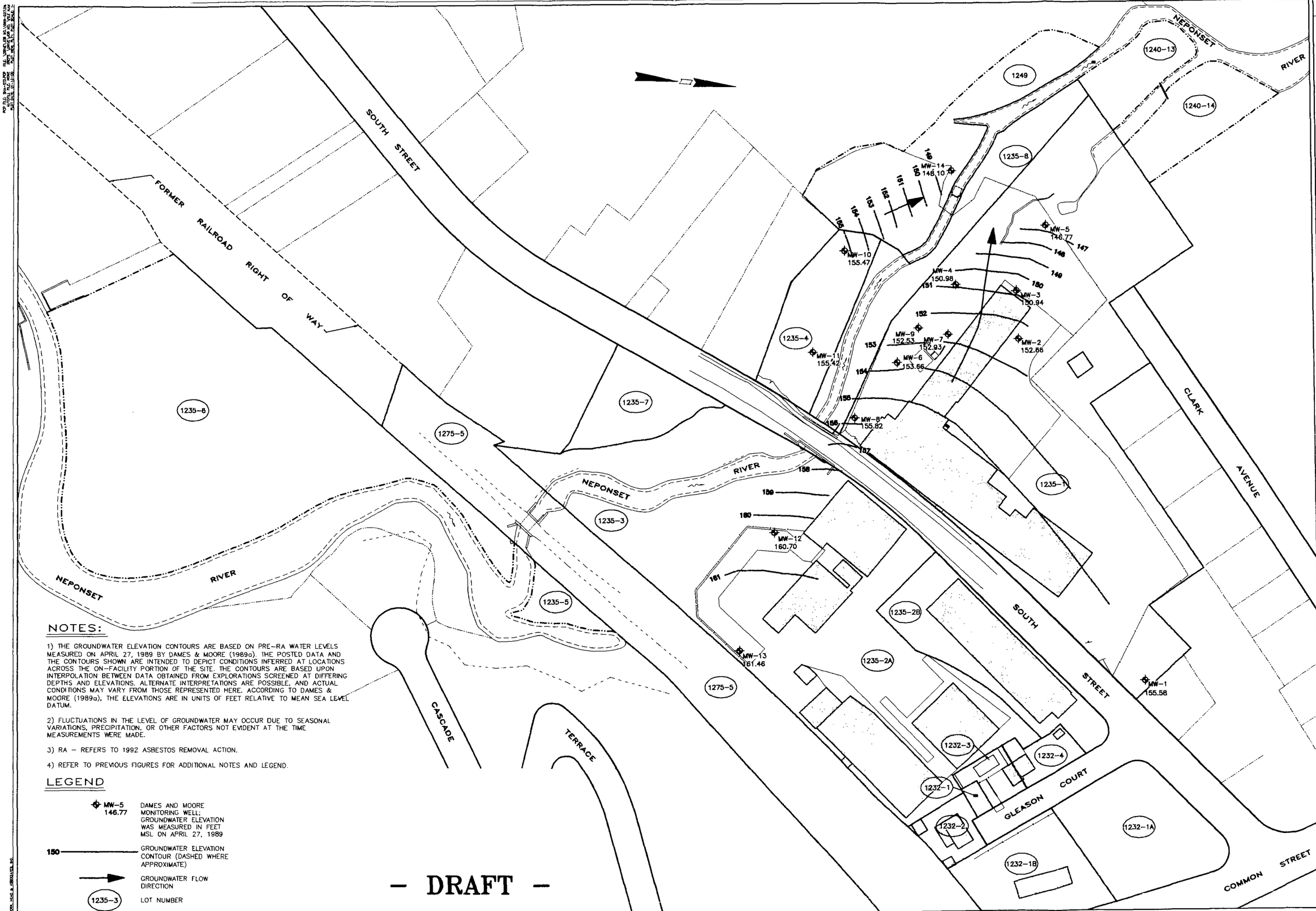
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

SUBSURFACE PROFILE B–B'

PROJECT NUMBER: 1669.2

FIGURE: 12



NOTES:

1) THE GROUNDWATER ELEVATION CONTOURS ARE BASED ON PRE-RA WATER LEVELS MEASURED ON APRIL 27, 1989 BY DAMES & MOORE (1989a). THE POSTED DATA AND THE CONTOURS SHOWN ARE INTENDED TO DEPICT CONDITIONS INFERRED AT LOCATIONS ACROSS THE ON-FACILITY PORTION OF THE SITE. THE CONTOURS ARE BASED UPON INTERPOLATION BETWEEN DATA OBTAINED FROM EXPLORATIONS SCREENED AT DIFFERING DEPTHS AND ELEVATIONS. ALTERNATE INTERPRETATIONS ARE POSSIBLE, AND ACTUAL CONDITIONS MAY VARY FROM THOSE REPRESENTED HERE. ACCORDING TO DAMES & MOORE (1989a), THE ELEVATIONS ARE IN UNITS OF FEET RELATIVE TO MEAN SEA LEVEL DATUM.

2) FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO SEASONAL VARIATIONS, PRECIPITATION, OR OTHER FACTORS NOT EVIDENT AT THE TIME MEASUREMENTS WERE MADE.

3) RA – REFERS TO 1992 ASBESTOS REMOVAL ACTION.

4) REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

MW-5 146.77	DAMES AND MOORE MONITORING WELL; GROUNDWATER ELEVATION WAS MEASURED IN FEET MSL ON APRIL 27, 1989
150	GROUNDWATER ELEVATION CONTOUR (DASHED WHERE APPROXIMATE)
→	GROUNDWATER FLOW DIRECTION
1235-3	LOT NUMBER

– DRAFT –

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

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DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN. 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

GROUNDWATER ELEVATION CONTOUR PLAN APRIL 27, 1989

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 13

SEE DETAIL A

SOUTH STREET

FORMER RAILROAD RIGHT OF WAY

SEWER EASEMENT

ASBESTOS AREA OF CONTAINMENT (AOC)

SETTLING BASIN NO. 2 CONTAINMENT CELL

END OF CULVERT

SWALE

ALUMINUM PLATE ARCH CULVERT

SHED

EXPOSED ROCK

GARAGE

CONCRETE DAM

ONSET RIVER

CLARK AVENUE

SOUTH STREET

GLEASON COURT

COMMON STREET

CASCADE TERRACE

NEPONSET RIVER

TOP OF BANK

TOP OF SLOPE

CONCRETE DECK

1249

1240-13

1240-14

1235-8

1235-7

1235-6

1235-4

1235-3

1235-1

1235-2A

1235-2B

1235-5

1275-5

1232-1

1232-2

1232-3

1232-4

1232-1A

1232-1B

1245-8

1245-9

— DRAFT —

NOTES:

1. THE BASE PLAN FOR THIS FIGURE IS A COMPILATION OF A DRAWING ENTITLED "PLAN OF LAND IN WALPOLE, MA" (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED NOVEMBER 26, 1991 AND FROM A DRAWING ENTITLED "AS-BUILT PLAN OF LAND IN WALPOLE, MASS." (#3982-01) PREPARED BY NORWOOD ENGINEERING COMPANY, INC. AND DATED DECEMBER 23, 1992 (UPDATED MAY 20, 1993). IN SEVERAL LOCATIONS IDENTIFIED ON THE FIGURE, THE APPROXIMATE LOCATION OF SITE BOUNDARIES WERE DIGITIZED FROM PREVIOUS REPORT FIGURES PREPARED BY OTHERS.

2. SANBORN, HEAD & ASSOCIATES, INC. (SHA) HAS NOT PERFORMED AN INDEPENDENT REVIEW TO ASSESS THE ACCURACY OF ANY INFORMATION PRESENTED ON THIS FIGURE WHICH WAS TAKEN FROM OTHER FIGURES. THIS FIGURE IS PRESENTED FOR SCHEMATIC PURPOSES ONLY AND SHALL NOT BE RELIED UPON AS A LEGAL BOUNDARY SURVEY.

3. THE CONTOURS SHOWN ON THIS FIGURE REFLECT THE DIFFERENCE BETWEEN THE PRE-ASBESTOS REMOVAL TOPOGRAPHY (REFER TO FIGURE 4) AND THE "AS- BUILT PLAN OF LAND" TOPOGRAPHY (REFER TO FIGURE 3) IN THE VICINITY OF THE AREA OF CONTAINMENT (AOC) WEST OF SOUTH STREET. THESE CONTOURS WERE GENERATED ELECTRONICALLY AND REFLECT THE APPROXIMATE AREA AND THICKNESS OF THE ASBESTOS AOC AND SETTLING BASIN NO. 2 CONTAINMENT CELL. THE ACTUAL LIMITS AND THICKNESSES MAY VARY FROM THAT WHICH IS IMPLIED ON THIS FIGURE.

LEGEND

10 — ELEVATION DIFFERENCE CONTOUR (ft.)

---------- AREA OF CONTAINMENT (RESTRICTED AREA). NOTE THAT AN AREA OF EXPOSED ROCK IN THE NORTHWESTERN PORTION OF THIS AREA, A CONCRETE VAULT NORTH OF THE OLD MILL BUILDING, AND THE "BRICK" BUILDING" SOUTH OF THE OLD MILL BUILDING ARE NOT INCLUDED IN THE AOC.

DETAIL A

LOTS LOCATED ON THE NEPONSET RIVER IN BETWEEN LEWIS AVENUE AND MAIN STREET

GRAPHICAL SCALE

0' 30' 60' 120' 180'

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

SHA Sanborn, Head & Associates
Consulting Engineers & Scientists

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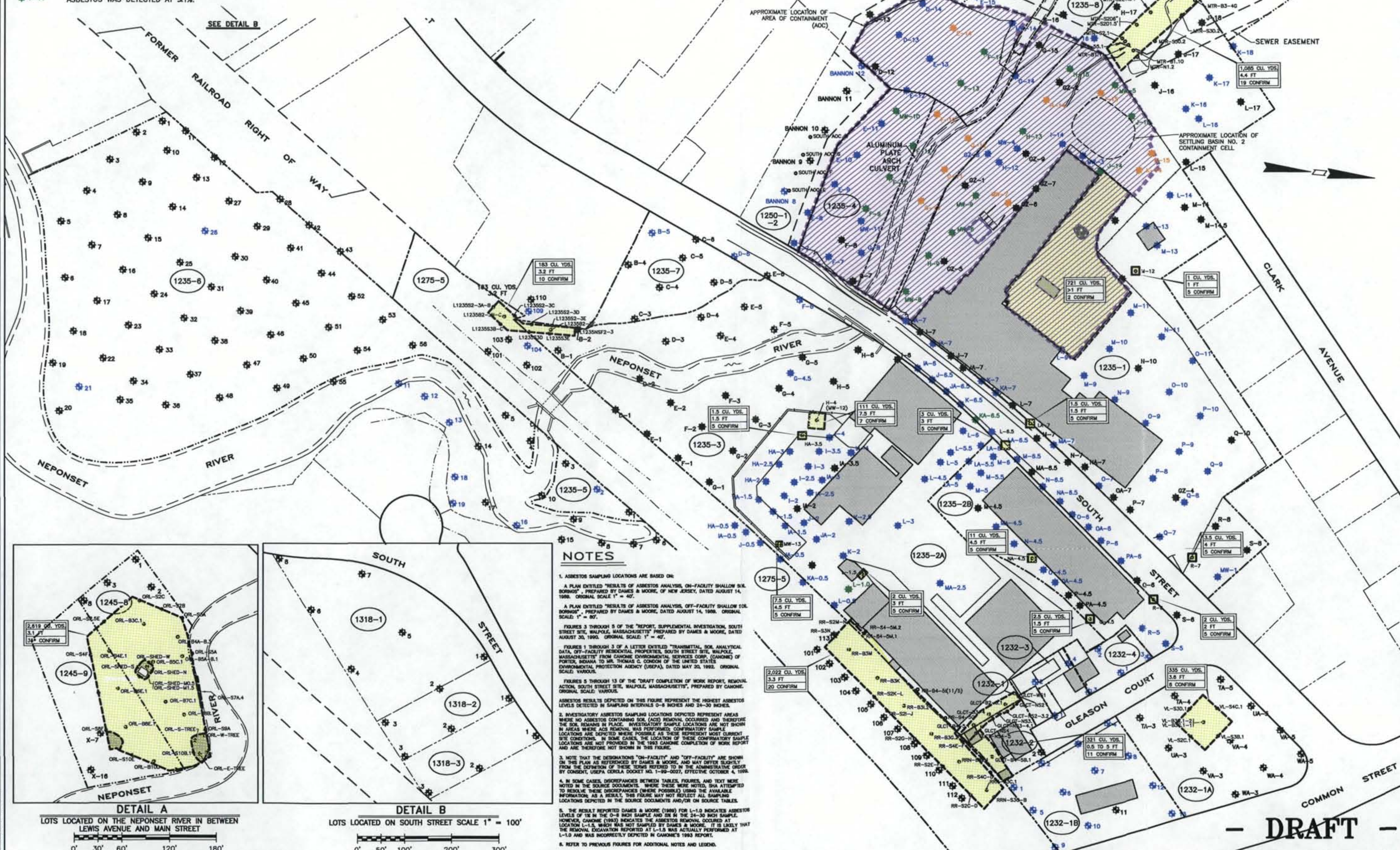
DESIGNED BY: JO
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

CHANGE IN TOPOGRAPHY FOLLOWING ASBESTOS REMOVAL ACTIONS

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 14



LEGEND

- NA-4.5 — INVESTIGATORY ON-FACILITY ASBESTOS SAMPLING LOCATION AND DESIGNATION. ASBESTOS WAS NOT DETECTED. (REFER TO NOTE 3).
- 112 — INVESTIGATORY OFF-FACILITY ASBESTOS SAMPLING LOCATION AND DESIGNATION. ASBESTOS WAS NOT DETECTED. (REFER TO NOTE 3.)
- F-13 — ASBESTOS WAS DETECTED AT <1%
- E-14 — VISUAL OBSERVATION OF ASBESTOS
- F-14 — ASBESTOS WAS DETECTED AT ≥1%.
- LIMITS OF ACS EXCAVATION WITH TOTAL VALUE REMOVED AND AVERAGE DEPTH OF EXCAVATION INDICATED
- ORL-S100 — CONFIRMATORY SOIL SAMPLE LOCATION AND DESIGNATION.
- 183 CU. YDS. / 3.2 FT / 10 — INFORMATION REGARDING THE ASBESTOS REMOVAL EXCAVATION. 183 CUBIC YARDS OF ASBESTOS CONTAINING SOIL (ACS) REMOVED, AVERAGE EXCAVATION DEPTH OF 3.2 FEET, AND 10 CONFIRMATORY SAMPLES COLLECTED BY CANONIE.
- AREA LEFT UNDISTURBED WHERE ASBESTOS WAS NOT DETECTED ABOVE 1% WITHIN LOTS 1245-8 AND 1245-9.
- AREA OF CONTAINMENT (RESTRICTED AREA). NOTE THAT AN AREA OF EXPOSED ROCK IN THE NORTHWESTERN PORTION OF THIS AREA, A CONCRETE VAULT NORTH OF THE OLD MILL BUILDING, AND THE "BRICK" BUILDING" SOUTH OF THE OLD MILL BUILDING ARE NOT INCLUDED IN THE AOC.

NOTES

1. ASBESTOS SAMPLING LOCATIONS ARE BASED ON:

A PLAN ENTITLED "RESULTS OF ASBESTOS ANALYSIS, ON-FACILITY SHALLOW SOIL BORINGS", PREPARED BY DAMES & MOORE, OF NEW JERSEY, DATED AUGUST 14, 1989. ORIGINAL SCALE 1" = 40'.

A PLAN ENTITLED "RESULTS OF ASBESTOS ANALYSIS, OFF-FACILITY SHALLOW SOIL BORINGS", PREPARED BY DAMES & MOORE, DATED AUGUST 14, 1989. ORIGINAL SCALE: 1" = 80'.

FIGURES 3 THROUGH 5 OF THE "REPORT, SUPPLEMENTAL INVESTIGATION, SOUTH STREET SITE, WALPOLE, MASSACHUSETTS" PREPARED BY DAMES & MOORE, DATED AUGUST 30, 1990. ORIGINAL SCALE: 1" = 40'.

FIGURES 1 THROUGH 3 OF A LETTER ENTITLED "TRANSMITTAL, SOIL ANALYTICAL DATA, OFF-FACILITY RESIDENTIAL PROPERTIES, SOUTH STREET SITE, WALPOLE, MASSACHUSETTS" FROM CANONIE ENVIRONMENTAL SERVICES CORP. (CANONIE) OF PORTER, INDIANA TO MR. THOMAS C. CONDON OF THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA), DATED MAY 20, 1992. ORIGINAL SCALE: VARIOUS.

FIGURES 5 THROUGH 13 OF THE "DRAFT COMPLETION OF WORK REPORT, REMOVAL ACTION, SOUTH STREET SITE, WALPOLE, MASSACHUSETTS", PREPARED BY CANONIE. ORIGINAL SCALE: VARIOUS.

ASBESTOS RESULTS DEPICTED ON THIS FIGURE REPRESENT THE HIGHEST ASBESTOS LEVELS DETECTED IN SAMPLING INTERVALS 0-6 INCHES AND 24-30 INCHES.

2. INVESTIGATORY ASBESTOS SAMPLING LOCATIONS DEPICTED REPRESENT AREAS WHERE NO ASBESTOS CONTAINING SOIL (ACS) REMOVAL OCCURRED AND THEREFORE THE SOIL REMAINS IN PLACE. INVESTIGATORY SAMPLE LOCATIONS ARE NOT SHOWN IN AREAS WHERE ACS REMOVAL WAS PERFORMED; CONFIRMATORY SAMPLE LOCATIONS ARE DEPICTED WHERE POSSIBLE AS THESE REPRESENT MOST CURRENT SITE CONDITIONS. IN SOME CASES, THE LOCATION OF THESE CONFIRMATORY SAMPLE LOCATIONS ARE NOT PROVIDED IN THE 1993 CANONIE COMPLETION OF WORK REPORT AND ARE THEREFORE NOT SHOWN IN THIS FIGURE.

3. NOTE THAT THE DESIGNATIONS "ON-FACILITY" AND "OFF-FACILITY" ARE SHOWN ON THIS PLAN AS REFERENCED BY DAMES & MOORE, AND MAY DIFFER SLIGHTLY FROM THE DEFINITION OF THESE TERMS REFERED TO IN THE ADMINISTRATIVE ORDER BY CONSENT, USEPA CERCLA DOCKET NO. 1-99-0027, EFFECTIVE OCTOBER 4, 1999.

4. IN SOME CASES, DISCREPANCIES BETWEEN TABLES, FIGURES, AND TEXT WERE NOTED IN THE SOURCE DOCUMENTS. WHERE THESE WERE NOTED, SHA ATTEMPTED TO RESOLVE THESE DISCREPANCIES (WHERE POSSIBLE) USING THE AVAILABLE INFORMATION; AS A RESULT, THIS FIGURE MAY NOT REFLECT ALL SAMPLING LOCATIONS DEPICTED IN THE SOURCE DOCUMENTS AND/OR ON SOURCE TABLES.

5. THE RESULT REPORTED DAMES & MOORE (1989) FOR L-1.0 INDICATES ASBESTOS LEVELS OF 1% IN THE 0-6 INCH SAMPLE AND 5% IN THE 24-30 INCH SAMPLE. HOWEVER, CANONIE (1993) INDICATES THE ASBESTOS REMOVAL OCCURED AT LOCATION L-1.5, WHICH WAS NOT SAMPLED BY DAMES & MOORE. IT IS LIKELY THAT THE REMOVAL EXCAVATION REPORTED AT L-1.5 WAS ACTUALLY PERFORMED AT L-1.0 AND WAS INCORRECTLY DEPICTED IN CANONIE'S 1993 REPORT.

6. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

Sanborn, Head & Associates
Consulting Engineers & Scientists

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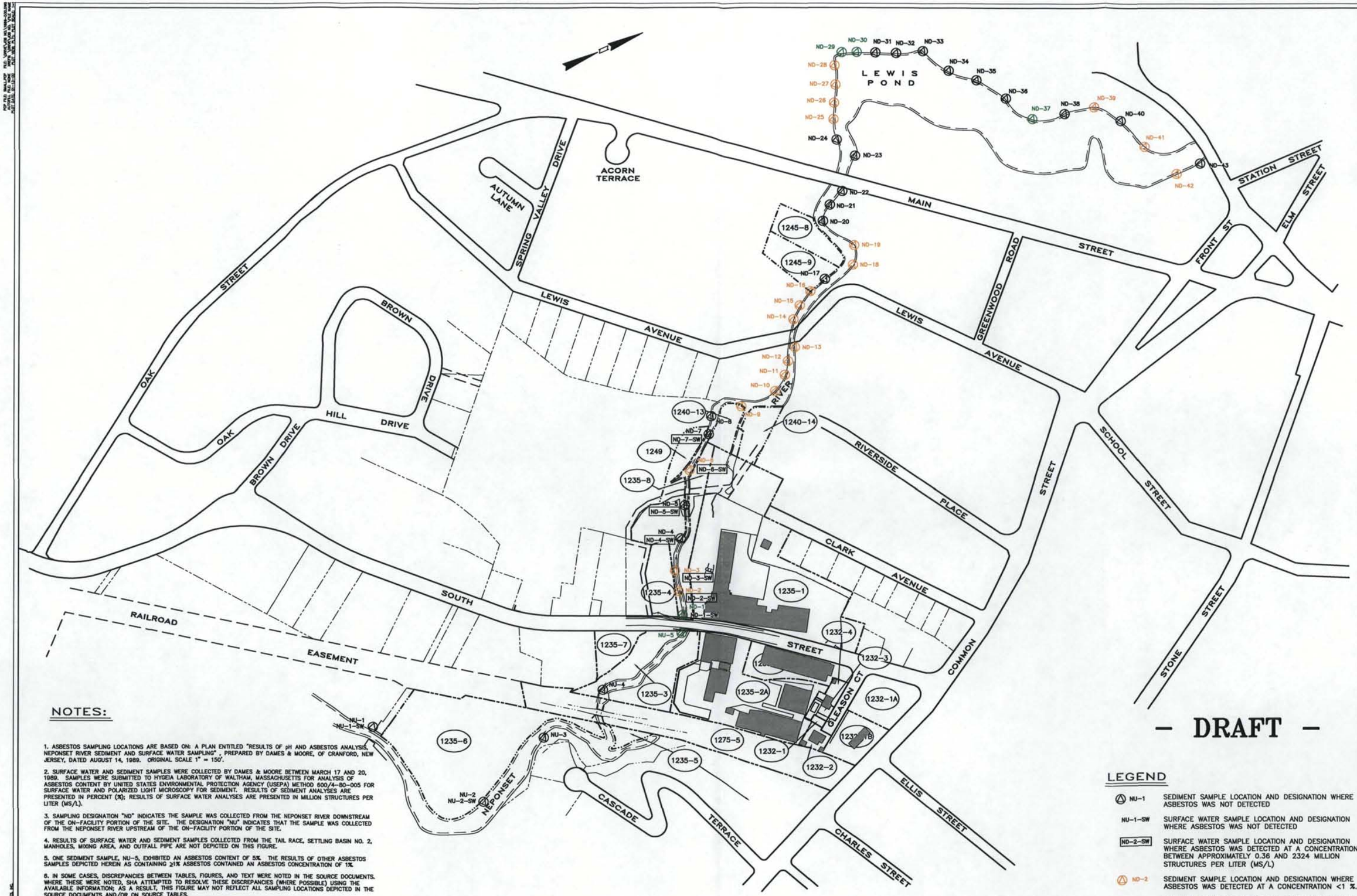
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

ASBESTOS RAP ACTIVITIES AND DISTRIBUTION OF ASBESTOS SOIL SAMPLING LOCATIONS

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 15



NOTES:

1. ASBESTOS SAMPLING LOCATIONS ARE BASED ON: A PLAN ENTITLED "RESULTS OF pH AND ASBESTOS ANALYSIS, NEPONSET RIVER SEDIMENT AND SURFACE WATER SAMPLING" , PREPARED BY DAMES & MOORE, OF CRANFORD, NEW JERSEY, DATED AUGUST 14, 1989. ORIGINAL SCALE 1" = 150'.

2. SURFACE WATER AND SEDIMENT SAMPLES WERE COLLECTED BY DAMES & MOORE BETWEEN MARCH 17 AND 20, 1989. SAMPLES WERE SUBMITTED TO HYGEIA LABORATORY OF WALTHAM, MASSACHUSETTS FOR ANALYSIS OF ASBESTOS CONTENT BY UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) METHOD 600/4-80-005 FOR SURFACE WATER AND POLARIZED LIGHT MICROSCOPY FOR SEDIMENT. RESULTS OF SEDIMENT ANALYSES ARE PRESENTED IN PERCENT (%); RESULTS OF SURFACE WATER ANALYSES ARE PRESENTED IN MILLION STRUCTURES PER LITER (MS/L).

3. SAMPLING DESIGNATION "ND" INDICATES THE SAMPLE WAS COLLECTED FROM THE NEPONSET RIVER DOWNSTREAM OF THE ON-FACILITY PORTION OF THE SITE. THE DESIGNATION "NU" INDICATES THAT THE SAMPLE WAS COLLECTED FROM THE NEPONSET RIVER UPSTREAM OF THE ON-FACILITY PORTION OF THE SITE.

4. RESULTS OF SURFACE WATER AND SEDIMENT SAMPLES COLLECTED FROM THE TAIL RACE, SETTLING BASIN NO. 2, MANHOLES, MIXING AREA, AND OUTFALL PIPE ARE NOT DEPICTED ON THIS FIGURE.

5. ONE SEDIMENT SAMPLE, NU-5, EXHIBITED AN ASBESTOS CONTENT OF 5%. THE RESULTS OF OTHER ASBESTOS SAMPLES DEPICTED HEREIN AS CONTAINING ≥1% ASBESTOS CONTAINED AN ASBESTOS CONCENTRATION OF 1%.

6. IN SOME CASES, DISCREPANCIES BETWEEN TABLES, FIGURES, AND TEXT WERE NOTED IN THE SOURCE DOCUMENTS. WHERE THESE WERE NOTED, SHA ATTEMPTED TO RESOLVE THESE DISCREPANCIES (WHERE POSSIBLE) USING THE AVAILABLE INFORMATION; AS A RESULT, THIS FIGURE MAY NOT REFLECT ALL SAMPLING LOCATIONS DEPICTED IN THE SOURCE DOCUMENTS AND/OR ON SOURCE TABLES.

7. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

NU-1	SEDIMENT SAMPLE LOCATION AND DESIGNATION WHERE ASBESTOS WAS NOT DETECTED
NU-1-SW	SURFACE WATER SAMPLE LOCATION AND DESIGNATION WHERE ASBESTOS WAS NOT DETECTED
ND-2-SW	SURFACE WATER SAMPLE LOCATION AND DESIGNATION WHERE ASBESTOS WAS DETECTED AT A CONCENTRATION BETWEEN APPROXIMATELY 0.36 AND 2324 MILLION STRUCTURES PER LITER (MS/L)
ND-2	SEDIMENT SAMPLE LOCATION AND DESIGNATION WHERE ASBESTOS WAS DETECTED AT A CONCENTRATION <1 %.
ND-1	SEDIMENT SAMPLE LOCATION AND DESIGNATION WHERE ASBESTOS WAS DETECTED AT A CONCENTRATION ≥ 1% (SEE NOTE 5)

— DRAFT —

GRAPHICAL SCALE
0' 75' 150' 300' 450'

SHA
Sanborn, Head & Associates
Consulting Engineers & Scientists

NO.	DATE	DESCRIPTION	BY

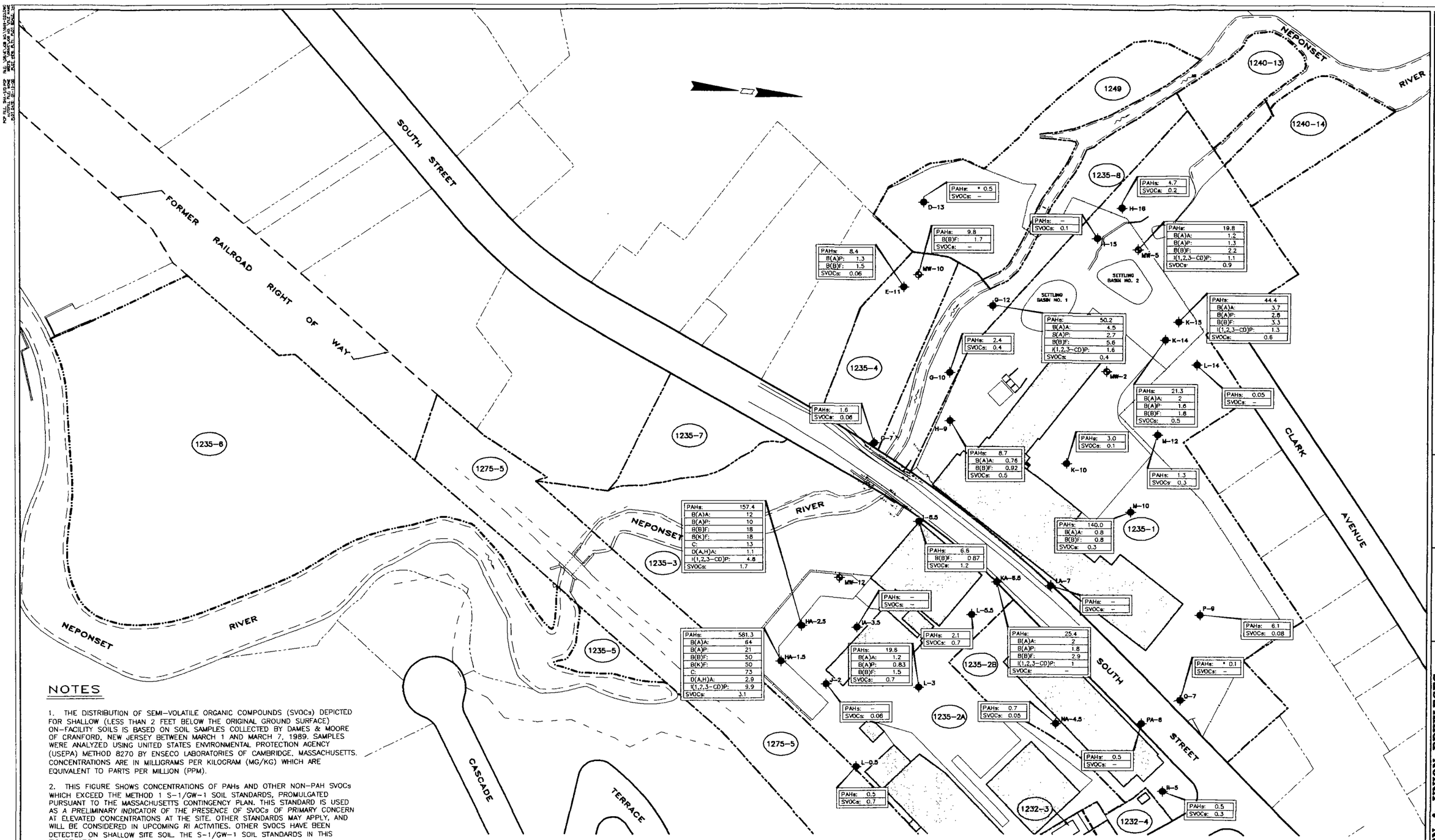
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF ASBESTOS IN SEDIMENT & SURFACE WATER SAMPLES

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 16



NOTES

1. THE DISTRIBUTION OF SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DEPICTED FOR SHALLOW (LESS THAN 2 FEET BELOW THE ORIGINAL GROUND SURFACE) ON-FACILITY SOILS IS BASED ON SOIL SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 1 AND MARCH 7, 1989. SAMPLES WERE ANALYZED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) METHOD 8270 BY ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS. CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (MG/KG) WHICH ARE EQUIVALENT TO PARTS PER MILLION (PPM).

2. THIS FIGURE SHOWS CONCENTRATIONS OF PAHs AND OTHER NON-PAH SVOCs WHICH EXCEED THE METHOD 1 S-1/GW-1 SOIL STANDARDS, PROMULGATED PURSUANT TO THE MASSACHUSETTS CONTINGENCY PLAN. THIS STANDARD IS USED AS A PRELIMINARY INDICATOR OF THE PRESENCE OF SVOCs OF PRIMARY CONCERN AT ELEVATED CONCENTRATIONS AT THE SITE. OTHER STANDARDS MAY APPLY, AND WILL BE CONSIDERED IN UPCOMING RI ACTIVITIES. OTHER SVOCS HAVE BEEN DETECTED ON SHALLOW SITE SOIL. THE S-1/GW-1 SOIL STANDARDS IN THIS FIGURE ARE:

3. THE FOLLWING ABBREVIATIONS ARE ALSO USED IN THIS FIGURE:

PAHs: THE SUM OF ALL POLYCYCLIC AROMATIC HYDROCARBONS
SVOCs: THE SUM OF ALL SVOCs COMPOUNDS OTHER THAN PAHs

SVOC	ABBREVIATION	METHOD1, S-1/GW-1 SOIL STANDARD (MG/KG)
BENZO (A) ANTHRACENE	B(A)A	0.7
BENZO (A) PYRENE	B(A)P	0.7
BENZO (B) FLUORANTHENE	B(B)F	0.7
BENZO (K) FLUORANTHENE	B(K)F	7
CHRYSENE	C	7
DIBENZ (A,H) ANTHRACENE	D(A,H)A	0.7
INDENO (1,2,3-CD) PYRENE	I(1,2,3-CD)P	0.7

4. SHALLOW SOIL SAMPLES WERE COLLECTED BETWEEN 0 AND 2 FEET BELOW THE ORIGINAL GROUND SURFACE. TYPICALLY, SINCE THE TIME OF THE SAMPLE COLLECTION, THE GROUND SURFACE ELEVATION IN THE VICINITY OF THE AOC AND SETTLING BASIN NO. 2 SOUTH AND WEST OF THE FORMER KENDALL BUILDING HAS CHANGED AS A RESULT OF ASBESTOS REMOVAL ACTIVITIES.

5. SOME OF THE SVOC RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ESTIMATED" THROUGH THE DATA VALIDATION/DATA USABILITY ASSESSMENT (REFER TO SECTION 5.0 OF THE TEXT). DATA WHICH HAVE BEEN "REJECTED" BY THE DATA VALIDATION/DATA USABILITY ASSESSMENT ARE NOT DEPICTED.

6. '*' THE RESULTS DEPICTED FOR SAMPLES D-13 AND Q-7 REPRESENT THE CONCENTRATIONS REPORTED FOR THE PRIMARY SAMPLES. THE RESULTS OF THE BLIND DUPLICATE DB-13 DID NOT INDICATE THE PRESENCE OF PAHs OR OTHER VOCs. RESULTS OF THE BLIND DUPLICATE SAMPLE QB-7 INDICATED THE PPESENCE OF PAHs AT 1.048 MG/KG AND DID NOT INDICATE THE PRESENCE OF OTHER SVOCs.

LEGEND

PAHs: 8.3
B(A)P: 1.3
B(B)F: 1.5
SVOCs: 0.1

SVOC CONCENTRATIONS IN MG/KG FOR SHALLOW SOIL SAMPLE. "–" INDICATES NO PAHs AND/OR NON-PAH SVOCs WERE DETECTED

– DRAFT –

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE
0' 30' 60' 120' 180'

Sanborn, Head & Associates
Consulting Engineers & Scientists

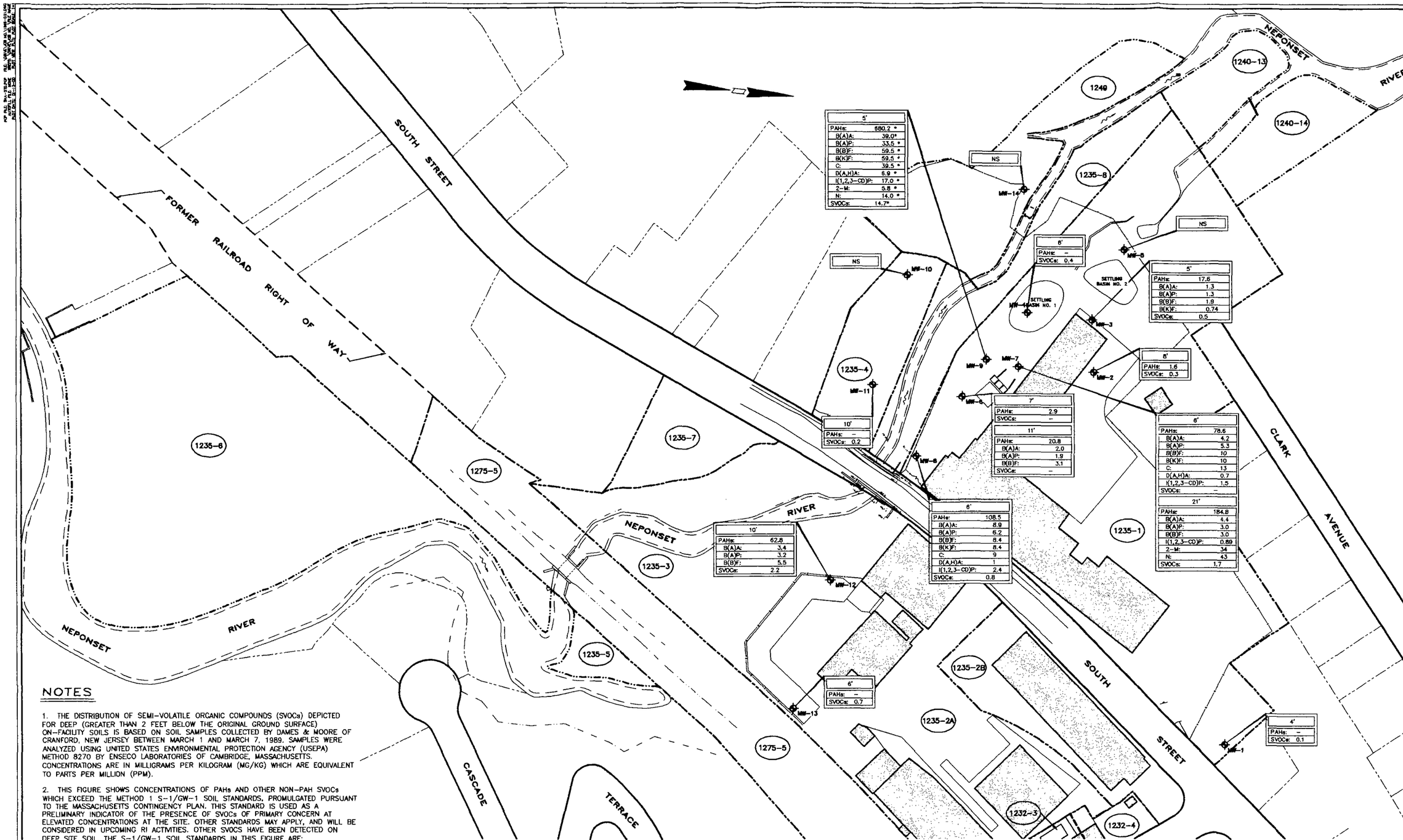
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR. CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF SVOCs IN ON-FACILITY SHALLOW SOIL SAMPLES

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 17



NOTES

1. THE DISTRIBUTION OF SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs) DEPICTED FOR DEEP (GREATER THAN 2 FEET BELOW THE ORIGINAL GROUND SURFACE) ON-FACILITY SOILS IS BASED ON SOIL SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 1 AND MARCH 7, 1989. SAMPLES WERE ANALYZED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) METHOD 8270 BY ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS. CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (MG/KG) WHICH ARE EQUIVALENT TO PARTS PER MILLION (PPM).

2. THIS FIGURE SHOWS CONCENTRATIONS OF PAHs AND OTHER NON-PAH SVOCs WHICH EXCEED THE METHOD 1 S-1/GW-1 SOIL STANDARDS, PROMULGATED PURSUANT TO THE MASSACHUSETTS CONTINGENCY PLAN. THIS STANDARD IS USED AS A PRELIMINARY INDICATOR OF THE PRESENCE OF SVOCs OF PRIMARY CONCERN AT ELEVATED CONCENTRATIONS AT THE SITE. OTHER STANDARDS MAY APPLY, AND WILL BE CONSIDERED IN UPCOMING RI ACTIVITIES. OTHER SVOCS HAVE BEEN DETECTED ON DEEP SITE SOIL. THE S-1/GW-1 SOIL STANDARDS IN THIS FIGURE ARE:

3. THE FOLLWING ABBREVIATIONS ARE ALSO USED IN THIS FIGURE:

PAHs: THE SUM OF ALL POLYCYCLIC AROMATIC HYDROCARBONS
SVOCs: THE SUM OF ALL SVOCs COMPOUNDS OTHER THAN PAHs

SVOC	ABBREVIATION	METHOD 1, S-1/GW-1 SOIL STANDARD (MG/KG)
ACENAPTHENE	A	20
BENZO (A) ANTHRACENE	B(A)A	0.7
BENZO (A) PYRENE	B(A)P	0.7
BENZO (B) FLUORANTHENE	B(B)F	0.7
BENZO (K) FLUORANTHENE	B(K)F	7
CHRYSENE	C	7
DIBENZ (A,H) ANTHRACENE	D(A,H)	0.7
INDENO (1,2,3-CD) PYRENE	I(1,2,3-CD)P	0.7
2-METHYLNAPHTHALENE	2-M	4
NAPHTHALENE	N	4

4. *THE SAMPLE DEPTHS INDICATED REPRESENT THE DEPTH BELOW THE ORIGINAL GROUND SURFACE.* TYPICALLY, SINCE THE TIME OF THE SAMPLE COLLECTION, THE GROUND SURFACE ELEVATION IN THE VICINITY OF THE AOC AND SETTLING BASIN NO. 2 SOUTH AND WEST OF THE FORMER MILL BUILDING HAS CHANGED AS A RESULT OF ASBESTOS REMOVAL ACTIVITIES.

5. SOME OF THE SVOC RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ESTIMATED" THROUGH THE DATA VALIDATION/DATA USABILITY ASSESSMENT (REFER TO SECTION 5.0 OF THE TEXT). DATA WHICH HAVE BEEN "REJECTED" BY THE DATA VALIDATION/DATA USABILITY ASSESSMENT ARE NOT DEPICTED.

6. "*" INDICATES THE RESULTS PRESENTED FOR MW-9 REPRESENT THE AVERAGE OF RESULTS FOR THE PRIMARY MW-9 SAMPLE AND THE BLIND DUPLICATE SAMPLE MW-9D.

LEGEND

5'	
PAHs:	17.6
B(A)A:	1.3
B(A)P:	1.3
B(B)F:	1.9
B(K)F:	0.74
SVOCs:	0.5

SVOC CONCENTRATIONS IN MG/KG FOR SOIL SAMPLE COLLECTED FROM 5 FEET (5') BELOW THE ORIGINAL GROUND SURFACE. A"–" INDICATES NO PAHs OR SVOCs WERE PRESENT ABOVE THE ANALYTICAL DETECTION LIMIT.

NS — NO DEEP SOIL SAMPLE COLEECTED FROM THIS LOCATION

— DRAFT —

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

Sanborn, Head & Associates
Consulting Engineers & Scientists

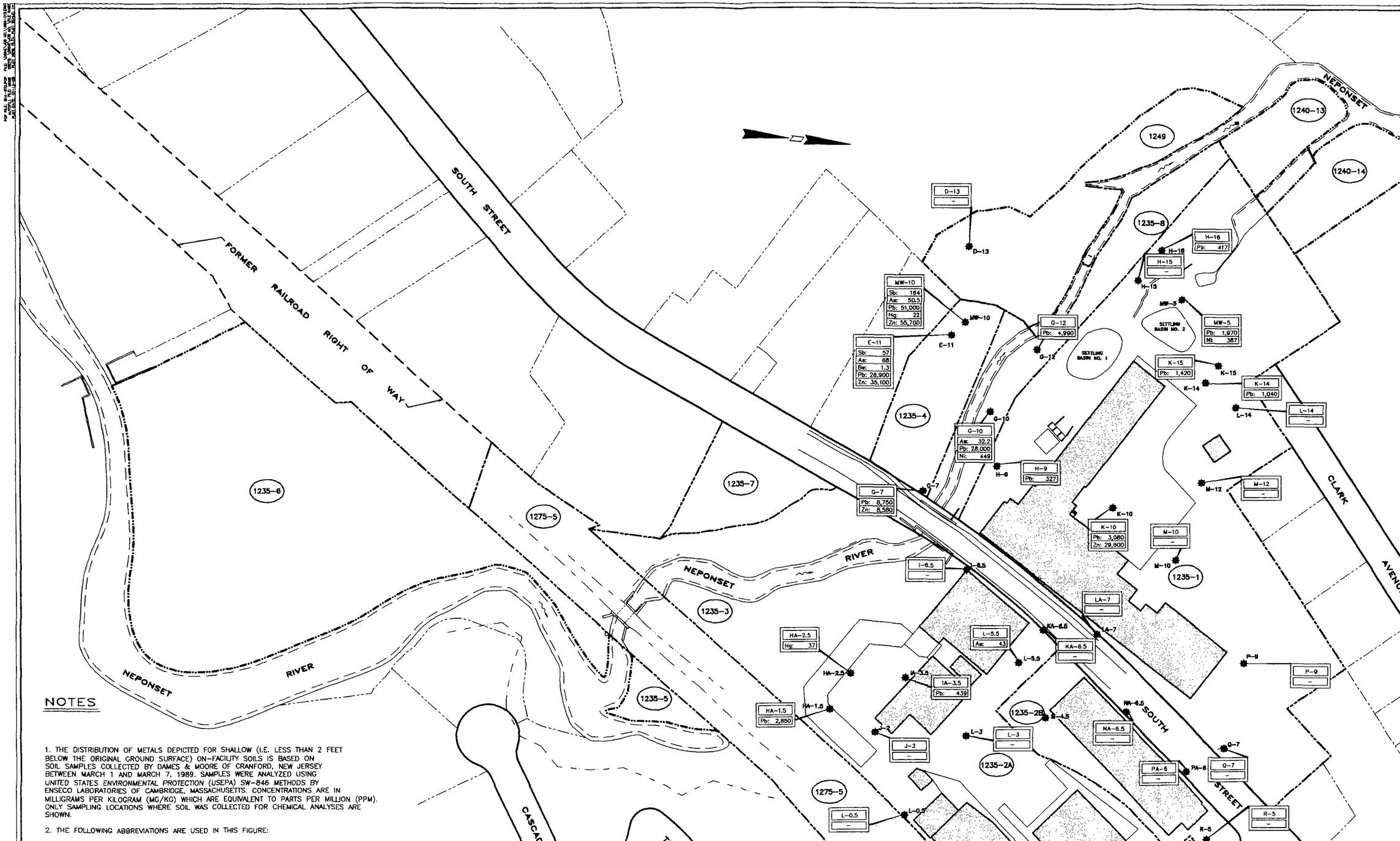
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF SVOCs IN ON-FACILITY DEEP SOIL SAMPLES

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 18



NOTES

1. THE DISTRIBUTION OF METALS DEPICTED FOR SHALLOW (I.E. LESS THAN 2 FEET BELOW THE ORIGINAL GROUND SURFACE) ON-FACILITY SOILS IS BASED ON SOIL SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 1 AND MARCH 7, 1989. SAMPLES WERE ANALYZED USING *UNITED STATES ENVIRONMENTAL PROTECTION (USEPA) SW-846 METHODS BY* ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS. CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (MG/KG) WHICH ARE EQUIVALENT TO PARTS PER MILLION (PPM). ONLY SAMPLING LOCATIONS WHERE SOIL WAS COLLECTED FOR CHEMICAL ANALYSES ARE SHOWN.

2. THE FOLLOWING ABBREVIATIONS ARE USED IN THIS FIGURE:

Sb: ANTIMONY
As: ARSENIC
Be: BERYLLIUM
Hg: MERCURY
Pb: LEAD
Ni: NICKEL
Zn: ZINC

3. THIS FIGURE SHOWS CONCENTRATIONS OF METALS WHICH EXCEED THE METHOD 1 S-1/GW-1 SOIL STANDARDS, PROMULGATED PURSUANT TO THE MASSACHUSETTS CONTINGENCY PLAN. THIS STANDARD IS USED AS A PRELIMINARY INDICATOR OF THE PRESENCE OF METALS OF PRIMARY CONCERN AT ELEVATED CONCENTRATIONS AT THE SITE. OTHER STANDARDS MAY APPLY, AND WILL BE CONSIDERED IN UPCOMING RI ACTIVITIES. OTHER METALS ARE PRESENT ABOVE BACKGROUND CONCENTRATIONS. THE S-1/GW-1 SOIL STANDARDS IN THIS FIGURE ARE:

METAL	METHOD 1 S-1/ GW-1 SOIL STANDARD (mg/kg)
ANTIMONY	10
ARSENIC	30
BERYLLIUM	0.7
MERCURY	20
LEAD	300
NICKEL	300
ZINC	2,500

4. SHALLOW SAMPLES WERE COLLECTED BETWEEN 0 AND 2 FEET BELOW THE ORIGINAL GROUND SURFACE. TYPICALLY, SINCE THE TIME OF THE SAMPLE COLLECTION, THE GROUND SURFACE ELEVATION IN THE VICINITY OF THE AOC AND SETTLING BASIN NO. 2 SOUTH AND WEST OF THE FORMER MILL BUILDING HAS CHANGED AS A RESULT OF ASBESTOS REMOVAL ACTIVITIES.

5. SOME OF THE METALS RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ESTIMATED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO *SECTION 5.0 OF THE TEXT). DATA WHICH HAVE BEEN "REJECTED" BY THE DATA VALIDATION /* DATA USABILITY ASSESSMENT ARE NOT INCLUDED.

6. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

E-11
Sb: 57
As: 68
Be: 1.3
Pb: 28,900
Zn: 35,100

METAL CONCENTRATIONS (IN MG/KG) FOR SHALLOW SOIL SAMPLES. A "_" INDICATES THAT NO METALS WERE DETECTED ABOVE METHOD 1 S-1/GW-1 SOIL STANDARDS.

— DRAFT —

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

SHA Sanborn, Head & Associates
Consulting Engineers & Scientists

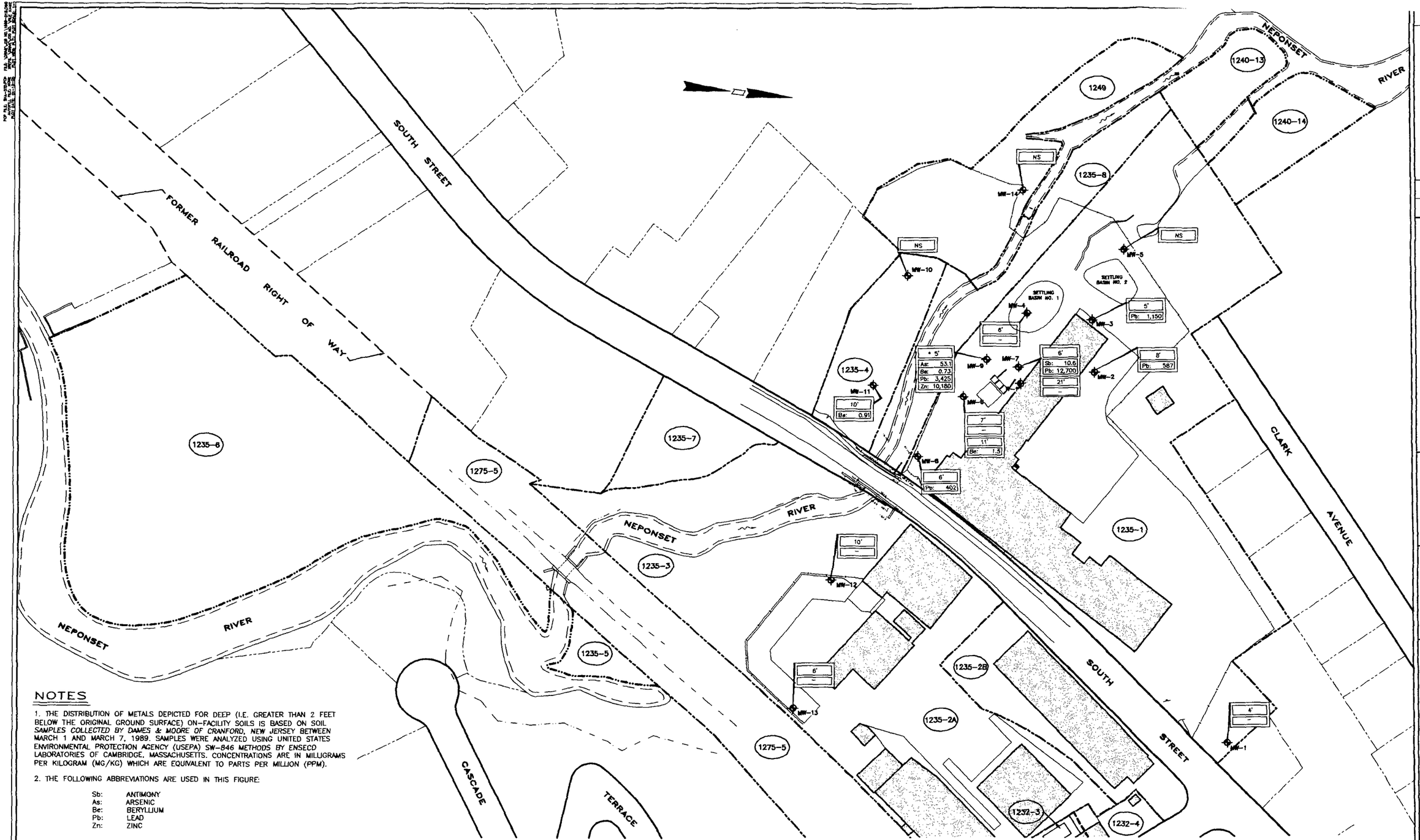
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF METALS IN SHALLOW SOIL SAMPLES

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 19



NOTES

1. THE DISTRIBUTION OF METALS DEPICTED FOR DEEP (I.E. GREATER THAN 2 FEET BELOW THE ORIGINAL GROUND SURFACE) ON-FACILITY SOILS IS BASED ON SOIL SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 1 AND MARCH 7, 1989. SAMPLES WERE ANALYZED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) SW-846 METHODS BY ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS. CONCENTRATIONS ARE IN MILLIGRAMS PER KILOGRAM (MG/KG) WHICH ARE EQUIVALENT TO PARTS PER MILLION (PPM).

2. THE FOLLOWING ABBREVIATIONS ARE USED IN THIS FIGURE:

Sb:	ANTIMONY
As:	ARSENIC
Be:	BERYLLIUM
Pb:	LEAD
Zn:	ZINC

3. "*" INDICATES THAT THE CONCENTRATION SHOWN FOR THE SAMPLE FROM MW-9 REPRESENTS THE AVERAGE OF THE PRIMARY SAMPLE (MW-9) AND THE BLIND DUPLICATE SAMPLE (MW-9D).

4. THIS FIGURE SHOWS CONCENTRATIONS OF METALS WHICH EXCEED THE METHOD 1 S-1/GW-1 SOIL STANDARDS, PROMULGATED PURSUANT TO THE MASSACHUSETTS CONTINGENCY PLAN. THIS STANDARD IS USED AS A PRELIMINARY INDICATOR OF THE PRESENCE OF METALS OF PRIMARY CONCERN AT ELEVATED CONCENTRATIONS AT THE SITE. OTHER STANDARDS MAY APPLY, AND WILL BE CONSIDERED IN UPCOMING RI ACTIVITIES. OTHER METALS ARE PRESENT ABOVE BACKGROUND CONCENTRATIONS. THE S-1/GW-1 SOIL STANDARDS IN THIS FIGURE ARE:

METAL	METHOD 1, S-1/GW-1 SOIL STANDARD (mg/kg)
ANTIMONY	10
ARSENIC	30
BERYLLIUM	0.7
LEAD	300
ZINC	2,500

5. THE SAMPLE DEPTHS INDICATED REPRESENT THE DEPTH BELOW THE ORIGINAL GROUND SURFACE. TYPICALLY, SINCE THE TIME OF THE SAMPLE COLLECTION, THE GROUND SURFACE ELEVATION IN THE VICINITY OF THE AOC AND SETTLING BASIN NO. 2 SOUTH AND WEST OF THE FORMER MILL BUILDING HAS CHANGED AS A RESULT OF ASBESTOS REMOVAL ACTIVITES.

6. SOME OF THE METALS RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ESTIMATED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO SECTION 5.0 THE TEXT). DATA WHICH HAVE BEEN "REJECTED" BY THE DATA VALIDATION / DATA USABILITY ASSESSMENT ARE NOT DEPICTED.

7. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

— DRAFT —

5'
Sb: 51.6
As: 53.1
Be: 0.73
Pb: 3,425
Zn: 10,180

METALS CONCENTRATIONS IN MG/KG FOR SOIL SAMPLE COLLECTED FROM INDICATED DEPTH BELOW THE ORIGINAL GROUND SURFACE. A "–" INDICATES NO METALS WERE DETECTED AT CONCENTRATIONS EXCEEDING THE S-1/GW-1 SOIL STANDARDS.

NS — NO DEEP SOIL SAMPLE COLLECTED FROM THIS LOCATION

GRAPHICAL SCALE
0' 30' 60' 120' 180'

Sanborn, Head & Associates
Consulting Engineers & Scientists

DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

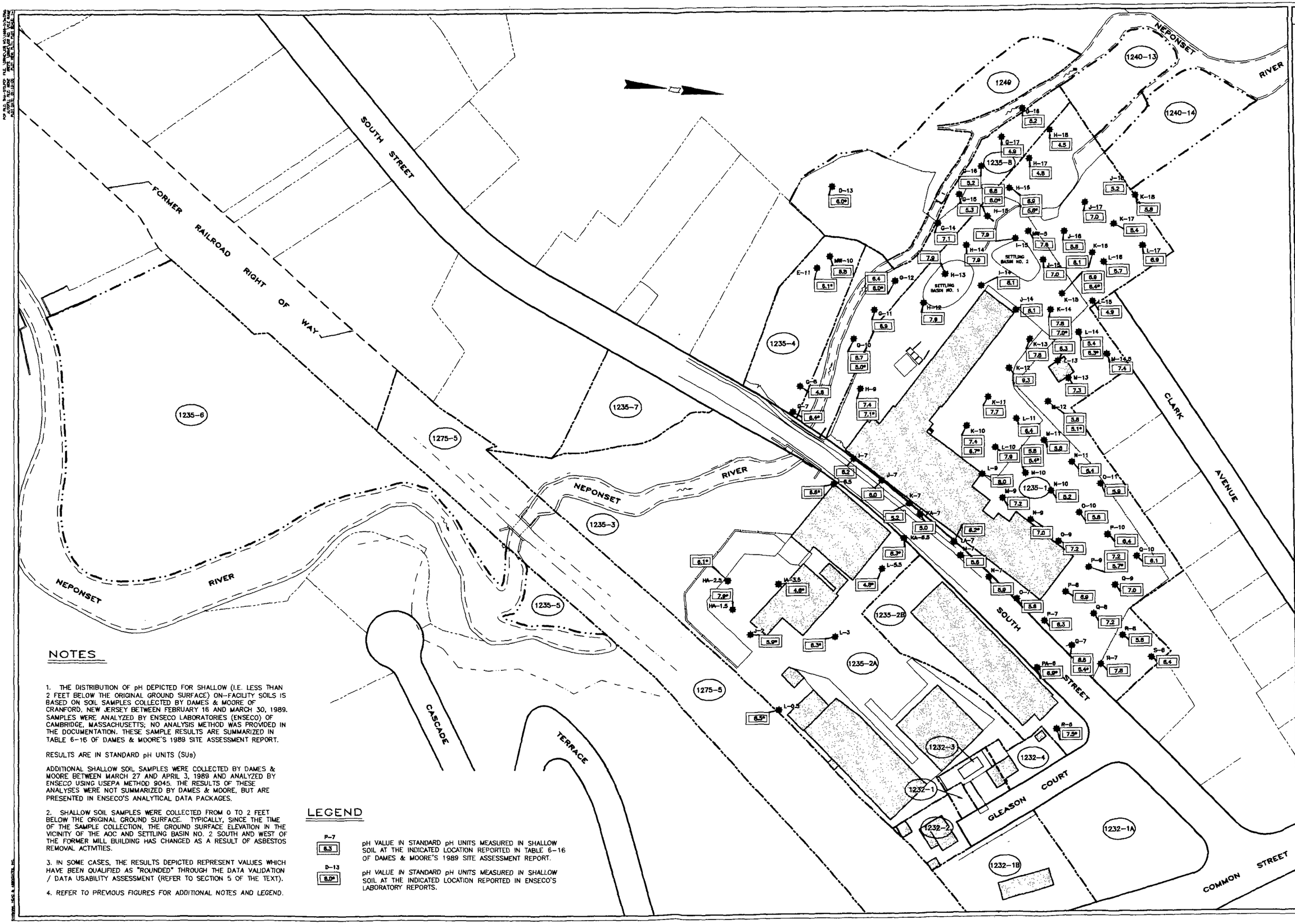
NO.	DATE	DESCRIPTION	BY

BLACKBURN & UNION PRIVILEGES
SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF METALS IN ON-FACILITY DEEP SOIL SAMPLES

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 20



NOTES

1. THE DISTRIBUTION OF pH DEPICTED FOR SHALLOW (I.E. LESS THAN 2 FEET BELOW THE ORIGINAL GROUND SURFACE) ON-FACILITY SOILS IS BASED ON SOIL SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN FEBRUARY 16 AND MARCH 30, 1989. SAMPLES WERE ANALYZED BY ENSECO LABORATORIES (ENSECO) OF CAMBRIDGE, MASSACHUSETTS; NO ANALYSIS METHOD WAS PROVIDED IN THE DOCUMENTATION. THESE SAMPLE RESULTS ARE SUMMARIZED IN TABLE 6-16 OF DAMES & MOORE'S 1989 SITE ASSESSMENT REPORT.

RESULTS ARE IN STANDARD pH UNITS (SUs)

ADDITIONAL SHALLOW SOIL SAMPLES WERE COLLECTED BY DAMES & MOORE BETWEEN MARCH 27 AND APRIL 3, 1989 AND ANALYZED BY ENSECO USING USEPA METHOD 9045. THE RESULTS OF THESE ANALYSES WERE NOT SUMMARIZED BY DAMES & MOORE, BUT ARE PRESENTED IN ENSECO'S ANALYTICAL DATA PACKAGES.

2. SHALLOW SOIL SAMPLES WERE COLLECTED FROM 0 TO 2 FEET BELOW THE ORIGINAL GROUND SURFACE. TYPICALLY, SINCE THE TIME OF THE SAMPLE COLLECTION, THE GROUND SURFACE ELEVATION IN THE VICINITY OF THE AOC AND SETTLING BASIN NO. 2 SOUTH AND WEST OF THE FORMER MILL BUILDING HAS CHANGED AS A RESULT OF ASBESTOS REMOVAL ACTIVITIES.

3. IN SOME CASES, THE RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ROUNDED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO SECTION 5 OF THE TEXT).

4. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

P-7 | 6.3 — pH VALUE IN STANDARD pH UNITS MEASURED IN SHALLOW SOIL AT THE INDICATED LOCATION REPORTED IN TABLE 6-16 OF DAMES & MOORE'S 1989 SITE ASSESSMENT REPORT.

D-13 | 6.0* — pH VALUE IN STANDARD pH UNITS MEASURED IN SHALLOW SOIL AT THE INDICATED LOCATION REPORTED IN ENSECO'S LABORATORY REPORTS.

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE
0' 30' 60' 120' 180'

SHA
Sanborn, Head & Associates
Consulting Engineers & Scientists

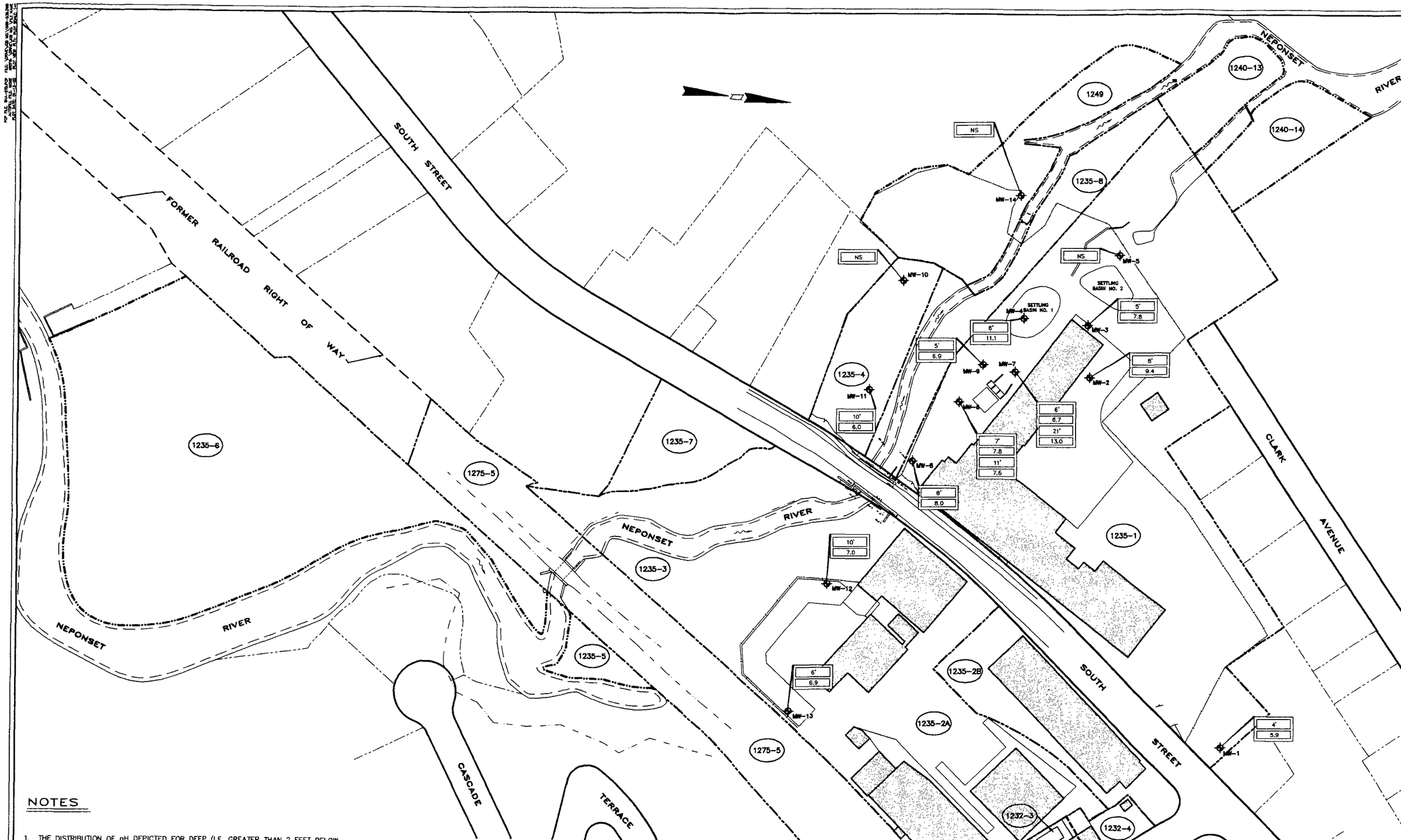
DRAWN BY: NMV/PGP
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF pH IN SHALLOW SOILS

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 21



NOTES

1. THE DISTRIBUTION OF pH DEPICTED FOR DEEP (I.E. GREATER THAN 2 FEET BELOW THE ORIGINAL GROUND SURFACE) ON-FACILITY SOILS IS BASED ON SOIL SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 1 AND MARCH 7, 1989. SAMPLES WERE ANALYZED BY ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS; NO ANALYSIS METHOD WAS PROVIDED IN THE DOCUMENTATION. RESULTS ARE IN STANDARD pH UNITS (SUs).

2. DEEP SOIL SAMPLES WERE COLLECTED FROM 4 TO 21 FEET BELOW THE ORIGINAL GROUND SURFACE. TYPICALLY, SINCE THE TIME OF THE SAMPLE COLLECTION, THE GROUND SURFACE ELEVATION IN THE VICINITY OF THE AOC AND SETTLING BASIN NO. 2 HAS CHANGED AS A RESULT OF ASBESTOS REMOVAL ACTIVITIES.

3. IN SOME CASES, THE RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ROUNDED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO SECTION 5 OF THE TEXT).

4. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

10' / 7.0	pH VALUE MEASURED IN STANDARD pH UNITS FOR SOIL SAMPLE COLLECTED FROM INDICATED DEPTH BELOW THE ORIGINAL GROUND SURFACE LOCATION
NS	NO DEEP SOIL SAMPLE WAS COLLECTED AT THE INDICATED LOCATION

— DRAFT —

NO.	DATE	DESCRIPTION	BY

Sanborn, Head & Associates
Consulting Engineers & Scientists

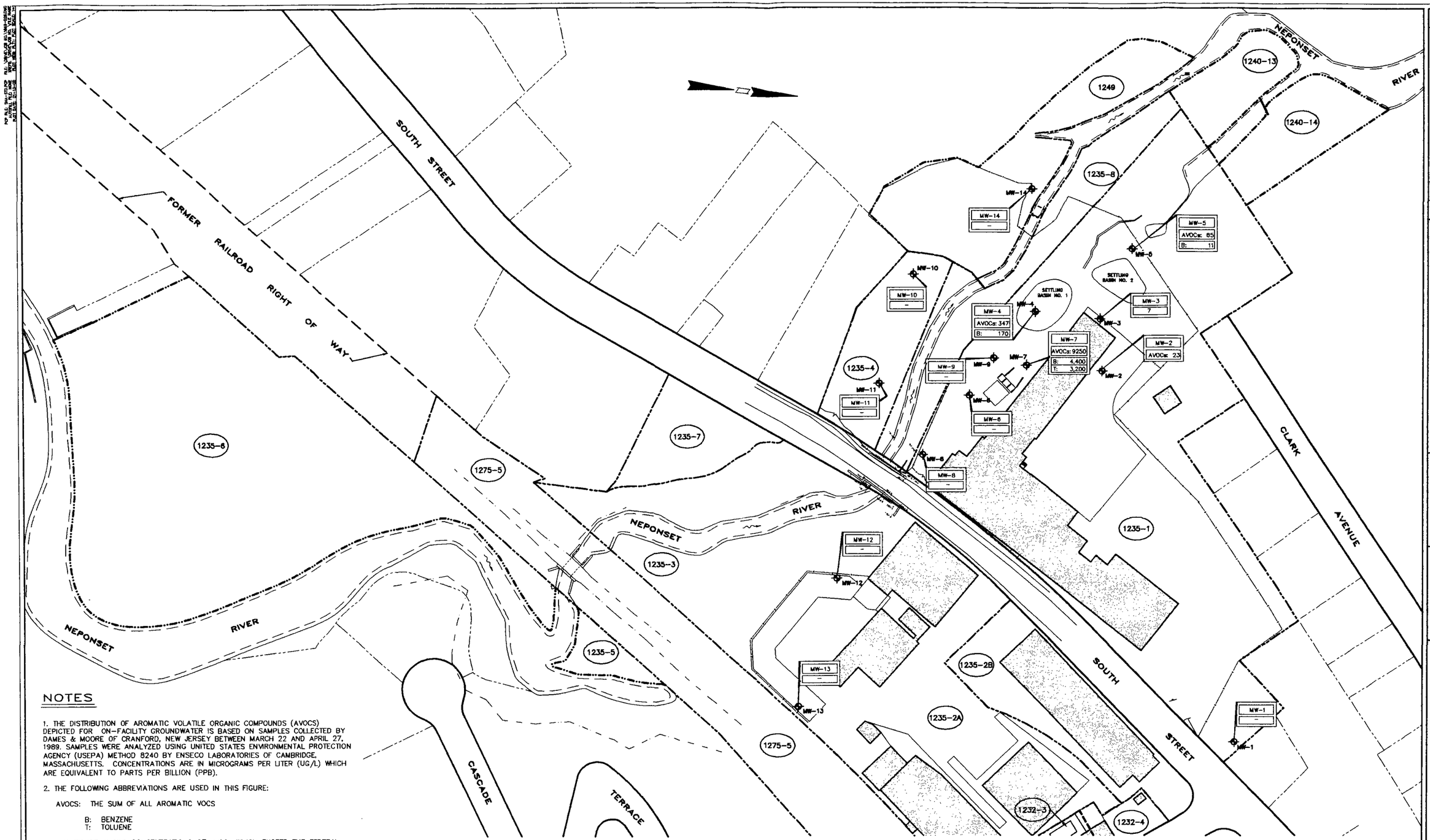
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF pH IN DEEP SOIL SAMPLES

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 22



NOTES

1. THE DISTRIBUTION OF AROMATIC VOLATILE ORGANIC COMPOUNDS (AVOCS) DEPICTED FOR ON-FACILITY GROUNDWATER IS BASED ON SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 22 AND APRIL 27, 1989. SAMPLES WERE ANALYZED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) METHOD 8240 BY ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS. CONCENTRATIONS ARE IN MICROGRAMS PER LITER (UG/L) WHICH ARE EQUIVALENT TO PARTS PER BILLION (PPB).

2. THE FOLLOWING ABBREVIATIONS ARE USED IN THIS FIGURE:

AVOCS: THE SUM OF ALL AROMATIC VOCS

B: BENZENE
T: TOLUENE

3. THIS FIGURE SHOWS CONCENTRATIONS OF AVOCs WHICH EXCEED THE FEDERAL MAXIMUM CONTAMINANT LEVELS (MCLS), AND/OR METHOD 1 GW-1 GROUNDWATER STANDARDS, PROMULGATED PURSUANT TO THE MASSACHUSETTS CONTINGENCY PLAN. THESE STANDARDS ARE USED AS A PRELIMINARY INDICATOR OF THE PRESENCE OF AVOCs OF PRIMARY CONCERN AT ELEVATED CONCENTRATIONS AT THE SITE. OTHER STANDARDS MAY APPLY, AND WILL BE CONSIDERED IN UPCOMING RI ACTIVITIES. OTHER AVOCs MAY BE PRESENT IN GROUNDWATER FROM THE SITE AT CONCENTRATIONS BELOW MCL/GW-1 STANDARDS. THE STANDARDS FOR THE AVOCs ARE SHOWN ON THIS FIGURE ARE:

SVOC	FEDERAL MAXIMUM CONTAMINANT LEVEL (MCL) (ug/l)	MASSACHUSETTS GW-1 GROUNDWATER STANDARD (ug/l)
BENZENE	5	5
TOLUENE	1,000	1,000

4. THE AVOC RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ESTIMATED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO SECTION 5 OF THE TEXT). DATA WHICH HAVE BEEN "REJECTED" BY THE DATA VALIDATION / DATA USABILITY ASSESSMENT ARE NOT DEPICTED.

5. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

MW-7
AVOCs: 9250
B: 4,400
T: 3,200

AVOCs CONCENTRATIONS (TOTAL AVOCs OR INDIVIDUAL CONSTITUENTS) IN UG/L FOR GROUNDWATER SAMPLE. A "–" INDICATES NO AVOCs WERE DETECTED AT CONCENTRATIONS EXCEEDING MCLs OR GW-1 STANDARDS.

– DRAFT –

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

Sanborn, Head & Associates
Consulting Engineers & Scientists

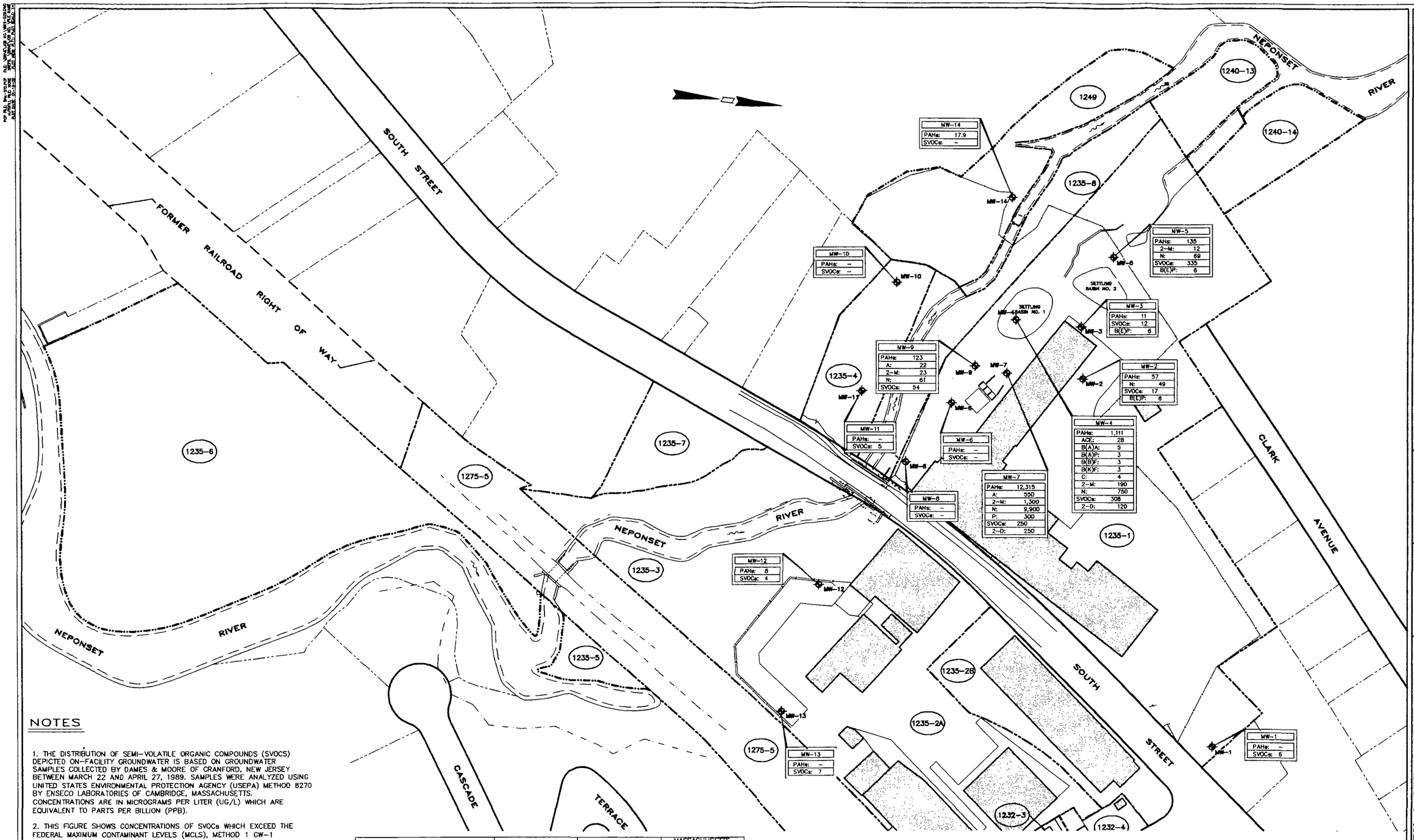
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF AROMATIC VOCS IN GROUNDWATER

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 23



NOTES

1. THE DISTRIBUTION OF SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCS) DEPICTED ON-FACILITY GROUNDWATER IS BASED ON GROUNDWATER SAMPLES COLLECTED BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 22 AND APRIL 27, 1989. SAMPLES WERE ANALYZED USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) METHOD 8270 BY ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS. CONCENTRATIONS ARE IN MICROGRAMS PER LITER (UG/L) WHICH ARE EQUIVALENT TO PARTS PER BILLION (PPB).

2. THIS FIGURE SHOWS CONCENTRATIONS OF SVOCs WHICH EXCEED THE FEDERAL MAXIMUM CONTAMINANT LEVELS (MCLS), METHOD 1 GW-1 GROUNDWATER STANDARDS, AND/OR METHOD 1 GW-3 GROUNDWATER STANDARDS, PROMULGATED PURSUANT TO THE MASSACHUSETTS CONTINGENCY PLAN (WHICHEVER ARE LOWER). THESE STANDARDS ARE USED AS A PRELIMINARY INDICATOR OF THE PRESENCE OF SVOCs OF PRIMARY CONCERN AT ELEVATED CONCENTRATIONS AT THE SITE. OTHER STANDARDS MAY APPLY, AND WILL BE CONSIDERED IN UPCOMING RI ACTIVITIES. OTHER SVOCs ARE PRESENT IN GROUNDWATER FROM THE SITE AT CONCENTRATIONS BELOW MCL/GW-1 OR GW-3 STANDARDS. THE STANDARDS FOR THE SVOCs ARE SHOWN ON THIS FIGURE ARE:

SVOC	ABBREVIATION	FEDERAL MAXIMUM CONTAMINANT LEVEL (MCL) (ug/l)	MASSACHUSETTS GW-1 OR GW-3 GROUNDWATER STANDARDS (ug/l)
ACENAPHTHENE	ACE	–	20
ACENAPHTHYLENE	A	–	300
BENZO (A) ANTHRACENE	B(A)A	–	1
BENZO (A) PYRENE	B(A)P	0.2	0.2
BENZO (B) FLUORANTHENE	B(B)F	–	1
BENZO (K) FLUORANTHENE	B(K)F	–	1
CHRYSENE	C	–	2
2-METHYLNAPHTHALENE	2-M	–	10
NAPHTHALENE	N	–	20
PHENANTHRENE	P	–	50
BIS (2-ETHYLHEXYL) PHTHALATE	B(E)P	6	6
2,4-DIMETHYLPHENOL	2-D	–	100

3. THE FOLLOWING ABBREVIATIONS ARE ALSO USED IN THIS FIGURE:

PAHS: THE SUM OF ALL POLYCYCLIC AROMATIC HYDROCARBONS
SVOCS: THE SUM OF ALL SVOC COMPOUNDS OTHER THAN PAHS

A "–" IN THE TABLE INDICATES THAT NO STANDARD EXISTS FOR THIS COMPOUND.

4. SOME OF THE SVOC RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ESTIMATED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO SECTION 5 OF THE TEXT). DATA WHICH HAVE BEEN "REJECTED" BY THE DATA VALIDATION / DATA USABILITY ASSESSMENT ARE NOT DEPICTED.

5. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

MW-2	
PAHs:	57
N:	49
SVOCs:	17
B(E)P:	6

SVOC CONCENTRATIONS IN UG/L FOR GROUNDWATER SAMPLE FROM MONITORING WELL, MW-2. A "–" INDICATES THAT NO PAHs OR NON-PAH SVOCs WERE DETECTED ABOVE GW-1 STANDARDS.

– DRAFT –

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

SHA Sanborn, Head & Associates
Consulting Engineers & Scientists

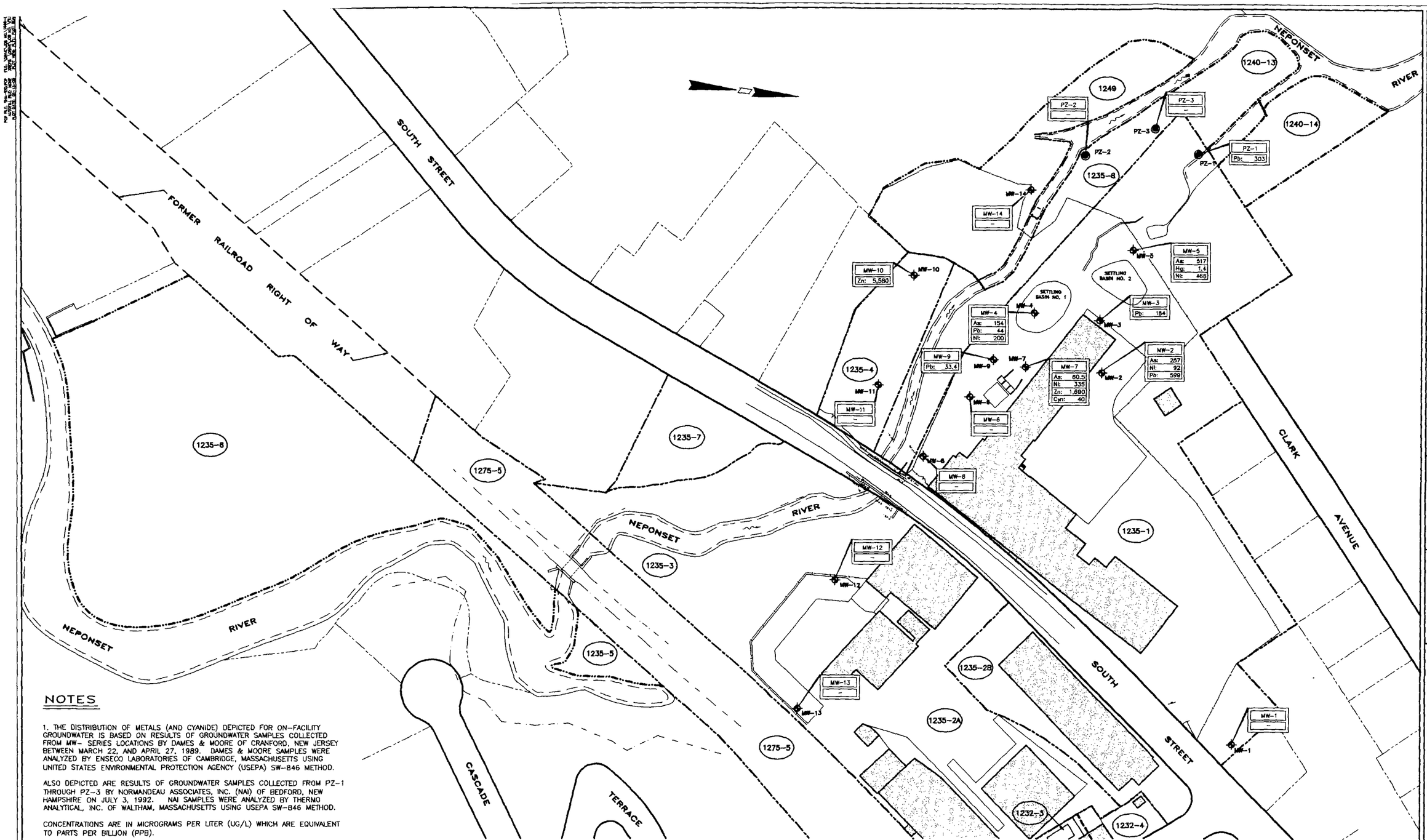
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF SVOCs IN GROUNDWATER

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 24



NOTES

1. THE DISTRIBUTION OF METALS (AND CYANIDE) DEPICTED FOR ON-FACILITY GROUNDWATER IS BASED ON RESULTS OF GROUNDWATER SAMPLES COLLECTED FROM MW- SERIES LOCATIONS BY DAMES & MOORE OF CRANFORD, NEW JERSEY BETWEEN MARCH 22, AND APRIL 27, 1989. DAMES & MOORE SAMPLES WERE ANALYZED BY ENSECO LABORATORIES OF CAMBRIDGE, MASSACHUSETTS USING UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) SW-846 METHOD.

ALSO DEPICTED ARE RESULTS OF GROUNDWATER SAMPLES COLLECTED FROM PZ-1 THROUGH PZ-3 BY NORMANDEAU ASSOCIATES, INC. (NAI) OF BEDFORD, NEW HAMPSHIRE ON JULY 3, 1992. NAI SAMPLES WERE ANALYZED BY THERMO ANALYTICAL, INC. OF WALTHAM, MASSACHUSETTS USING USEPA SW-846 METHOD.

CONCENTRATIONS ARE IN MICROGRAMS PER LITER (UG/L) WHICH ARE EQUIVALENT TO PARTS PER BILLION (PPB).

2. THE FOLLOWING ABBREVIATIONS ARE USED IN THIS FIGURE:

As:	ARSENIC	Hg:	MERCURY
Pb:	LEAD	Cyn:	CYANIDE
Ni:	NICKEL		
Zn:	ZINC		

3. THIS FIGURE SHOWS CONCENTRATIONS OF METALS (AND CYANIDE) WHICH EXCEED THE FEDERAL MAXIMUM CONTAMINANT LEVELS (MCLS) AND/OR METHOD 1 GW-1 OR GW-3 GROUNDWATER STANDARDS PROMULGATED PURSUANT TO THE MASSACHUSETTS CONTINGENCY PLAN (WHICHEVER IS LOWER). THESE STANDARDS ARE USED AS A PRELIMINARY INDICATOR OF THE PRESENCE OF METALS OF PRIMARY CONCERN AT ELEVATED CONCENTRATIONS AT THE SITE. OTHER STANDARDS MAY APPLY, AND WILL BE CONSIDERED IN UPCOMING RI ACTIVITIES. OTHER METALS ARE PRESENT IN GROUNDWATER FROM THIS SITE AT CONCENTRATIONS BELOW MCL/GW-1 STANDARDS. THE S-1/GW-1 GROUNDWATER STANDARDS IN THIS FIGURE ARE:

PARAMETER	MCL (ug/l)	METHOD 1, GW-1 OR GROUNDWATER STANDARDS (ug/l)
ARSENIC	50	50
LEAD	15	15
NICKEL	100	80
ZINC	5,000 (SECONDARY MCL)	900
MERCURY	1	1
CYANIDE	200	10

4. SOME OF THE RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ESTIMATED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO SECTION 5.0 OF THE TEXT). DATA WHICH HAVE BEEN "REJECTED" BY THE DATA VALIDATION / DATA USABILITY ASSESSMENT ARE NOT DEPICTED.

5. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

— DRAFT —

MW-2
As: 257
Ni: 92
Pb: 599

MONITORING WELL LOCATION

METALS/CYANIDE CONCENTRATION IN UG/L. A "-" INDICATES NO METALS WERE DETECTED AT CONCENTRATIONS EXCEEDING MCLs, METHOD 1 GW-1 OR GW-3 GROUNDWATER STANDARDS AT THIS SAMPLING LOCATION

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE
0' 30' 60' 120' 180'

SHA
Sanborn, Head & Associates
Consulting Engineers & Scientists

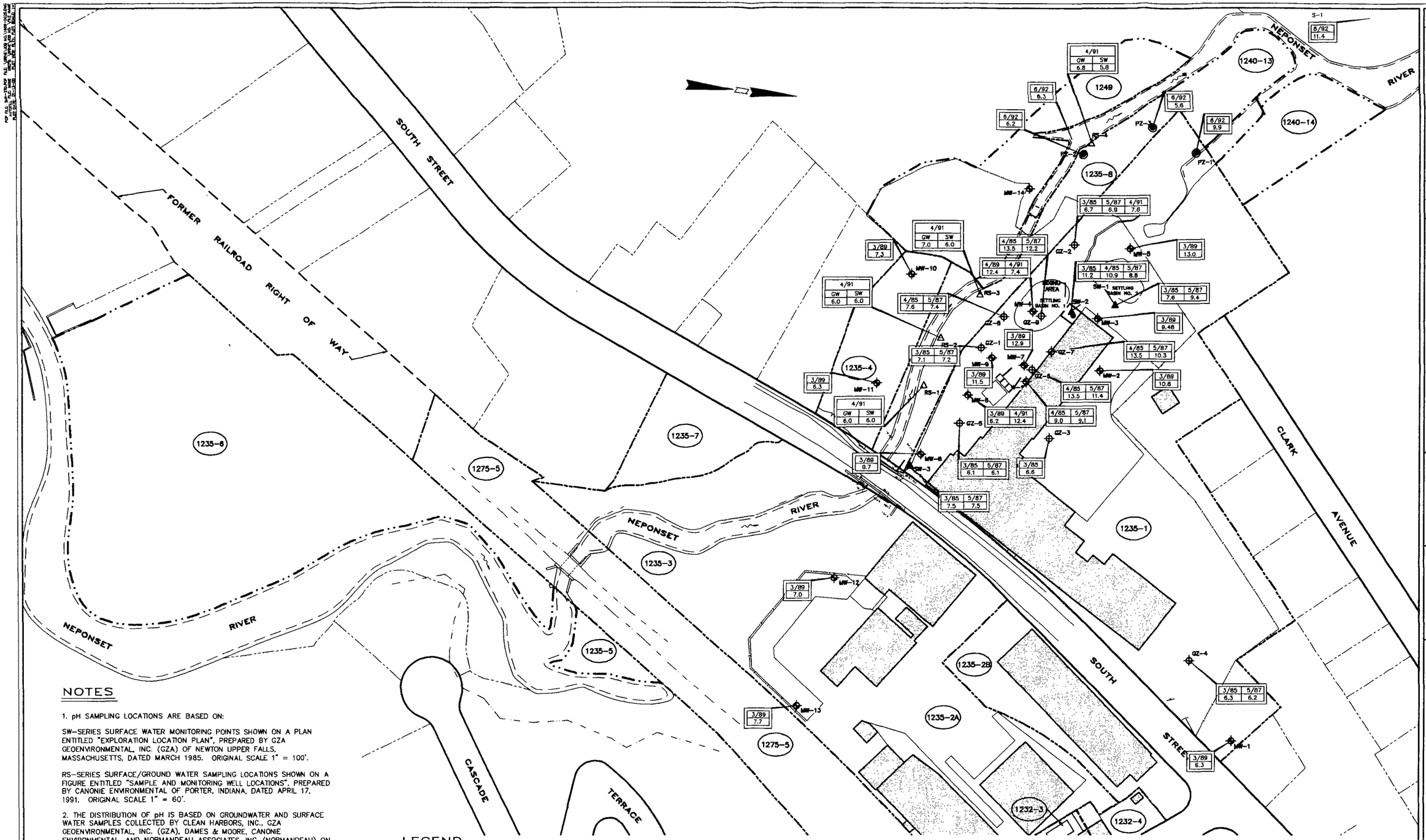
DRAWN BY: NMV
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES
SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF METALS IN GROUNDWATER

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 25



NOTES

1. pH SAMPLING LOCATIONS ARE BASED ON:

SW-SERIES SURFACE WATER MONITORING POINTS SHOWN ON A PLAN ENTITLED "EXPLORATION LOCATION PLAN", PREPARED BY GZA GEOENVIRONMENTAL, INC. (GZA) OF NEWTON UPPER FALLS, MASSACHUSETTS, DATED MARCH 1985. ORIGINAL SCALE 1" = 100'.

RS-SERIES SURFACE/GROUND WATER SAMPLING LOCATIONS SHOWN ON A FIGURE ENTITLED "SAMPLE AND MONITORING WELL LOCATIONS", PREPARED BY CANONIE ENVIRONMENTAL OF PORTER, INDIANA, DATED APRIL 17, 1991. ORIGINAL SCALE 1" = 60'.

2. THE DISTRIBUTION OF pH IS BASED ON GROUNDWATER AND SURFACE WATER SAMPLES COLLECTED BY CLEAN HARBORS, INC., GZA GEOENVIRONMENTAL, INC. (GZA), DAMES & MOORE, CANONIE ENVIRONMENTAL, AND NORMANDEAU ASSOCIATES, INC. (NORMANDEAU) ON THE DATES INDICATED. THE METHOD OF ANALYSIS VARIED. RESULTS ARE IN STANDARD pH UNITS (SUs).

3. IN SOME CASES, THE RESULTS DEPICTED REPRESENT VALUES WHICH HAVE BEEN QUALIFIED AS "ROUNDED" THROUGH THE DATA VALIDATION / DATA USABILITY ASSESSMENT (REFER TO SECTION 5 OF THE TEXT).

4. IN ADDITION TO THE pH MEASUREMENTS DEPICTED IN THIS FIGURE, NORMANDEAU RECORDED pH MEASUREMENTS OF 9.3 AND 10.0 "IN THE TAILRACE" AND 7.6 IN "THE NEPONSET RIVER" IN 1996; IN ADDITION NORMANDEAU RECORDED A pH MEASUREMENT OF 9.5 "IN THE TAILRACE" AND 7.6 "IN THE NEPONSET RIVER IN 1997." EXACT SAMPLING LOCATIONS WERE NOT PROVIDED BY NORMANDEAU (NORMANDEAU, 1996; 1997).

5. REFER TO PREVIOUS FIGURES FOR ADDITIONAL NOTES AND LEGEND.

LEGEND

▲ SW-3 — SURFACE WATER SAMPLING POINTS ESTABLISHED BY GZA.

△ RS-1 — SURFACE WATER/GROUNDWATER MONITORING POINTS ESTABLISHED BY CANONIE.

4/91	
GW	SW
6.8	5.8

pH VALUE, IN STANDARD UNITS, MEASURED IN GROUNDWATER OR SURFACE WATER ON THE DATE INDICATED WHERE BOTH GROUNDWATER AND SURFACE WATER SAMPLES WERE COLLECTED. THE NOTATION "GW" WAS USED TO INDICATE THE SAMPLE WAS FROM GROUNDWATER; "SW" WAS USED TO INDICATE THE SAMPLE WAS FROM SURFACE WATER.

— DRAFT —

NO.	DATE	DESCRIPTION	BY

GRAPHICAL SCALE 0' 30' 60' 120' 180'

Sanborn, Head & Associates
Consulting Engineers & Scientists

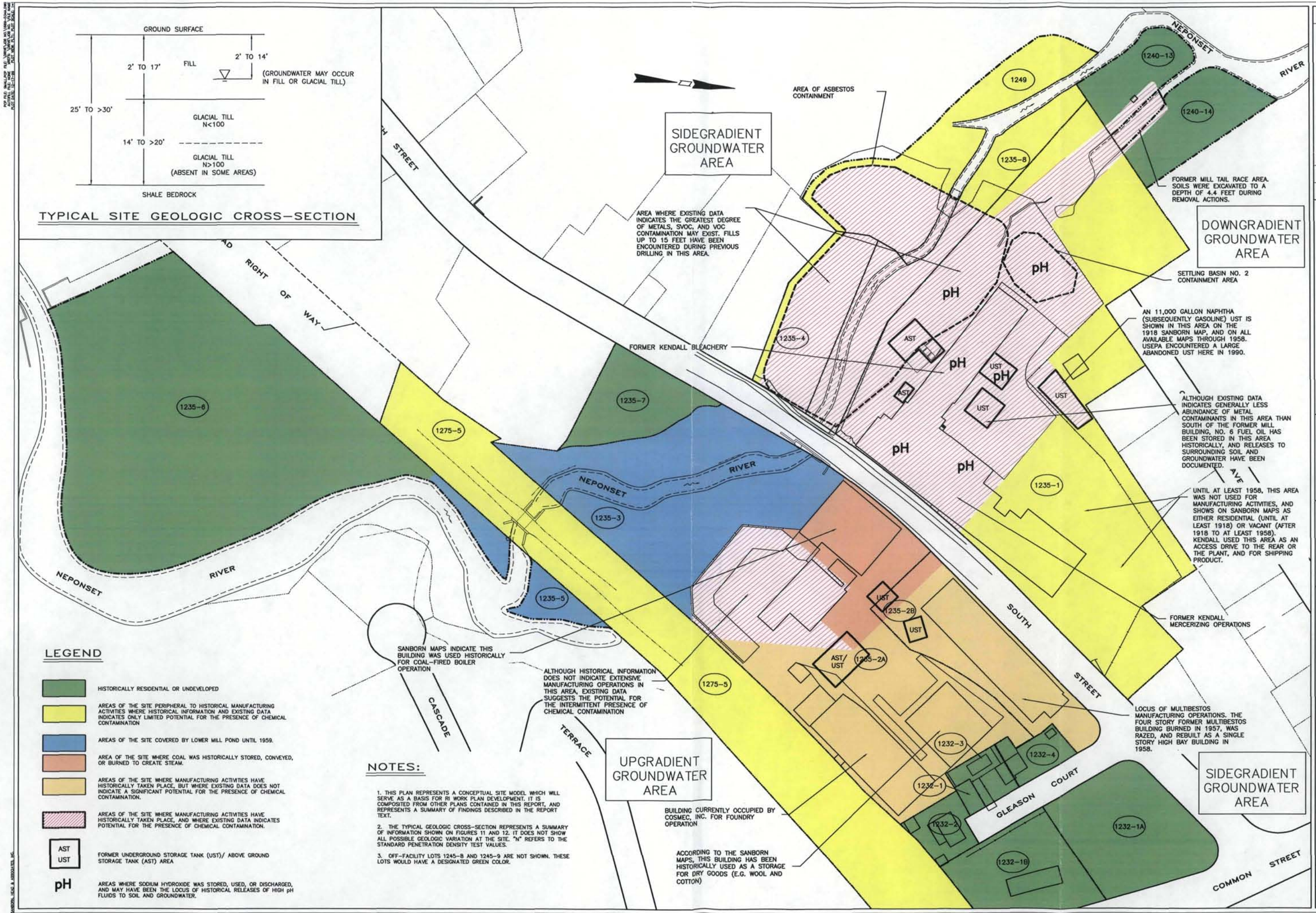
DRAWN BY: NMV/PGP
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: JAN 00

BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS

DISTRIBUTION OF pH IN GROUNDWATER AND SURFACE WATER

PROJECT NUMBER: 1669.2

FIGURE NUMBER: 26


GROUND SURFACE
2' TO 17'
FILL
2' TO 14'
(GROUNDWATER MAY OCCUR IN FILL OR GLACIAL TILL)
25' TO >30'
GLACIAL TILL N<100
14' TO >20'
GLACIAL TILL N>100 (ABSENT IN SOME AREAS)
SHALE BEDROCK
TYPICAL SITE GEOLOGIC CROSS-SECTION
SIDEGRADIENT GROUNDWATER AREA
AREA OF ASBESTOS CONTAINMENT
AREA WHERE EXISTING DATA INDICATES THE GREATEST DEGREE OF METALS, SVOC, AND VOC CONTAMINATION MAY EXIST. FILLS UP TO 15 FEET HAVE BEEN ENCOUNTERED DURING PREVIOUS DRILLING IN THIS AREA.
FORMER MILL TAIL RACE AREA. SOILS WERE EXCAVATED TO A DEPTH OF 4.4 FEET DURING REMOVAL ACTIONS.
DOWNGRADIENT GROUNDWATER AREA
SETTLING BASIN NO. 2 CONTAINMENT AREA
AN 11,000 GALLON NAPHTHA (SUBSEQUENTLY GASOLINE) UST IS SHOWN IN THIS AREA ON THE 1918 SANBORN MAP, AND ON ALL AVAILABLE MAPS THROUGH 1958. USEPA ENCOUNTERED A LARGE ABANDONED UST HERE IN 1990.
FORMER KENDALL BLEACHERY
ALTHOUGH EXISTING DATA INDICATES GENERALLY LESS ABUNDANCE OF METAL CONTAMINANTS IN THIS AREA THAN SOUTH OF THE FORMER MILL BUILDING, NO. 6 FUEL OIL HAS BEEN STORED IN THIS AREA HISTORICALLY, AND RELEASES TO SURROUNDING SOIL AND GROUNDWATER HAVE BEEN DOCUMENTED.
UNTIL AT LEAST 1958, THIS AREA WAS NOT USED FOR MANUFACTURING ACTIVITIES, AND SHOWS ON SANBORN MAPS AS EITHER RESIDENTIAL (UNTIL AT LEAST 1918) OR VACANT (AFTER 1918 TO AT LEAST 1958). KENDALL USED THIS AREA AS AN ACCESS DRIVE TO THE REAR OR THE PLANT, AND FOR SHIPPING PRODUCT.
FORMER KENDALL MERCERIZING OPERATIONS
SANBORN MAPS INDICATE THIS BUILDING WAS USED HISTORICALLY FOR COAL-FIRED BOILER OPERATION
ALTHOUGH HISTORICAL INFORMATION DOES NOT INDICATE EXTENSIVE MANUFACTURING OPERATIONS IN THIS AREA, EXISTING DATA SUGGESTS THE POTENTIAL FOR THE INTERMITTENT PRESENCE OF CHEMICAL CONTAMINATION
LOCUS OF MULTIBESTOS MANUFACTURING OPERATIONS. THE FOUR STORY FORMER MULTIBESTOS BUILDING BURNED IN 1957, WAS RAZED, AND REBUILT AS A SINGLE STORY HIGH BAY BUILDING IN 1958.
UPGRADIENT GROUNDWATER AREA
SIDEGRADIENT GROUNDWATER AREA
BUILDING CURRENTLY OCCUPIED BY COSMEC, INC. FOR FOUNDRY OPERATION
ACCORDING TO THE SANBORN MAPS, THIS BUILDING HAS BEEN HISTORICALLY USED AS A STORAGE FOR DRY GOODS (E.G. WOOL AND COTTON)
NEPONSET RIVER
SOUTH STREET
RIGHT OF WAY
CASCADE TERRACE
GLEASON COURT
COMMON STREET
1249
1240-13
1240-14
1235-8
1235-4
1235-6
1235-7
1275-5
1235-3
1235-5
1235-1
1235-2B
1235-2A
1232-3
1232-4
1232-1
1232-2
1232-1A
1232-1B
pH
AST
UST
AST/ UST
LEGEND
HISTORICALLY RESIDENTIAL OR UNDEVELOPED
AREAS OF THE SITE PERIPHERAL TO HISTORICAL MANUFACTURING ACTIVITIES WHERE HISTORICAL INFORMATION AND EXISTING DATA INDICATES ONLY LIMITED POTENTIAL FOR THE PRESENCE OF CHEMICAL CONTAMINATION
AREAS OF THE SITE COVERED BY LOWER MILL POND UNTIL 1959.
AREA OF THE SITE WHERE COAL WAS HISTORICALLY STORED, CONVEYED, OR BURNED TO CREATE STEAM.
AREAS OF THE SITE WHERE MANUFACTURING ACTIVITIES HAVE HISTORICALLY TAKEN PLACE, BUT WHERE EXISTING DATA DOES NOT INDICATE A SIGNIFICANT POTENTIAL FOR THE PRESENCE OF CHEMICAL CONTAMINATION.
AREAS OF THE SITE WHERE MANUFACTURING ACTIVITIES HAVE HISTORICALLY TAKEN PLACE, AND WHERE EXISTING DATA INDICATES POTENTIAL FOR THE PRESENCE OF CHEMICAL CONTAMINATION.
AST UST
FORMER UNDERGROUND STORAGE TANK (UST)/ ABOVE GROUND STORAGE TANK (AST) AREA
pH
AREAS WHERE SODIUM HYDROXIDE WAS STORED, USED, OR DISCHARGED, AND MAY HAVE BEEN THE LOCUS OF HISTORICAL RELEASES OF HIGH pH FLUIDS TO SOIL AND GROUNDWATER.
NOTES:
1. THIS PLAN REPRESENTS A CONCEPTUAL SITE MODEL WHICH WILL SERVE AS A BASIS FOR RI WORK PLAN DEVELOPMENT. IT IS COMPOSITED FROM OTHER PLANS CONTAINED IN THIS REPORT, AND REPRESENTS A SUMMARY OF FINDINGS DESCRIBED IN THE REPORT TEXT.
2. THE TYPICAL GEOLOGIC CROSS-SECTION REPRESENTS A SUMMARY OF INFORMATION SHOWN ON FIGURES 11 AND 12. IT DOES NOT SHOW ALL POSSIBLE GEOLOGIC VARIATION AT THE SITE. "N" REFERS TO THE STANDARD PENETRATION DENSITY TEST VALUES.
3. OFF-FACILITY LOTS 1245-8 AND 1245-9 ARE NOT SHOWN. THESE LOTS WOULD HAVE A DESIGNATED GREEN COLOR.
GRAPHICAL SCALE
0' 30' 60' 120' 180'
Sanborn, Head & Associates
Consulting Engineers & Scientists
NO. DATE DESCRIPTION BY
DRAWN BY: PGP
DESIGNED BY: NAD
CHECKED BY: CLH
REVIEWED BY: CAC
PROJECT MGR: CLH
PIC: PMS
DATE: DEC 99
BLACKBURN & UNION PRIVILEGES SUPERFUND SITE
WALPOLE, MASSACHUSETTS
CONCEPTUAL SITE MODEL PLAN
PROJECT NUMBER: 1669
FIGURE NUMBER: 27

APPENDIX A

LIMITATIONS

APPENDIX A
LIMITATIONS

1. In preparing this report, SHA has relied on certain information provided by state and local officials and other parties referenced herein, and on information contained in the files of state and/or local agencies available to us at the time of the existing data review. Although there may have been some degree of overlap in the information provided by these various sources, we did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this existing data review.

2. Our conclusions regarding the site are based on observations of existing site conditions, our interpretation of available site history and site usage information. The findings are relevant to the dates of our site visit and should not be relied upon to represent conditions at other dates. The results of this evaluation are qualified by the fact that no borings, soil or groundwater sampling or chemical testing was performed by SHA, but instead, SHA has relied upon data collected by others.

3. This report was prepared for specific application to the Blackburn and Union Privileges Superfund Site, in accordance with requirements of the Administrative Order by Consent for a Remedial Investigation / Feasibility Study entered to by and between the United States Environmental Protection Agency (USEPA) and the Kendall Company and W.R. Grace & Co-Conn. This report was prepared exclusively for Kendall and Grace by SHA, in accordance with standard practices and no other warranty, expressed or implied, is made.

APPENDIX B

HISTORICAL INFORMATION

APPENDIX B.1

Sanborn Fire Insurance Maps

SANBORN MAP LEGEND

CODING OF FIRE–RESISTIVE STRUCTURAL UNITS FOR FIREPROOF AND NON–COMBUSTIBLE BUILDINGS

FRAMING

CODE	STRUCTURAL UNIT
A.	Reinforced Concrete Frame.
B.	Reinforced Concrete Joists, Columns, Beams, Trusses, Arches, Masonry Piers.
C.	Protected Steel Frame.
D.	Individually Protected Steel Joists, Columns, Beams, Trusses, Arches.
E.	Indirectly Protected Steel Frame.
F.	Indirectly Protected Steel Joists, Columns, Beams, Trusses, Arches.
G.	Unprotected Steel Frame.
H.	Unprotected Steel Joists, Columns, Beams, Trusses,Arches.
I.	Masonry Bearing Walls only.

FLOORS

CODE	STRUCTURAL UNIT
1.	Reinforced Concrete. Reinforced Concrete with Masonry Units Pre–cast Concrete or Gypsum Slabs or Planks.
2.	Concrete or Metal Lath, Incombustible Form Boards, Paper–backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
3.	Open Steel Deck or Grating.

ROOF

CODE	STRUCTURAL UNIT
a.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Reinforced Gypsum Concrete.Pre–cast Concrete or Gypsum Slabs or Planks.
b.	Concrete or Gypsum on Metal Lath, Incombustible Form Boards, Paper-backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
c. or	Incombustible Composition Boards with without Insulation. Masonry or Metal Tiles.
d.	Steel Deck, Corrugated Metal or Asbestos Protected Metal with or without Insulation.

The coding to the left, for framing, floor and roof structural units is used in describing the construction of fie–resistive buildings. In addition, reports for fire–resistive buildings will show the date built, wall construction other than brick, and ceilings.

FP – 1962 (CONC.) A-1-a — A fireproof building built in 1962 with concrete walls and reinforced concrete frame, floors and roof.

FPX - 1962 (METAL PANELS) B-2-a (NONCOMB. CEILINGS) — A fireproof building built in 1962 with metal panel walls, reinforced concrete columns and beams, concrete walls on metal lath and gypsum slab roof; noncombustible ceilings.

NC - 1962 (C.B.) H-2-d — A non combustible building built in 1962 with concrete block walls; unprotected steel columns, beams and joists; concrete floors on metal lath and steel deck roof

MASONRY CONSTRUCTION

Important interior and all exterior masonry walls of all non–residential buildings and residential buildings of five or more dwelling units are shown with weighted (—) lines.

Masonry walls of residential buildings of four dwelling units or less are shown in a standard line and the construction is noted on all buildings diagramed after July, 1963.

WALLS

- 8" Brick
- (CONC.) 12" Concrete
- (STONE) 18" & 20" Stone
- (TILE) 12" & 8" Hollow Tile Wall Thicknesses Placed Relative to Respective Floors
- (C.BR) Cinder, Concrete or Cement Brick
- (C.B) PILASTD Hollow Cinder or Concrete Blocks, Pilastered
- (CBBR F) Mixed Construction of Concrete Blocks, Brick Faced
- (CB & BR) Mixed Construction of Concrete Blocks and Brick
- (METAL F) Masonry Walls, Metal Faced
- (ADOBE) Adobe
- C.B Hollow Cinder or Concrete Block Interior Wall Basement to Roof
- TILE Tile Interior Wall Basement to Roof
- C.BR Cement Brick End Wall

PARTITIONS

- Frame
- TILE TO CEILING Tile from Foundation to Top Ceiling only
- CONC. 1ST Concrete First Floor only
- C.B. 1ST Hollow Cinder or Concrete Block 1st Floor only
- BR. 2ND Brick 2nd Floor only
- TILE 1&3 Tile 1st & 3rd Floor only

OPENINGS

(Interior)

- Wall with No Openings
- Wall with Double Standard Fire Doors 1st Floor
- Wall with Standard Fire Door Basement
- Wall with Substandard Fire Doors 1st & 3rd Floors
- Wall with Metal & Wired Glass Fire Doors all Floors
- Wall with Substandard Fire Doors 1st, 2nd & 3rd Floors & Unprotected Opening 4th Floor
- Wall with Small Unprotected Openings only
- Wall with Unprotected Openings all Floors

(Exterior)

- 1st Floor
- 1st & 2nd Floors
- 3rd Floor
- 1st & 4th Fl. with Metal Shutter 1st.
- 10th& 22nd only
- 10th & 22nd Fl.
- Glass Block
- Wired Glass in Metal Sash 2nd & 3rd Fl.

NON–MASONRY CONSTRUCTION

Non–masonry walls are shown with fine(——) lines.
(Walls construction other than wood and stucco on wood frame is noted)

- Wood & Stucco & Cement Plaster, Etc. on Wood Frame
- (VEN'D) Brick Veneered on Wood Frame (Other Types of Veneered on Wood Frame Specifically Noted)
- Mixed Masonry & Non–Masonry(Type of Masonry Specifically Noted)
- (BR FILLED) Wood, Brick Lined, Br.. Filled & Brick Nogged
- WOOD & GLASS Wood & Sash Glass
- IR & GLASS Metal & Sash Glass
- (IR. CL) Metal Clad on Wood Frame
- (IRON) Iron Building
- (IR) WOOD RF. Iron Building with Wood Roof. (Location of Extensive Wood Areas Specifically noted)
- (ASB CL) Asbestos Clad on Wood Frame, Noted in Non-Residential Structures only.
- (CB 9' GLASS ABV) Mixed Wall--(9' of CB with Metal Sash Above
- (METAL PANELS) Metal Panels
- (C.B.5') Apron Walls with wood Sash and Glass
- (M.L.& P. STEEL FR.) Stucco, Cement Plaster, Etc. on Steel Frame
- (GUNITE STEEL FR.) Gunite on Steel Frame
- (A.R.M) STEEL FR. Asphalt and/or Asbestos Protected Metal on Steel Frame
- (A.R.M) WOOD FR. Asphalt and/or Asbestos Protected Metal on Wood Frame
- (GLASS PANELS) Glass Panels

GLOSSARY

A-B Lines An arbitrary boundary between adjoining sheets.
A Private garage
ABV Above
A.F. A. Equipped with fire detecting devices which automatically signal a central fire department.
AIR COND Air cooling system employing ducts through floors
APRON WALL A masonry wall extending 5' or less above foundation
ASSOC RISK Risk not underwritten by stock Fire Ins. Companies.
BASEMENT A story having its floor below ground and it's ceiling at least 4' above ground. Cook County Ill.: A floor of a building next below the first floor. Shown by the symbol B following story height. Sub–basements or sub–cellars, (stories below the first basement), are shown by the symbol SB following basement symbol.
CHIMNEYS (Applicable to maps in Rocky Mountain & Pacific Coast States.)
- B.C. Brick, stone, concrete brick & concrete chimneys.
- C. BL. C. Concrete block chimney
- C.C. Non standard concrete chimney
- T.C. Tile Chimney
- P.C. Patent chimney
- IR. CH. Iron chimneys
- S.P. Stove pipe
- S.P.V. Stove pipe with patent ventilator.

RESIDENTIAL OCCUPANCY SYMBOLS
- D Single family unit or as qualified by a numeral.
- F. APTS A multi–family residential building corresponding with local Rating Bureau definition in family units per floor, story height, & separation of entrance.
- ROOM G A residential Building normally occupied by a single family but with 10 or more rooms rented for lodging purposes.
  EXCEPTIONS: 6 rooms in Arizona, California, Nevada, Utah & Montana; 5 rooms in Oregon & Washington; 4 rooms in Idaho & Hawaii.

FIRE RESISTIVE CONSTRUCTION SYMBOLS
- F.P. Approved masonry walls, floors & roof, interior supports of approved masonry, concrete and/or protected steel
- F.P.X. F.P. qualifications except inferior or sub-standard walls.
- N.C. Fire resistive with unprotected structural steel units

HOLLOW WALL A bonded masonry wall having a continuous air space within.
I.E.P. Independent Electric Plant.
IMPASSABLE Not traversable due to condition of terrain
LEDGED WALL A masonry bearing wall with extended edges to support floors.
LOFT Tenanted by industrial occupancies.
M.L. & P. Concrete or plaster applied to metal lath on wood studdings.
M.S. & G. Metal sash & glass.
NOT OPEN Streets appearing on records but not open on ground.
O.L. Windows overlooking the roof above the corresponding floor of an adjoining building
O.U. Open between ground and first floor.
PILAST'D. Masonry reinforcing columns in walls.
SKYTS. Skylights.
SL. CL. Slate attached to wood siding.
SM. HO. Smoke House.
STABLE Shown by crossing or diagonal lines on diagram.
SUSP'D Suspended Ceilings below floor and/or roof beams.
SYST. System.
TRANSF. Transformer.
WD. Wood.

LAND USE APPLICABLE TO CHANGES DIAGRAMMED AFTER 5/69

R	RESIDENTIAL	M	MANUFACTURING
RT	RESIDENTIAL-TRANSIENT	P	PUBLIC OR INSTITUTIONAL
C	COMMERCIAL	U	UTILITY
W	WAREHOUSE	T	TRANSPORTATION

NUMERICAL PREFIX INDICATES THE NUMBER OF ESTABLISHMENTS IN EACH CATEGORY

FIRE PROTECTION

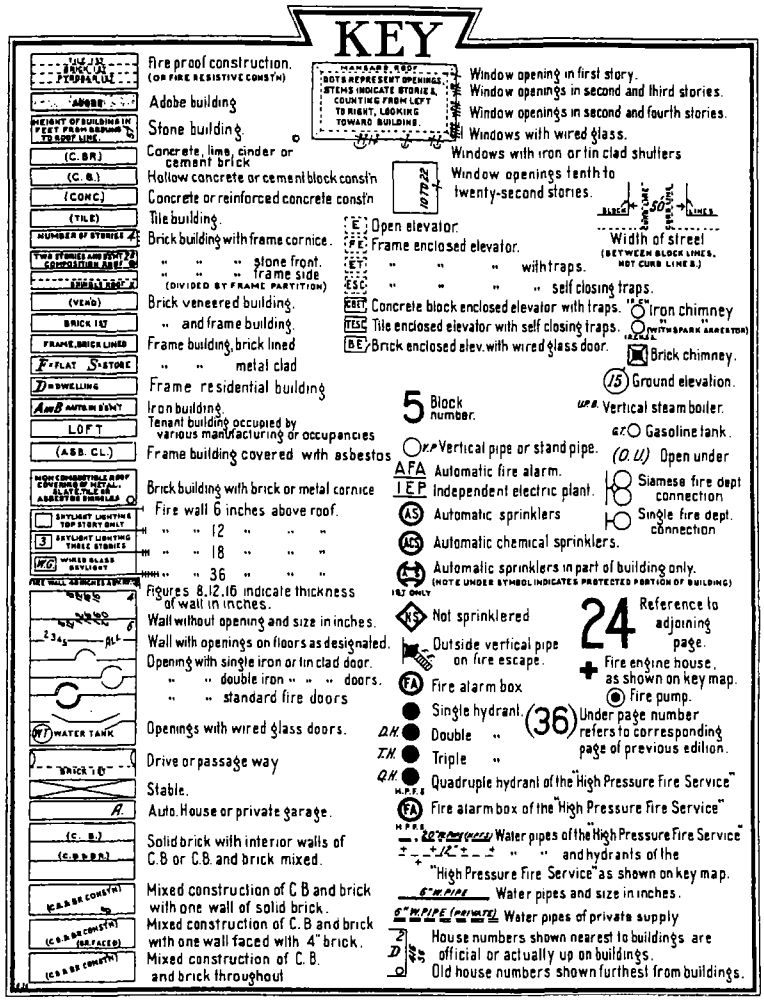
- Fire Department Connection
- (AS) THRU-OUT Automatic Sprinklers throughout contiguous sections of single risk
- (AS) Automatic Sprinklers all floors of building
- (AS) 1ST ONLY Automatic Sprinklers in part of building only (Note under Symbol indicates protected portion of building)
- (NS) Not Sprinklered
- (ACS) Automatic Chemical Sprinklers
- (ACS) Chemical Sprinklers in part of building only (Note under Symbol indicated protected portion of building)
- VP HYD. Vertical Pipe or Stand Pipe
- AFA Automatic Fire Alarm
- (WT) Water Tank
- FE Outside Vertical Pipe on fire Escape
- (FA) Fire Alarm Box Noted "HPFS" on High Pressure Fire Service
- Single Hydrant
- D.H. Double Hydrant
- T.H. Triple Hydrant
- Q.H. H.P.F.S Quadruple Hydrant of the High Pressure Service
- 20"W.P. (H.P.F.S.) Water Pipes of the High Pressure Service
- +12"+ Water Pipes of the High Pressure Service as shown on Key Map
- 6"W.P. / 4"W.P. Public Water Service
- 6"W.P. (PRIV.) Private Water Service

VERTICAL OPENINGS

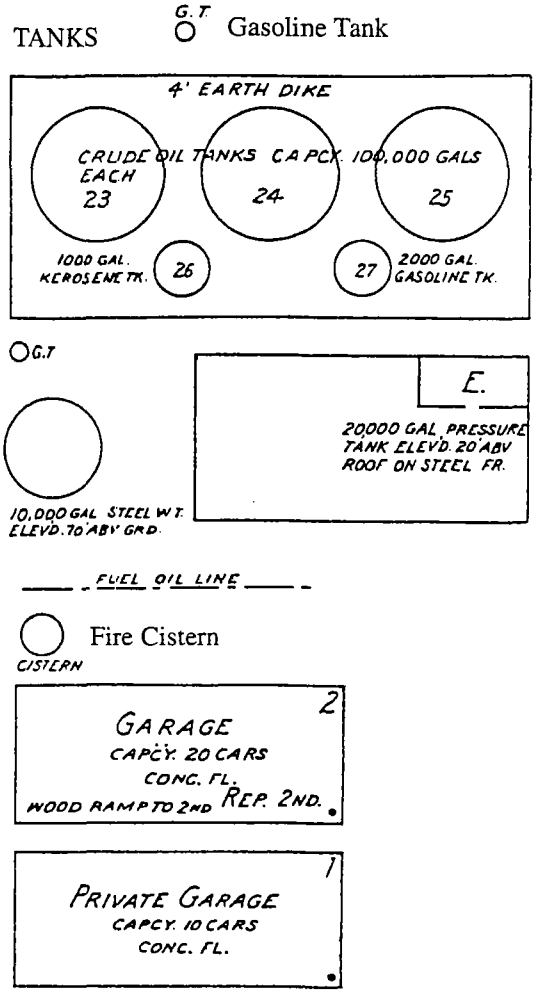
- Skylight lighting top story only
- (3) Skylight lighting 3 stories
- (WG) Skylight with Wired Glass in Metal Sash
- E Open Elevator
- FE Frame Enclosed Elevator
- ET Frame Enclosed Elevator with Traps
- ESC Frame Enclosed Elevator with Self Closing Traps
- CBET Concrete Block Enclosed Elevator with Traps
- TESC Tile Enclosed Elevator with self closing Traps
- BE Brick Enclosed Elevator with wired Glass Door
- H Open Hoist
- HT Hoist with Traps
- H B.TO1 Open Hoist Basement to 1st
- Stairs

MISCELLANEOUS

- MANSARD ROOF Number of stories, Height in Feet Composition Roof Covering
- Parapet 6" above Roof Frame Cornice Parapet 12" above Roof
- W HO. Parapet 24" above Roof Occupied by Warehouse Metal, Slate, Tile or Asbestos Shingle Roof Covering Parapet 48" above Roof
- S 2B 2-D. A in B. AB 1ST — 2 Stories & Basement 1st Floor Occupied by Store 2 Residential Units above 1st Auto in Basement Drive or Passageway Wood Shingle Roof.
- IR CH. Iron Chimney
- IR.CH. S A Iron Chimney (with spark arrestor)
- UP B. Vertical Steam Boiler
- Horizontal Steam Boiler
- CURB LINE 50 Width of Street between Block Lines, not Curb Lines
- (15) Ground Elevation
- 56 416 2 D. House numbers nearest to Buildings are Official or Actually up on Buildings. Old house numbers are farthest from Buildings
- 24 Reference Adjoining Page
- + Fire Department as shown on Key Map
- Vac. or V – Vacant
- Vac. & Op. or V.–O. – Vacant & Open
- Brick Chimney
- G.T. Gasoline Tank
- Fire Pump
- 5 Block Number



TANKS



CODING OF STRUCTURAL UNITS FOR FIREPROOF AND NON–COMBUSTIBLE BUILDINGS

FRAMING

CODE	STRUCTURAL UNIT
A.	Reinforced Concrete Frame.
B.	Reinforced Concrete Joists, Columns, Beams, Trusses, Arches, Masonry Piers.
C.	Protected Steel Frame.
D.	Individually Protected Steel Joists, Columns, Beams, Trusses, Arches.
E.	Indirectly Protected Steel Frame.
F.	Indirectly Protected Steel Joists, Columns, Beams, Trusses, Arches.
G.	Unprotected Steel Frame.
H.	Unprotected Steel Joists, Columns, Beams, Trusses, Arches.
O.	Masonry Bearing Walls.

FLOORS

CODE	STRUCTURAL UNIT
1.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Pre–cast Concrete or Gypsum Slabs or Planks.
2.	Concrete or Metal Lath, Incombustible Form Boards, Paper–backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
3.	Open Steel Deck or Grating.

LAND USE APPLICABLE TO CHANGES DIAGRAMMED AFTER 5/69

R	RESIDENTIAL	M	MANUFACTURING
RT	RESIDENTIAL-TRANSIENT	P	PUBLIC OR INSTITUTIONAL
C	COMMERCIAL	U	UTILITY
W	WAREHOUSE	T	TRANSPORTATION

NUMERICAL PREFIX INDICATES THE NUMBER OF ESTABLISHMENTS IN EACH CATEGORY

ROOF

CODE	STRUCTURAL UNIT
a.	Reinforced Concrete. Reinforced Concrete with Masonry Units. Reinforced Gypsum Concrete. Pre–cast Concrete or Gypsum Slabs or Planks.
b.	Concrete or Gypsum on Metal Lath, Incombustible Form Boards, Paper–backed Wire Fabric, Steel Deck, and Cellular, Ribbed or Corrugated Steel Units.
c.	Incombustible Composition Boards with or without Insulation. Masonry or Metal Tiles.
d.	Steel Deck, Corrugated Metal or Asbestos Protected Metal with or without Insulation.

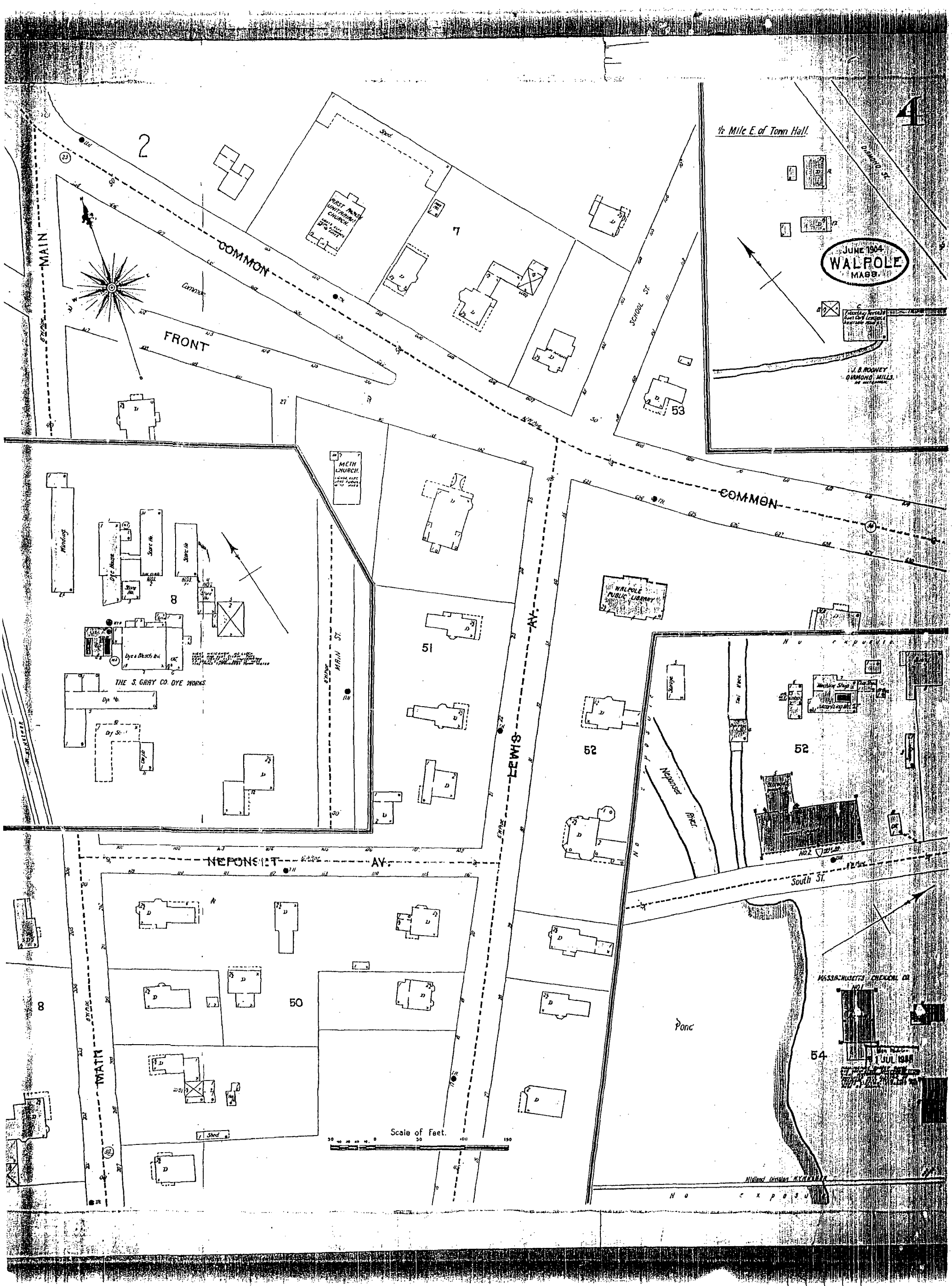
The coding for framing, floor and roof structural units as shown above is used in describing the construction of fire–resistive buildings. In addition, reports for fire resistive buildings will show the date built and wall construction other than brick.

F P Buildings have masonry floors and roof; concrete and/or directly or indirectly protected steel framing; and clay brick. stone or poured concrete walls.

F P X buildings are F P buildings with inferior walls such as concrete block, cement brick, metal or glass panels, etc.

N C buildings have unprotected steel framing and fire–resistive but non–masonry floors and roof.

FP–1962 (CONC.) A-1-a	A fire–resistive building built in 1962 with concrete walls and reinforced concrete frame, floors, and roof.
FPX–1962 (METAL PANELS) E-2-b NONCOMB. CEIL.	A fire–resistive building built in 1962 with metal panel walls, indirectly protected steel frame, concrete floors and roof on metal lath, noncombustible ceilings.
NC–1962 (C.B.) H-2-d	A noncombustible building built in 1962 with concrete block walls; unprotected steel columns and beams; concrete floors on metal lath and steel deck roof.



Environmental Risk Information & Imaging Services

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ERIS

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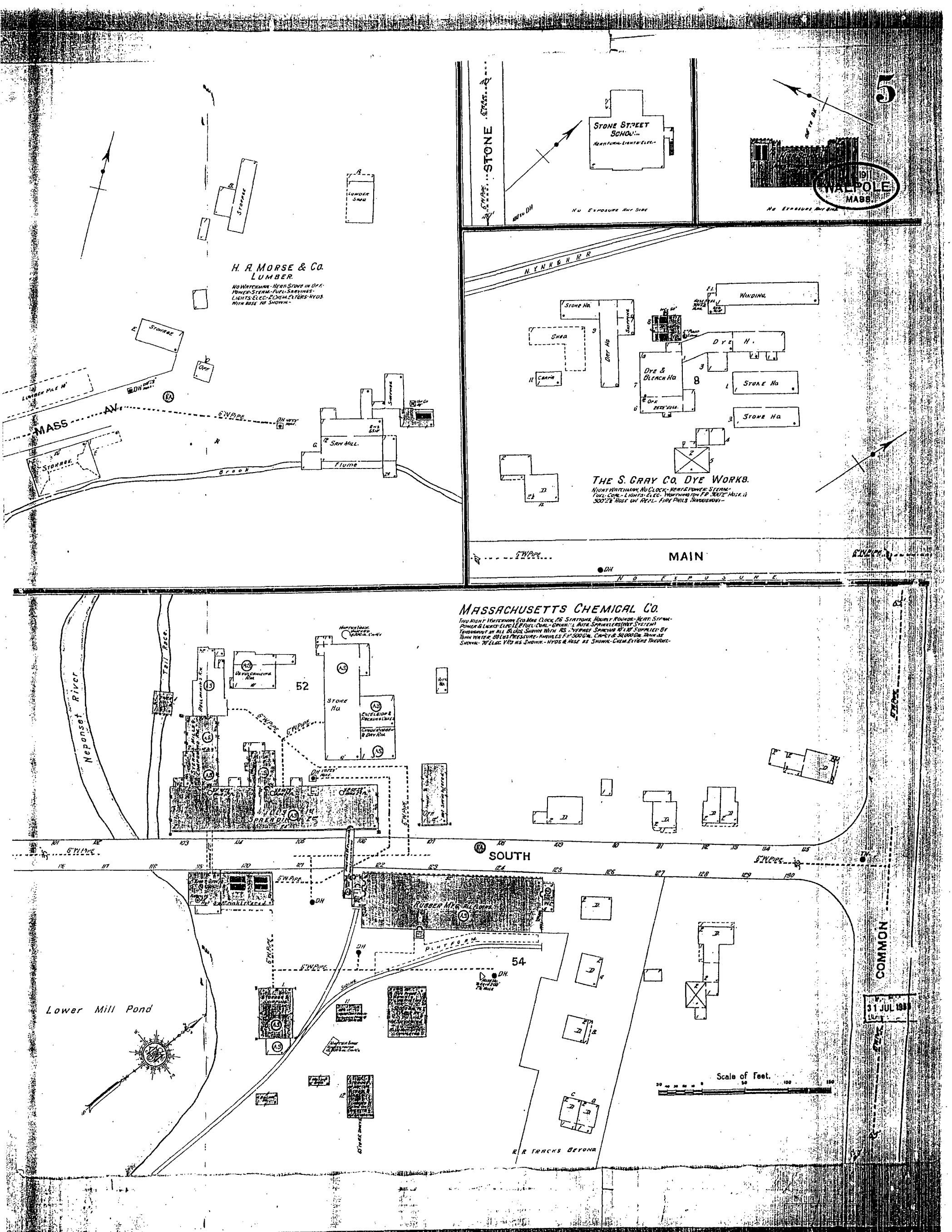
SANBORN

1904



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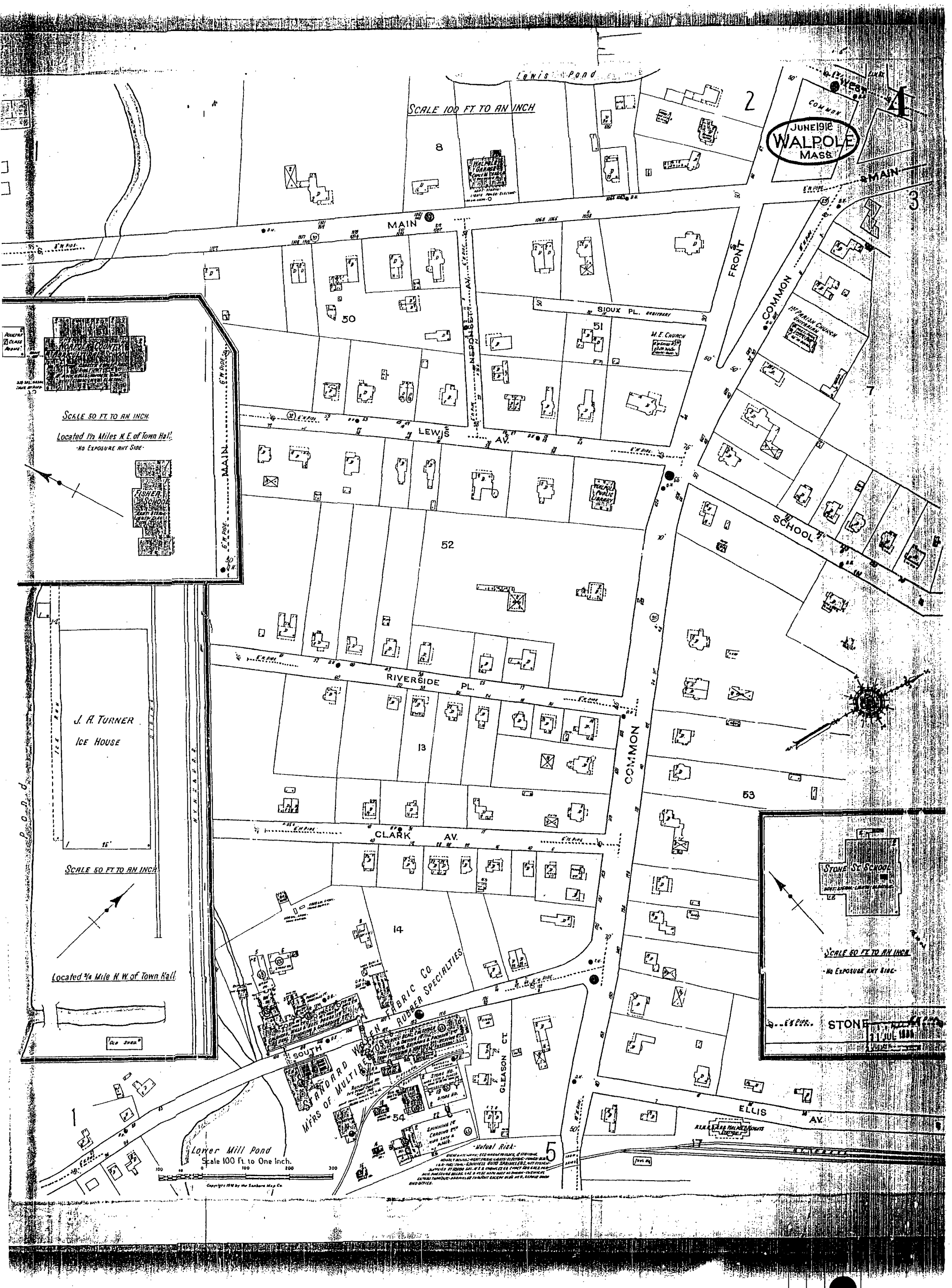
SANBORN

1911



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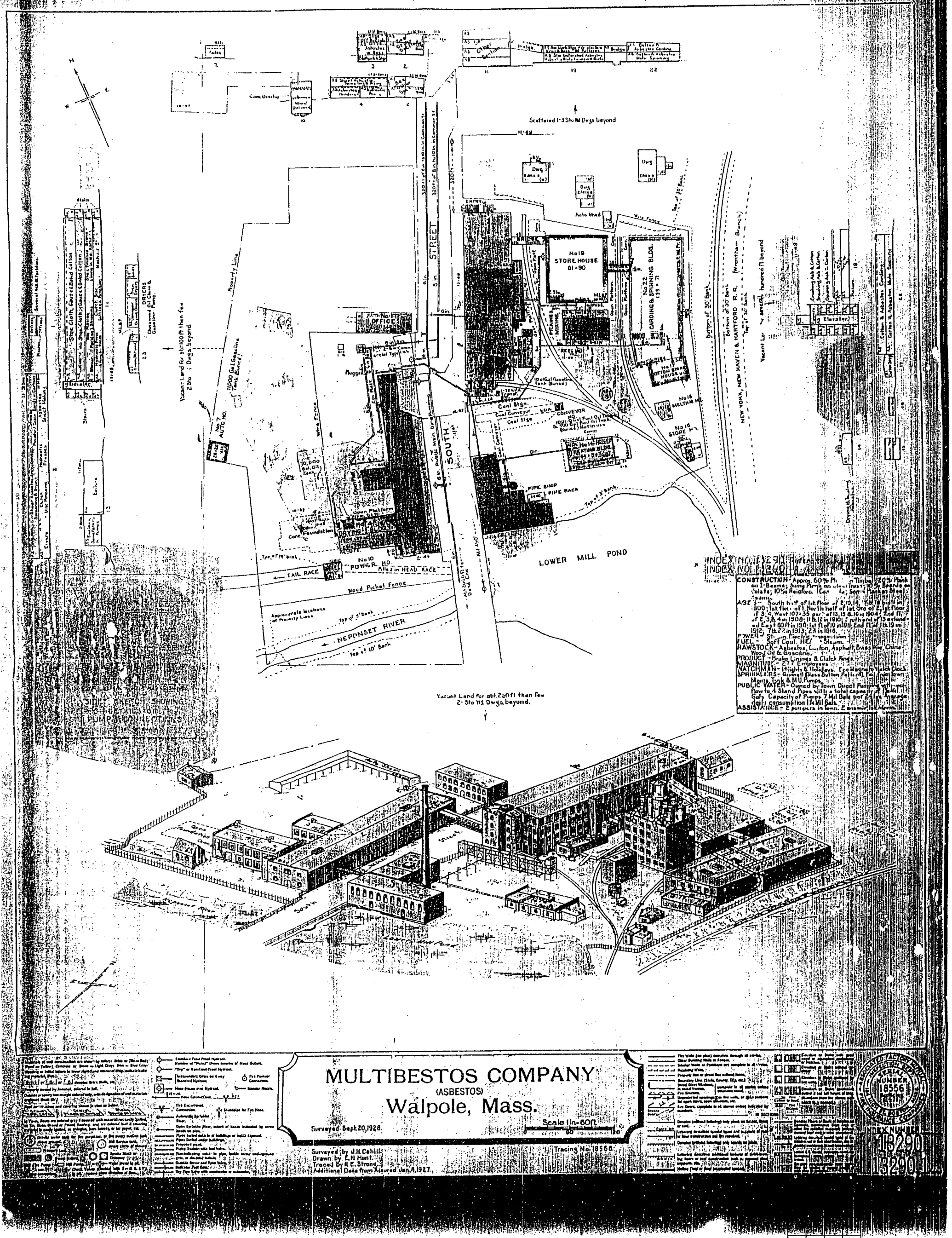
1918

SANBORN



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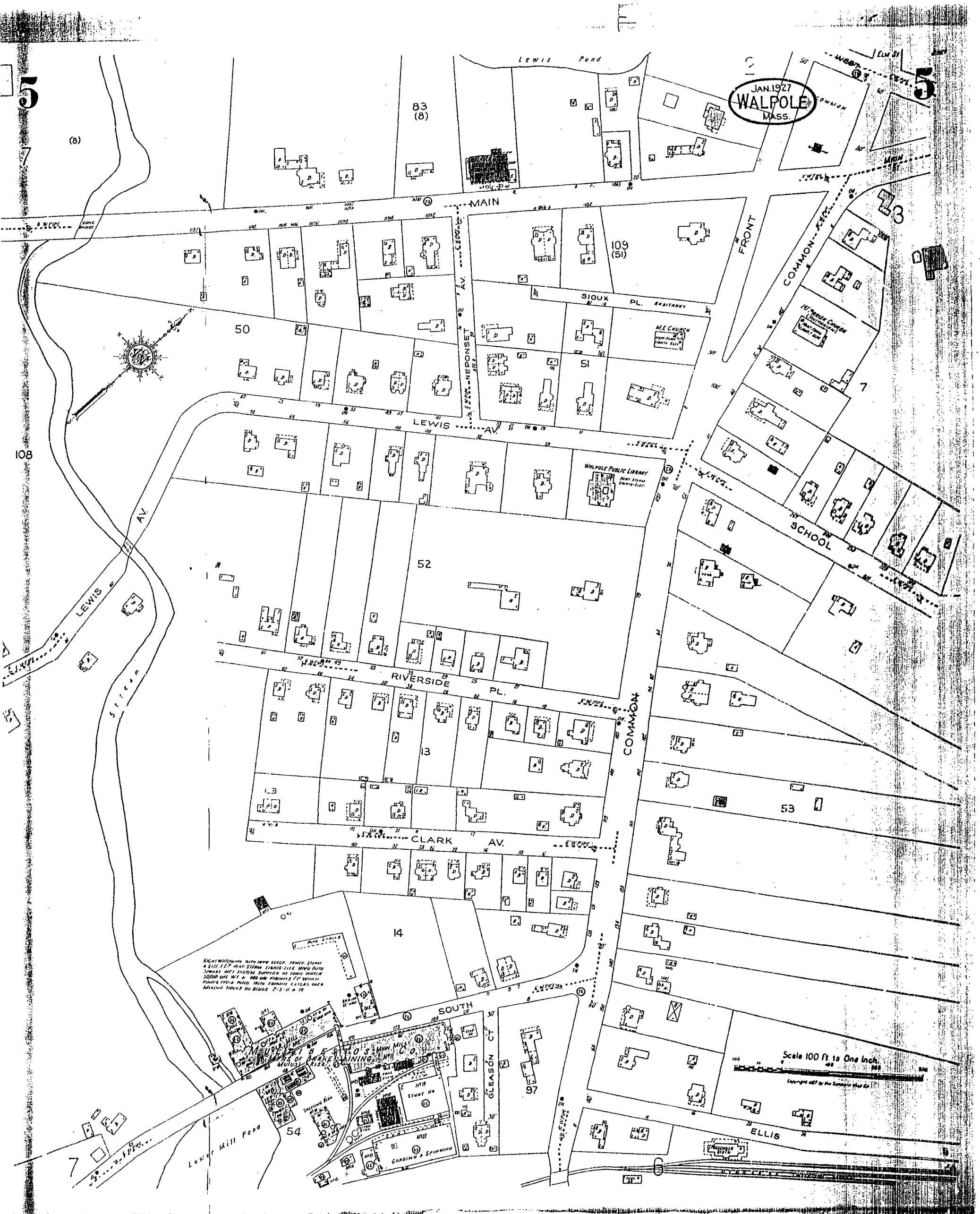
1926



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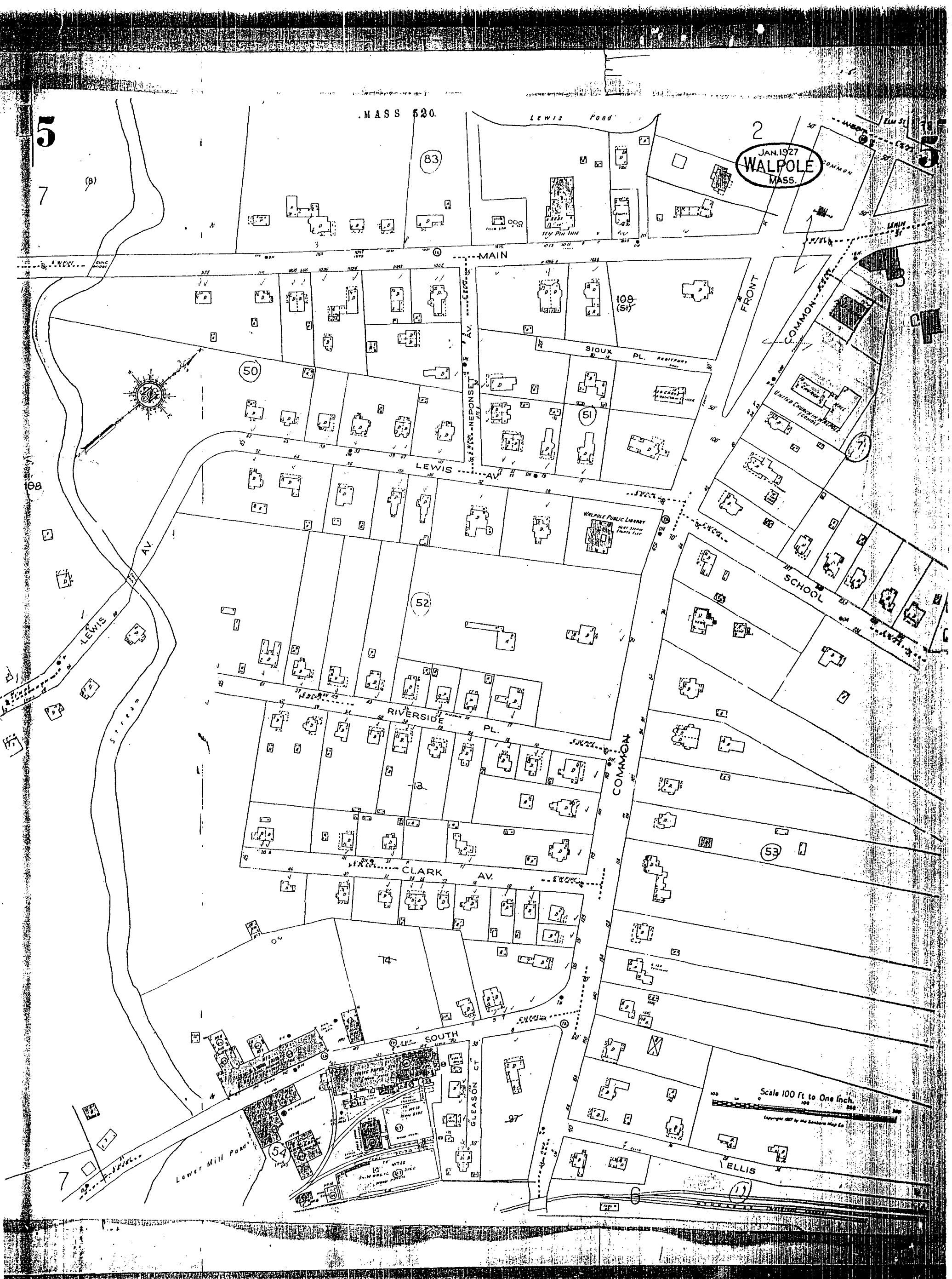
SANBORN

1927



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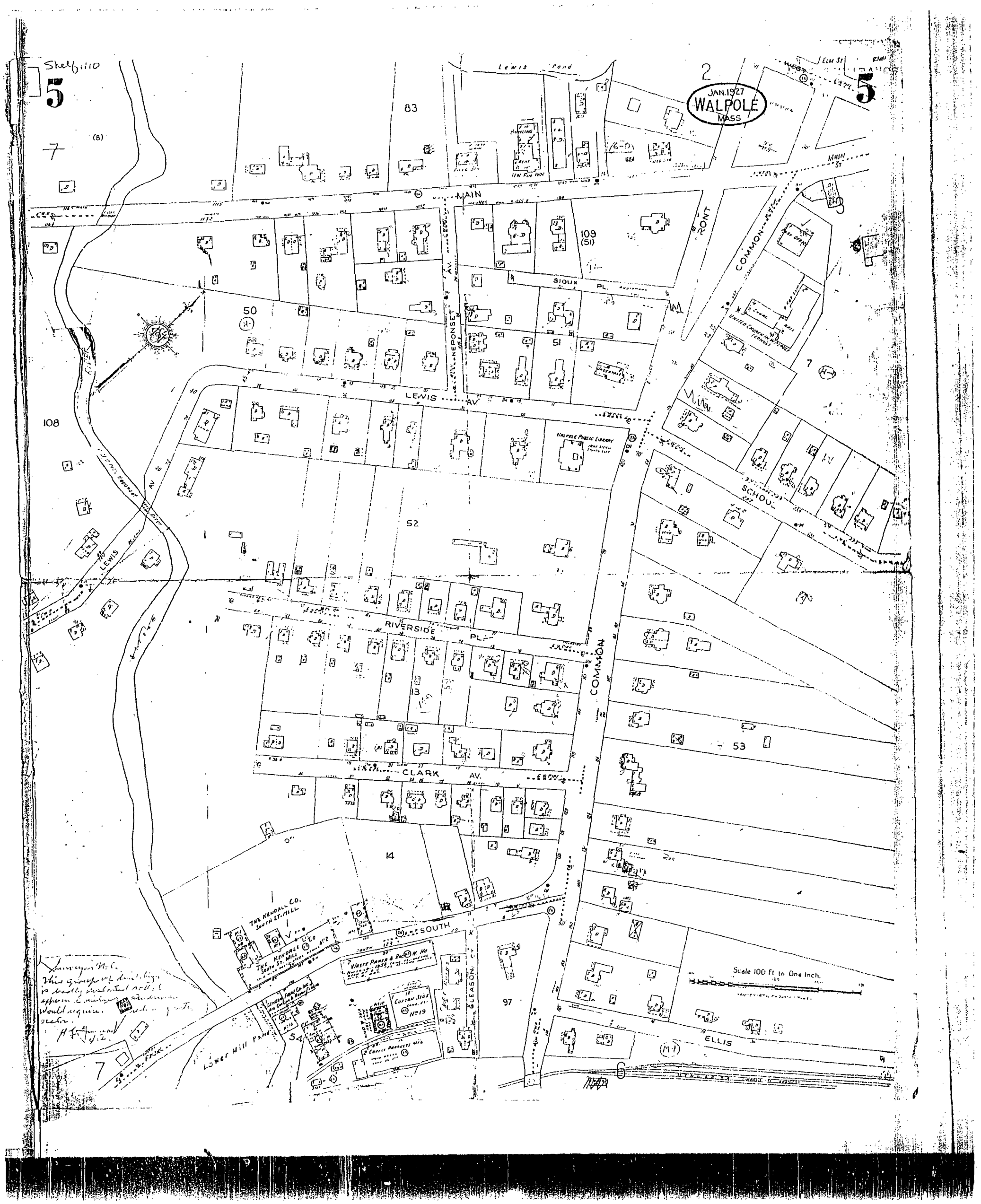
SANBORN

1944



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1958

APPENDIX B.2

Kendall Operations

KENDALL

ONE FEDERAL STREET, BOSTON, MASSACHUSETTS 02110-2003 · (617) 423-2000
CABLE: KENDALL
TELEX: 94-0503

RECEIVED
AUG 13 1987
D.E.Q.E.-Northeast Region

RECEIVED
2 1 1987

August 5, 1987

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
5 Commonwealth Avenue
Woburn, Massachusetts 01801

Attention: Ms. Lauri Jacobson

Dear Ms. Jacobson:

This letter is in response to the letter from Mr. Richard J. Chalpin of your department, dated July 8, 1987, referencing Walpole - South Street, Site Assessment Pursuant to M.G.L. Chapter 21E, DEQE Case # 3-603.

The attachments to this letter comprise the information that we have been able to obtain from our files. After the sale of the referenced Kendall property, and after the closing of the Kendall Walpole manufacturing plant on West Street, many records and drawings pertaining to the South Street location were discarded as being unnecessary. Also, many personnel who may have had first-hand knowledge pertinent to the requested information are no longer with the company. Therefore, not all of the information requested in Mr. Chalpin's letter is available. Nevertheless, please be assured that we are responding in good faith and to the best of our present ability.

Below is a listing of the attachments, keyed to the 6 specific areas of information requested in Mr. Chalpin's letter:

Attachment A: Description of the cotton bleaching process, including chemicals used, (Item 3)
Attachment B: Description of the non-woven fabric process, including chemicals used, (Item 3)
Attachment C: A "history" of the property, (Item 1)
Attachment D: A copy of a portion of the Purchase and Sale Agreement, wherein the property boundaries are described, (Item 1)
Attachment E: Kendall Drawing C-1-197, (Item 1,2, and 5)

Attachment F: Kendall Drawing D-1-79, (Items 3, 4, and 6)
Attachment G: Kendall Drawing C-1-120, (Items 2 and 3)
Attachment H: Kendall Drawing C-1-123, (Items 2 and 3)
Attachment I: Kendall Drawing D-1-136, (Items 2, 3, 5, and 6)
Attachment J: Kendall Drawing D-1-137, (Items 2, 3, and 4)
Attachment K: Kendall Drawing D-1-394, (Items 4, 5, and 6)
Attachment L: Kendall Drawing D-1-453, (Items 4 and 5)
Attachment M: Kendall Drawing D-1-500 (Page 4), (Items 2 and 5)
Attachment N: Kendall Drawing D-1-506, (Item 5)
Attachment O: Kendall Drawing AD50018D,(Items 4 and 5)
Attachment P: Kendall Drawing AD00031D,(Item 5)
Attachment Q: Kendall Drawing AD10032D,(Item 5)

I hope this information is of use to you. Please contact me if you have any questions concerning the information provided.

Sincerely,

THE KENDALL COMPANY

Charles J. Cole

Charles J. Cole
Manager
Regulatory Compliance

CJC/kkr
lt 8/5/CJC7

ATTACHMENT A

COTTON BLEACHING:

1. Cotton fiber was "wet-out" in dilute aqueous solution of Tergitol 15-S-12, a non-ionic surfactant.

2. Cotton was then scoured in aqueous solution of sodium hydroxide, Hampene OH-1, Tergitol 15-S-12, and tetrasodium pyrophosphate.

3. Cotton was then bleached in aqueous solution of sodium hypochlorite, tetrasodium pyrophosphate, sodium hydroxide, hydrogen peroxide.

4. Cotton was then washed with dilute aqueous solution of sulfuric acid.

5. Cotton was then washed with dilute aqueous solution of ammonium hydroxide.

6. Cotton was then washed with dilute aqueous solution of Supreme Soap.

7. Cotton was then washed with dilute solution of acetic acid, then dried.

All process drains led to a neutralization tank, where "spent" sulfuric acid was used to manitain pH within sewer permit requirements. From this tank, waste solution was sent to one of two lagoons so cotton fiber carried over could settle out prior to the solution entering the sewer system. Two lagoons were used so that one could be cleaned of the cotton while the other was in use. After 1982, one lagoon was taken out of service and straight-piped through to the outflow into the sewer system. This coincided with the shutdown of bleachery operations, such that the need to allow cotton fiber to settle out no longer existed. The other lagoon was then used as a receptacle for non-contact cooling water prior to introduction into the sewer system.

"Spent" sulfuric acid was strong sulfuric acid which had been used in the manufacture of soaps, not at South Street.

ATTACHMENT B

2. Fabric Production

Bleached cotton fiber was carded into a web and introduced into a bath containing as aqueous solution of sodium hydroxide. After exitting the bath, the fabric was rinsed with water to remove residual sodium hydroxide, then washed with dilute sulfuric acid, then washed with water, then dried and wound up.

On occasion, other chemicals were added to the fabric after final washing. These included Carboxymethyl cellulose, Polyvinyl Alcohol, Triethanolamine, Triton X-100, Ferric Ammonium Sulfate, Manganous Chloride, Acetic Acid, Isopropyl Alcohol, Dianol RSS, 1,3 Butylene Glycol, Lubol Concentrate, Pyroban K (formerly used Fyran J2K), and colorants Vat Blue #4, Metro White BSV, Lubricrease Red Violet 3LB, Atlantic Direct Fast Scarlet 4BA, Atlantic Direct Sky Blue 6B, and prior to 1976, Niagra Sky Blue 6B, Indanthrene Blue RP, Amalthrene Blue, Fatusol Red Violet LRL, Calcomine Blue 2BEX, Erie Fast Scarlet 4BA.

Waste solutions from the above operations were drained to the neutralization tank noted under the bleaching operation at Attachment A.

ATTACHMENT C

RECEIVED
JUL 28 1987
Regulatory Affairs

February 22, 1979

RE: Job No. 1-7209
Recollections-
Addendum #1

The Story of Walpole, published in 1925, describes the South Street Plant Site as The Union Factory Privilege. This location is pointed to as one of the town's oldest plant sites, and quite possibly, the location of the Old Saw Mill with which Walpole's colonial history began. Various mills occupied this site prior to 1813 but of most interest to our current investigation, I believe, are the site occupants subsequent to 1813. The following listing of site occupants, with dates of occupancy, seems to be reasonably accurate from my reading of The Story of Walpole:

1813 — Walpole Union Manufactory (Cotton and wool textiles) At this time, water was conveyed through the land so that the factory was on a ditch or sluiceway north of the main stream and west of South Street.

1852 — Manning Glover and Company (Curled hair matting and cotton batting and wicking)

1881 to 1891 — Union Carpet Lining Company

Massachusetts Chemical Company

1905 — Walpole Tire and Rubber Company ("Which developed an extensive modern industrial plant").

During construction to prepare the machine building for the R2 Line, we excavated foundations that appeared to be bamberry foundations. I was familiar with these foundations as, prior to this job, I had spent some time performing various foundation work with The American Biltrite Rubber Company and had some introduction to the type of foundations required by the equipment used by this industry.

If the foundations encountered were as I suspect, then it would seem the machine building was most probably constructed near the 1905 date. It is apparent, from observations, that the boiler room was built after the machine building but my guessing stops here.

1915 — Standard Woven Fabric Company (Later called Multibestos Company)

1947

ATTACHMENT D

The Kendall Company
a corporation duly established under the laws of Delaware

and having its usual place of business at One Federal Street, Boston, MA

Suffolk County, Massachusetts, for consideration ~~paid~~

of two hundred seventy thousand ($270,000) dollars
grant to Milton Shaffer, Irving Shaffer and Burton Shaffer, Trustees of B.I.M. Investment Trust u/d/t dated February 28, 1966, recorded herewith, having as their address 98 Taylor Street, Boston, Massachusetts

~~of~~ with quitclaim covenants
Two lots of land together with the buildings thereon on the Northwesterly side of South Street, Walpole, Massachusetts shown as Lot A and Lot C on a plan by E. Worthington, Engineer, dated March 12, 1937 and recorded with the ~~xxxxxxxx~~ the land in Norfolk County Registry of Deeds as plan 154 of 1937 in Book 2137 at Page 501, bounded and described as follows:

[Description and encumbrances, if any]

Said lot A is bounded southeasterly by South Street five hundred fifty and sixty-six hundredths (550.66) feet. Northeasterly by land now or formerly of Frank Baldassari eighty nine and eleven hundredths (89.11) feet and by land now or formerly of John J. Cwiklinski and Mary Cwiklinski fifteen and eleven hundredths (15.11) feet. Northwesterly by land of said Cwiklinski eighty-two and eighty one hundredths (82.81) feet. Northeasterly by land of said Cwiklinski ninety one and twenty eight hundredths (91.28) feet. Northwesterly by land now or formerly of Porter S. Boyden, land now or formerly of Thomas W. White and by land now or formerly of Harold T. White two hundred seventy five and seventy four hundredths (275.74) feet. Northeasterly by land now or formerly of Harold T. White one hundred (100.00) feet. Northwesterly by Clark Avenue one hundred (100.00) feet. Northeasterly by the end of Clark Avenue and by land now or formerly of Maynard T. Boyden one hundred forty (140.00) feet. Northwesterly by land now or formerly of Lottie A. Leach two hundred fifty three and thirty three hundredths (253.33) feet. Southwesterly by lot B on said plan by two lines, four hundred fifteen and thirty two hundredths (415.32) feet and one hundred seventy three and thirty three hundredths (173.33) feet. Containing 205490 square feet.

The most easterly corner of lot C lies fifty (50.00) feet southerly from the most southerly corner of lot A measured along the northwesterly side line of South Street and is bounded southeasterly by South Street eighty six and ninety seven hundredths (86.97) feet northeasterly by lot B on said plan two hundred sixty one and thirty four hundredths (261.34) feet. Northwesterly fourteen (14.00) feet by land now or formerly of Lottie A. Leach. Westerly by land of said Leach forty six and thirty hundredths (46.30) feet. Southwesterly in two lines by land of Mary T. Harrison ninety seven and thirty hundredths (97.30) feet and one hundred forty five and eighty six hundredths (145.86) feet. Containing 20800 square feet.

Being the same property conveyed to The Kendall Company, by deed of Industrial Properties, Inc. recorded with the Norfolk County Registry of Deeds, Book 2137, Page 518.

Said premises are conveyed subject to the easements, conditions and restrictions on record insofar as the same are in force and applicable.

This conveyance does not constitute all nor substantially all of the real estate assets of The Kendall Company in Massachusett.

Original: 2/15/79
Revised: 2/22/79

TO: Ned Sheahan

RE: Job No. 1-7209

As per your request I am submitting the following list of recollections relating to events in the recent history of the South Street Plant Boiler Room:

1947	Kendall occupancy began with refurbishment of plant for R-1 facilities.	
1948	Construction and completion of Webril R-1 Facilities	
1948	Boiler Room equipment installation	
1948	Boiler Caustic Tank Foundations Caustic Tanks Caustic Pumps	MAIN 1248-30
1952	Compressor foundation Compressor	MAIN 1248-51
1961	Solution Preparation Building constructed	MAIN 1248-94

1966 A 6" V.C. pipe drain was installed under the Old Boiler Room floor tying the open trench drain in the New Boiler Room addition to the open trench drain in the Solution Prep Building.

When this work was done, it was noted that the construction joint which ran and runs east west near the center of the floor, had been in the process of opening in such a way as to indicate either the slab was rising at the construction joint or settling at the building walls or both. This condition had been noticed and discussed prior to 1966, and was assumed to be caused by minor settlement of the underfill.

1966 New Boiler Room Addition constructed. LOCKWOOD GREENE, ENGINEERS

1969 Mutch Company removed caustic pumps, replaced pump foundations then replaced pumps. This work was necessary because of settlement and decay of concrete. As I remember, there was, at the time, a situation wherein the concrete floor appeared to be rising to a point at the center on the north south axis approximately 12' west of the machine room west wall. Cracks were evident and were opening travelling to this point.

Again, it was apparent that the floor slab was moving. I can recall comments being exchanged which took notice of the fact that the floor seemed to be settling, rising or both. The movement was not measured and caused no concern as it seemed of minor importance and was assumed to be caused by minor settlement of underfill.

1972 The old boiler was removed together with the floor under the old boiler. A new boiler support slab was installed and the new boiler installed on the slab.

1972 Zaremba Caustic Recovery System installed. The installation of this system increased the flow in the 6" V.C. drain installed in 1966.

1973 Recaulked joint where Solution Prep wall panels butt Boiler Room south brick wall at south west corner of Boiler Room. Approximately one year elapsed between the first discussions taking notice of the need for recaulking and the actual performance of the work in October of 1973. According to an examination of the site 2/21/79, it appeared to me that:

1. Originally the siding from Sol. Prep. butted tight to the Boiler Room Brick work.

2. By 1973, prior to recaulking, the joint had opened 3/8" at the bottom of the paneling and 1" at the panel fascia. (Width of joint determined by measuring 1973 caulking 2/21/79).

3. The total opening at the bottom of the paneling between the panel edge and the brickwork appears to be 3/4" and at the panel fascia the total opening from the panel edge to the brick work appears to be 2½" all as per observations 2/21/79.

1974 In April of 1974, a pipe, connected to one of the caustic pumps in the boiler room, broke due to the pressure caused by pump foundation or floor movement. This brought attention to the floor movement situation, and it was noticed that the caustic tanks were leaning south towards the Solution Preparation Building and pressure exerted by a pipe attached to one of the leaning caustic tanks cracked the south boiler room wall. At this time, we were asked to establish points on the floor and on the caustic tanks so that Kendall would have points of reference for future study.

In November of 1974, Kendall asked that we establish reference points on the boiler so that movement of the boiler could be monitored.

As you know we have continued to monitor the boiler reference points periodically.

1974 Repointed brickwork and stone foundation on the exterior of the west boiler room wall in the area of the caustic fill pipe.

1975 The caustic tanks were removed from the boiler room, I believe, sometime in early 1976. However, they were last used for caustic storage approximately late 1975.

1975 Repaired the coping on the west boiler room wall. It was necessary to replace a piece of V.C. coping and reset several loose pieces of V.C. coping. In addition, at this time, the flashing at the base of the parapet at the roof required repair.

1978 In February of 1978, the first notice was made of the large cracks in the brickwork of the south boiler room wall and the situation where the roof beam adjacent and parallel to the south boiler room wall and seated in the west machine room wall had moved or the machine room wall had moved so that the beam bearing was reduced by 1".

1979 In January 1979, measurements were made which indicated that the largest crack in the south wall of the boiler room had opened an additional ¼" and the movement at the beam seat mentioned above had increased ¼". It was at this time that the situation at the south west corner of the boiler room, where the Solution Prep Building girder bears on the south boiler room wall, was noted. That is, the spalling of the brick work at the bearing and the movement of the wall away from the girder. Also noticed at this time were the cracks in the north boiler room wall and the west machine room wall.

ADDITIONAL FACTORS TO BE CONSIDERED:

1. Water run off, from the caustic pumps in the south east corner of the boiler room, ran into the open concrete trench along the south wall of the boiler room for many years and probably ran through cracks in the concrete to the underfill.

2. Water run off, from the condensate returns, etc., ran into the open concrete trench along the north boiler room wall and probably ran through cracks in the concrete into the underfill.

3. For many years a drinking fountain was located in the boiler room near the pilaster at the machine room wall. This drinking fountain was made to run continuously for many years to provide the employees with cold water. The drinking fountain drain emptied so that the water ran into the underfill through the construction joint

3. (continued)
separating the boiler room floor and the west machine room wall.

4. In 1972, The Zaremba Caustic Recovery System was installed. This brought considerable added water through the pipe drain under the boiler room floor, and increased the opportunity for water to enter the underfill under the Boiler Room floor through cracks in the concrete cleanout boxes at the north and south walls of the boiler room.

Sanborn, Head & Associates

Consulting Engineers & Scientists

MEMORANDUM

To: File

From: Charles A. Crocetti, Ph.D., P.G., Charles L. Head, P.E., LSP
Sanborn, Head & Associates, Inc.

File: 1669

Date: November 17, 1999

Re: Blackburn & Union Privileges Superfund Site
Textile Manufacturing Operations
Former Kendall Facility
South Street
Walpole, Massachusetts

This memorandum describes the textile manufacturing operations employed by The Kendall Company at the South Street facility from approximately 1947 to 1984. The information contained within this memorandum was transcribed from notes and videotape of on-Site interview with Mr. Charles J. Cole, former manager of Regulatory Compliance for The Kendall Company at the South Street Site. The interview was held on Site May 21, 1999, and both authors of this memorandum were present.

The Kendall Company purchased the Site in approximately 1937, but did not initiate manufacturing operations at the facility until 1946. Between 1937 and 1946, the facility was used primarily for storage.

In 1946, a "pilot line" of the mercerizing process was initiated at the Site. This represented the first non-laboratory application of this process. Full production was not initiated until approximately 1947. Bleaching operations, to preprocess the cotton fabric prior to the mercerizing process, were not added to the Site until the early 1960s, and were terminated in 1982.

The textile manufacturing operations included a mercerization process whereby raw cotton was converted into a finished product consisting of a non-woven textile fabric. A general description of the process going from raw cotton to finished product textile is provided below:

- Raw cotton was received in Bales;
- The bales were opened and the cotton was processed (cleaned/scoured) through the bleachary which included the placing of the cotton in vessels with agitators containing a

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solution consisting of approximately 2 percent to 3 percent sodium hypochlorite (NaClO) and 3 percent sodium hydroxide (NaOH) (the bleach);

- The bleaching process took place in "kiers". NaOH entered the bleachery from a storage tank (or tanks) located to the north of the bleachery, through underground pipes penetrating the foundation wall at the east end of the bleachery. NaOH entered as a 50 percent solution, and was subsequently diluted for use in a variety of mixing tanks located in the basement area of the bleachery. In addition to NaClO and NaOH, sulphuric acid (H_2SO_4) was used to neutralize the caustic waters as required in the process;

- The bleachery placed a large demand on water use, with an estimated 400,000 gallons of water required for every 24 hours of facility operation. Water was derived from the Neponset River near its crossing with West Street, and piped to the South Street facility. Water was stored in a 50,000-gallon concrete holding tank in the basement of the bleachery prior to use within the bleachery;

- Subsequent to bleaching, the material was dried and blown up an air conductance pipe to an area on the second floor of the portion of the facility fronting on South Street, where it would be carded or combed into sheets of cotton;

- The carding machines combed the raw cotton into sheets ("laps") consisting of unidirectional cotton fibers;

- These combed sheets of cotton were then carried by conveyor belt down one level to the area where they would be immersed in one of two 50-foot long trays holding a 14 percent NaOH solution, chilled to a temperature of approximately 36° Fahrenheit (F). The NaOH solution was chilled in an above ground 10,000-gallon tank located in the chilling compressor room in the west side of the 1st floor of the portion of the Kendall facility fronting on South Street. The tank was divided in two sections, with one section holding 50 percent solution of NaOH drawing from pumps located in the east end of the bleachery, and piped overhead to the chilling room, and the second compartment held 14 percent NaOH solution which would be used in the mercerizing process. The tank was insulated to keep the liquid cold;

- This 14 percent NaOH solution caused the cotton fibers to curl up and interlock or web and make a fabric (web) out of what was previously unidirectional cotton sheets;

- The mercerizing process also used a significant amount of water, with an estimated draw of approximately 75 to 100 gallons per minute delivery to the caustic trays within which the cotton laps were soaked. In late 1970's, Kendall added a caustic recovery operation, to recover and reconcentrate caustic from the saturated laps. This process was installed north of the mercerizing lines;

- The cotton web was then sent through a series of flooders which were designed to wash out the caustic. This process consisted of a series of flooder boxes where the fabric would be flooded with water (at a later date, acid was used to neutralize the residual NaOH) and then vacuumed to remove the water;

- Once the sheets of web were dried, they would be wound on the winder into a large roll of fabric.

Major chemicals used at the facility as part of the mercerization process included NaOH which was received and stored in bulk as a 50 percent solution, NaClO which was received as a 26 percent to 28 percent solution; H_2SO_4 received at 93 percent to 98 percent; and hydrogen peroxide (H_2O_2) received at 70 percent and diluted to 50 percent at the Site. An estimated 1,000 to 3,000 gallons per day (gpd) of 50 percent NaOH solution was used in the process.

CAC/CLH:pmm/lje S:\DATA\1669\99files\1117mercerizing process.mem

APPENDIX B.3

Selected Plans –

CHIEE (1987b) and Weston & Sampson (1990a)

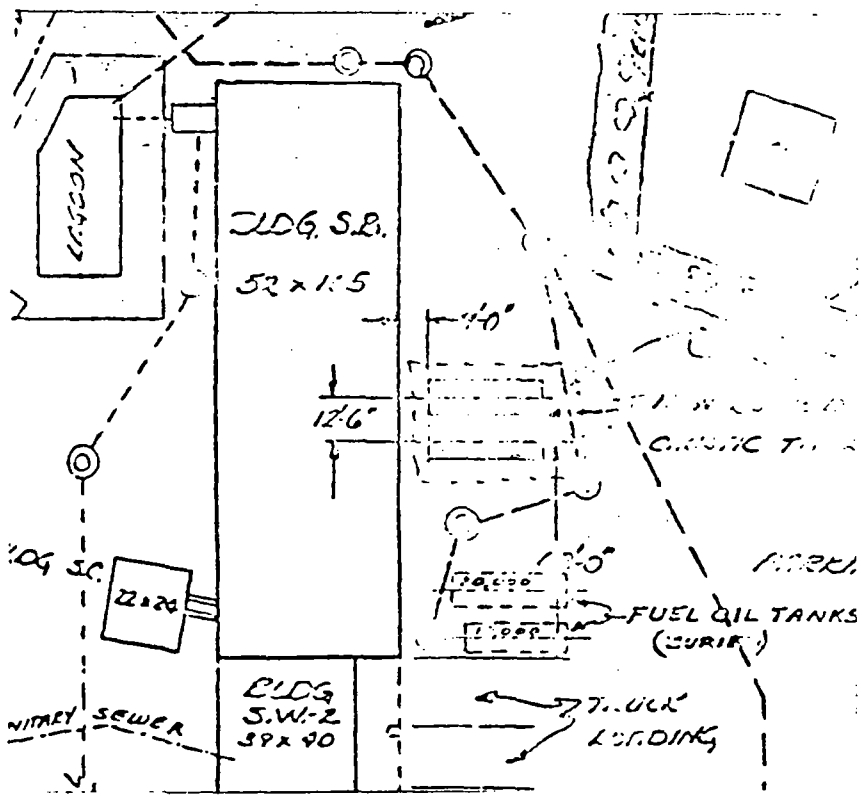


FIGURE 7

LOCATION OF CAUSTIC AND OIL TANKS

KENDALL COMPANY

SOUTH STREET

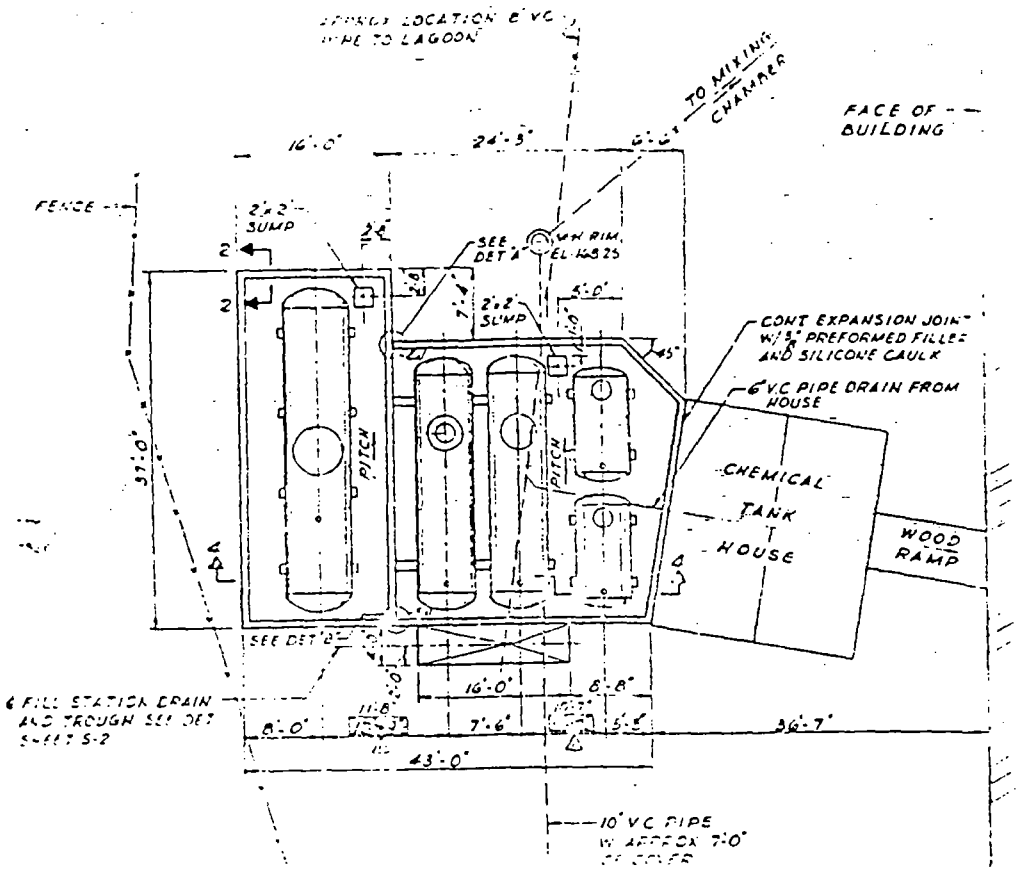
WALPOLE, MASSACHUSETTS

ENVIRONMENTAL ENGINEERING CORPORATION

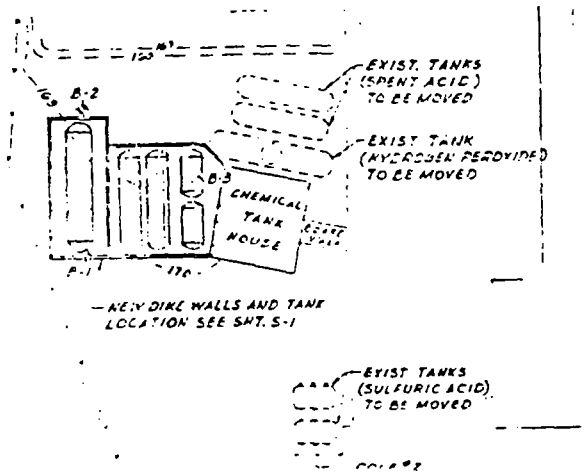
A CLEAN HARBORS COMPANY

PROJECT NO. E 1384

SCALE NTS



DETAIL OF RELOCATED TANKS



RELOCATION OF SPENT ACID, SULFURIC ACID, AND HYDROGEN PEROXIDE TANKS

FIGURE 6

CHI ENVIRONMENTAL ENGINEERING CORPORATION
A CLEAN HARBORS COMPANY

PROJECT NO. E 1384

SCALE NTS

RELOCATION OF TANKS
KENDALL COMPANY
SOUTH STREET
WALPOLE, MASSACHUSETTS

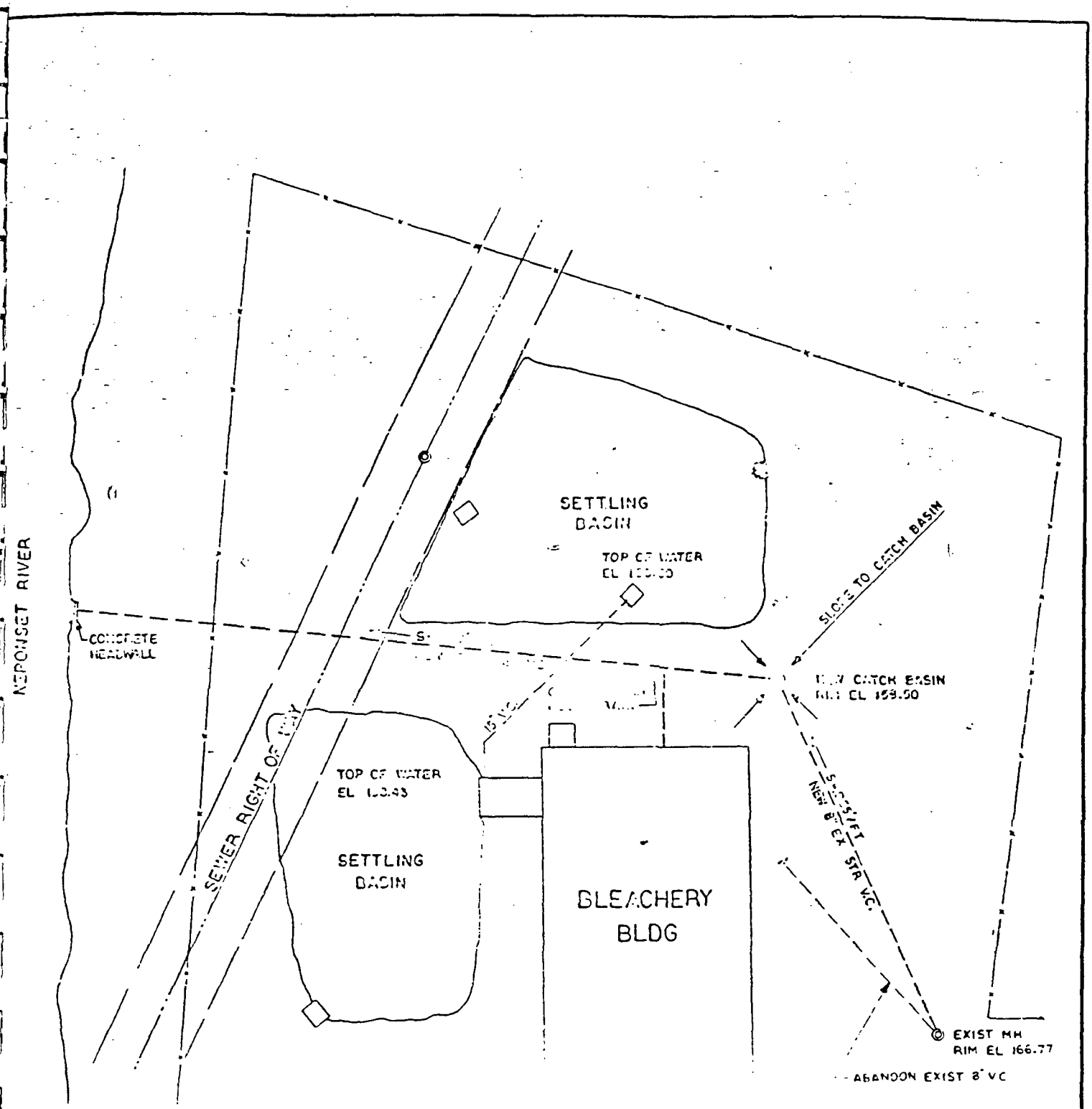
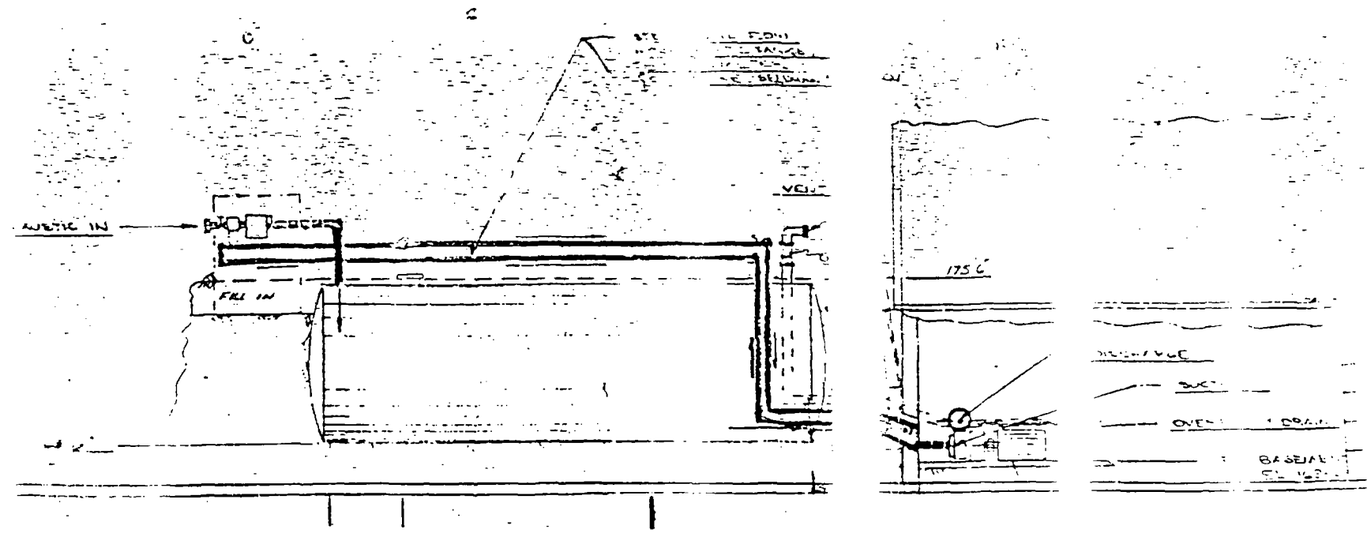


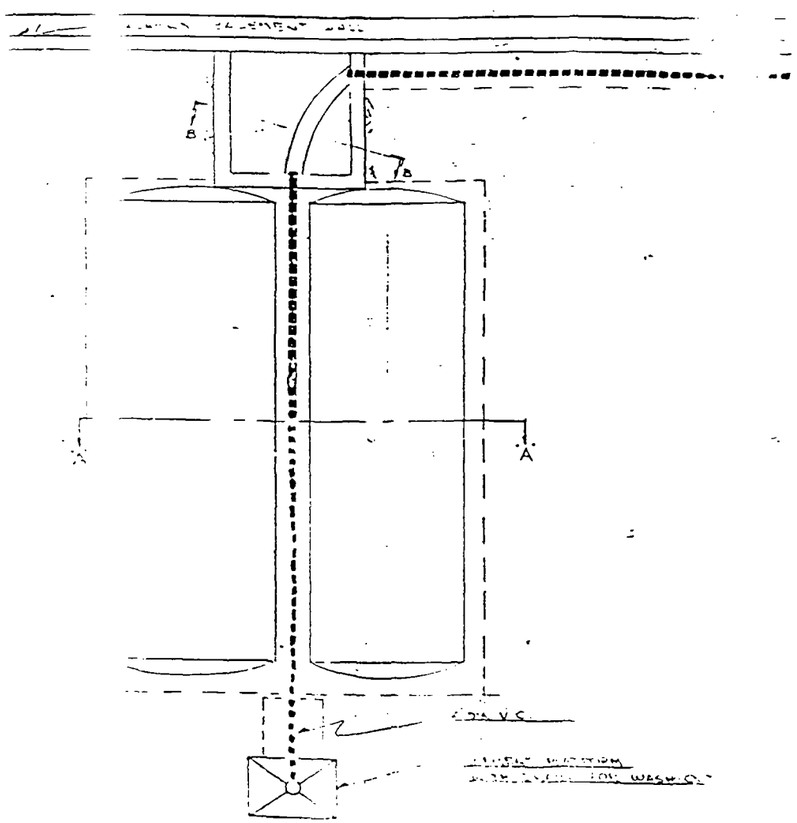
FIGURE 5

CHI ENVIRONMENTAL ENGINEERING CORPORATION A CLEAN HARBORS COMPANY	DRAINAGE SYSTEM KENDALL COMPANY SOUTH STREET WALPOLE, MASSACHUSETTS
PROJECT NO. E-1384 SCALE NTS	

SIDE VIEW



TOP VIEW



A CLEAN HARBORS COMPANY

PROJECT NO. E 1384

SCALE NTS

PREPARED

FIGURE REFERENCE

FIGURE

CAUST TANK ETAIL

OLD NDALL C ANY

OUTH STR T

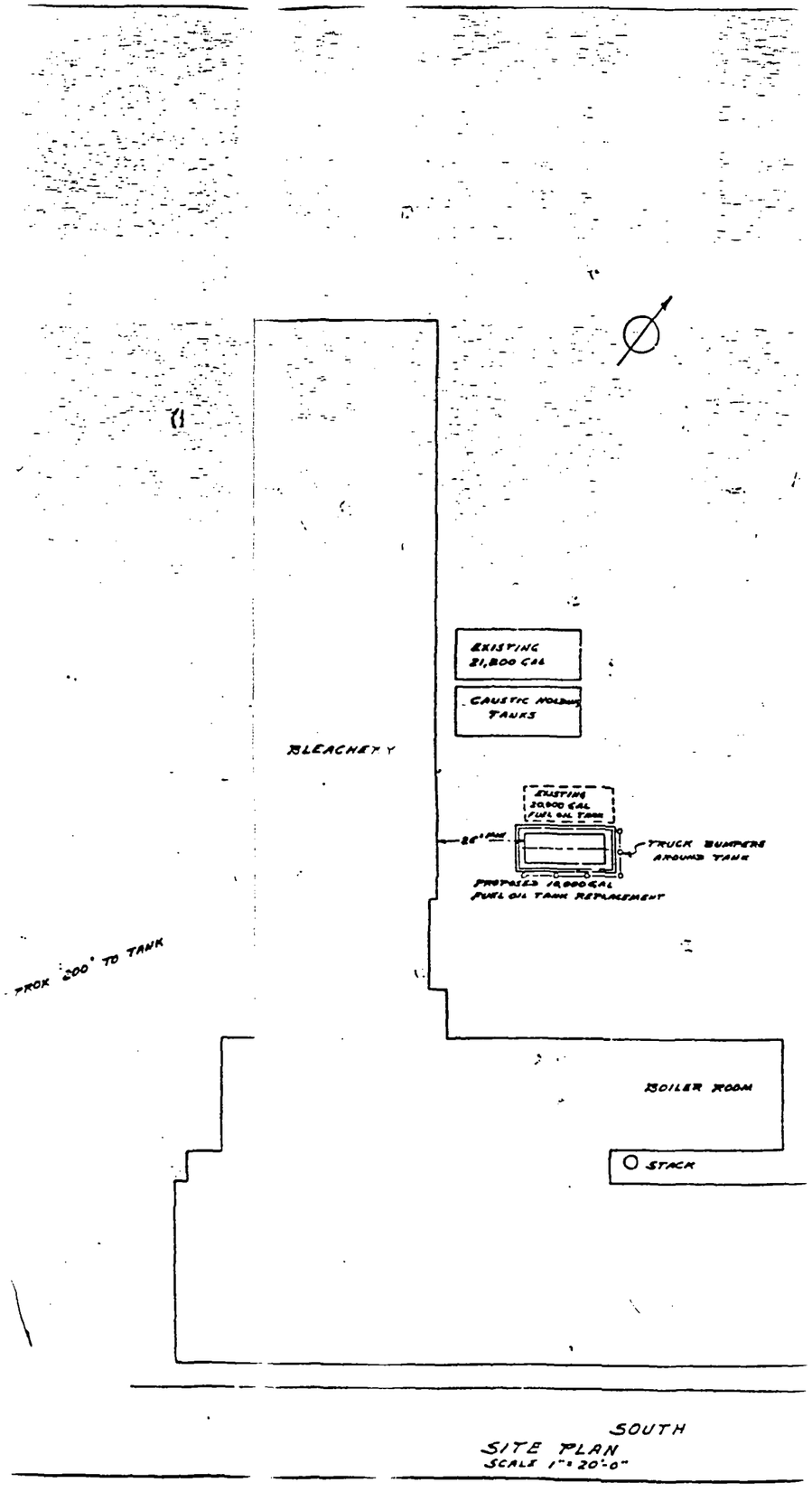
WALPOLE, A.

DRAWING NO.

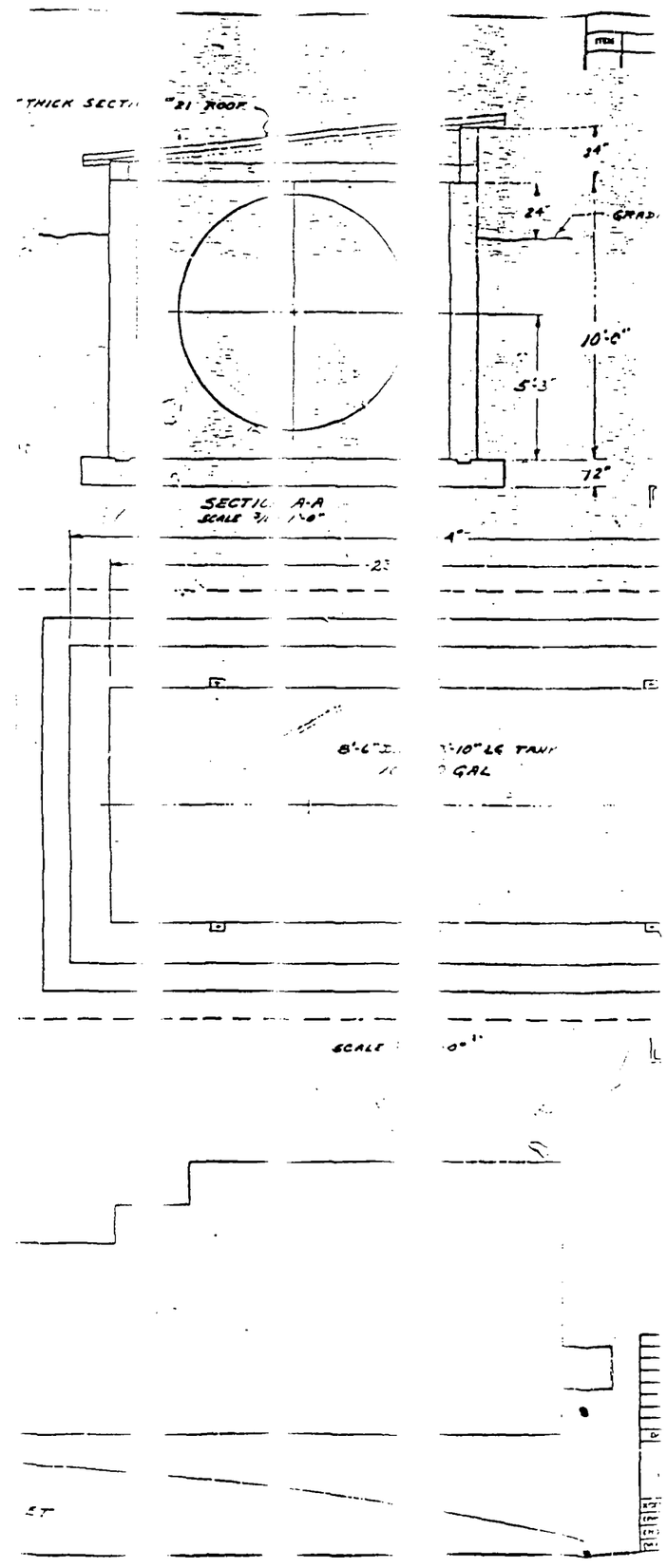
LL CAUSTIC STO

g D-1-500

/75



SITE PLAN
SCALE 1" = 20'-0"



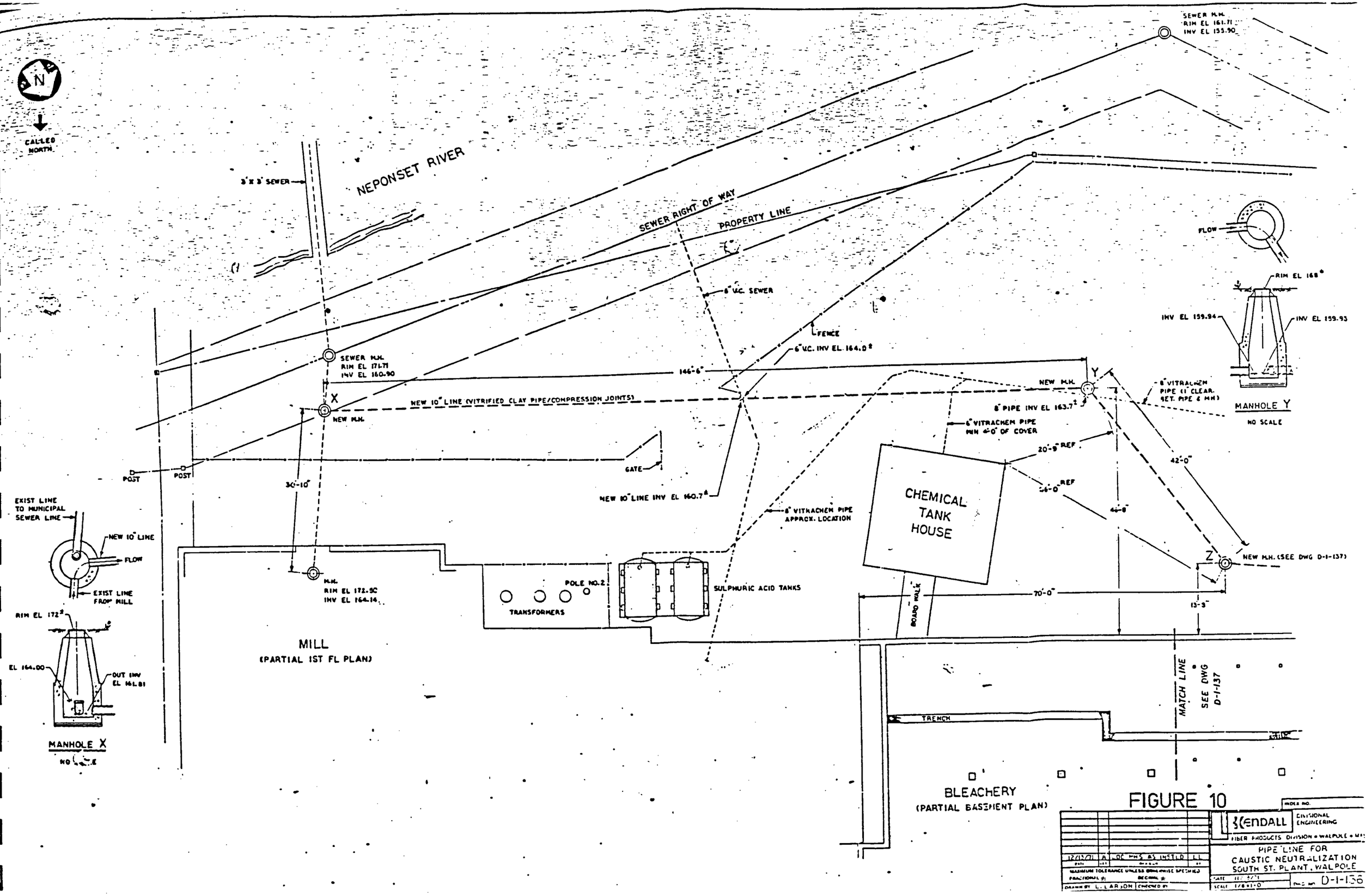

N
CALLED NORTH
NEPONSET RIVER
3'x3' SEWER
SEWER RIGHT OF WAY
PROPERTY LINE
8" V.C. SEWER
FENCE
6" V.C. INV EL 164.0±
SEWER M.H.
RIM EL 171.71
INV EL 160.90
146'-6"
NEW 10" LINE (VITRIFIED CLAY PIPE/COMPRESSION JOINTS)
X
NEW M.H.
POST
POST
30'-10"
GATE
NEW 10" LINE INV EL 160.7±
8" VITRACHEM PIPE APPROX. LOCATION
M.H.
RIM EL 172.50
INV EL 164.14
POLE NO. 2
TRANSFORMERS
SULPHURIC ACID TANKS
MILL
(PARTIAL 1ST FL PLAN)
CHEMICAL TANK HOUSE
BOARD WALK
70'-0"
13'-3"
NEW M.H.
Y
8" PIPE INV EL 163.7±
6" VITRACHEM PIPE MIN 4'-0" OF COVER
20'-9" REF
26'-0" REF
42'-0"
44'-8"
8" VITRACHEM PIPE (1" CLEAR. SET. PIPE & MH)
Z
NEW M.H. (SEE DWG D-1-137)
TRENCH
MATCH LINE
SEE DWG D-1-137
BLEACHERY
(PARTIAL BASEMENT PLAN)
FLOW
RIM EL 168±
INV EL 159.94
INV EL 159.93
MANHOLE Y
NO SCALE
EXIST LINE TO MUNICIPAL SEWER LINE
NEW 10" LINE
FLOW
EXIST LINE FROM MILL
RIM EL 172±
EL 164.00
OUT INV EL 161.81
MANHOLE X
NO SCALE
12/13/71
A
DC MMS AS INSTLD
LL
MAXIMUM TOLERANCE UNLESS OTHERWISE SPECIFIED
FRACTIONAL ±
DECIMAL ±
DRAWN BY L. LARSON
CHECKED BY
KENDALL
DIVISIONAL ENGINEERING
FIBER PRODUCTS DIVISION • WALPOLE • MASS
PIPE LINE FOR
CAUSTIC NEUTRALIZATION
SOUTH ST. PLANT, WALPOLE
SCALE 1/8"=1'-0"
D-1-136

FIGURE 10

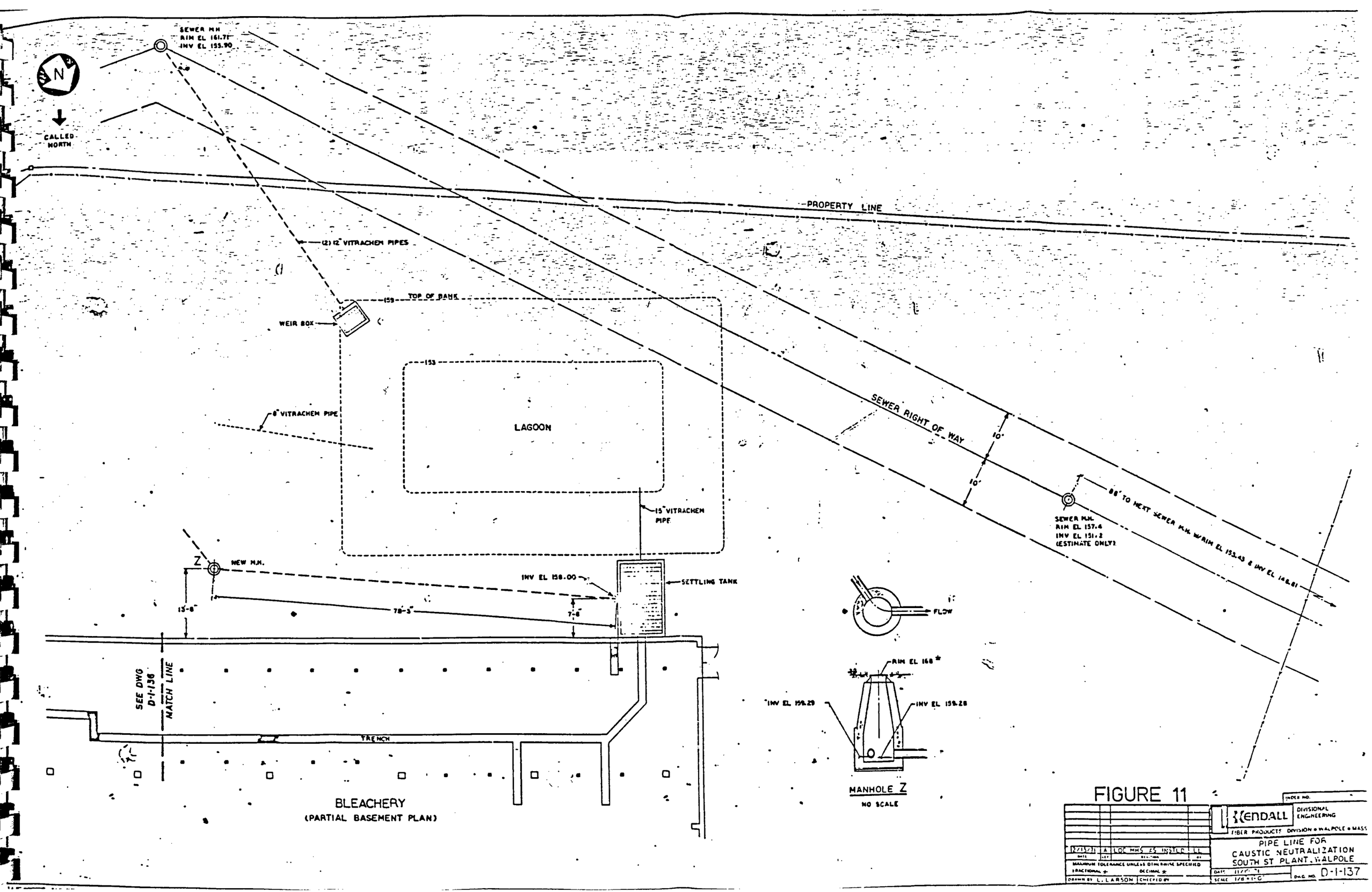

SEWER MH
RIM EL 161.71
INV EL 155.90
N
CALLED NORTH
PROPERTY LINE
(2) 12" VITRACHEM PIPES
TOP OF BANK
153
WEIR BOX
153
8" VITRACHEM PIPE
LAGOON
15" VITRACHEM PIPE
SEWER RIGHT OF WAY
10'
10'
SEWER MH.
RIM EL 157.4
INV EL 151.2
(ESTIMATE ONLY)
88' TO NEXT SEWER MH. W/RIM EL 153.43 & INV EL 146.81
Z
NEW M.H.
INV EL 158.00
SETTLING TANK
15'-8"
78'-3"
7'-8"
SEE DWG D-1-136
MATCH LINE
TRENCH
BLEACHERY
(PARTIAL BASEMENT PLAN)
FLOW
RIM EL 168 *
INV EL 159.29
INV EL 159.28
MANHOLE Z
NO SCALE
FIGURE 11
KENDALL
DIVISIONAL ENGINEERING
FIBER PRODUCTS DIVISION • WALPOLE • MASS
PIPE LINE FOR
CAUSTIC NEUTRALIZATION
SOUTH ST PLANT, WALPOLE
DRAWN BY L. LARSON
CHECKED BY
D-1-137

TABLE 1

South Street Site - Vacant Building on Lot 1235-1
Container Inventory

January 18, 1990

Container Reference Number	Size	Container Type	Condition	Content Description (volume: liquid or solid)
Loading Dock: Shipping and Receiving Area First Floor				
1	55 gallon	steel drum	good	empty
2	60 gallon	paper drum	good	trash - predominantly paper
3	75 gallon	stainless steel drum	good	empty
3A	5 gallon	steel bucket	good	lubrication oil 2.5 gallons
Wet Processing Room First Floor				
4	5 gallon	steel can	good	roofing cement 3.75 gallons
Recirculation Line #2 Trench				
5	55 gallon	stainless steel drum	good	empty
6	55 gallon	stainless steel drum	good	empty
7	55 gallon	stainless steel drum	good	empty
8	55 gallon	stainless steel drum	good	empty
9	55 gallon	stainless steel drum	good	caustic solution 1.5 gallons SAMPLE #1
10	5 gallon	stainless steel can	good	empty - caustic residue
11	5 gallon	stainless steel can	good	empty - caustic residue
12	5 gallon	stainless steel can	good	empty - caustic residue
13	5 gallon	stainless steel can	good	trace: frozen liquid
14	450 gallon	stainless steel tank	good	vacuum tank
Recirculation Line #1 Trench				
15	67 gallon	steel rectangular tank	good	empty
16	67 gallon	steel rectangular tank	good	empty
17	67 gallon	steel rectangular tank	poor: holes in tank	light blue colored solution 2 gallons SAMPLE #2
18	67 gallon	steel rectangular tank	good	empty
19	100 gallon	steel condensation tank	good	empty

TABLE 1 (cont.)

January 18, 1990

Container Reference Number	Size	Container Type	Condition	Content Description (volume: liquid or solid)
Refrigeration Compressor Room				
20	10,000 gallon	steel tank section 1	good	Refrigerated black viscous 50% caustic solution for recirculation line #1 500 gallons SAMPLE #5
		section 2	good	
Quality Control Laboratory				
		(1) pH indicator bottle - empty (1) bottle of potassium iodide - trace (crystalized) (1) liter bottle of black solid - 100 ml (1) pressure cooker		
Wet Processing Room				
21	55 gallon	plastic drum	good	acetic acid - 30 gallons
22	(2) 5 gallon	plastic bucket	good	multi-purpose gear lubrication
23	(2) 5 gallon	plastic bucket	good	multi-purpose gear lubrication
24	(2) 5 gallon	plastic bucket	good	multi-purpose gear lubrication
25	(2) 5 gallon	plastic bucket	good	multi-purpose gear lubrication
26	(2) 5 gallon	plastic bucket	good	multi-purpose gear lubrication
27	(2) 5 gallon	plastic bucket	good	multi-purpose gear lubrication
28	55 gallon	steel drum	good	lubrication fluid "Gulf Oil" - empty
29	55 gallon	steel drum	good	lubrication fluid "Gulf Oil" - empty
30	55 gallon	steel drum	good	lubrication fluid "Gulf Oil" - empty
31	10,000 gallon	steel tank section 1	good	empty
		section 2	good	empty Refrigerated caustic solution for recirculation line #2
32	55 gallon	steel drum	good	empty
33	55 gallon	paper drum	good	empty
34	55 gallon	paper drum	good	empty
35	55 gallon	steel drum	good	empty
36	55 gallon	paper drum	good	trash - predominantly paper
Maintenance Room Second Floor				
37	40 gallon	steel drum	good	#2 grease 15 gallons
38	40 gallon	steel drum	good	white caustic powder 15 gallons SAMPLE 3
39	40 gallon	steel drum	good	empty
Parts Room				
40	steel cabinet:	(1) tube of lubrication paste (1) tube of plastic cement - neoprene bonding cement (2) 1 liter plastic containers of oil (2) 500 milliliter container of ink (1) gallon can of red paint		

TABLE 1 (cont.)

January 18, 1990

Container Reference Number	Size	Container Type	Condition	Content Description (volume: liquid or solid)
		Boiler Room First Floor		
41	55 gallon	steel drum (black)	good	empty
42	55 gallon	steel drum (red & white)	good	diethylamindethanol - solid 15.4 gallons
43	55 gallon	stainless steel drum	good	boiler treatment tank liquid 5 gallons
44	55 gallon	stainless steel drum	good	residue - empty
45	55 gallon	paper drum	good	trash - predominantly paper
46	55 gallon	stainless steel drum	good	detergent solvent 15 gallons HNU: 50 ppm SAMPLE #4
47	40 gallon	paper drum	good	empty
48	5 gallon	plastic bucket	good	gear oil empty
49	250 gallon	plastic drum	good	solid 220 gallons
50	55 gallon	steel drum (black & white)	good	Nutmeg 7D-24 empty
51	55 gallon	steel drum (red)	good	lubrication oil empty
52	40 gallon	paper drum	good	Speedy Dry 30 gallons
		(1) 50 pound bag of rock salt (1) liter bottle of iodide (1) liter bottle of phenol (1) 1 quart steel can of hydromotor oil		
		Storage & Spare Parts Room		
53	55 gallon	steel drum	good	empty
54	1 gallon	steel can	good	paint 0.5 gallons
55	1 gallon	steel can	good	brake fluid empty
		Electrical Shop		
		(1) 1 gallon steel can of paint (1) 1 gallon steel can of cutting oil (2) steel 5 gallon oil cans (1) steel 2 gallon gasoline can (2) steel 1 quart oil cans (1) steel 1 quart of wire pulling lubricant		
		Bleachery Receiving & Storage: Cotton Bails First Floor		
56	55 gallon	steel drum (red & white)	good	empty
		Bleachery First Floor		
57	55 gallon	steel drum (red & white)	good	1-3 Butylene Glycol solid: trace amount on bottom
58	55 gallon	steel drum	good	detergent solvent empty
59	55 gallon	paper drum	good	trash - predominantly paper

TABLE 1 (cont.)

January 18, 1990

Container Reference Number	Size	Container Type	Condition	Content Description (volume: liquid or solid)
		Bleachery Utility Room Basement		
60	55 gallon	plastic drum (black)	good	acetic acid 80 full
61	55 gallon	paper drum	good	trash - predominantly paper
62	55 gallon	steel drum (gray)	good	pine oil empty
63	55 gallon	steel drum	good	trash - cotton
64	185 gallon	steel tank	good	white powder residue
65	185 gallon	steel tank	good	white powder residue trace water
66	4,000 gallon	steel tank	good	white powder residue
67	185 gallon	steel tank	good	white powder residue
68	711 gallon	steel tank	good	white powder residue
69	711 gallon	steel tank	good	white powder residue
70	711 gallon	stainless steel tank	good	white powder residue
71	711 gallon	stainless steel tank	good	white powder residue
72	4,000 gallon	steel tank	good	bleaching solution empty
73	4,000 gallon	steel tank	good	bleaching solution 1,200 gallons
74	4,000 gallon	steel tank	good	bleaching solution 2,000 gallons SAMPLE #8
75	4,000 gallon	steel tank	good	bleaching solution 3,000 gallons SAMPLE #7
76	4,000 gallon	steel tank	good	bleaching solution empty
77	4,000 gallon	steel tank	good	bleaching solution 4,000 gallons SAMPLE #6
		Bleachery First Floor		
78	3,175 gallon	stainless steel vat	good	empty
79	3,175 gallon	stainless steel vat	good	empty
80	3,175 gallon	stainless steel vat	good	empty
81	3,175 gallon	stainless steel vat	good	empty
82	3,175 gallon	stainless steel vat	good	empty
83	3,175 gallon	stainless steel vat	good	empty
84	3,175 gallon	stainless steel vat	good	empty
85	3,175 gallon	stainless steel vat	good	empty
86	3,175 gallon	stainless steel vat	good	empty
87	3,175 gallon	stainless steel vat	good	empty

TABLE 1 (cont.)

January 18, 1990

Container Reference Number	Size	Container Type	Condition	Content Description (volume: liquid or solid)
		Wet Processing Room First Floor		
88	wooden cabinet: (6) 1 liter glass containers - empty			
		Bleachery First Floor		
89	3,175 gallon	stainless steel vat	good	empty
90	3,175 gallon	stainless steel vat	good	empty
91	3,175 gallon	stainless steel vat	good	empty
92	3,175 gallon	stainless steel vat	good	empty
		Holding Tank Shed Building Exterior		
93	55 gallon	steel drum	good	oil - empty
94	55 gallon	steel drum	good	oil - empty
95	40 gallon	steel drum	good	oil 40 gallons
96	2,016 gallon	fiberglass insulated tank	good	dry residue empty
97	2,016 gallon	fiberglass insulated tank	good	dry residue empty
98	1 gallon	steel can	poor: rust	paint 0.5 gallons
		Shed Exterior		
99	55 gallon	steel drum	good	liquid 18 gallons
100	55 gallon	steel drum	good	trash
101	55 gallon	steel drum	good	trash
		Bleachery First Floor		
102	2,500 gallon	steel tank	good	empty
103	2,500 gallon	steel tank	good	empty

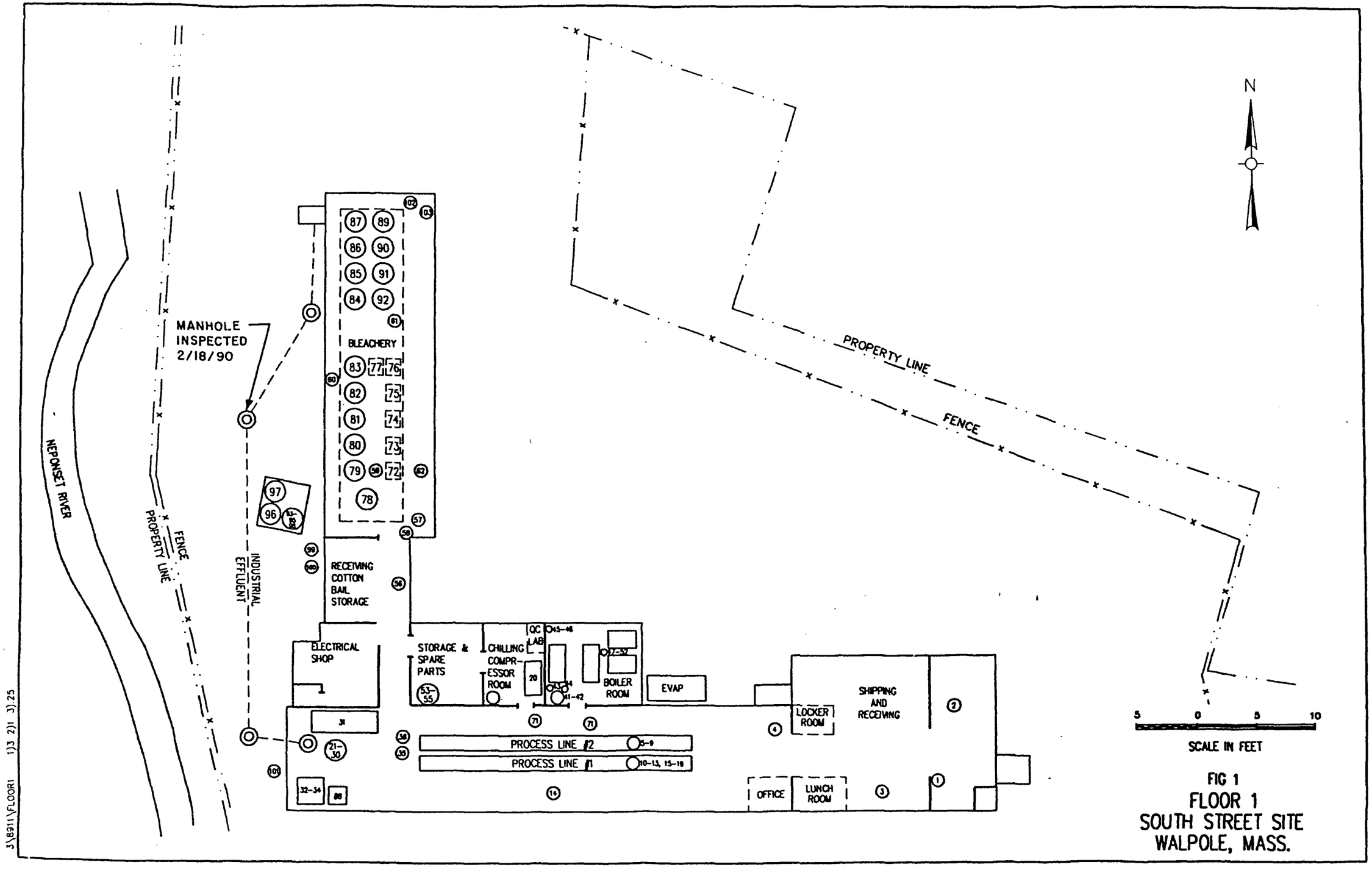


FIG 1
FLOOR 1
SOUTH STREET SITE
WALPOLE, MASS.

3\8911\FLOOR1 1)3 2)1 3).25

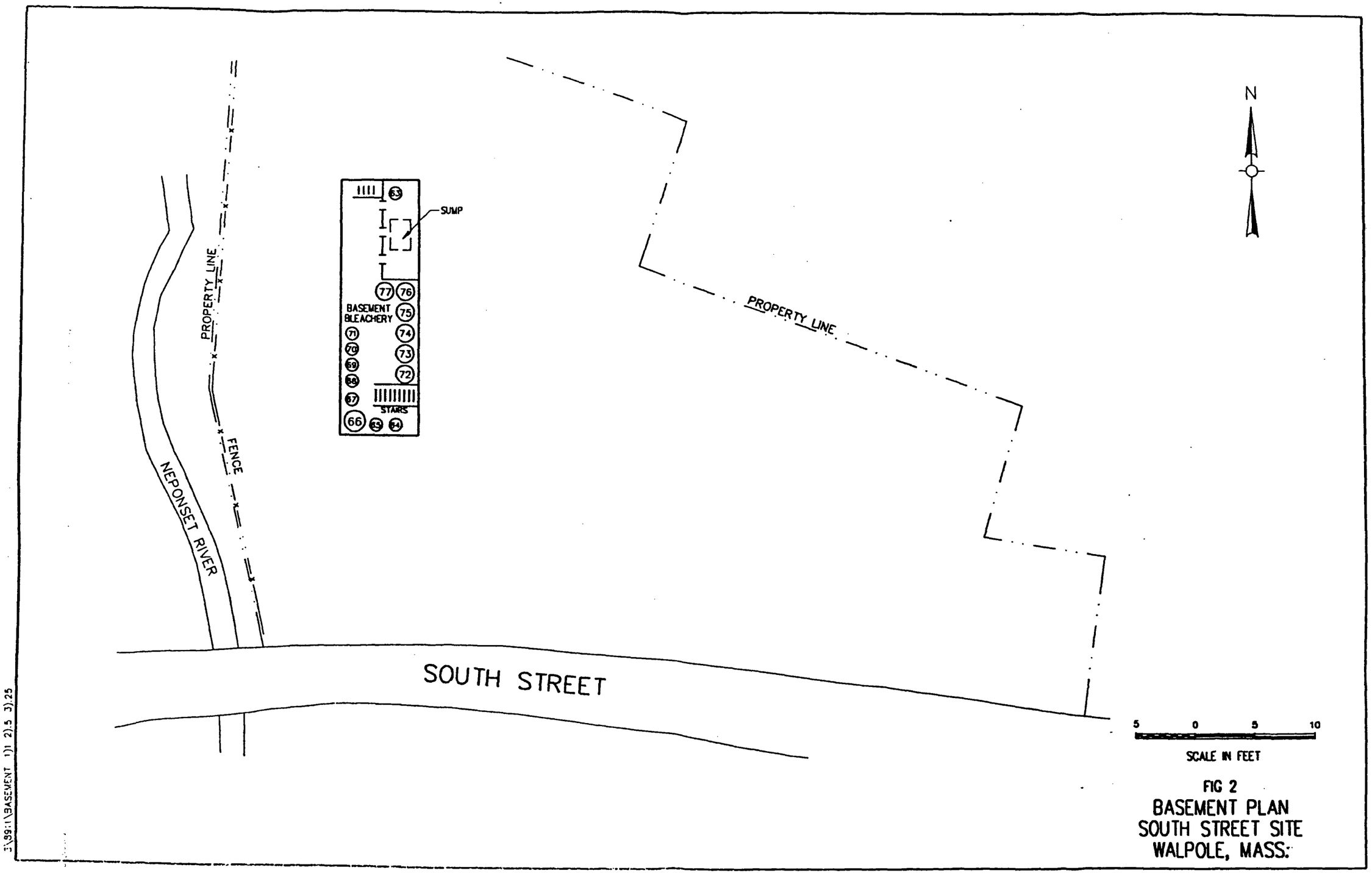


FIG 2
BASEMENT PLAN
SOUTH STREET SITE
WALPOLE, MASS.

3\89:1\BASEMENT 1)1 2).5 3).25

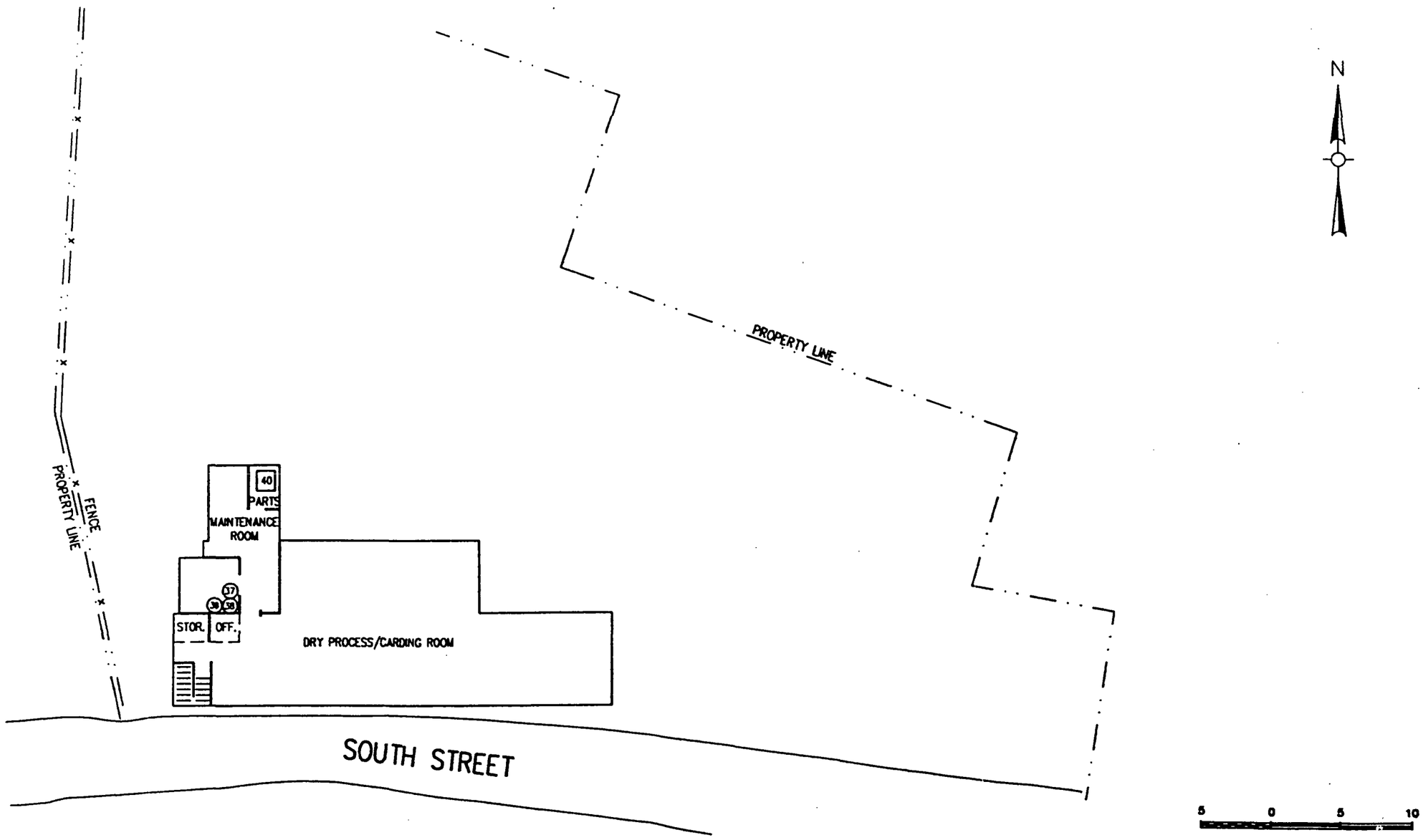


FIG 3
FLOOR 2
SOUTH STREET SITE
WALPOLE, MASS.

3\8911\FLOOR2 1)1

APPENDIX B.4

No. 6 Fuel Oil Release History

MEMORANDUM FOR THE RECORD May 23, 1983

TO: Paul Anderson PRA

FROM: Ernie Penta

SUBJECT: Oil Spill at Kendall Co.
Walpole (South Street Plant)

I checked with Jim Joy Plant Engineer and found out that a faulty diaphram of an oil pressure regulator let go and #6 got in to a storm drain. Approximately ten gallons was spilled and contained in a storm drain. He put down pads and has called in Cyn-Oil to proceed with the clean-up. Check the storm drain system where it goes into the sewage system and that was clean. No further action is necessary.

EP/jb

MEMORANDUM

To: Paul Anderson

FROM: Ernie Penta

DATE: 8/2/83

SUBJECT: Oil Spill at Kendall Co.
South Streeet Walpole

On July 18, 1983 this writer checkeda #6 oil (approximately 50 gals) oil spill that occurred when a valve let go in the heating line according to Mr. Jim Joy engineer of Kendall Co. They put absorbing pads into the storm drains before it would get into a nearby brook. Cyn Oil was called in for the cleanup.

I went back on July 28, for final inspection and found it o.k. No further action needed.

EP/jb

KENDALL
REGULATORY AFFAIRS

ONE FEDERAL STREET, BOSTON, MASSACHUSETTS 02101 • (617) 423-2000
CABLE: KENDALL
TELEX 94-0503

MAR 6 1984
DEPT OF ENVIRONMENTAL

March 1, 1984

Mr. John Duggan
Mass. Department of Environmental Quality Engineering
323 New Boston Street
Woburn, MA 01801

Ref. 1: Kendall Company, South Street, Walpole - Oil Spill
October 8-10, 1983

Ref. 2: Your letter dated 1/24/84 requesting Kendall's intentions for final disposition of soil presently stockpiled at the Kendall Company, South Street Walpole site.

Dear Mr. Duggan:

Since our analytical work and the resulting decision of your office to classify the referenced soil as a solid waste, we have investigated several options for disposal. Although approved disposal sites are available local boards of health are slow to approve this project because they are not confident that it is legal or environmentally sound. If the Department feels we must dispose of this soil immediately, we will be forced to ship to distant or out-of-state sites at considerable cost. We feel we could eventually provide the required assurance to boards of health if given time to make a comprehensive presentation.

As an alternative to the landfill approach, however, we propose to spread the soil over the existing asphalt surface parking area at the South Street plant and then resurface with a new coating of asphalt. This approach would present no environmental threat and would correct a parking area surface deficiency which would not be cost justified otherwise.

If you feel this is acceptable to the Department, we will provide any additional engineering detail of the project you may require.

Sincerely,

Charles J. Cole

Charles J. Cole, P.E.
Manager of Regulatory Affairs

cc: J. Publicover
Walpole Plant Engineer

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
223 - New Boston Street, Woburn, MA 01801

ANTHONY D. CORTESE, Sc.D.
Commissioner
727-5194

935-2160

January 24, 1984

Kendall Company
One Federal Street
Boston, Ma 02101

Attention: Charles J. Cole

Dear Mr. Cole:

This letter is in regard to the final disposition of the soil presently stockpiled at the Kendall Company on South Street in Walpole. This soil was stockpiled as a result of the cleanup of the No. 6 Fuel Oil Spill that occurred on October 8-10 1983. This soil was analyzed by Sias Research Laboratories for Flashpoint, % Oil and Grease and EP Toxicity (metals).

Since these results indicate an oil and grease content of 0.4% dry weight and Flashpoint and EP Toxicity values within acceptable limits, this material is being classified as a solid waste. Proper disposal options include:

(1) Disposal at a site specifically established for this Solid waste which has been assigned pursuant to MGL Chapter 111, Section 150A, and approved by the Department in accordance with 310 CMR 19.00 the "Regulations for the Disposal of Solid Waste by Sanitary Landfill.

(2) Disposal at an existing approved landfill under the conditions that the material is used as a daily cover material in an area that will again be covered the next day during the normal operation of the landfill. Due to these handling requirements, the material is subject to 310 CMR 19.16 of the "Regulations for Disposal of Solid Waste by Sanitary Landfill." Such special disposal requires the permission of the local assigning agency which is usually the Board of Health of the Community where the disposal is to occur.

You are requested to inform this office within ten days of receipt of this letter of the actions you intend to take in the removal of this soil.

If you have any questions with regard to this letter, please contact Jack Duggan at 935-2160.

Very truly yours,

Richard J. Chalpin
Deputy Regional Environmental Engineer

RJC/Ejd/erc
cc: James Colman, DHW, One Winter St., Boston, Ma 02108

Regional Case Referral No. _____

DEQE OIL AND HAZARDOUS MATERIAL SPILL/RELEASE INCIDENT
INITIAL INSPECTION REPORT

1. REGION NERO
2. MUNICIPALITY WALPOLE
3. ADDRESS KENDALL CO.
SOUTH ST

4. INCIDENT 1st REPORTED to DEQE
Date 10/10 Time 7:30 A.M./P.M.
5. INCIDENT OCCURRED
Date 10/10 Time 9:00 A.M./P.M.

6. PERSON who 1st NOTIFIED DEQE
Name Jim Joy
Address KENDALL
Telephone No. 668-0175

7. OIL or HAZARDOUS MATERIAL RELEASED
a. Specify name(s), quantity(ies), type & capacity of container(s)
~1000GAL #6 OIL INTO S. DRAIN INTO DRAINAGE DITCH.

b. Total number of samples obtained —
c. CHAIN OF CUSTODY RECORD completed for each sample obtained ___ Yes ___ No

8. BRIEF DESCRIPTION of SPILL RELEASE INCIDENT
VALVE FAILURE AT 10,000GAL TANK HOLDING #6 OIL - ~1000GAL SPILLED INTO S. DRAIN → DRAINAGE DITCH BEFORE NOTICED @ 9:00AM SPILL CONTAINED 30YDS BEFORE NEPONSET RIVER. SOME OIL SPILLED IN BLDG. DUE TO VALVE FAILURE. CONTAINED AT ~~DIR~~ DIKE BEFORE SEWER (~25GAL)

9. POTENTIALLY RESPONSIBLE PERSON IDENTIFIED by DEQE
Name KENDALL CO.
Telephone No. 668-0175
Address SOUTH ST.
Agent/Contact Jim Joy
Telephone No. _____

10. VERBAL NOTICE OF RESPONSIBILITY ACCOMPANIED BY WRITTEN SYNOPSIS OF M.G.L.c.21E
Date _____ Time _____ A.M./P.M.

11. RESPONSE to SPILL/RELEASE INCIDENT
a. Spill source identified ✓ Yes ___ No
b. Responsibility accepted ✓ Yes ___ No
c. Name of cleanup contractor hired by responsible person Cyn Oil
d. Name of cleanup contractor hired by DEQE — (617) 344-0265
Date & Time contractor notified AM 10/9 Date & Time of on-scene arrival AM 10/
e. Enforcement action(s) recommended (check appropriate action(s))
Cost recovery ___ Civil penalty ___ Injunction ___
Administrative order ___ Other ___ None applicable ✓

12. AGENCIES NOTIFIED by DEQE of SPILL/RELEASE INCIDENT
Name _____ Tel. No. _____ Date & Time _____
Name _____ Tel. No. _____ Date & Time _____

Report prepared by _____
Signature Title

Tentatively 15-20 LOADS

KENDALL
REGULATORY AFFAIRS

ONE FEDERAL STREET, BOSTON, MASSACHUSETTS 02101 • (617) 423-2000
CABLE: KENDALL
TELEX 94-0503

December 30, 1983

5 1984
DEPT. OF ENVIRONMENTAL
QUALITY

Mr. John Duggan
Massachusetts Department of Environmental Quality Engineering
323 New Boston Street
Woburn, MA 01801

Ref: Kendall Company, South Street, Walpole - Oil Spill
October 8-10, 1983

Dear Mr. Duggan:

This letter will confirm our telephone conversation about the referenced subject and about the subsequent analytical work on the soils removed from the spill site.

I have attached a report from the Lahey Clinic Research group describing their site sampling technique and results of the required analyses.

It is our understanding that this information will permit the D.E.Q.E. to classify the spill site soils as to degree of contamination by No. 6 fuel oil. By classifying the soil, the D.E.Q.E. is informing us as to what uses or to what types of landfill applications we can transfer these soils.

At present these soils remain stacked on polyethylene in a 42'X27'X4½' (ave) pile in the South Street plant yard. When D.E.Q.E. gives Kendall a formal classification of these soils, we will determine final disposition and inform D.E.Q.E. for concurrence.

Sincerely,

Charles J. Cole

Charles J. Cole, P.E.
Manager of Regulatory Affairs

djd

cc: J. Publicover
Walpole Plant Engineer

SIAS RESEARCH LABORATORIES
LAHEY CLINIC MEDICAL CENTER
41 MALL ROAD
BURLINGTON, MASSACHUSETTS 01803

AREA CODE 617 273-5100
CABLE ADDRESS "LAHEYCLIN"

November 24, 1983

Mr. Charles J. Cole
Manager of Regulatory Affairs
Kendall Company
1 Federal Street
Boston, MA 02101

Dear Mr. Cole:

Enclosed are the Results of Analyses for the Kendall Walpole South Street Plant sand pile. A composite sample of the pile was obtained on November 15, 1983.

The pile was sub-divided into a measured 50 square grid. Twenty-five core samples were obtained from various squares as dictated by a random numbers table (see attached drawing).

A 1¼" diameter stainless steel tube fitted with handles and a strike plate was utilized to retrieve the samples. The cores were typically three to six feet deep depending on the slope, depth, and location of the designated square. The individual cores were composited and mixed into a uniform sample for the analyses.

The values for metals represent EPA-Extraction Procedure extract levels.

If there are any questions regarding the analyses or if we may be of additional assistance, please feel free to call.

Yours truly,

Robert L. Imbaro

Robert L. Imbaro
Senior Research Technologist

RLI:nje

SIAS RESEARCH LABORATORIES
LAHEY CLINIC MEDICAL CENTER
41 MALL ROAD
BURLINGTON, MASSACHUSETTS 01803

AREA CODE 617 273-5100
CABLE ADDRESS "LAHEYCLIN"

RESULTS OF ANALYSES

Kendall Company Walpole South Street Plant
Sand Pile Composite Sample

Sample Dates: November 15, 1983

Sampled By: Robert L. Imbaro

Report Date: November 1983

Parameter	Value
pH	6.60
Total Solids	87.6%
Flash Point	> 140°F
Oil & Grease	3960, mg/kg, dry wt. (0.4% dry wt)
*Metals:	
Arsenic	< 0.002
Barium	< 0.1
Cadmium	< 0.01
Chromium	< 0.05
Lead	0.1
Mercury	0.0002
Selenium	< 0.002
Silver	< 0.01

*EP extract, mg/l

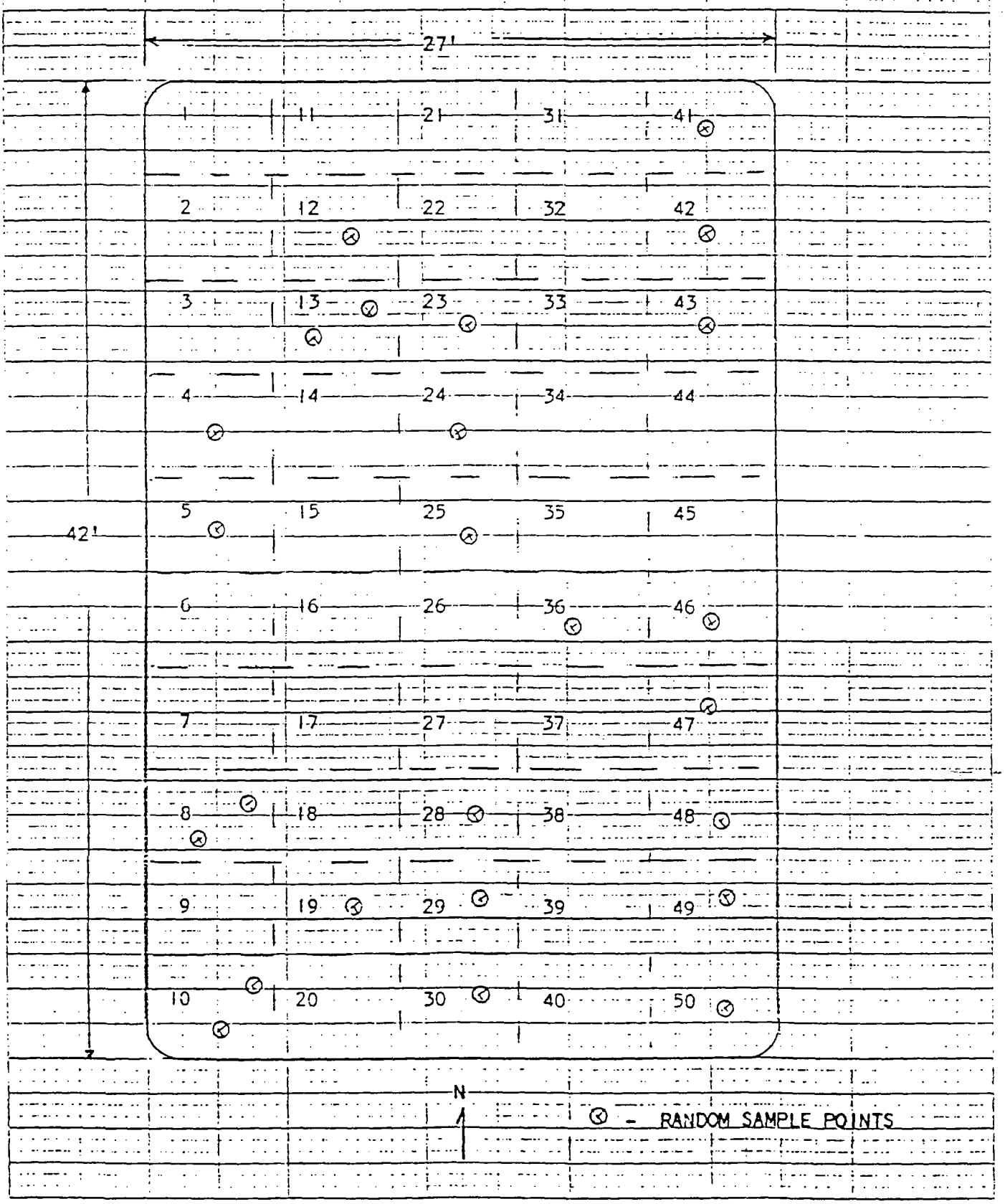
William A. Curby
Head: Sias Biophysics Unit

KENDALL COMPANY WALPOLE SOUTH STREET PLANT

NOVEMBER 1983

SAND PILE SAMPLING GRID

SIAS LABS



APPENDIX B.5

UST and AST – Related Correspondence

THE COMMONWEALTH OF MASSACHUSETTS

Town of Walpole

FIRE DEPARTMENT

FIRE PREVENTION DIVISION

PERMIT FOR STORAGE OF FUEL OIL

Stoffer

In accordance with provisions of Chapter 148, General Laws, and amendments thereto and Regulations made under authority thereof.

Name General Fibre (owner or occupant) Name F.L. Fraser Eng. Co. (Installer)

Address 70 South St. Address

BURNER **STORAGE**

Name Clever Brooks Steam Gen. Type of Tank Oval

Manufacturer Clever Brooks Co. Capacity 5000 gals. (or) Size

Model No. or Size LF 8 Location Outside of Building

Type Gun Mass. Approval No. 678

Permit issued 9/23/54 expires (Head of Fire Department)

Fee Paid By A.H.Hill

This Permit must be Conspicuously Posted on Premises

FORM 245 HOBBS & WARREN, INC BOSTON

OIL BURNER RECORD

Stoffer

NAME General Fibre
OWNER OR OCCUPANT

ADDRESS South St.

DESCRIPTION NAME Clever Brooks Steam Generator

MANUFACTURER Clever Brooks, Milwaukee, Wis.

BURNER: TYPE Gun MODEL OR SIZE LF 8

LOCATION Boiler Rm. MASS. APPROVAL NO. 678

STORAGE TANK: TYPE Oval CAPACITY 5000 GALS. (OR) SIZE

LOCATION Outside of Building

AMOUNT OF FUEL REQUIRED FOR TESTING PURPOSES 50 GALS.

APPL. REC'D. F.L.Fraser Eng. Co.

PERMIT ISSUED BY F.L.Fraser

PERMIT NO. ADDRESS 63 Court St.

STORAGE PERMIT CERTIFICATE OF COMPETENCY NO. 5818

A.H.Hill
HEAD OF FIRE DEPARTMENT

Form FP-2. 10M-4-64-93773c

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

June 23, 1969
(City or Town) (Date)

APPLICATION FOR LICENSE

For the lawful use of the herein described building ... or other structure...., application is hereby made in accordance with the provisions of Chapter 148 of the General Laws, for a license to use the land on which such building.... or other structure.... is/are or is/are to be situated, and only to such extent as shown on plot plan which is filed with and made a part of this application.

Shaffner

Location of land South Street (Street & Number) Nearest cross street Common Street

Owner of land Kendall Co. Address 24 West Street

Number of buildings or other structures to which this application applies One

Occupancy or use of such buildings Oil Storage

Total capacity of tanks in gallons:—Aboveground None Underground 20,000.

Kind of fluid to be stored in tanks #6 Fuel Oil

Approved ~~Disapproved~~ 6/24 1969

Robert Gardner Chief
(Head of Fire Dept.)
by - Chester Donnell Ass't Chief

Kendall Co. Raymond E. Fiske
(Signature of Applicant)

24 West Street
(Address)

BUILDING PERMIT

JOB WEATHER CARD

DATE [redacted] 19 [redacted] PERMIT NO. [redacted]

APPLICANT [redacted] ADDRESS [redacted] (NO.) (STREET) (CONTR'S LICENSE)

PERMIT TO [redacted] (TYPE OF IMPROVEMENT) (____) NO. STORY (PROPOSED USE) NUMBER OF DWELLING UNITS

AT (LOCATION) [redacted] (NO.) (STREET) ZONING DISTRICT

BETWEEN (CROSS STREET) AND (CROSS STREET)

SUBDIVISION LOT BLOCK LOT SIZE

BUILDING IS TO BE FT. WIDE BY FT. LONG BY FT. IN HEIGHT AND SHALL CONFORM IN CONSTRUCTION

TO TYPE USE GROUP BASEMENT WALLS OR FOUNDATION (TYPE)

REMARKS: [redacted]

AREA OR VOLUME (CUBIC/SQUARE FEET) ESTIMATED COST $ [redacted] PERMIT FEE $ [redacted]

OWNER [redacted]

ADDRESS [redacted]

BUILDING DEPT.

FORM NO. BOCA-BP 1969

THIS PERMIT CONVEYS NO RIGHT TO OCCUPY ANY STREET, ALLEY OR SIDEWALK OR ANY PART THEREOF, EITHER TEMPORARILY OR PERMANENTLY. ENCROACHMENTS ON PUBLIC PROPERTY, NOT SPECIFICALLY PERMITTED UNDER THE BUILDING CODE, MUST BE APPROVED BY THE JURISDICTION. STREET OR ALLEY GRADES AS WELL AS DEPTH AND LOCATION OF PUBLIC SEWERS MAY BE OBTAINED FROM THE DEPARTMENT OF PUBLIC WORKS. THE ISSUANCE OF THIS PERMIT DOES NOT RELEASE THE APPLICANT FROM THE CONDITIONS OF ANY APPLICABLE SUBDIVISION RESTRICTIONS.

MINIMUM OF THREE CALL INSPECTIONS REQUIRED FOR ALL CONSTRUCTION WORK:
1. FOUNDATIONS OR FOOTINGS.
2. PRIOR TO COVERING STRUCTURAL MEMBERS (READY TO LATH).
3. FINAL INSPECTION BEFORE OCCUPANCY.

APPROVED PLANS MUST BE RETAINED ON JOB AND THIS CARD KEPT POSTED UNTIL FINAL INSPECTION HAS BEEN MADE. WHERE A CERTIFICATE OF OCCUPANCY IS REQUIRED, SUCH BUILDING SHALL NOT BE OCCUPIED UNTIL FINAL INSPECTION HAS BEEN MADE.

WHERE APPLICABLE SEPARATE PERMITS ARE REQUIRED FOR ELECTRICAL, PLUMBING AND MECHANICAL INSTALLATIONS.

POST THIS CARD SO IT IS VISIBLE FROM STREET

BUILDING INSPECTION APPROVALS	PLUMBING INSPECTION APPROVALS	ELECTRICAL INSPECTION APPROVALS
	1	1
	2	2
3	HEATING INSPECTING APPROVALS	REFRIGERATION INSPECTION APPROVALS
	1	1
OTHER	2	2

WORK SHALL NOT PROCEED UNTIL THE INSPECTOR HAS APPROVED THE VARIOUS STAGES OF CONSTRUCTION.

PERMIT WILL BECOME NULL AND VOID IF CONSTRUCTION WORK IS NOT STARTED WITHIN SIX MONTHS OF DATE THE PERMIT IS ISSUED AS NOTED ABOVE.

INSPECTIONS INDICATED ON THIS CARD CAN BE ARRANGED FOR BY TELEPHONE OR WRITTEN NOTIFICATION.

The Commonwealth of Massachusetts

RECEIVED JUL 0 6 1999

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: April 14, 1987

TO: HEAD OF FIRE DEPARTMENT
Walpole
City or Town

F.D.I.D.# 21307

C.82 S.40 M.G.L.

DIG SAFE NUMBER
871-51-747
Start Date: April 17-20

In accordance with the provisions of Chapter 148, G.L., as provided in Section 38A, Application is hereby made

by: P. Shaffer Family Trust
Name of Person, Firm or Corporation

152 Hampden St.
Street Address

Roxbury, MA
City State

445-3900
Telephone

5/4-87

for permission to remove and transport underground steel storage tank(s) from

Former Kendall property - South Street, Walpole
Name of Facility

5000 Spent sulfuric
Address

to approved Tank Yard #: 149-01 (Tombarello)

Size of Tank(s): 1-20,000 gal #6 fuel; 2-10,000 gal caustic; 2-5,000 waste H_2SO_4; 2-3500 gal H_2SO_4; 1-9,000 gal H_2O_2

Contents: Spent sulfuric

Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

(7)

Date issued/rejected 5-4 1987

By: P. Shaffer TRUSTEE
Signature of Applicant

Date of expiration 5-15-87 19 (paid/due) 200.00

.....

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: 5-5-87

TO: HEAD OF FIRE DEPARTMENT
Walpole
City or Town

F.D.I.D.# 21307

C.82 S.40 M.G.L.

DIG SAFE NUMBER
871209 55
Start Date:

In accordance with the provisions of Chapter 148, G.L., as provided in Section 38A, Application is hereby made

by: Philip Shaffer Family Trust
Name of Person, Firm or Corporation

152 Hampden St.
Street Address

Roxbury, MA
City State

445-3900
Telephone

for permission to remove and transport underground steel storage tank(s) from

#80 South Street Walpole
Name of Facility

1-1000
1-5000
Address

to approved Tank Yard #: 149-01

Size of Tank(s): ~~2@1000 gal~~

Contents: Diesel

Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Kenneth A. Tarbell, P. E.
131 Parker Street
Lowell, Massachusetts 01851
(617) 458-4749

TUE MAR 17, 1987

Leonard Anderson, Chief
Fire Department
Walpole, MA

Re: Tanks at former Kendall Properties, South Street.

Dear Chief Anderson:

This is to notify you that since I last wrote to you regarding the tanks at the South Street site, the owners have received several proposals for the removal of the tanks on the property, and have contracted with Clean Harbors, Inc. to accomplish the removal of these tanks as part of the general clean-up of the area. This will include the asbestos dump area and the area south of the buiding where ground water investigations will be undertaken to determine the sources of oils and caustics found in the area.

The tanks to be removed are:

1- 20,000 gal. #6 fuel oil tank
2- 20,000 gal caustic soda tanks
1- 9,000 gal hydrogen peroxide tank
2- 3,500 gal sulfuric acid tanks
? 2- 5,000 gal spent sulfuric acid tanks
2- 1,000 gal diesel fuel tanks (east of South Street)

This work is planned to begin in the Spring, as soon as weather permits removal and testing. Since this project must be scheduled to coincide with other work on the property, an exact start date can not be given at this time; however, I expect most of this work will be under way sometime in April.

We have not planned at this time to remove the existing 10,000 gallon tank installed in 1979, and I will be contacting you in the next few days to discuss proper securing And registration of this tank.

Sincerely,

Kenneth A. Tarbell

Kenneth A. Tarbell

KAT/kt
cc: Board of Health, Walpole, MA
DEQE, Woburn

Name and Address of Approved Tank Yard _____ Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8-88-295

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature _____ Date signed 5/25/87

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

Form F.P. 291 OVER

SHAFFER REALTY SOUTH ST WALPOLE MA 02316

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

F.D.I.D.# 21307

PERMIT

Date: 5-4-87

FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DIG SAFE NUMBER

Start Date: _____

In accordance with the provisions of Chapter 148, G.L., as provided in Section 38A, this permit is granted to:

Name: Clean Harbors Inc. (Full name of person, firm or corporation)

Sent separately

to transport underground steel storage tank(s) to Approved Tank Yard # 1419-01

From: Shaffer Realty South St, Walpole (Name, Address)

Steel Tank: Nitrogen (Type of inert gas used)

Clean Harbors Inc Braintree MA (Name and Address of Contractor disposing tank)

Tom Barrell - Lawrence 1419-01 (Location to which tank will be transported, Tank Yard #)

This permit will expire: 5/15 pd 7 Leonard Fiske

CHIEF ENG.

Name and Address of
Approved Tank Yard

Approved Tank
Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8701024

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

5/6/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL

MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

Form F.P. 291 OVER

RECEIPT OF DISPOSAL OF UNDERGROUND STEEL STORAGE TANK

Name and Address of
Approved Tank Yard

Approved Tank
Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8701023

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

5/6/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSA

MASSACHUSETTS STATE FIRE MARSHAL'S OFFIC

Form F.P. 291 OVER

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

F.D.I.D.# 21307

PERMIT

Date: 5/5/87

FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DIG SAFE NUMBER
871209[illegible]
Start Date: 5/5/87

In accordance with the provisions of Chapter 148, G.L. as provided in Section 38A, this permit is granted to:

Name: CLH
Full name of person, firm or corporation

to transport underground steel storage tank(s) to Approved Tank Yard # 149-01

From: Shipyard 80 South
Name Address

Steel Tank: CO_2
Type of inert gas used

CLH
Name and Address of Contractor disposing tank

Frank Barcelo - Lawrence 149-01
Location to which tank will be transported Tank Yard #

This permit will expire: 5-7-87 19

Name and Address of Approved Tank Yard _____

Approved Tank Yard No. 149-01

Tank Yard Ledger 502 CMR 3.03(4) Number: 87-009-88

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature _____ Date signed 5/1/87

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: April 14, 1987

TO: HEAD OF FIRE DEPARTMENT Walpole (City or Town) F.D.I.D.# 21307

C.32 S.40 M.G.L.

DIG SAFE NUMBER 871-51-747 Start Date: April 17-20

In accordance with the provisions of Chapter 148, G.L., as provided in Section 39A, Application is hereby made

By: P. Shaffer Family Trust (Name of Person, Firm or Corporation) 152 Hampden St. (Street Address)

Roxbury, MA (City, State) 445-3900 (Telephone)

for permission to remove and transport underground steel storage tank(s) from

Former Kendall property - South Street, Walpole (Name of Facility) 120 [illegible] Fuel (Address)

to approved Tank Yard #: 149-01 (Tomarello) Size of Tank(s): 1-20,000 gal #6 fuel; 2-10,000 gal caustic; 2-5,000 waste H2SO4; 2-350 gal H2SO4; 1-9,000 gal H2O2

Contents: _____ Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Date issued/rejected 4/29 1987 By: P. Hoffer Trus

Date of expiration 5/4 - 5/7 Signature of Applicant

3

Name and Address of Approved Tank Yard _____

Lawrence, MA 01841

Approved Tank Yard No. 149-01

Tank Yard Ledger 502 CMR 3.03(4) Number: 8200990

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature _____ Date signed 5/26/87

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: April 14, 1987

TO: HEAD OF FIRE DEPARTMENT Walpole (City or Town) F.D.I.D.# 21307

C.22 S.40 M.G.L.

DIG SAFE NUMBER 871-51-747 Start Date: April 17-20

In accordance with the provisions of Chapter 148, G.L., as provided in Section 38A, Application is hereby made

by: P. Shaffer Family Trust (Name of Person, Firm or Corporation) 152 Hampden St. (Street Address)

Roxbury, MA (City, State) 445-3900 (Telephone)

for permission to remove and transport underground steel storage tank(s) from Former Kendall property - South Street, Walpole (Name of Facility) (Address) 1927 8000 Gal Storage 1-20,000 gal #6 fuel 2-10,000 gal caustic 2-15,000 waste H2SO4 2-3500 gal H2SO4 1-9,000 gal H2O2

to approved Tank Yard #: 149-01 (Tomborello) Size of Tank(s):

Contents: _____ Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Date issued/rejected 5/1 1987 By: _____ (Signature of Applicant)

Date of expiration 5/1 1987 Fee (paid/due) _____

(4)

Name and Address of Approved Tank Yard _____

Approved Tank Yard No: 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 2200222

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature _____ Date signed 5/11/87

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPO

MASSACHUSETTS STATE FIRE MARSHAL'S OFF

Form F.P. 291 OVER

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: April 14, 1987

TO: HEAD OF FIRE DEPARTMENT Walpole (City or Town) F.D.I.D.# 21307 C.89 S.40 M.G.L.

DIG SAFE NUMBER 871-51-747 Start Date: April 17-20

In accordance with the provisions of Chapter 148, G.L., as provided in Section 38A, Application is hereby made

by: P. Shaffer Family Trust (Name of Person, Firm or Corporation) 152 Hampden St. (Street Address)

Roxbury, MA (City, State) 445-3900 (Telephone)

for permission to remove and transport underground steel storage tank(s) from 1927 Stoco Acid

Former Kendall property - South Street Walpole (Name of Facility) (Address)

to approved Tank Yard #: 149-01 (Tombarello) Size of Tank(s): 1-20,000 gal #6 fuel; 2-10,000 gal caustic; 3-5,000 waste H2SO4; 2-3500 gal H2SO4; 1-9,000 gal H2O2

Contents: _____ Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing Tank: Clean Harbors

Date issued/rejected 5/1 1987 By: [signature] (Signature of Applicant)

Date of expiration 5-14-87 (Period/days)

Name and Address of Approved Tank Yard [illegible]
Lawrence, MA [illegible]

Approved Tank Yard No. 149-01

Tank Yard Ledger 502 CMR 3.03(4) Number: 8-20-9-81

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21300 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

5/11/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21300 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

Form F.P. 291

OVER

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: April 14, 1987

TO: HEAD OF FIRE DEPARTMENT
Walpole
City or Town

F.D.I.D.#
21300

C.32 S.40 M.G.L.

DIG SAFE NUMBER
871-51-747
Start Date: April 17-20

In accordance with the provisions of Chapter 148, G.L., as provided in Section 39A, Application is hereby m

by: P. Shaffer Family Trust
Name of Person, Firm or Corporation

152 Hampden St.
Street Address

Roxbury, MA
City State

445-3900
Telephone

for permission to remove and transport underground steel storage tank(s) from

Former Kendall property - South Street, Walpole
Name of Facility

1927
(5000 Acid)
Address

to approved Tank Yard #: 149-01 (Tomborello)

Size of Tank(s): 1 - 20,000 gal #6 fuel
2 - 10,000 gal caustic
2 - 5,000 waste H_2SO_4
2 - 35 gal H_2SO_4
1 - 9,000 gal H_2O_2

Contents:

Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Date issued/rejected 4-5-1 1987

By: [illegible]
Signature of Applicant

Date of expiration 4-5-87
(Initials)

Name and Address of
Approved Tank Yard _____

Approved Tank
Yard No. 149-01

Tank Yard Ledger 502 CMR 3.03(4) Number: 8200951

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21302 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

4/28/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21302 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSA

MASSACHUSETTS STATE FIRE MARSHAL'S OFFIC

Form F.P. 291

OVER

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: April 14, 1987

TO: HEAD OF FIRE DEPARTMENT
Walpole
City or Town

F.D.I.D.#
21307

C.82 S.40 M.G.L.

DIG SAFE NUMBER
871-51-747
Start Date: April 17-20

In accordance with the provisions of Chapter 148, G.L., as provided in Section 38A, Application is hereby mad

by: P. Shaffer Family Trust
Name of Person, Firm or Corporation

152 Hampden St.
Street Address

Roxbury, MA
City State

445-3900
Telephone

for permission to remove and transport underground steel storage tank(s) from

Former Kendall property - South Street, Walpole
Name of Facility

20,000 Fed
Address

to approved Tank Yard #: 149-01 (Tombarello)

Size of Tank(s): 1 - 20,000 gal #6 fuel
2 - 10,000 gal caustic
2 - 5,000 waste H_2SO_4
2 - 3500 gal H_2SO_4
1 - 9,000 gal H_2O_2

Contents:

Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Date issued/rejected 4-28 1987

Date of expiration 5-4-87

By: P. Shaffer TRUS
Signature of Applicant

(1)

Name and Address of Approved Tank Yard _____

Approved Tank Yard No.: 149-01

Tank Yard Ledger 502 CMR 3.03(4) Number: 8700946

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature _____ Date signed 4/29/87

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOS

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFI

SOUTH ST. WALPOLE MA

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT FOR REMOVAL AND TRANSPORTATION TO APPROVED TANK YARD

DATE: April 14, 1987

TO: HEAD OF FIRE DEPARTMENT Walpole (City or Town) F.D.I.D.# 21307

C.82 S.40 M.G.L.

DIG SAFE NUMBER 871-51-747
Start Date: April 17-20

In accordance with the provisions of Chapter 148, G.L., as provided in Section 38A, Application is hereby m

by: P. Shaffer Family Trust (Name of Person, Firm or Corporation) 152 Hampden St. (Street Address)

Roxbury, MA (City, State) 445-3900 (Telephone)

for permission to remove and transport underground steel storage tank(s) from 20,000 caustic

Former Kendall property - South Street, Walpole (Name of Facility) Address

to approved Tank Yard #: 149-01 (Tombarello) Size of Tank(s): 1 - 20,000 gal #6 fuel; 2 - 10,000 gal caustic; 2 - 5,000 waste H_2SO_4; 2 - 3500 gal H_2SO_4; 1 - 9,000 gal H_2O_2

Contents: _____ Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Date issued/rejected 4-29 1987 By: _____ Signature of Applicant

Date of expiration 5-4-87 Fee paid/due 200.00

(2)

F.P.6 REV. 3/84

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT

_____ 19
(Date)

C.82 S.40 M.G.L.

DIG SAFE NUMBER
— — — — — — — — — —
Start Date _____

To: HEAD OF FIRE DEPARTMENT
Walpole
City or Town

In accordance with the provisions of Chapter 148, G.L. as provided in Sec. _____ application is hereby made By

Name Philip Shaffer Family Trust
(Full name of person, firm or corporation)

Address 152 Hampden Street, Roxbury, MA
(Street or P.O. Box) (City or Town)

State clearly purpose for which permit is requested: for permission to maintain empty 10,000 gallon fuel tank at former Kendall property on South Street.

at South Side of South Street

Name of competent operator _____ Cert. No. _____
(If applicable)

Date issued—rejected _____ 19 By _____

Date of expiration _____ 19 Fee $10.00 Paid Due

(Signature of applicant) Trustee

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

C.82 S.40 M.G.L. 1010 COMMONWEALTH AVENUE, BOSTON

DIG SAFE NUMBER
— — N/A — — — — —
Start Date _____

Walpole June 15, 19 87
(City or Town) (Date)

PERMIT

In accordance with the provisions of Chapter 148, G. L. as provided in 10-A

this permit is granted to

Name Philip Shaffer Family Trust
(Full name of person, firm or corporation granted permit)

State clearly purpose for which permit is granted: to maintain an empty 10,000 fuel oil tank, vaulted, installed in 1982

Restrictions: Must comply with 527 CMR 9.00, prior to activating tank. Re: testing, permit to store

at South Street, Walpole Mass. (former Kendall property)
(Give location by street and no., or describe in such manner as to provide adequate identification of location)

Fee Paid $ 10.00

(Signature of official granting permit)

This permit will expire 6/15 19 89

(Title)

(THIS PERMIT MUST BE CONSPICUOUSLY POSTED UPON THE PREMISES.)

RECEIPT OF DISPOSAL OF UNDERGROUND STEEL STORAGE TANK

State of Massachusetts

SOUTH ST. Walpole

Name and Address of Approved Tank Yard: JOHN B. TOMBARELLO & SONS, INC.
[illegible] Merrimack Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8700988

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

5/1/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

City

For permission to remove and transport underground steel storage tank(s) from

Former Kendall property - South Street, Walpole — 20,000 Fuel
Name of Facility — Address

To approved Tank Yard #: 149-01 (Tombarello)

Size of Tank(s): 1 - 20,000 gal #6 fuel; 2 - 10,000 gal caustic; 2 - 5,000 waste H_2SO_4; 2 - 3500 gal H_2SO_4; 1 - 9,000 gal H_2O_2

Contents:

Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Date issued/rejected 4/29 1987 By: [illegible] TRUSTEE

Date of expiration 5/4-87 19 paid/due 200.00 Signature of Applicant

3

RECEIPT OF DISPOSAL OF UNDERGROUND STEEL STORAGE TANK

Name and Address of Approved Tank Yard: JOHN B. TOMBARELLO & SONS, INC.
[illegible] Merrimack Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8701023

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

5/6/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

SHAFER REALTY
80 SOUTH ST.
WALPOLE MA.

Name and Address of Contractor disposing Tank

Tom Barello - Lawrence — 149-01
Location to which tank will be transported — Tank Yard #

This permit will expire: 5-7-87 19

...STORAGE TANK ...Commonwealth of Massachusetts SOUTH ST. WALPOLE ...NTION

...ddress of JOHN C. TOMBARELLO & SONS, INC.
pproved Tank Yard 207 Marston Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

ank Yard Ledger 502 CMR 3.03(4) Number: 8200982

certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or artnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving nderground Steel Storage Tank dismantling yards. A valid permit was issued by OCAL Head of Fire Department FDID#21307 to transport this tank to this yard. me and official title of approved tank yard owner or owners authorized -presentative:

Signature

5/12/87
Date signed

is signed receipt of disposal must be returned to the local head of the fire epartment FDID#21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

...m F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

City State

For permission to remove and transport underground steel storage tank(s) from

Former Kendall property - South Street, Walpole
Name of Facility Address

1 - 20,000 gal #6 fuel
2 - 10,000 gal caustic
2 - 5,000 waste H_2SO_4
2 - 3500 gal H_2SO_4
1 - 9,000 gal H_2O_2

Size of Tank(s):

To approved Tank Yard #: 149-01 (Tombarello)

Type of Inert Gas Used: Nitrogen

Contents:

Name of Person, Firm, Corporation disposing tank: Clean Harbors

By: Signature of Applicant TRUSTEE

Date issued/rejected 5/1 1987

Date of expiration 5/4 87

RECEIPT OF DISPOSAL OF UNDERGROUND STEEL STORAGE TANK ...Commonwealth of Massachusetts 5000 ...NTION

Name and Address of Approved Tank Yard JOHN C. TOMBARELLO & SONS, INC.
207 Marston Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8200990

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID#21307 to transport this tank to this yard. ame and official title of approved tank yard owner or owners authorized representative:

Shatter SOUTH ST WALPOLE

Signature

5/12/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID#21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

City State

For permission to remove and transport underground steel storage tank(s) from

Former Kendall property - South Street, Walpole
Name of Facility Address

1 - 20,000 gal #6 fuel
2 - 10,000 gal caustic
2 - 5,000 waste H_2SO_4
2 - 3500 gal H_2SO_4
1 - 9,000 gal H_2O_2

Size of Tank(s): 8000 hydrogen

To approved Tank Yard #: 149-01 (Tombarello)

Type of Inert Gas Used: Nitrogen

Contents:

Name of Person, Firm, Corporation disposing tank: Clean Harbors

By: Signature of Applicant TRU

Date issued/rejected 5/1 1987

Name ~~and~~ Address of Approved Tank Yard: JOHN G. TOMBARELLO & SONS, INC.
207 Marston Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8200951

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID#21302 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature — Date signed 4/28/87

This signed receipt of disposal must be returned to the local head of the fire department FDID#21302 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

City State Telephone

for permission to remove and transport underground steel storage tank(s) from

Name of Facility: Former Kendall property - South Street, Walpole

Address: 20,000 Fuel

To approved Tank Yard #: 149-01 (Tombarello)

Size of Tank(s): 1 - 20,000 gal #6 fuel; 2 - 10,000 gal caustic; 2 - 5,000 waste H_2SO_4; 2 - 3500 gal H_2SO_4; 1 - 9,000 gal H_2O_2

Type of Inert Gas Used: Nitrogen

Contents:

Name of Person, Firm, Corporation disposing tank: Clean Harbors

By: TRUSTEE

Date issued/rejected 4-28 1987

Date of expiration 5-4-87 10 paid/due

(1)

RECEIPT OF DISPOSAL OF UNDERGROUND STEEL STORAGE TANK SOUTH ST - Walpole

Name and Address of Approved Tank Yard: JOHN G. TOMBARELLO & SONS, INC.
207 Marston Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8700981

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID#21302 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature — Date signed 5/11/87

This signed receipt of disposal must be returned to the local head of the fire department FDID#21302 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291 OVER MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

City State Telephone

1927

for permission to remove and transport underground steel storage tank(s) from

Name of Facility: Former Kendall property - South Street, Walpole

Address: 5000 Acid

To approved Tank Yard #: 149-01 (Tombarello)

Size of Tank(s): 1 - 20,000 gal #6 fuel; 2 - 10,000 gal caustic; 2 - 5,000 waste H_2SO_4; 2 - 3500 gal H_2SO_4; 1 - 9,000 gal H_2O_2

Type of Inert Gas Used: Nitrogen

Contents:

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Commonwealth of Massachusetts

UNDERGROUND STEEL STORAGE TANK

PREVENTION

Name and Address of Approved Tank Yard: JOHN C. TOMBARELLO & SONS, INC.
207 Marston Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8700964

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

4/30/87
Date signed

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291

OVER

MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

SOUTH ST. WALPOLE MA. 58 1316

Name and Address of Contractor: Tombarello Lawrence

Location to which tank will be transported

Tank Yard #

This permit will expire: 5/15 1987

Chief GWFD

RECEIPT OF DISPOSAL OF UNDERGROUND STEEL STORAGE TANK

Name and Address of Approved Tank Yard: JOHN C. TOMBARELLO & SONS, INC.
207 Marston Street
Lawrence, MA 01841

Approved Tank Yard No. 14901

Tank Yard Ledger 502 CMR 3.03(4) Number: 8700946

I certify under penalty of Law I have personally examined the underground steel storage tank delivered to this "approved tank yard" by firm, corporation or partnership Clean Harbors and accepted same in conformance with Massachusetts Fire Prevention Regulation 502 CMR 3.00 Provisions for Approving Underground Steel Storage Tank dismantling yards. A valid permit was issued by LOCAL Head of Fire Department FDID# 21307 to transport this tank to this yard. Name and official title of approved tank yard owner or owners authorized representative:

Signature

4/29/87
Date signed

SWAFFER REALTY SOUTH ST. WALPOLE MA

58 1316

This signed receipt of disposal must be returned to the local head of the fire department FDID# 21307 pursuant to 502 CMR 3:00. (EACH TANK MUST HAVE A RECEIPT OF DISPOSAL)

Form F.P. 291

OVER

MASSACHUSETTS STATE FIRE MARSHAL'S OFFICE

City: Norwood, MA State: Telephone:

For permission to remove and transport underground steel storage tank(s) from

Name of Facility: Former Kendall property - South Street, Walpole

Address: 28,000 caustic

Size of Tank(s): 1 - 20,000 gal #6 fuel; 2 - 10,000 gal caustic; 2 - 5,000 waste H_2SO_4; 2 - 3500 gal H_2SO_4; 2 - 9,000 gal H_2O_2

To approved Tank Yard #: 149-01 (Tombarello)

Contents:

Type of Inert Gas Used: Nitrogen

Name of Person, Firm, Corporation disposing tank: Clean Harbors

Date issued/rejected 4-29 1987

By: Signature of Applicant TRUSTEE

Date of expiration 5-4-87 19 paid/due

THE TOWN OF WALPOLE

Commonwealth of Massachusetts

FIRE DEPARTMENT
Leonard Anderson
Fire Chief

Telephone 668-0260

June 18, 1987

Mr. Kenneth A. Tarbell, P. E.
131 Parker Street
Lowell, Massachusetts 01851

Dear Mr. Tarbell:

Enclosed please find a permit to maintain an empty 10,000 gallon fuel tank on the Shaffer property located on South Street, Walpole. Note that prior to reactivation, tank must be tested and application for a permit to store fuel made.

Please keep us informed with regard to plans concerning removal of contaminated soil. Thank you in advance for your cooperation.

Yours very truly,

Leonard Anderson, Chief
Walpole Fire Department

cc: Health Agent

242/87
LA/bk

F.P.6 REV. 3/84

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

1010 COMMONWEALTH AVENUE, BOSTON

APPLICATION FOR PERMIT

_____ 19
(Date)

C.82 S.40 M.G.L.

DIG SAFE NUMBER
— — — — — — — — — —
Start Date _____

To: HEAD OF FIRE DEPARTMENT
Walpole
(City or Town)

In accordance with the provisions of Chapter 148, G.L. as provided in Sec. _____ application is hereby made By

Name Philip Shaffer Family Trust
(Full name of person, firm or corporation)

Address 152 Hampden Street, Roxbury, MA
(Street or P.O. Box) (City or Town)

State clearly purpose for which permit is requested: for permission to maintain empty 10,000 gallon fuel tank at former Kendall property on South Street.

at South Side of South Street

Name of competent operator _____ Cert. No. _____
(If applicable)

Date Issued—rejected _____ 19 By _____

Date of expiration _____ 19 Fee $10.00 Paid—Due

(Signature of applicant) TRUSTEE

The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC SAFETY—DIVISION OF FIRE PREVENTION

C.82 S.40 M.G.L. 1010 COMMONWEALTH AVENUE, BOSTON

DIG SAFE NUMBER
— — N/A — — — — —
Start Date _____

Walpole June 15, 19 87
(City or Town) (Date)

PERMIT

In accordance with the provisions of Chapter 148, G. L. as provided in 10-A

this permit is granted to

Name Philip Shaffer Family Trust
(Full name of person, firm or corporation granted permit)

State clearly purpose for which permit is granted: to maintain an empty 10,000 fuel oil tank, vaulted, installed in 1982

Restrictions: Must comply with 527 CMR 9.00, prior to activating tank. Re: testing, permit to store

at South Street, Walpole Mass. (former Kendall property)
(Give location by street and no., or describe in such manner as to provide adequate identification of location)

Fee Paid $ 10.00

(Signature of official granting permit)

This permit will expire 6/15 19 89

CHIEF
(Title)

(THIS PERMIT MUST BE CONSPICUOUSLY POSTED UPON THE PREMISES.)

Kenneth A. Tarbell, P. E.
131 Parker Street
Lowell, Massachusetts 01851
(617) 458-4749

FRI JUN 12, 1987

Ms. Lauri Jacobson
DEQE Regional Office
5 Commonwealth Avenue
Woburn, MA 01801

Re: Walpole: Progess report on "Oil Spill"

Dear Lauri:

This letter is to confirm the verbal report previously given regarding attempts to clean up the #6 oil encountered on the north side of the "Kendall" property on South Street on April 29. The "spill" was confirmed in a letter to Mr. Chalpin dated 4 May 1987, and a photocopy of same was provided to you at our meeting at your office on June 10.

As previously noted, the oil encountered upon removal of the old 20.000 gallon #6 fuel oil tank appears to be residue from leakage or overfill several years ago. In attempting to vacuum off the oil and remove the contaminated soil from the edges of the excavation, it became apparent that oil had travelled beyond the immediate area, and that other methods of removal would be required. Test holes dug in the areas west and north of the tank site indicated that oil migration was limited to a radius of 100-125 feet, and no oil contamination was found in test pits further out, or in the storm drains.

In view of the need for special handling of the affected soils, and the absence of any need for rapid removal, work has been temporarily suspended until a complete work plan can be developed, including proper handling of both clean and oil-contaminated materials.

As you know, CHI Engineering is engaged in preparing an extended work plan for this area, and we/they will keep you informed or our progess.

Sincerely,

Kenneth A. Tarbell

cc: CHI Eng., Inc.
Chief Anderson, Walpole F.D.

THE TOWN OF WALPOLE

Commonwealth of Massachusetts

FIRE DEPARTMENT
Leonard Anderson
Fire Chief

2 Stone Street
Walpole, MA 02081
Telephone (508) 668-0260

October 8, 1992

TO: Board of Health

FROM: Fire Chief

RE: South Street - former Kendall Mills Property

As of this date, the 10,000 gallon tank has been removed from this site and a large amount of #6 bunker fuel and water has been removed from the vault. The vault remains to be thoroughly cleaned of all fuel residue and in my opinion, the vault should be completely filled with gravel or some other material. If left as is this represents a serious hazard.

In addition to several 55 gallon drums which will be removed by Suffolk Services, there are also three other drums at this location which are filled with an unknown substance which must also be removed.

Suffolk Services has applied for a permit to remove the other very old underground tank on this property accessible from the end of Clark Avenue. At this time I do not know when this will be accomplished.

pc: BIM Investment Trust
Suffolk Services

245/92
LA/bk

2919

SUFFOLK SERVICES, INC.

53-222/113

10/5/1992

PAY TO THE ORDER OF Town of Walpole $ 200.00

Two hundred and 00/100 DOLLARS

broadway national bank
REVERE / CHELSEA, MASSACHUSETTS 02150

NOT VALID FOR OVER $500.00

FOR SHAFFER TANK REMOVAL
For 2 Tanks

⑈002919⑈ ⑆011302221⑆ ⑈71 776 2⑈

For permission to remove and transport one underground storage tank from.

Owner: BIM Investment trust Street Address: 48 Clarck Ave

THE TOWN OF WALPOLE

Commonwealth of Massachusetts

FIRE DEPARTMENT
Leonard Anderson
Fire Chief

Telephone 668-0260

May 17, 1990

Mr. Irving Shaffer
Philip Shaffer Family Trust
152 Hampden Street
Roxbury, Massachusetts 02119-2835

Dear Mr. Shaffer:

As you know, the U. S. Environmental Protection Agency in the course of their investigation into the asbestos situation on the property located at the rear of 46 Clark Avenue, (section of former Kendall Company, South Street), has discovered another abandoned underground storage tank. This tank is approximately 35' long with a top dome reminiscent of a railroad tank car and appears to contain an undetermined amount of kerosene.

This tank must be removed as required by Commonwealth of Massachusetts Regulations 527 CMR 9:00, with permit application made at this office. Please advise me as to which contractor will conduct said removal and when.

Yours very truly,

Leonard Anderson, Fire Chief
Walpole Fire Department

pc: Thomas Condon, EPA
Health Agent

111/90
LA/bk

APPENDIX B.6

Asbestos – Related Correspondence

FILE COPY (Mailed 11/14/80)

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
323 New Boston Street, Woburn, MA 01801

ANTHONY D. CORTESE, Sc.D.
Commissioner
727-5194

November 12, 1980

Kendall Company
95 West Street
Walpole, Massachusetts 02081

RE: KENDALL COMPANY -
Walpole, Massachusetts

Gentlemen:

The Metropolitan Boston/Northeast Region of the Department of Environmental Quality Engineering is writing in regard to the materials recently discovered on the Kendall Company property located on West Street in Walpole.

Could be South Street

On October 22, 1980, a representative from the Department met on site with representatives from both the Kendall Company and from the Town of Walpole. It is understood that during recent excavation of the area (less than 1 acre in size), it was discovered that in the past there had been buried some material containing asbestos, in particular brake shoes and linings. The Kendall Company is now proposing to dispose of the excavated material by covering it, grading the area and seeding it with final vegetative cover.

The existing form of the asbestos material poses no threat to the environment or public health. Since it is not friable, it will not become air-borne. Furthermore, its characteristics are such that it is not leachable and will not effect groundwater.

It is the Department's understanding that the excavated material is to be covered with approximately 5 inches of clean gravel fill followed by an additional 4 inches of loam, the area then leveled and graded and finally seeded with a permanent vegetative cover to stablize it. Discussions with the Walpole Board of Health determined that due to the fact that the material was buried there prior to 1955, the site is considered to be already "assigned". Further, since there will be no additional refuse accepted at this located it does not require a further site assignment under Section 150A of Chapter 111 of the General Laws from the Board. Upon completion of the project, please contact the Department so a final inspection can be made.

In addition it is the Department's concern that appropriate measures

RE: KENDALL COMPANY -
Walpole, Massachusetts

November 12, 1980

are taken to inform any prospective buyers of this property about the buried waste. This will avoid any disturbance or further excavation of the site without knowing of or planning for the buried asbestos. Please inform this Office as to how this will be accomplished.

Should you have any questions regarding this project, please contact Miss Brooke Monroe at the above address or 935-2160.

Very truly yours,

For the Commissioner,

William J. St. Hilaire, P.E.

William J. St. Hilaire, P.E.
Regional Environmental Engineer
Metropolitan Boston/Northeast Region

WJSTH/Ebm/lkw

CC: James E. Mello
Town Administrator
Town Hall
Walpole, Massachusetts 02081

Board of Health
Main Street
Walpole, Massachusetts 02081
ATTENTION: Mr. Warren Bushway

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
323 New Boston Street, Woburn, MA 01801

ANTHONY D. CORTESE, Sc.D.
Commissioner
727-5194

South Street
17.8

December 9, 1980

Kendall Company
95 West Street
Walpole, Massachusetts 02081

RE: KENDALL COMPANY -
West Street
Walpole, Massachusetts

Gentlemen:

The Metropolitan Boston/Northeast Region of the Department of Environmental Quality Engineering is writing in regard to the project which involved the covering of asbestos material on the Kendall Company property (see letter from the Department dated November 12, 1980).

On November 26, 1980 a representative from the Department visited the above-referenced site, at the request of the Kendall Company, in order to make a final inspection of the area.

It is the Department's opinion that all the work has been completed satisfactorily. The area has been properly covered, leveled, graded to maintain minimal erosion, and loamed. In addition, it was indicated that the area has been seeded with a proper vegetative cover crop, which will become established in the Spring.

Furthermore, an affadavit will be provided by the Kendall Company as a measure by which prospective buyers of the property can be informed of the site conditions. The original affadavit will be filed in the Kendall Company office along with a copy of the deed. A copy of the affadavit will be filed with their legal department in Boston along with the original deed, and further copies of the affadavit will be submitted to this Department and the Walpole Board of Health. These measures should be a sufficient means by which to record this information.

Once again, the Department feels assured that as a result of the recent work, the buried material will pose no threat to the public or the environment, and that the property is safegaurded against future disturbance.

The Kendall Company's cooperation relative to this matter has been greatly appreciated. Should you need further information relative to this

RE: KENDALL COMPANY -
West Street
Walpole, Massachusetts

December 9, 1980

matter please call Miss Brooke Monroe at 935-2160.

Very truly yours,

William J. St. Hilaire, P.E.

William J. St. Hilaire, P.E.
Regional Environmental Engineer
Metropolitan Boston/Northeast Region

WJSTH/Ebm/lkw

CC: James E. Mello
Town Hall
Walpole, Massachusetts 02081

Board of Health
Main Street
Walpole, Massachusetts 02081
Attention: Mr. Warren Bushway

Enclosure

Kenneth A. Tarbell, P. E.
131 Parker Street
Lowell, Massachusetts 01851
(617) 458-4749

December 3, 1986

Richard J. Chalpin
Dep Reg. Environmental Eng.
Met. Boston/N.E. Region
5 Commonwealth Ave
Woburn, MA 01801

Re: WALPOLE: Asbestos site on South Street

Dear Mr. Chalpin:

The following will summarize the actions taken to date by Shaffer Realty Corp. to secure the area on South Street in Walpole where evidence of asbestos disposal has been identified, as well as preliminary plan outlines for alternative methods of more permanent stabilization of the exposed asbestos products.

The owners were first notified by telephone of the discovery of asbestos on the South Street site on Friday, October 31, 1986. On that same date, Clean Harbors Inc., was contacted to provide "CAUTION" tapes to define the areas then believed to contain asbestos and to post general hazard signs provided by the Department. This work was completed at approximately 8:30 p.m., and personnel were dismissed for the night.

On Saturday, November 1, 1986, this writer met with Mr. MacAuley of DFCE and a workman from Clean Harbors to complete taping of the area, posting of additional signs specifically warning of asbestos hazard, and placement of 6-mil polyethylene sheeting over the exposed asbestos at the rear of 80 South Street and visible areas on the banks of the Neponset River west of South Street. Also on-site on this occasion was Ms. Sarah Hannah of GZA Inc., who were responsible for a "21E" report prepared in the general area in 1985. At this time, the need for more permanent security fencing was discussed.

On Wednesday, Nov. 5, 1986, installation of six foot high chain-link fence was begun along the property southwesterly of the river and South Street. The northerly bank of the river was secured by fencing at both ends of the property, and the southerly bank protected by fencing along the southerly property line of Lot C to a point 190 feet westerly of South Street, pending a determination concerning responsibility

for continuation beyond this point by other parties.

On Friday, Nov. 7, 1986, new permanent plastic signs were installed to replace the temporary paper signs installed on November 1.

On Monday, November 10, 1986, additional fence was completed to the point from which DEQE would continue fencing on the neighboring land. A 16 foot gate was installed in the fence at South Street.

Wednesday, November 12, 1986. Meeting on-site with Lauri Jacobson of DEQE to outline area to be fenced by State.

Thursday, November 13, 1986. Meeting at DEQE Regional Office with EPA representatives to determine steps to be taken next. Set up meeting for November 17, 1986.

Follow-up site examination on Monday, November 17, 1986 with EPA and DEQE. Samples collected by EPA representatives, results expected November 19, together with recommendations.

Attached hereto is a preliminary Phase I Site Exam and Remedial Action Report covering what has been determined to this point, subject to receiving results of samples apparently still in analysis, and presenting some of the alternatives which we would like to consider for the eventual stabilization of this site. Clearly, it is too early to have developed a complete plan for this site, and the attached is intended only as a very preliminary outline of actions intended or proposed.

Sincerely,

Shaffer Realty Corp.

Kenneth A. Tarbell

Kenneth A. Tarbell, P.E.

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
5 Commonwealth Avenue
Woburn, Massachusetts 01801

S. RUSSELL SYLVA
Commissioner

SITE: BACYBURN
BREAK: 10.3
OTHER:

MEMORANDUM

TO: Enforcement Review Committee

FROM: Richard J. Chalpin, Deputy Regional Environemental Engineer

DATE: December 5, 1986

RE: WALPOLE - Shaffer Realty

This referral seeks civil penalties through the Attorney General's Office for failure to report a release/threat of release of oil or hazardous materials puprsuant to Section 7, M.G.L. Chapter 21E.

On October 29, 1986, personnel from this office investigated a complaint about exposed asbestos along the banks of the Neponset River in the vicinity of 80 South Street, Walpole. The complaint originated from Mr. Jim Fitzgerald, a member of the Walpole zoning board and his wife, Ms. Susan Fitzgerald, a Walpole Selectwoman. Soil samples and a site survey verified the presence of asbestos (six samples, between 45% and 75% chrysotile). We immediately initiated remedial measures to cover, secure and post the exposed asbestos. In doing so, we contacted the present site owners, Shaffer Realty Corp., 152 Hampden Street, Roxbury, MA 02119, Mr. Burt Shaffer, principal. At a site visit, Mr. Shaffer accepted responsibility for the necessary response actions and the IRM's proceeded. I have requested and received EPA's technical assistance for designing final remedial options for this asbestos site. In summary, the asbestos situation appears to be under control and progressing.

While gathering information about the asbestos site, the Shaffer's disclosed that they had an environmental site assessment conducted on this property (known as the former Kendall Co.) by Goldberg Zoino and Associates and were dismayed that GZA had not discovered the exposed asbestos. I requested a copy of GZA assessment which was provided to Ms. Laurie Jacobson of this office on 11/17/86 by Mr. Burt Shaffer.

GZA conducted two studies of the property in March and April, 1985. The GZA cover letter, dated 3/25/85 states, "The purpose of the assessment was to evaluate whether hazardous materials or oil, as defined in Massachusetts General Laws, Chapter 21E, is present in the environment at the site." This memorandum also summarizes pertinent points of these reports.

After reviewing the reports, I feel that the environmental investigations clearly define a condition which constitutes a release/threat of release of oil or hazardous materials. The recent discovery of exposed asbestos is a secondary although important issue. The contamination discovered 16 months ago has not been addressed by Shaffer Realty Trust and there is no indication that it ever would have been.

Chronology of Past DEQE Actions, Kendall Co.

1. 5/25/73 Industrial Waste Survey by Stan Szczurko, DWPC, references release of oil through a pipe, (no followup indicated).

2. 11/12/80 Letter from DEQE to Kendall Co., Buried asbestos discovered, leave on site and cap.

3. 12/9/80 Letter from DEQE to Kendall Co.; all work to cap asbestos completed satisfactorily

NOTE: The area addressed in these two letters is not the area recently discovered which has had IRM's conducted. The 1980 area is in the plant rather than along the banks of the Neponset.

4. 12/28/82 Report of Mr. Jim Joy, Kendall Co.; release of 2 gallons of oil to Neponset; investigated by DEQE; no trace found, (No action).

The following three items were mentioned in GZA;s 3/25/85 report. They are missing from our files.

5/23/83 DEQE Memo, 10 gallons of #6 oil spilled; (clean-up satisfactory.)

6/18/83 60 gal. #6 spilled, DEQE found clean-up satisfactory.

10/10/83 1000 gal. spill cleanup complete August 1984.

CHIEC 2/87

The Commonwealth of Massachusetts

Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
5 Commonwealth Avenue
Woburn, Massachusetts 01801

S. RUSSELL SYLVA
Commissioner
935-2160

January 14, 1987

Shaffer Realty Corp.
152 Hampden Street
Roxbury, MA 02119
ATTN: Mr. Burt Shaffer

RE: WALPOLE, former
Kendall Co., Site, South St.
DEQE Case #

Dear Mr. Shaffer:

The Department is in receipt of two consultant reports concerning environmental conditions at the subject site. These reports were developed for Mr. Burt Shaffer, Shaffer Realty Trust by Goldberg-Zoino and Associates and are dated March 25, 1985 and April 9, 1985. These reports document site assessment activities at the former Kendall Co. property and were conducted by Shaffer Realty prior to purchasing this property in April, 1985. The GZA cover letter, dated March 25, 1985 states, "The purpose of the assessment was to evaluate whether hazardous materials or oil, as defined in Massachusetts General Laws, Chapter 21E, is present in the environment at the site."

After reviewing the reports, the Department finds that the environmental investigations clearly define a condition which constitutes a release/threat of release of oil or hazardous materials as governed by M.G.L. Chapter 21E.

The conclusions in GZA March 25, 1985 report are as follows:

"An environmental assessment was conducted at the Kendall Company site on South Street in Walpole, Massachusetts. The assessment included a review of site history, a site visit, a subsurface exploration program, and screening of soil and water samples. No quantitative chemical laboratory testing was performed.

Fuel oil is present on the site in underground storage tanks. An underground tank for the storage of caustic is also present. Sulfuric acid and hydrogen peroxide are present in above-ground storage tanks.

Based on the observations made during the current assessment, it is GZA's opinion that a petroleum product, probably fuel oil, is present in the environment at the site in the vicinity of the underground oil storage tanks. The source of the oil is believed to be leakage from the underground oil storage tanks or surface spillage."

Elevated pH and conductivity levels were observed at surface water station SW-2, a mixing area of the northwest corner of the existing building, and an elevated conductivity was noted at boring GZ-1. The elevated pH may be due to the presence of caustic soda in the water.

The monitoring data showed the presence of volatile organic chemicals in soils from four of five borings, a surface water sample in the so-called "mixing area" with a pH of 11.2, and a groundwater sample with 12 VOC's present, which GZA stated was "indicative of the presence of fuel oil in the groundwater."

GZA was authorized by Mr. Burt Shaffer on March 25, 1986, the date of the first report, to perform additional site investigations. The report of these additional investigations, date April 9, 1985 stated in its conclusions:

> Several of the soil samples collected during the second phase of investigation at the Kendall Company site exhibited elevated concentrations of volatile organic compounds. The groundwater samples generally exhibited elevated pH and conductivity values, especially at stations GZ-6, GZ-7, and W-1. Volatile organic compounds believed to be indicative to the presence of oil in the groundwater at the site were detected in several of the new observation wells.
>
> The source of the volatile organic compounds and of the elvated pH and conductivity observed at the site is believed to be leakage and/or spillage from the underground fuel tanks and the underground caustic storage tank located on the north side of the Kendall Company building. The presence of these compounds on the south side of the building indicates that the compounds have migrated under the building from their presumed source area.
>
> Although the site does not appear to pose an immediate threat to public health or the environment, the compounds detected on the south side of the building may be expected to move with the groundwater, eventually discharging to the Neponset River at the Southern edge of the site. The compounds are currently within approximately 100 feet or less of the river. A drinking water supply well is located approximately 4,000 feet downstream from the site, along the Neponset River."

The additional investigations found more widespread VOC contamination plus a floating oil phase at one well. In addition, the pH in groundwater at three locations was 13.5. The pH was measured with pH paper, but, for reference, a corrosive hazardous waste (310 CMR 30.123) has a pH greater than or equal to 12.5.

Statement of Conclusions/Statutory Liabilities

Based upon the aforementioned investigation, a release/threat of release exists at the subject site. The prevention and/or mitigation of such a release or threat of release is governed by Massachusetts General Law, Chapter 21E, the "Massachusetts Oil and Hazardous Materials Release Prevention and Response Act."

Chapter 21E identifies as responsible parties the current owner or operator of a site at which there has been a release or threat of release of oil or a hazardous material; the past owner or operator of a site where a release of a hazardous material has occurred; any person who directly or indirectly arranged for the transport, disposal, storage or treatment of hazardous materials to or at such a site; and any person who caused or is legally responsible for a release or a threat of release of oil or a hazardous material at such a site. Such parties are liable without regard to fault; the nature of this liability is joint and several. (M.G.L. Chapter 21E, Section 5 a).

This letter is to inform you in writing that:

(1) The Department has determined that conditions at the site constitute a release/threat of release of oil and hazardous materials.

(2) Information available to the Department indicates that you as present owner of the property are a liable and "responsible" party pursuant to Section 5(a) of Chapter 21E.

(3) Should you fail to implement those actions deemed necessary by this Office, the Department may, pursuant to M.G.L. Chapter 21E, take or arrange for any and all necessary actions at the site. If public funds are expended under such conditions, Chapter 21E, Section 11 stipulates that the Attorney General of the Commonwealth of Massachusetts may initiate legal action against the responsible party(s) to recover all costs incurred by the Department in the assessment, containment, and removal of any release or threat of release of oil or hazardous materials.

(4) The liability of responsible parties in (2) above includes up to three times the cost of:

a. all response costs incurred by the Department due to the release/threat of release, including all contract, administrative, and personnel costs; and

b. all damages for any injury to, destruction, or loss of, natural resources due to the release/threat of release.

Shaffer Realty trust became aware of the conditions at the site in April, 1985. Section 7 of MGL Chapter 21E states that "Any owner or operator of a site or vessel, and any person otherwise described in paragraph [a] of Section five, as soon as he has knowledge of a release or threat of release of oil or hazardous material, shall immediately notify the Department thereof." The Department received a copy of GZA's reports on November 17, 1986 while gathering background information about an asbestos problem in the area adjacent to this site. A separate Notice of Responsibility letter dated November 4, 1986 was sent to Shaffer Realty for the asbestos problem. It is the Department's position that Shaffer Realty failed to properly notify the Department of the release/threat of release described in GZA's 3/85 and 4/85 reports as required in Section 7 of MGL Chapter 21E.

REQUISITE SITE ACTION

(1) You must immediately retain the services of a professional environmental engineering firm to conduct an investigation and assessment of site conditions. Such an initiative should be consistent with the Department's "Site Investigation/Remedial Action Guidelines", a copy of which is attached.

(2) Your environmental consultant must submit a report describing site conditions and site history, to include but not be limited to.

a) A brief summary of why, where, and how the release/threat of release occurred.

b) A chronological summary of actions that have been taken for the investigation, assessment, containment, and removal of the oil and/or hazardous material.

c) an estimate of the quantity of oil or hazardous material released.

d) copies of all hazardous waste manifests regarding this incident.

e) Any other information pertinent to the spill/release incident or any additional "Phase I" information necessary to adequately define site conditions/history. (Refer to attached guidelines)

(3) Included with and in consideration of the report required in (2) above, your consultant must submit a proposal for a "Phase II" site investigation and assessment. Such a proposal shall specify what actions will be taken to define and evaluate pollutant conditions, including, where applicable, specifications for the siting installation and sampling of borings/monitoring wells, and sampling and analysis of other environmental media.

(4) Any plans to institute or continue immediate site remedial/containment actions should be delineated in the Phase I report/Phase II submittal.

Please inform this office in writing within ten (10) days of receipt of this letter of your intentions and a time table to address those items outlined in this correspondence. Should you have further questions regarding this matter, you may contact me at 935-2160.

Very truly yours,

Richard J. Chalpin

Richard J. Chalpin
Deputy Regional
Environmental Engineer

RJC/RJC/gg

cc: DEQE,DSHW, 1 Winter Street, Boston, MA 02108, Attn: Madeline Snow
Northeast Regional Office-Site Assessment Section
Jim Colman, DEQE,DSHW, 1 Winter Street, Boston, MA 02108

Enclosures;
(1) Site Investigation/Remedial Action Guidelines
(2) Minimal Standards for the Submission of Analytical Data.
(3) Interim Policy for Design, Installation and Operation of Groundwater Recovery and Treatment Systems

The Commonwealth of Massachusetts
Department of Environmental Quality Engineering
Metropolitan Boston - Northeast Region
5 Commonwealth Avenue
Woburn, Massachusetts 01801

S. RUSSELL SYLVA
Commissioner
935-2160

June 25, 1987

Shaffer Realty Corporation
152 Hampden Street
Roxbury, MA 02119

RE: WALPOLE - South Street,
Site Assessment Pursuant to
to M.G.L. Chapter 21E
DEQE Case #3-603

Attention: Mr. Burt Shaffer

Dear Mr. Shaffer:

This correspondence is in regard to our meeting of June 10, 1987. As discussed, you have agreed to submit additional information to supplement the CHI Environmental Engineering Corporation (CHIEE) Phase I Submittal/Phase II Proposals dated February 17, 1987 and March 24, 1987. These reports addressed the release/threat of release of fuel oil, caustic soda, and asbestos.

The subject site consists of lots 1235-1 (Area A) 1235-8 (Area B), 1235-4 (Area C), 1235-2-A & 1235-2-B (Area D), 1235-5 & 1275-3 (former pond area), and 1275-5 (railroad bed) on the Walpole Assessor's Map. Additonal evaluation of the site is necessary to determine both the nature and extent of environmental contamination due to any hazardous materials present.

A thorough site description/site history must be completed before an adequate site investigation/sampling proposal can be developed. The site description/site history report should include, but not be limited to:

- Past and present owners and operators.
- Past and present processes performed including types of chemicals used.
- Locations of past and present chemical storage and treatment areas, including underground and above ground storage tanks and containers, mixing areas, lagoons, and any other areas or containers that may have been past and/or continuing sources of contamination. Depths of underground storage tanks (USTs) should be documented.
- Past and present disposal practices, locations of former disposal areas on the site, and the history of wetland filling.
- Locations of past and present buildings, as well as floor plans for existing buildings showing foundation depths, locations of drains, sumps and loading areas.
- Status of chemical storage and other hazardous materials (such as asbestos on pipes and boilers, etc.) inside buildings.

- Railroad history including dates of installation and use as well as past functions.

- Former pond history and function.

- Documentation of the removal of USTs that have been excavated to date.

- Information regarding the migration of #6 oil and subsurface asbestos detected during the recent test pit program.

- A copy of the Walpole Fire Department permit for the remaining abandoned UST and a proposal for cleaning the tank's concrete vault.

- Results of the stadia survey.

- Air monitoring results that were obtained during the Area D temporary stabilization work on March 18 and 19, 1987.

The locations of the areas and activities discussd above should be presented in a comprehensive site map. Additionally, the map should illustrate potential routes of contaminant transport such as:

- Sewer lines
- Subsurface utility lines (including those beneath South Street)
- Storm drains
- Catch basins
- Other hydraulic connections between chemical storage/treatment areas, the Neponset River, and the westerly flowing stream behind the lagoon in Area A.

The Phase I report must include, a thorough discussion of the impact of past and present site activities and structures on the nature, extent, and transport of hazardous materials.

A comprehensive Phase II proposal addressing sampling plans and protocols for the environmental investigation must be completed. This Phase II proposal should include the following items:

- An asbestos investigation plan must be developed based on the EPA guidance that was given to Ken Tarbell at the June 10, 1987 meeting. A proposal for field screening for other hazardous materials during the asbestos coring investigation should supplement this plan.

- Based on the results of the site description/site history and initial field sampling mentioned above, a subsurface boring program should be devised to evaluate the vertical extent of asbestos contamination.

- Based on the site description/site history and asbestos boring locations, a boring and/or monitoring well installation program should be prepared to detect, the vertical and horizontal extent of contamination by other hazardous materials that may be present in the subsurface soils and/or groundwater.

- Additional sampling of the existing wells will be required and will be discussed at a later date.

- Monitoring Well GZ-3 must be sampled and analyzed for the same constituents as the samples collected by CHIEE from the other wells and surface waters at the site on May 15, 1987.

- If monitoring well W-1 is to be used during the site investigation as a sampling point, the well constructon documentation must be provided.

- Conductivity readings from field screening activities performed by CHIEE on May 15, 1987 must be reported.

- The laboratory results and conductivity readings mentioned above must be summarized and evaluated.

- A proposal for sampling Neponset River sediment for asbestos and other hazardous materials must be submitted after characterizing the contaminants on site.

- A statement of qualifications of the personnel responsible for visually identifying and selecting samples for asbestos analysis, including years of experience and capacity in which the work was performed, must be provided.

- A protocol for laboratory quantification of samples for asbestos should be presented.

- Analytical methodologies that will be used to determine the presence of hazardous materials should be specified.

- A health and safety plan for on site workers as well as nearby residents must be developed by the consultant.

- The geology and hydrogeology in the vicinity of the site must be characterized. The consultants must evaluate the effect of these conditions on the direction, rate, and ultimate extent of contaminant transport. Potential sensitive receptors of groundwater contamination must be identified including rivers, ponds, aquifers, and water supply wells. The lower boundary of the groundwater formation (bedrock or another confining layer) must be determined. Seasonal variations in the water table must be determined by periodic monitoring.

During the meeting the necessity of maintaining the security of the site was stressed in order to prevent exposure of those who reside or work in the contiguous area. Exposed surficial asbestos must be covered immediately to the extent necessary to ensure that there is no release/threat of release of asbestos from the site to the ambient air. Warning signs must be posted and access to these areas must be restricted by whatever means are necessary to protect public health.

If you have any questions regarding this matter, please contact Lauri Jacobson at 935-2160 or the letterhead address. All further communications regarding this site must reference the DEQE Case Number designated in the subject heading.

Very truly yours,

Richard J. Chalpin
Deputy Regional
Environmental Engineer

RJC/LAJ/ae

cc: DEQE, DHW, 1 Winter St., Boston, MA 02108, Attn: SA Section Chief, 5th Fl.
Walpole BOH, Town Hall, School St., Walpole, MA 02081, Attn: Ms. Robin Chapell
CHI Env. Engineering, 325 Wood Road, Braintree, MA 02184, Attn: William St. Hilaire
CHI Env. Engineering, 325 Wood Road, Braintree, MA 02184, Attn: Beverly Slader
Kenneth A. Tarbell, P.E., 131 Parker St., Lowell, MA 01851

APPENDIX B.7

Miscellaneous Correspondence

OCT 3 6 19

RECEIVED

OCT 2

DIVISION OF
WATER POLLUTION CONTROL
WESTERN REGIONAL OFFICE

October 18, 1972

David G. Nicoll
Kendall Company
Fiber Products Division
West Street
Walpole, Massachusetts 02081

Re: State Recommendation
Corps Permit Program
Corps Application No.3-09368
State Application No.515

Dear Mr. Nicoll:

In response to your request in a letter dated October 5, 1971, this Division has reviewed your application for a permit to discharge from your plant located at South Street into the Neponset River which has been designated a Class B water. This classification was assigned under authority of Section 27 (4) of Chapter 21 of the Massachusetts General Laws as part of the State water quality standards filed with the Secretary of State of the Commonwealth on March 6, 1967.

This Division has reviewed your application and the proposed discharge from the above-cited facility. Based on our investigation and the information you supplied, we consider that this discharge may be in contravention of our water quality standards.

I am hereby notifying and directing your company to do the following:

1. After start-up of the proposed discharge, submit to this Division temperature data in the river and in the discharge to indicate the effect of the discharge on the river temperature.

2. This cooling water discharge shall not be contaminated by any operations from within the plant.

As long as you comply with the above, we will recommend the issuance of an appropriate permit by the Corps of Engineers under authority of Section 13 of the River and Harbor Act of 1899 (33 USC 407). If, in the future, the discharge from your facility should be found to be in contravention of our water quality standards, this Division will issue an abatement

order establishing dates by which this condition shall be corrected and will recommend to the Corps of Engineers that the permit be so modified.

Very truly yours,

Thomas C. McMahon
Director

TCM/WAS/arm
cc: Chief, Permit Branch, Operations Division, Corps of Engineers, 424 Trapelo Road, Waltham, Massachusetts 02154

APPENDIX B.8

Notification and Grant of Use Restrictions and Easement

BUILDING PERMIT

JOB WEATHER CARD

DATE [illegible] 19 79 PERMIT NO. 387

APPLICANT [illegible] ADDRESS [illegible] (NO.) (STREET) (CONTR'S LICENSE)

PERMIT TO [illegible] (TYPE OF IMPROVEMENT) (____) NO. STORY (PROPOSED USE) NUMBER OF DWELLING UNITS

AT (LOCATION) [illegible] (NO.) (STREET) ZONING DISTRICT

BETWEEN (CROSS STREET) AND (CROSS STREET)

SUBDIVISION LOT BLOCK LOT SIZE

BUILDING IS TO BE FT. WIDE BY FT. LONG BY FT. IN HEIGHT AND SHALL CONFORM IN CONSTRUCTION

TO TYPE USE GROUP BASEMENT WALLS OR FOUNDATION (TYPE)

REMARKS: [illegible]

AREA OR VOLUME (CUBIC/SQUARE FEET) ESTIMATED COST $ [illegible] PERMIT FEE $ [illegible]

OWNER [illegible]

ADDRESS [illegible] BUILDING DEPT. BY

THIS PERMIT CONVEYS NO RIGHT TO OCCUPY ANY STREET, ALLEY OR SIDEWALK OR ANY PART THEREOF, EITHER TEMPORARILY OR PERMANENTLY. ENCROACHMENTS ON PUBLIC PROPERTY, NOT SPECIFICALLY PERMITTED UNDER THE BUILDING CODE, MUST BE APPROVED BY THE JURISDICTION. STREET OR ALLEY GRADES AS WELL AS DEPTH AND LOCATION OF PUBLIC SEWERS MAY BE OBTAINED FROM THE DEPARTMENT OF PUBLIC WORKS. THE ISSUANCE OF THIS PERMIT DOES NOT RELEASE THE APPLICANT FROM THE CONDITIONS OF ANY APPLICABLE SUBDIVISION RESTRICTIONS.

MINIMUM OF THREE CALL INSPECTIONS REQUIRED FOR ALL CONSTRUCTION WORK:

1. FOUNDATIONS OR FOOTINGS.
2. PRIOR TO COVERING STRUCTURAL MEMBERS (READY TO LATH).
3. FINAL INSPECTION BEFORE OCCUPANCY.

APPROVED PLANS MUST BE RETAINED ON JOB AND THIS CARD KEPT POSTED UNTIL FINAL INSPECTION HAS BEEN MADE. WHERE A CERTIFICATE OF OCCUPANCY IS REQUIRED, SUCH BUILDING SHALL NOT BE OCCUPIED UNTIL FINAL INSPECTION HAS BEEN MADE.

WHERE APPLICABLE SEPARATE PERMITS ARE REQUIRED FOR ELECTRICAL, PLUMBING AND MECHANICAL INSTALLATIONS.

POST THIS CARD SO IT IS VISIBLE FROM STREET

BUILDING INSPECTION APPROVALS	PLUMBING INSPECTION APPROVALS	ELECTRICAL INSPECTION APPROVALS
1	1	1
2	2	2
3	HEATING INSPECTING APPROVALS	REFRIGERATION INSPECTION APPROVALS
	1	1
OTHER	2	2

WORK SHALL NOT PROCEED UNTIL THE INSPECTOR HAS APPROVED THE VARIOUS STAGES OF CONSTRUCTION.

PERMIT WILL BECOME NULL AND VOID IF CONSTRUCTION WORK IS NOT STARTED WITHIN SIX MONTHS OF DATE THE PERMIT IS ISSUED AS NOTED ABOVE.

INSPECTIONS INDICATED ON THIS CARD CAN BE ARRANGED FOR BY TELEPHONE OR WRITTEN NOTIFICATION.

FORM NO. BOCA-BP 1969

EXHIBIT B

NOTIFICATION AND GRANT OF USE RESTRICTIONS AND EASEMENT

The undersigned MILTON SHAFFER, IRVING SHAFFER and BURTON SHAFFER, Trustees of Shaffer Realty Nominee Trust under Declaration of Trust dated December 26, 1986, recorded with the Norfolk County Registry of Deeds, Book 7382, Page 267, with an address of 152 Hampden St., Roxbury, Massachusetts ("Shaffer"), as to Parcel A described in Exhibit A attached hereto and made a part hereof, and

BURTON SHAFFER, IRVING SHAFFER and MILTON SHAFFER as Trustees of B.I.M. Investment Trust under Declaration of Trust dated February 28, 1966, recorded with said Deeds, Book 6710, Page 563, with an address of 152 Hampden St., Roxbury, Massachusetts ("BIM"), as to Parcel B described in said Exhibit A hereto (Shaffer and BIM are collectively referred to herein as the "Grantors"),

in consideration of the implementation by W. R. Grace & Co. - Conn., a Connecticut corporation ("Grace"), on behalf of itself and the Grantors, of certain work required by the Second EPA Order (as hereinafter defined) on property of Grantors, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged,

HEREBY GIVE NOTICE that:

(a) The property shown as "Restriction Area" on that certain plan prepared by Norwood Engineering Co., Inc., entitled "Easement Plan of Land in Walpole, Mass.," scale: 1"=40', dated January 7, 1993, recorded with said Deeds as Plan No. 123 of 1994 in Plat Book 420 (the "Restriction Plan"), and more fully described in Exhibit B attached hereto and by this reference made a part hereof (the "Restriction Area") has been used for the disposal of asbestos-containing waste material; and

(b) The survey plot and record of the known location of asbestos-containing waste disposed of within the Restriction Area has been filed with the United States Environmental Protection Agency ("EPA") in accordance with 40 C.F.R. §61.151(e)(2); and

(c) The Restriction Area is subject to 40 C.F.R. part 61, Subpart M;

HEREBY GRANT to:

GRACE, with an address of 100 North Main Bldg., #1700, Memphis, Tennessee 38103 (hereinafter referred to herein as "Grantee"),

with QUITCLAIM COVENANTS, the easements, covenants and restrictions set forth below in this instrument on, in and across the Restriction Area, the property designated on the Restriction Plan as the "Wetlands Restoration Area" and more fully described in Exhibit B attached hereto, and the remaining property of the Grantors described above in this instrument, for the purposes of protecting the soil and asphalt cover materials (collectively, the "Cap") which have been placed above asbestos-containing soils in the Restriction Area, protecting the aluminum plate arch culvert (the "Culvert") which has been placed in the bed of the Neponset River where it crosses the Restriction Area, and inspecting and maintaining from time to time the Cap and the Culvert and the wetlands created in the Wetlands Restoration Area (the "Restoration Wetlands"), all as further provided herein. The Cap and the Culvert were installed in the Restriction Area and the Restoration Wetlands were created pursuant to the "Second Administrative Order for Removal Action" (EPA Region I CERCLA Docket No. I-92-1033) issued by EPA to Shaffer, BIM, and Grace on January 31, 1992 (the "Second EPA Order").

The rights hereby granted include the perpetual right to enforce the easements and restrictions set forth below in this instrument, and each Grantor hereby COVENANTS, for that Grantor and that Grantor's successors and assigns, to stand seized and hold title to the property of the Grantor described above and subject to the easements, covenants and restrictions granted by this instrument. The easement, covenants and restrictions granted by this instrument are for the benefit of Grantee.

The further terms and conditions of the easements, covenants and restrictions granted by this instrument are as follows:

1. Prohibited Activities. No Grantor shall perform or shall permit to be performed on any portion of the Restriction Area described in this instrument as property of the Grantor any activity which may disturb or disrupt the integrity of the Cap or the Culvert ("Prohibited Activities"), except as expressly provided herein. The Prohibited Activities include but are not necessarily limited to:

(a) construction, modification, expansion, or development of any buildings, roads, parking lots, driveways, pedestrian walkways, other paved or asphalted areas, fences, signs, utility poles, or other structures;

(b) excavation, digging, dredging, drilling, or other similar activity that in any way disturbs the Cap or the asbestos-containing soils beneath the Cap, including but not limited to the installation or excavation of underground storage tanks, utility lines, wells, septic tanks, leach fields, or other such subsurface structures or devices;

(c) the use of motorized vehicles of any nature or kind on unpaved portions of the Restriction Area, except such vehicles as may be necessary for purposes of repair or maintenance activities (e.g., lawn mowers), security patrol or to fight fire;

(d) activities likely to cause erosion of the Cap; and

(e) any other activity which in the reasonable opinion of the EPA or the Massachusetts Department of Environmental Protection ("DEP") is detrimental to preservation of the Cap or the Culvert.

Nothing herein shall prohibit activities associated with the use and/or maintenance of the buildings located on or adjacent to the Restriction Area, or for normal activities associated with the use of the paved portion of the Cap (e.g., parking of vehicles, vehicle deliveries, location of dumpsters, etc.) provided that such activities are conducted in such a manner so that the integrity of the Cap, Culvert and Restriction Area are protected. If such activities disturb the integrity of the Cap, Culvert or Restriction Area, Grantors shall restore them at their expense.

2. Notification. In the event that any Grantor desires to conduct a Prohibited Activity, it must, at least ninety (90) days prior to the proposed starting date for such Prohibited Activity, submit written notice of its plans to conduct a Prohibited Activity to EPA and DEP, with a copy of such notice to Grantee.

3. Inspection and Maintenance Activities. Each Grantor, and Grantee by its acceptance hereof, acknowledges that EPA is requiring the conduct of certain ongoing inspection and maintenance activities in the Restriction Area and the Wetlands Restoration Area so that the integrity of the Cap and the Culvert and the Restoration Wetlands will be maintained. Those activities are specifically described in: (a) the document entitled "Long-Term Inspection and Maintenance Plan South Street Site Walpole, Massachusetts" (the "I&M Plan"), dated September 1992 and prepared by Canonie

Environmental Services, Corp., a copy of which is attached to that certain document entitled Grant of Easement dated December 3, 1993 recorded with said deeds in Book 10,395, Page 123 (the "I&M Easement") and incorporated herein by this reference; and (b) the document entitled "Wetland Mitigation Design South Street Site Walpole, Massachusetts" (the "Wetlands Plan"), dated October 1992 and prepared by Normandeau Associates, Inc., a copy of which is attached to said I&M Easement and incorporated herein by this reference.

4. Access to the Restriction Area and Wetlands Restoration Area. Grantee, through its duly authorized officers, directors, employees, contractors, or agents, shall have the right and easement to enter the Restriction Area and the Wetlands Restoration Area at reasonable times and in a reasonable manner for the purposes of conducting oversight, inspection, and monitoring activities to assure compliance with the covenants and restrictions granted by this instrument, and to prevent, cure, abate, or remedy any violations of the covenants and restrictions granted by this instrument, but Grantee shall not have any obligation to do so.

5. Notification Concerning Disturbances and Transfers.

(a) Upon any Grantor's obtaining knowledge that any fencing, containment cell, Cap, Culvert, or other improvements or structures erected or placed in or around the Restriction Area or Wetlands Restoration Area for the purpose of protecting and maintaining the integrity of the Cap or Culvert is being or has been disturbed by natural processes or other factors, such Grantor shall promptly report to EPA the date of the discovery, the location of the disturbance, and a general description of the condition observed by the Grantor. In addition, if any Grantor becomes aware of any emergency related to the Restriction Area which threatens the integrity of the Cap or the Culvert, such Grantor shall

immediately notify the emergency response personnel of the Town of Walpole of such emergency. The obligations to provide the notifications specified in this paragraph do not impose an obligation on any Grantor to conduct regular or periodic inspections of the Restriction Area; provided, however, this provision is not intended to waive or abrogate any such obligation such Grantor may have pursuant to other principles of statutory or common law, the Second EPA Order, or under other contractual provisions with Grantee or other third parties.

(b) Each Grantor shall notify Grantee in writing of any transfer, subdivision or other direct or indirect change in ownership or interest in any portion of the Restriction Area or the Wetlands Restoration Area described in this instrument as property of the Grantor prior to such transfer or change in ownership. Grantee shall notify each of the Grantors in writing prior to any assignment of its interest in the easements, covenants and restrictions granted by this instrument.

6. Benefits in Gross. The benefits of the easements, covenants and restrictions granted by this instrument are in gross, and shall not be limited in any way as a result of the absence of any interest in real property benefited thereby.

7. Binding Effect; Joint and Several. The burdens of the easements, covenants and restrictions granted by this instrument shall run with the Restriction Area and the Wetlands Restoration Area and shall be enforceable against the Grantors and their respective heirs, executors, administrators, assigns, legal representatives, tenants, subtenants, and successors as owners of the Restriction Area and the Wetlands Restoration Area by Grantee and its respective heirs, executors, administrators, assigns, legal representatives, and successors, except that the original Grantors named herein and each successive Grantor shall

be liable only for obligations accruing during the period of that specific Grantor's ownership. If any Grantor is constituted of more than one person or entity, the obligations of each of the persons or entities constituting such Grantor with respect to that portion of the Restriction Area and the Wetlands Restoration Area described in this instrument as property of such Grantor (or its predecessor) shall be joint and several.

8. Expiration Date. The easements, covenants and restrictions set forth in this instrument are established in the public interest and for the public purpose of protecting human health and the environment. The covenants and restrictions granted by this instrument are intended to be effective and enforceable under the provisions of M.G.L. c. 184, § 26, et seq. The Grantors shall record a notice of restriction before the expiration of thirty (30) years from the date of this Notification and before the expiration of each succeeding twenty (20) year period, pursuant to M.G.L. c. 184, § 27, which notice or extension of restriction shall extend the covenants, conditions and restrictions set forth in this instrument or any amendment to this instrument that was approved by Grace, and shall be duly recorded in accordance with the laws of the Commonwealth of Massachusetts.

9. Enforcement. In the event that a breach of any of the easements, covenants or restrictions granted by this instrument comes to the attention of Grantee, Grantee may notify the Grantor(s) whose property described in this instrument includes that portion or portions of the Restriction Area or the Wetlands Restoration Area on which the breach is occurring (the "Defaulting Grantor(s)") in writing of such a breach. The Defaulting Grantor(s) shall, within a reasonable time after receipt of such notice, but in no event longer than sixty (60) days thereafter, undertake actions reasonably calculated to cure the conditions constituting the breach. If the Defaulting Grantor(s) fail to take such corrective action, Grantee may, at its

discretion, undertake any and all actions reasonably necessary to cure said breach or restore the Restriction Area to its condition prior to the Prohibited Activity. In the event that any Grantor is responsible for a breach of any of the easements, covenants or restrictions granted by this instrument such Grantor shall bear the cost of corrective action (whether undertaken by Grantee or otherwise), including, without limitation, repair or restoration, as appropriate, and shall reimburse Grantee for legal fees and costs incurred in the enforcement of the easements, covenants or restrictions granted by this instrument on demand. In addition, Grantee shall have the right to exercise any other remedies available at law or in equity for any breach of the easements, covenants or restrictions granted by this instrument, including, without limitation, injunctive relief or specific performance. The remedies of Grantee for any breach of the easements, covenants or restrictions granted by this instrument shall be cumulative and not exclusive. Nothing contained in the easements, covenants or restrictions granted by this instrument shall impose upon Grantee any duty to maintain or require that the Restriction Area be maintained in any particular state or condition.

10. Severability. If a court or other tribunal determines that any provision of this document is invalid or unenforceable, such provision shall be deemed to have been modified automatically to conform to the requirements for validity and enforceability as determined by such court or tribunal. In the event that the provision invalidated is of such a nature that it cannot be so modified, the provision shall be deemed deleted from this instrument as if it had never been included herein. In either case, the remaining provisions of this instrument shall remain in full force and effect.

11. Notices. Any notice or other communication given hereunder shall be in writing and shall be deemed to be delivered on the earlier of: (i) the date received, or (ii)

the date of delivery, refusal or non-delivery indicated on the return receipt, if deposited in a United States Postal Service depository, postage prepaid, sent registered or certified mail, return receipt requested, or sent prepaid by a recognized commercial delivery service providing for a return receipt, addressed to the party to receive the same at the address of such party set forth at the beginning of this instrument or at such other address as may be designated in a notice delivered or mailed as herein provided.

12. Miscellaneous. This instrument may be executed in any number of counterparts, and if so executed, shall be effective as against each of the respective Grantors when that Grantor has executed and delivered at least one such counterpart. Execution and delivery of this instrument by any or all of the other Grantors shall not be a condition of the effectiveness of this instrument against any Grantor that has executed and delivered a counterpart of this instrument. The headings in this instrument are for convenience only, and shall not be used in interpreting this instrument. In this instrument the singular includes the plural, and vice versa, and each of the masculine, feminine, and neuter genders includes each of the others.

13. Other Encumbrances. The easements, covenants and restrictions granted by this instrument shall be in addition to and not in lieu of any other restrictions or easements of record affecting the Restriction Area or the Wetlands Restoration Area, as the case may be. This grant is made subject to all easements, restrictions and covenants of record, to the extent in force and applicable.

14. Title Reference. For the Grantors' title, see the Deed from The Kendall Company to BIM dated April 25, 1985 recorded with said Deeds, Book 6654, Page 431, and

the Deed from Shaffer Realty Corp. to Shaffer dated December, 1986 recorded with said Deeds, Book 7382, Page 271.

WITNESS our hands and seals as of the respective dates set forth below.

12-3, 1993

Milton Shaffer, Trustee of
Shaffer Realty Nominee Trust

12-3, 1993

Irving Shaffer, Trustee of
Shaffer Realty Nominee Trust

12-3-, 1993

Burton Shaffer, Trustee of
Shaffer Realty Nominee Trust

12-3, 1993

Milton Shaffer, Trustee
B.I.M. Investment Trust

12-3, 1993

Irving Shaffer, Trustee of
B.I.M. Investment Trust

12-3-, 1993

Burton Shaffer, Trustee of
B.I.M. Investment Trust

COMMONWEALTH OF MASSACHUSETTS

Suffolk ss. 12/3, 1993

Then personally appeared the above-named Milton Shaffer and acknowledged the foregoing to be his free act and deed, as Trustee of Shaffer Realty Nominee Trust and B.I.M. Investment Trust as aforesaid before me,

Carol McIntyre
Notary Public

My commission expires: 10/5/95

COMMONWEALTH OF MASSACHUSETTS

Suffolk ss. 12/3, 1993

Then personally appeared the above-named Irving Shaffer and acknowledged the foregoing to be his free act and deed, as Trustee of Shaffer Realty Nominee Trust and B.I.M. Investment Trust as aforesaid before me,

Carol McIntyre
Notary Public

My commission expires: 10/5/95

COMMONWEALTH OF MASSACHUSETTS

Suffolk ss. 12/3, 1993

Then personally appeared the above-named Burton Shaffer and acknowledged the foregoing to be his free act and deed, as Trustee of Shaffer Realty Nominee Trust and B.I.M. Investment Trust as aforesaid before me,

Carol McIntyre
Notary Public

My commission expires: 10/5/95

List of Exhibits

Exhibit A	Legal Description of Burdened Parcels
Exhibit B	Legal Description of Restriction Area and Wetlands Restoration Area

EXHIBIT A

DESCRIPTION OF BURDENED PARCELS

Land in Walpole, Norfolk County, Massachusetts, more particularly described below.

PARCEL A

The land on the Northwesterly side of South Street shown as Lot B on plan entitled "Plan of Land in Walpole, Mass.," by E. Worthington, Engineer, dated March 12, 1937, recorded with Norfolk County Registry of Deeds, Book 2137, Page 501, bounded:

SOUTHEASTERLY	by South Street, 50 feet;
SOUTHWESTERLY	by Lot C, 261.34 feet;
NORTHWESTERLY	by land now or formerly of Leach by two lines measuring, respectively, 27.20 feet and 23 feet, more or less;
SOUTHWESTERLY	by the center line of the Neponset River;
NORTHWESTERLY	again by said land of Leach, 35 feet, more or less; and
NORTHEASTERLY	by Lot A by two lines measuring, respectively, 415.32 feet and 173.33 feet;

containing about 31,000 square feet, all as shown on said plan.

PARCEL B

Two lots of land together with the buildings thereon on the Northwesterly side of South Street, Walpole, Massachusetts shown as Lot A and Lot C on a plan by E. Worthington, Engineer, dated March 12, 1937 and recorded with the Norfolk County Registry of Deeds as plan 154 of 1937 in Book 2137 at Page 501, bounded and described as follows:

Said lot A is bounded southeasterly by South Street five hundred fifty and sixty-six hundredths (550.66) feet. Northeasterly by land nor or formerly of Frank Baldassari

eighty nine and eleven hundredths (89.11) feet and by land now or formerly of John J. Cwiklinski and Mary Cwiklinski fifteen and eleven hundredths (15.11) feet. Northwesterly by land of said Cwiklinski eighty-two and eighty one hundredths (82.81) feet. Northeasterly by land of said Cwiklinski ninety one and twenty eight hundredths (91.28) feet. Northwesterly by land now or formerly of Porter S. Boyden, land now or formerly of Thomas W. White and by land now or formerly of Harold T. White two hundred seventy five and seventy four hundredths (275.74) feet. Northeasterly by land now or formerly of Harold T. White one hundred (100.00) feet. Northwesterly by Clark Avenue one hundred (100.00) feet. Northeasterly by the end of Clark Avenue and by land now or formerly of Maynard T. Boyden one hundred forth (140.00) feet. Northwesterly by land now or formerly of Lottie A. Leach two hundred fifty three and thirty three hundredths (253.33) feet. Southwesterly by lot B on said plan by two lines, four hundred fifteen and thirty two hundredths (415.32) feet and one hundred seventy three and thirty three hundredths (173.33) feet. Containing 205,490 square feet.

The most easterly corner of lot C lies fifty (50.00) feet southerly from the most southerly corner of lot A measured along the northwesterly side line of South Street and is bounded southeasterly by South Street eighty six and ninety seven hundredths (86.97) feet northeasterly by lot B on said plan two hundred sixty one and thirty four hundredths (261.34) feet. Northwesterly fourteen (14.00) feet by land now or formerly of Lottie A. Leach. Westerly by land of said Leach forth six and thirty hundredths (46.30) feet. Southwesterly in two lines by land of Mary T. Harrison ninety seven and thirty hundredths (97.30) feet and one hundred forty five and eighty six hundredths (145.86) feet. Containing 20,800 square feet.

EXHIBIT B

RESTRICTION AREA
SOUTH STREET, WALPOLE, MASSACHUSETTS

Beginning at a point, said point being on the Westerly Sideline of South Street, a length of Thirty-One and 99/100 (31.99) feet and a radius of Eighteen Hundred and 00/100 (1800.00) feet from a stone bound with a drill hole (SB/dh) at a point of curvature on South Street; thence

Northeasterly	And curving to the right along the arc of a curve having a radius of Eighteen Hundred and 00/100 (1800.00) feet, a length of One Hundred Sixty-Nine and 00/100 (169.00) feet by the Northwesterly sideline of South Street; thence
N 57-32-02 W	A distance of Fifty-Three and 81/100 (53.81) feet; thence
N 32-27-58 E	A distance of Three and 70/100 (3.70) feet; thence
N 57-32-02 W	A distance of Eight and 20/100 (8.20) feet; thence
N 32-27-58 E	A distance of Twelve and 50/100 (12.50) feet; thence
N 57-32-02 W	A distance of Thirty-Two and 20/100 (32.20) feet; thence
N 32-27-58 E	A distance of Three and 30/100 (3.30) feet; thence
N 58-02-38 W	A distance of Two Hundred and Five and 33/100 (205.33) feet; thence
N 32-06-08 E	A distance of Fifty-Two and 02/100 (52.02) feet; thence
S 57-53-37 E	A distance of One Hundred Sixty-Six and 18/100 (166.18) feet; thence
S 32-00-56 W	A distance of Two and 13/100 (2.13) feet; thence
S 57-53-37 E	A distance of Twenty-Five and 90/100 (25.90) feet; thence
N 32-06-23 E	A distance of Seven and 00/100 (7.00) feet; thence
S 57-53-37 E	A distance of Seven and 15/100 (7.15) feet; thence
N 32-06-23 E	A distance of Six and 00/100 (6.00) feet; thence
S 57-53-37 E	A distance of Seven and 00/100 (7.00) feet; thence

N 32-06-23 E	A distance of Eleven and 48/100 (11.48) feet; thence
N 58-26-55 W	A distance of Zero and 40/100 (0.40) feet; thence
N 31-33-05 E	A distance of Twenty-Eight and 79/100 (28.79) feet; thence
S 58-26-55 E	A distance of Zero and 40/100 (0.40) feet; thence
N 32-11-22 E	A distance of Forty-Nine and 04/100 (49.04) feet, the previous Twenty (20) courses being by the building line of the "Old Mill"; thence
N 34-21-49 E	A distance of Nineteen and 57/100 (19.57) feet; thence
N 55-48-44 W	A distance of One Hundred Thirteen and 17/100 (113.17) feet; thence
S 41-18-14 W	A distance of Forty-Nine and 11/100 (49.11) feet; thence
Southwesterly and Northwesterly	And curving to the right along the arc of a curve having a radius of Thirty-Six and 00/100 (36.00) feet, a length of Fifty-Two and 00/100 (52.00) feet; thence
N 55-56-02 W	A distance of Fifty-Four and 99/100 (54.99) feet; thence
N 35-59-38 E	A distance of Six and 49/100 (6.49) feet; thence
N 55-16-16 W	A distance of Fifty-One and 38/100 (51.38) feet; thence
S 63-55-25 W	A distance of Thirty-Four and 81/100 (34.81) feet; thence
N 67-22-39 W	A distance of Fourteen and 34/100 (14.34) feet; thence
S 49-15-23 W	A distance of Seventy-Four and 25/100 (74.25) feet; thence
S 52-05-10 W	A distance of Forty-Four and 15/100 (44.15) feet; thence
S 22-01-22 W	A distance of Eighty-Six and 00/100 (86.00) feet; thence

S 60-18-24 E	A distance of Twenty-Six and 60/100 (26.60) feet; thence
S 55-44-08 E	A distance of Eleven and 56/100 (11.56) feet; thence
S 20-00-24 W	A distance of Sixteen and 00/100 (16.00) feet; thence
N 75-47-08 W	A distance of Seventeen and 56/100 (17.56) feet; thence
N 57-36-09 W	A distance of Nineteen and 26/100 (19.26) feet; thence
S 12-46-37 W	A distance of Thirty-Nine and 92/100 (39.92) feet; thence
S 06-53-31 E	A distance of Forty-One and 42/100 (41.42) feet; thence
S 16-43-55 W	A distance of Thirty-Seven and 41/100 (37.41) feet; thence
S 12-55-08 E	A distance of Forty-Three and 81/100 (43.81) feet; thence
S 36-56-51 E	A distance of Fifty-Nine and 45/100 (59.45) feet; thence
S 67-37-34 E	A distance of Thirty-Nine and 91/100 (39.91) feet; thence
N 38-12-56 E	A distance of Sixty-Eight and 41/100 (68.41) feet; thence
S 53-30-30 E	A distance of Ninety-Seven and 30/100 (97.30) feet; thence
S 75-34-46 E	A distance of One Hundred Forty-Five and 85/100 (145.85) feet, the previous three (3) courses being by land of Thomas F. Bannon and Francis E. Bannon, to the point of beginning and containing 124,994 square feet.

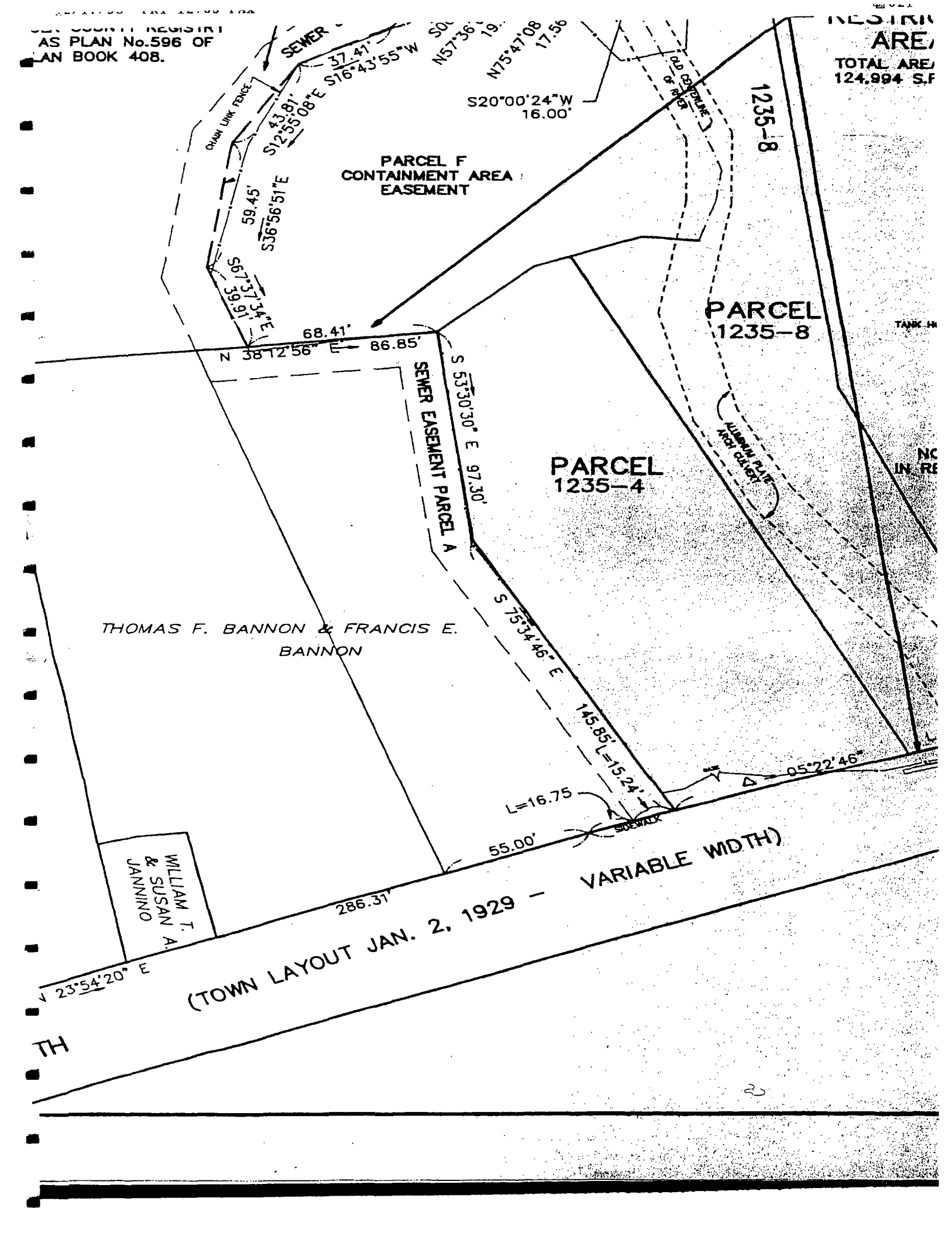
Meaning and intending to describe the Restriction Area as shown on a plan of land entitled "Easement Plan of Land in Walpole, Mass." Scale: 1" = 40', January 7, 1993, Norwood Engineering Co., Inc., Consulting Engineers-Land Surveyors, 1410 Route One, Norwood, Mass. 02062.

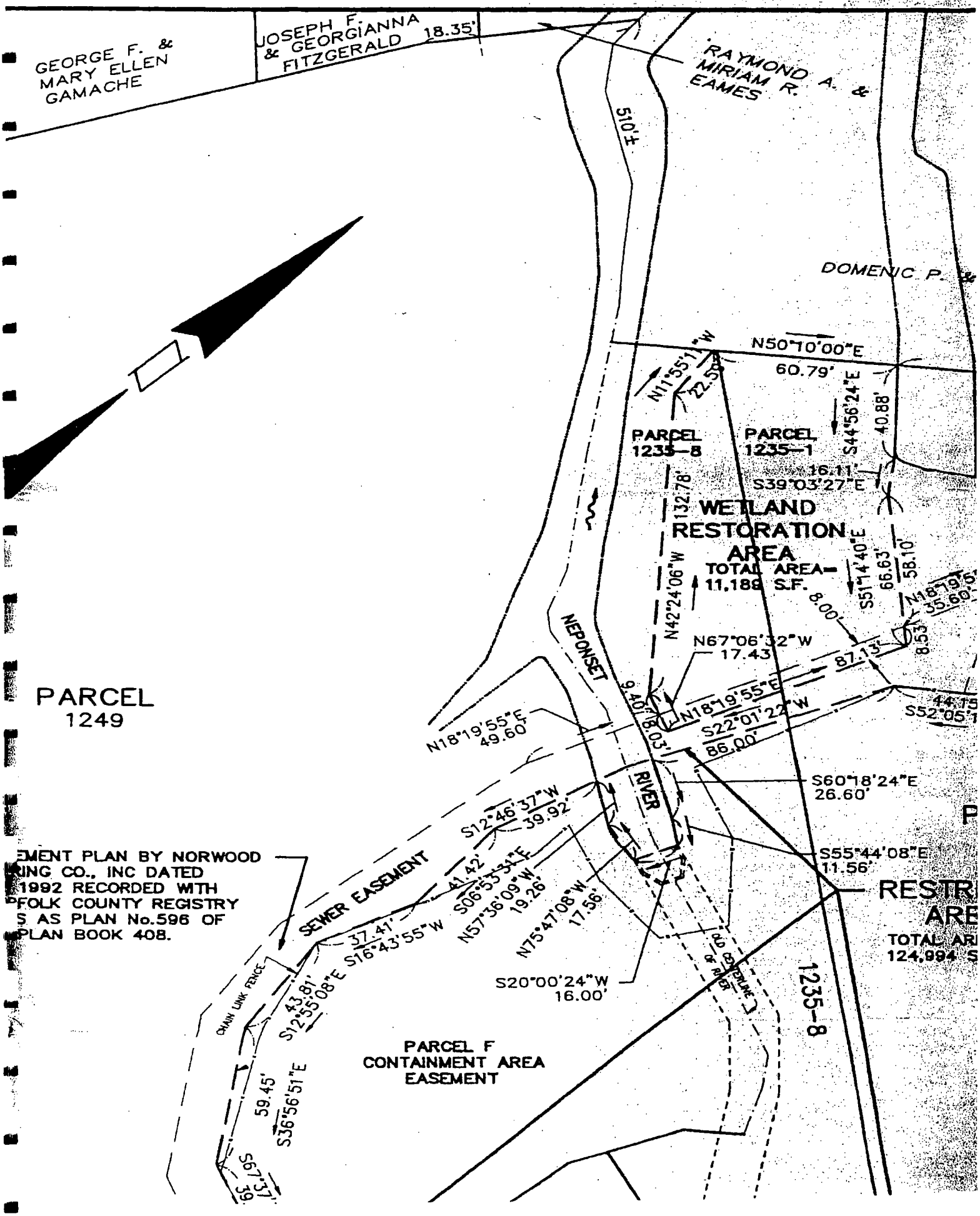
WETLANDS RESTORATION AREA
OFF SOUTH STREET, WALPOLE, MASSACHUSETTS

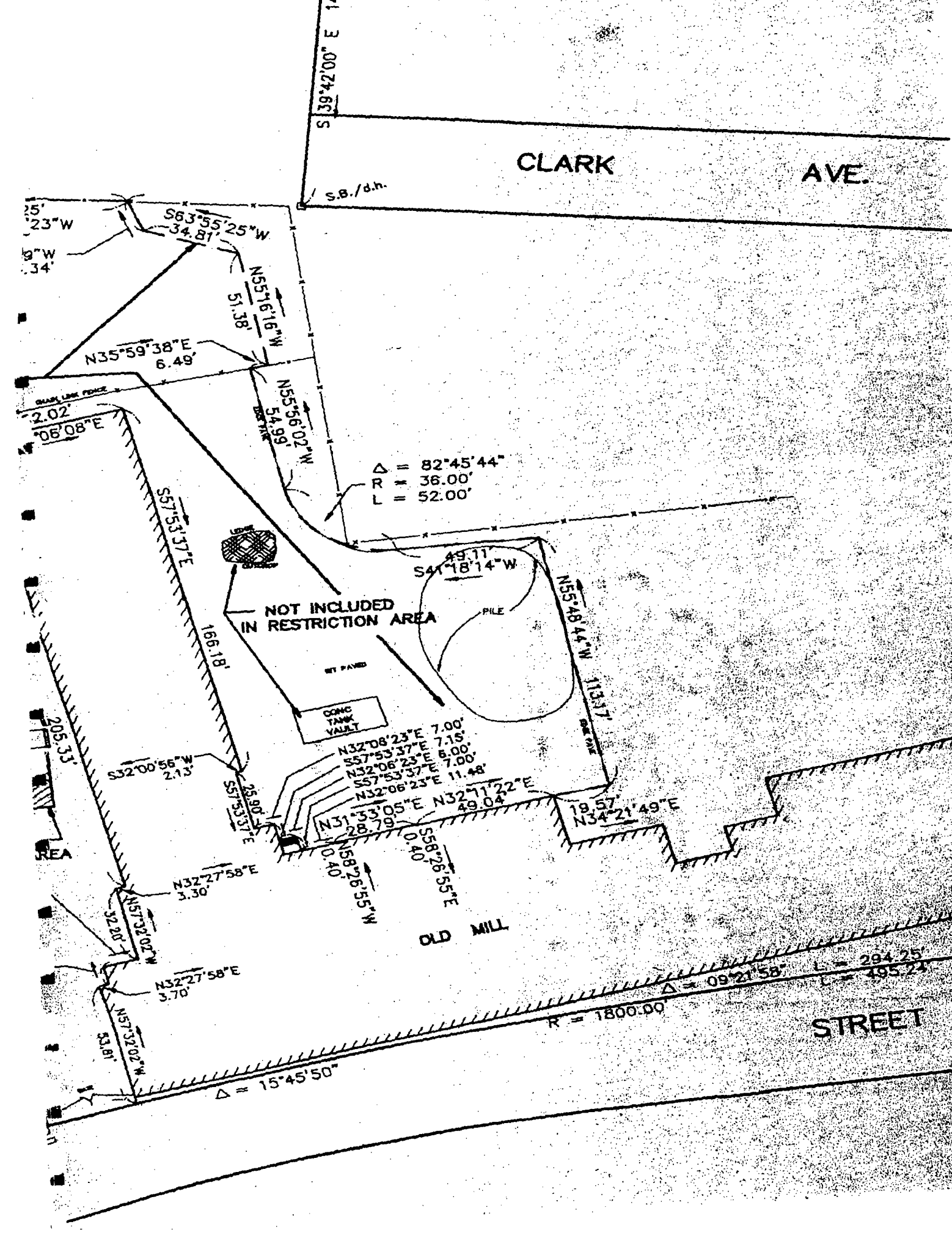
Beginning at a point, said point being on the Southeasterly Property Line of Domenic P. and Anna H. Silvi and being S 50-10-00 W a distance of One Hundred Fifty-Six and 92/100 (156.92) feet from a stone bound with a drill hole (SB/dh) set on the Southeasterly Property Line of Domenic P. and Anna H. Silvi; thence

S 44-56-24 E	A distance of Forty and 88/100 (40.88) feet; thence
S 39-03-27 E	A distance of Sixteen and 11/100 (16.11) feet; thence
S 51-14-40 E	A distance of Sixty-Six and 63/100 (66.63) feet; thence
S 18-19-55 W	A distance of Eighty-Seven and 13/100 (87.13) feet; thence
N 67-06-32 W	A distance of Seventeen and 43/100 (17.43) feet; thence
N 42-24-06 W	A distance of One Hundred Thirty-Two and 78/100 (132.78) feet; thence
N 11-55-11 W	A distance of Twenty-Two and 59/100 (22.59) feet; thence
N 50-10-00 E	A distance of Sixty and 79/100 (60.79) feet by land of Domenic P. and Anna H. Silvi, to the point of beginning and containing 11,189 square feet.

Meaning and intending to describe the Wetlands Restoration Area as shown on a plan of land entitled "Easement Plan of Land in Walpole, Mass.: Scale 1" = 40', January 7, 1993, Norwood Engineering Co., Inc., Consulting Engineers-Land Surveyors, 1410 Route One, Norwood, Mass. 02062.


AS PLAN No.596 OF
AN BOOK 408.
SEWER
37.41'
S16°43'55"W
N57°36'
N75°47'08
17.56
S20°00'24"W
16.00'
OLD SHORELINE
CHAIN LINK FENCE
43.81'
S12°55'08"E
59.45'
S36°56'51"E
S67°37'34"E
39.91'
PARCEL F
CONTAINMENT AREA
EASEMENT
TOTAL AREA
124.994 S.F
1235-8
PARCEL
1235-8
68.41'
N 38°12'56" E 86.85'
S 53°30'30" E 97.30'
SEWER EASEMENT PARCEL A
PARCEL
1235-4
ALUMINUM PLATE
ARCH CULVERT
THOMAS F. BANNON & FRANCIS E.
BANNON
S 75°34'46" E
145.85'
L=15.24'
Δ 05°22'46"
L=16.75
SIDEWALK
55.00'
286.31'
WILLIAM T.
& SUSAN A.
JANNINO
(TOWN LAYOUT JAN. 2, 1929 - VARIABLE WIDTH)
N 23°54'20" E


GEORGE F. & MARY ELLEN GAMACHE
JOSEPH F. & GEORGIANNA FITZGERALD
18.35'
RAYMOND A. & MIRIAM R. EAMES
510'±
DOMENIC P.
N50°10'00"E
60.79'
N11°55'1"W
22.50'
S44°56'24"E
40.88'
PARCEL 1235-8
PARCEL 1235-1
16.11'
S39°03'27"E
132.78'
WETLAND RESTORATION AREA
TOTAL AREA-11,188 S.F.
N42°24'06"W
S51°14'40"E
66.63'
58.10'
8.00'
8.53'
N67°06'32"W
17.43'
87.13'
NEPONSET
RIVER
N18°19'55"E
9.40'
N18°19'55"E
49.60'
S22°01'22"W
86.00'
S60°18'24"E
26.60'
PARCEL 1249
S12°46'37"W
39.92'
41.42'
S06°53'31"E
N57°36'09"W
19.26'
N75°47'08"W
17.56'
S55°44'08"E
11.56'
SEWER EASEMENT
37.41'
S16°43'55"W
43.81'
S12°55'08"E
CHAIN LINK FENCE
S20°00'24"W
16.00'
59.45'
S36°56'51"E
S67°37'
PARCEL F CONTAINMENT AREA EASEMENT
1235-8
EMENT PLAN BY NORWOOD RING CO., INC DATED 1992 RECORDED WITH FOLK COUNTY REGISTRY S AS PLAN No.596 OF PLAN BOOK 408.


S 39°42'00" E
CLARK AVE.
S.B./d.h.
S63°55'25"W
34.81'
N55°16'16"W
51.38'
N35°59'38"E
6.49'
N55°56'02"W
54.99'
Δ = 82°45'44"
R = 36.00'
L = 52.00'
S57°53'37"E
166.18'
NOT INCLUDED
IN RESTRICTION AREA
PILE
49.11'
S41°18'14"W
N55°48'44"W
113.37'
CONC TANK VAULT
N32°08'23"E 7.00'
S57°53'37"E 7.15'
S57°53'37"E 6.00'
N32°06'23"E 7.00'
S57°53'37"E 11.48'
N32°06'23"E
N32°11'22"E
49.04'
N31°33'05"E
28.79'
19.57'
N34°21'49"E
S32°00'56"W
2.13'
25.90'
S57°53'37"E
205.33'
N32°27'58"E
3.30'
N57°32'02"W
32.20'
N32°27'58"E
3.70'
N57°32'02"W
53.81'
S58°26'55"E
0.40'
S58°26'55"W
0.40'
OLD MILL
Δ = 09°21'58"
L = 294.25'
L = 295.24'
R = 1800.00
STREET
Δ = 15°45'50"

APPENDIX C

GZA, CHIEE, AND DAMES & MOORE

BORING / MONITORING WELL AND TEST PIT LOGS

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Kendall (21E), Walpole, MA

REPORT OF BORING NUMBER GZ-1
SHEET 1 OF 1
DATE 3/13/85 FILE F-4711

BORING CO. GZA Drilling, Inc.
FOREMAN D. Paquette
GZA ENGINEER A. Bjarngard/mlb

BORING LOCATION see plan
GROUND ELEV.
DATE STARTED 3/13/85 DATE ENDED 3/13/85

CASING
SIZE: 2¼" ID Hollow Stem Auger
HAMMER: lb.
FALL:

SAMPLER
TYPE: Split Spoon
OTHER:
HAMMER: 140 lb.
FALL: 30"

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
3/13	10.8	14.0'	10 min.
3/13	10.8	*	6 hours

* observation well

DEPTH	CAS. BL./FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA CHG. and GEN. DESC.	EQUIPMENT INSTALLED	TESTING	RMKS.
		S-1	18/9	0-1.5	3-7-6	Medium dense, dark brown, fine to coarse SAND, little Silt, trace fine to coarse Gravel, green gummy fibrous material.	FILL	Collapsed Natural Sands.	< 0.1	
5		S-2	18/3	4.5-6.0	4-3-3	Loose, dark brown compressed Wood, green gummy fibrous material.		Ottawa Sand 5.5-10.0'	< 0.1	
10		S-3	18/5	9.5-11.0	4-2-3	Loose, dark brown, fine to coarse SAND, some fibrous material.	10.8' FINE TO COARSE SAND		0.1	1 2 3
						Bottom of boring at 12.5 feet.				4

REMARKS:

1. Tip of spoon wet.
2. Auger and spoon refusal (60 blows/0) at 12.5 feet.
3. One 1½" PVC observation well installed with tip of five foot screen at 12.6 feet. Bentonite seal from 1.5 to 2.0 feet.
4. Testing results represent total organic vapor levels measured in the headspace of sealed soil sample jar using an HNU Model PI-101 photoionization analyzer. Sample injection size was 30 cc. Results in parts per million (ppm). Testing completed at GZA's Newton Laboratory.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORINGS LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE TIME MEASUREMENTS WERE MADE.

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Kendall (21E), Walpole, MA

REPORT OF BORING NUMBER: GZ-2
SHEET: 1 OF: 1
DATE: 3/13/85 FILE: F-4711

BORING CO.: GZA Drilling, Inc.
FOREMAN: D. Paquette
GZA ENGINEER: A. Bjarngard/mlb

BORING LOCATION: see plan
GROUND ELEV.:
DATE STARTED: 3/13/85 DATE ENDED: 3/13/85

CASING
SIZE: 2¼" ID Hollow Stem Auger
HAMMER: lb.
FALL:

SAMPLER
TYPE: Split Spoon OTHER:
HAMMER: 140 lb.
FALL: 30"

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
3/13	4.3	9.5	5 min.
3/13	4.0	*	4.5 hrs

* observation well

DEPTH	CAS. BL./FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA CHG OR GEN. DESC.	EQUIPMENT INSTALLED	TESTING	RMKS.
		S-1	18/3	0-1.5	8-18-16	Dense, dark brown, fine to coarse SAND, little+ Silt, trace fine to coarse Gravel, slight organic odor.	FILL		1.8	
5		S-2	18/14	4.5-6.5	14-8-3	Top 4" medium dense, dark brown, fine to coarse SAND, little+ Silt, trace fine to coarse Gravel, slight organic odor. Bottom 12" loose, brown, fine SAND, little+ Silt.	5.0' FINE SAND 8.5'		2.6	1
10		S-3	18/12	9.5-11.0	13-12-10	Top 7" medium dense, brown, fine to coarse SAND, some fine to coarse Gravel, trace- Silt. Bottom 5" medium dense, brown, fine SAND, little Silt.	FINE TO COARSE SAND 10.5' FINE SAND		3.0	2 3 4

Bottom of boring at 11.0 feet.

REMARKS:

1. Spoon wet at 4.5 feet.
2. Well came up with augers 3.0 feet, pushed down 2.0 feet.
3. One 1½" PVC Observation well installed with tip of five foot screen at 8.0 feet. Bentonite seal from 2.0 to 2.5 feet.
4. Refer to remark #4 on log GZ-1 for explanation of testing results.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE [illegible] IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Kendall (21E), Walpole, MA

REPORT OF BORING NUMBER _____
SHEET 1 OF 1
DATE 3/13/85 FILE E-4211

BORING CO. GZA Drilling, Inc.
FOREMAN D. Paquette
GZA ENGINEER A. Bjarngard/mlb

BORING LOCATION see plan
GROUND ELEV. _____
DATE STARTED 3/13/85 DATE ENDED 3/13/85

CASING
SIZE: 4¼" ID Hollow Stem Auger
HAMMER: _____ lb.
FALL: _____

SAMPLER
TYPE: Split Spoon OTHER:
HAMMER: _____ lb.
FALL: _____

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
3/13	5.9	*	3 hrs

* observation well

DEPTH	CAS. BL./FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA. CHG. and GEN. DESC.	EQUIPMENT INSTALLED	TESTING	RMKS.
		S-1	12/7	0-1.0	4-22	Medium dense, dark brown, fine to coarse SAND, little Silt, trace fine to coarse Gravel, occasional Cobble, trace Organic fibers.	FILL 3'±	Roadway Box; Bentonite Seal	1.4	1
5		S-2	18/	4.5-6.0	3-3-5	Loose, gray, fine SAND, some Silt.	FINE SAND 7'±	Collapsed Natural Soil	2.2	2
10		S-3	16/16	9.5-11.0	32-32-62	Very dense, gray to black, fine to coarse SAND, some fine to coarse Gravel, trace Silt, oil odor	FINE TO COARSE SAND		12.2 16.0	3 4
		(See Note 5)				Bottom of boring at 11.4 feet.				5 6 7

REMARKS:

1. Auger refusal at 1.3 feet. Boring offset 4 feet north.
2. Sample saturated at 5.0 feet.
3. Oil in 10 foot sample, two jar samples (S-3A and S-3B) taken.
4. Auger and spoon refusal (60 blows/¼ inch) at 11.4 feet.
5. Oily soil on plug jar sample taken. (S-4)
6. One 1¼" PVC Observation well installed with tip of five foot screen at 11.4 feet. Bentonite Seal from 2.0 to 2.5 feet.
7. Refer to remark #4 on log GZ-1 for explanation of testing results.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORINGS LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE TIME MEASUREMENTS WERE MADE.

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Kendall (21E), Walpole, MA

REPORT OF BORING NUMBER GZ-4
SHEET 1 OF 1
DATE 3/13/85 FILE E-4711

BORING CO. GZA Drilling, Inc.
FOREMAN D. Paquette
GZA ENGINEER A. Bjarngard/mlb

BORING LOCATION see plan
GROUND ELEV.
DATE STARTED 3/13/85 DATE ENDED 3/13/85

CASING
SIZE: 2¼" ID Hollow Stem Auger
HAMMER: lb.
FALL:

SAMPLER
TYPE: Split Spoon OTHER:
HAMMER lb.
FALL:

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
3/13	8.6	9.5'	5 min.
3/13	8.1	*	3 hrs.

* observation well

DEPTH	CAS. BL /FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA CHG. AND GEN. DESC.	EQUIPMENT INSTALLED	TESTING	RMKS.
		S-1	18/10	0-1.5	8-7-7	Medium dense, brown, fine SAND, some Silt, trace fine to coarse Gravel.	FINE SAND 3.0±	Bentonite Seal 2.0-2.5 feet	4.2	
5		S-2	18/14	4.5-6.0	12-17-23	Dense, orange-brown, fine to coarse SAND, trace fine to coarse Gravel, trace- Silt, occasional Cobble.	FINE TO COARSE SAND 7.0±		3.6	
10		S-3	18/14	9.5-11.0	31-12-11	Medium dense, brown, fine SAND, little Silt, one 2" layer orange-brown, fine to coarse SAND at 10.0'	FINE SAND	Collapsed Natural Sand	3.0	1
						Medium dense, brown, fine SAND, little Silt, trace fine to coarse Gravel, occasional Cobble.			1.4	2
15		S-4	18/8	14.5-16	5-11-44					3
						Bottom of boring at 16.0 feet.				

REMARKS:

1. Sample saturated.
2. One 1¼" PVC observation well installed with tip of five foot screen at 13.8 feet. Bentonite Seal from 2.0 to 2.5 feet.
3. Refer to remark #4 on log GZ-1 for explanation of testing results.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORINGS LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE [illegible] WERE MADE

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Kendall (CIE), Walpole, MA

REPORT OF BORING NUMBER GZ-5
SHEET 1 OF 1
DATE 3/13/85 FILE F-4711

BORING CO. GZA Drilling, Inc.
FOREMAN D. Paquette
GZA ENGINEER A. Biarngard/mlb

BORING LOCATION see plan
GROUND ELEV.
DATE STARTED 3/13/85 DATE ENDED 3/13/85

CASING
SIZE: 2¼" ID Hollow Stem Auger
HAMMER: lb.
FALL:

SAMPLER
TYPE: Split Spoon OTHER:
HAMMER: lb.
FALL:

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
3/13	10.0	*	1.0 hours

* observation well

DEPTH	CAS. BL. /FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA CHG. AND GEN. DESC.	EQUIPMENT INSTALLED	TESTING	RMKS.
		S-4	18/8	0-1.5	5-8-9	Medium dense, brown, fine to coarse SAND, little Silt, little fine to coarse Gravel.	FILL	Roadbox; Bentonite Seal; Ottawa Sand 7.0 to 12.0 feet	1.6	
5		S-2	18/7	4.5-6.0	4-5-10	Medium dense, brown, fine to coarse SAND, little Clayey Silt.	4.5' FINE TO COARSE SAND		1.8	
10		S-3	18/3	9.5-11.0	10-12-13	Medium dense, brown, fine to coarse SAND, little Clayey Silt, trace+ fine to coarse Gravel.		5 foot screen	4.0	1
15		S-4	18/18	14.5-16	6-9-35	Dense, brown, fine to coarse SAND, some fine to coarse Gravel, trace+ Clayey Silt.			13.6	2
						Bottom of boring at 16.0 feet.				3

REMARKS:

1. Sample saturated.
2. One 1¼" PVC observation well installed with tip of five foot screen at 13.9 feet. Bentonite Seal from 2.0 to 2.5 feet.
3. Refer to remark #4 on log GZ-1 for explanation of testing results.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORINGS LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE TIME MEASUREMENTS WERE MADE.

GOLDBERG-ZOINO & ASSOCIATES, INC GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS	PROJECT Kendall Company Walpole, MA	REPORT OF BORING NUMBER G-1 SHEET 1 OF 1 DATE 4/1/85 FILE F-4711

BORING CO Carr Dee Test Boring Co.
FOREMAN John DiSimone
GZA ENGINEER Stacy Pancoast/mlb

BORING LOCATION see location plan
GROUND ELEV.
DATE STARTED 4/1/85 DATE ENDED 4/1/85

CASING
SIZE 3 3/4" HSA
HAMMER lb
FALL

SAMPLER
TYPE Split Spoon OTHER:
HAMMER 140 lb
FALL 30"

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
4/1	9.0	removed	at completion

DEPTH	CAS. BL. /FT.	SAMPLE NO	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA. CHG. and GEN. DESC.	EQUIPMENT INSTALLED	HNU TESTING 1)	RMKS.
		S-1	24/9	0-2	2-3 17-14	Medium dense, black, fine to coarse SAND, little- fine Gravel, (FILL).	SAND FILL	Bentonite Seal 1 to 2 feet	4.0	
5		S-2	24/6	5-7	5-3 2-2	Loose, balck, medium SAND, some+ Asbestos fragments, little- Silt, trace fine Gravel (FILL).	7' PEAT FILL	1½" PVC Wellscreen 7 to 17 feet.	1.8	
10		S-3	24/	10-12	2-1 2-4	Very loose, black PEAT, little+ Cinders, trace Brick fragments (FILL).	12' FIBROUS SILT FILL		6.8	
15		S-4	24/10	15-17	2-1	Very loose, brown SILT, with Fibers, little Peat, little fine Sand (FILL).			8.4	4
						Bottom of boring at 17 feet				
20										

REMARKS:

1. Refer to remark #4 on boringlog GZ-1 for explanation of testing results.
2. Strong odor in sample S-4.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Kendall Company, Walpole, MA

REPORT OF BORING NUMBER GZ-[illegible]
SHEET 1 OF 1
DATE 4/1/85 FILE [illegible]

BORING CO. Carr Dee Test Boring Co.
FOREMAN John DiSimone
GZA ENGINEER Stacy Pancoast/mlb

BORING LOCATION see location plan
GROUND ELEV
DATE STARTED 4/1/85 DATE ENDED 4/1/85

CASING
SIZE
HAMMER lb
FALL

SAMPLER
TYPE OTHER
HAMMER lb
FALL

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME

DEPTH	CAS. BL./FT.	SAMPLE NO	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA. CHG. OR GEN. DESC.	EQUIPMENT INSTALLED	HNU TESTING 1	RMKS.
		S-1	24/8	0-2	3-12	Medium dense, brown, medium SAND and SILT, little- fine Gravel (FILL).	SAND AND SILT FILL	Bentonite Seal 1 to 1.5 feet.	1.2	
					17-14					
5		S-2	24/8	5-7	2-2	Very loose, black SILT and medium SAND, little fine Gravel (FILL).	SILT FILL (OIL SHEEN)	PVC Wellscreen 1.5 to 11.5 feet	1.4	
					2-6					
10		S-3	24/20	10-12	6-3	Loose, black SILT, trace fine Gravel (FILL).			8.4	2
					4-6					
						Bottom of boring at 12 feet.				
15										

REMARKS:

1. Refer to remark #4 on boringlog GZ-1 for explanation of testing results.
2. Strong, unidentifiable odor in sample S-3 which is marked by an oil sheen coating.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE BORING LOGS. FLUCTUATIONS IN THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE

2

GOLDBERG-ZOINO & ASSOCIATES, INC GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS	PROJECT Kendall Company Walpole, MA	REPORT OF BORING NUMBER GZ-1 SHEET 1 OF 1 DATE 4/1/85 FILE 5-6211

BORING CO Carr Dee Test Boring co. — BORING LOCATION see location plan
FOREMAN John DiSimone — GROUND ELEV.
GZA ENGINEER Stacy Pancoast/mlb — DATE STARTED 4/1/85 DATE ENDED 4/1/85

CASING	SAMPLER
SIZE 3 3/4" HSA	TYPE Split Spoon OTHER:
HAMMER lb	HAMMER 140 lb
FALL	FALL 30"

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
4/1	9.7	removed	at completion

DEPTH	CAS. BL./FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA. CHG. OR GEN. DESC.	EQUIPMENT INSTALLED	HNU TESTING [1]	RMKS.
		S-1	24/9	0-2	3-6 5-5	Medium dense, brown SILT, some coarse Sand, some fine Gravel (FILL).	SAND AND SILT FILL	Bentonite Seal 1 to 2 feet	0.8	
5		S-2	24/9	5-7	10-8 13-8	Medium dense, brown SILT and fine to coarse GRAVEL, some- fine to coarse Sand, little- Brick fragments (FILL).	7' SAND FILL	1½" PVC Wellscreen 4 to 14 feet	1.2	
10		S-3	24/17	10-12	5-2 4-9	Loose, brown, fine to medium SAND, some Silt (FILL).	12' SILT AND GRAVEL		1.4	
15		S-4	24/8	15-17	20-37 42-50	Very dense, dark brown SILT and fine to coarse GRAVEL, little fine Sand.			1.4	
						Bottom of broing at 17 feet.				

REMARKS:

1. Refer to remark #4 on boring log GZ-1 for explanation of testing results.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE [illegible] THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE

GOLDBERG-ZOINO & ASSOCIATES, INC.
GEOTECHNICAL/GEOHYDROLOGICAL CONSULTANTS

PROJECT: Kendall Company, Walpole, MA

REPORT OF BORING NUMBER GZ-9
SHEET 1 OF 1
DATE 4/1/85 FILE E-4711

BORING CO. Carr Dee Test Boring Co.
FOREMAN John DiSimone
GZA ENGINEER Stacy Pancoast/mlb

BORING LOCATION see location plan
GROUND ELEV
DATE STARTED 4/1/85 DATE ENDED 4/1/85

CASING
SIZE: 3 3/4" HSA
HAMMER lb
FALL:

SAMPLER
TYPE: Split Spoon OTHER:
HAMMER 140 lb
FALL: 30"

GROUNDWATER READINGS

DATE	DEPTH	CASING AT	STABILIZATION TIME
4/1	3.0'	removed	at completion

DEPTH	CAS. BL. /FT.	SAMPLE NO.	PEN./REC.	DEPTH	BLOWS/6"	SAMPLE DESCRIPTION	STRTA. CHG. and GEN. DESC.	EQUIPMENT INSTALLED	HNU TESTING 1	RMKS.
		S-1	24/11	0-2	5-13	Medium dense, brown, fine GRAVEL, some- Silt, little medium to coarse Sand, trace Cinders, trace- Brick fragments (FILL).	SILT AND GRAVEL FILL	Bentonite Seal 1 to 2 feet	1.2	
					12-7					
5		S-2	24/10	5-7	11-6	Loose, black SILT and fine to coarse GRAVEL, little medium Sand (FILL).		1½" PVC Wellscreen 3 to 8 feet	13.8	2
					2-3					
10						Bottom of boring at 8 feet.				

REMARKS:

1. Refer to remark #4 on boring log GZ-1 for explanation of testing results.
2. Strong odor in sample S-2.

NOTES: 1) THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. 2) WATER LEVEL READINGS HAVE BEEN MADE IN THE DRILL HOLES AT TIMES AND UNDER CONDITIONS STATED ON THE [illegible] THE LEVEL OF GROUNDWATER MAY OCCUR DUE TO FACTORS NOT ACCOUNTED FOR AT THE

CHI ENVIRONMENTAL ENGINEERING CORP.
325 WOOD ROAD
BRAINTREE, MA 02184
849-1200

SHEET 1 OF 1
DATE 5/21/87
HOLE NO TPI
LINE & STA
OFFSET

O
ROJECT NAME Shaffer Realty
EPORT SENT TO
AMPLES SENT TO

ADDRESS South Street
LOCATION Walpole, MA
PROJ. NO
OUR JOB NO. F 1384

GROUND WATER OBSERVATIONS

At _____ after _____ Hours

At _____ after _____ Hours

	CASING	SAMPLER	CORE BAR
Type			
Size I.D.			
Hammer Wt.			BIT
Hammer Fall			

SURFACE ELEV
DATE STARTED 5/21/87
DATE COMPL. 5/21/87
BORING FOREMAN Felix
INSPECTOR B. Slader
SOILS ENGR.

LOCATION OF BORING: 15' off of cement vault towards large paved area.

DEPTH	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	18-24	Moisture Density or Consist	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, type of soil etc. Rock color, type, condition, hardness, Drilling Time, seams and etc.	SAMPLE No	Pen	Rec.
1'									Brown medium silt with some sand.			
3'									Fibrous asbestos in a green/grey matrix. Some woven pads of it.			
4'									Dark, black oil saturated medium sand and silt. Some small rounded cobbles.			
6'												

GROUND SURFACE TO _____ USED _____ CASING _____ THEN _____

SAMPLE TYPE
D Dry C Cored W Washed
UP Undisturbed Piston TP Test Pit
A Auger V Vane Test
UT Undisturbed Thinwall

Proportions	Used
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50

140 lb wt x 30" fall on 2" O.D. Sampler

Cohesionless Density	Cohesive Consistency
0-10 Loose	0-4 Soft
10-30 Med. Dense	4-8 M. Stiff
30-50 Dense	8-15 Stiff
50+ Very Dense	15-30 V. Stiff
	30+ hard

SUMMARY
Earth Boring 6'
Rock Core
Samples
HOLE NO TP"I

CHI ENVIRONMENTAL ENGINEERING CORP.

325 WOOD ROAD
BRAINTREE, MA 02184
849-1200

SHEET 1 OF 1
DATE 5/21/87
HOLE NO TP2
LINE & STA
OFFSET

TO
ADDRESS South Street
PROJECT NAME Shaffer Realty
LOCATION Walpole, MA
REPORT SENT TO
PROJ. NO.
SAMPLES SENT TO
OUR JOB NO. E 1384

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR
At ____ after ____ Hours	Type			
	Size I.D.			
At ____ after ____ Hours	Hammer Wt.			BIT
	Hammer Fall			

SURFACE ELEV
DATE STARTED 5/21/87
DATE COMPL. 5/21/87
BORING FOREMAN Felix
INSPECTOR B. Slader
SOILS ENGR.

LOCATION OF BORING. In between cement vault and building

DEPTH	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	18-24	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, type of soil etc. Rock color, type, condition, hardness, Drilling Time, seams and etc.	SAMPLE No	Pen	Rec.
									Brown silt with medium sand			
0-5'								0.5'	Black ash red brick.			
3'		TP							Grey adhesive with rocks and other debris stuck into it 150ppm on HNU meter.			
4'									Brown silt with fine to medium sand and a little amount of rounded cobbles.			
4.5'									Large Boulders.			

GROUND SURFACE TO ... USED .... CASING THEN

SAMPLE TYPE
D Dry C Cored W Washed
UP Undisturbed Piston TP Test Pit
A Auger V Vane Test
UT Undisturbed Thinwall

Proportions	Used
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb wt x 30 fall on 2 O.D. Sampler

Cohesionless	Density	Cohesive	Consistency
0-10	Loose	0-4	Soft
10-30	Med Dense	4-8	M-Soft
30-50	Dense	8-15	Stiff
50+	Very Dense	15-30	V-Stiff
		30+ hard	

SUMMARY
Each Boring 4.5'+
Rock Coring
Samples
HOLE NO TP2

CHI ENVIRONMENTAL ENGINEERING CORP.

325 WOOD ROAD
BRAINTREE, MA 02184
849-1200

SHEET 1 OF 1
DATE 5/22/87
HOLE NO TP3
LINE & STA
OFFSET

O
PROJECT NAME Shaffer Realty
PORT SENT TO
AMPLES SENT TO

ADDRESS South Street
LOCATION Walpole, MA
PROJ. NO.
OUR JOB NO. E 1384

GROUND WATER OBSERVATIONS			CASING	SAMPLER	CORE BAR
t 7"	after IMM	Hours	Type		
			Size I.D.		
t	after	Hours	Hammer Wt		BIT
			Hammer Fall		

SURFACE ELEV
DATE STARTED 5/22/87
DATE COMPL. 5/22/87
BORING FOREMAN Felix
INSPECTOR B. Slader
SOILS ENGR. J. Higgins

LOCATION OF BORING: 35-40' Off of cement vault on pavement

DEPTH	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	12-18	18-24 To	Moisture Density or Consist	Strata Change Elev	SOIL IDENTIFICATION Remarks include color, gradation, type of soil etc. Rock color, type, condition, hardness, Drilling Time, seams and etc.	SAMPLE No	Pen	Rec.
0									Ash fill, black			
								2'	Dark brown silt.			
								3'	Orange brown silt with some fine sand. Trace amounts of large rounded boulders.			
5'												
								6'	Green gray silt and clay wet			
									No oil present No organic smell			
9'												

GROUND SURFACE TO USED CASING THEN

SAMPLE TYPE
D Dry C Cored W-Washed
UP Undisturbed Piston TP=Test Pit
A Auger V Vane Test
U Undisturbed Thinwall

Proportions	Used
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb wt x 30" fall on 2" O.D. Sampler

Cohesionless	Density	Cohesive	Consistency
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50+	Very Dense	15-30	V-Stiff
		30+	hard

SUMMARY
Earth Boring 9'
Rock Coring
Samples
HOLE NO TP3

CHI ENVIRONMENTAL ENGINEERING
325 WOOD ROAD
BRAINTREE, MA 02184
849-1200

SHEET 1 OF 1
DATE 5/22/87
HOLE NO TP4
LINE & STA
OFFSET

O
PROJECT NAME Shaffer Realty
EPORT SENT TO
AMPLES SENT TO

ADDRESS South Street
LOCATION Walpole, MA
PROJ. NO.
OUR JOB NO. E 1384

GROUND WATER OBSERVATIONS

At 7' after TMM Hours
At after Hours

	CASING	SAMPLER	CORE BAR
Type			
Size I.D.			
Hammer Wt.			BIT
Hammer Fall			

SURFACE ELEV
DATE STARTED 5/22/87
DATE COMPL. 5/22/87
BORING FOREMAN Felix
INSPECTOR B. Slader
SOILS ENGR. J. Higgins

LOCATION OF BORING: 25' off cement vault, opposite 20,000 oil tank, on pavement

DEPTH	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From To 0-6	6-12	12-18	18-24	Moisture Density or Consist	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, type of soil etc. Rock color, type, condition, hardness, Drilling Time, seams and etc.	SAMPLE No	Pen	Rec.
0'									Brown medium sand and silt. Some medium to coarse pebbles.			
								1'	Black Ash			
								2'	Brown silt with fine sand some medium cobbles rounded.			
5'								5'	Brown medium sand with some silt. Black oil present at groundwater level			
8'												

GROUND SURFACE TO USED CASING THEN

SAMPLE TYPE
D Dry C Cored W Washed
UP Undisturbed Piston TP Test Pit
A Auger V Vane Test
UT Undisturbed Thinwall

Proportions	Used
trace	0 to 10%
little	10 to 20%
some	20 to 35%
and	35 to 50%

140 lb wt x 30 fall on 2" O O Sampler

Cohesionless	Density	Cohesive	Consistency
0-10	Loose	0-4	Soft
10-30	Med Dense	4-8	M/Stiff
30-50	Dense	8-15	Stiff
50+	Very Dense	15-30	V-Stiff
		30+ hard	

SUMMARY
Earth Boring 8'
Rock Coring
Samples
HOLE NO TP4

CHI ENVIRONMENTAL ENGINEERING CORP.

325 WOOD ROAD
BRAINTREE, MA 02184
849-1200

SHEET 1 OF 1
DATE 5/22/87
HOLE NO TP5
LINE & STA
OFFSET

O
PROJECT NAME Shaffer Realty
PORT SENT TO
AMPLES SENT TO

ADDRESS South Street
LOCATION Walpole, MA
PROJ. NO.
OUR JOB NO E 1384

GROUND WATER OBSERVATIONS		CASING	SAMPLER	CORE BAR
At 11' after IMM Hours	Type			
	Size I.D.			
after Hours	Hammer Wt.			BIT
	Hammer Fall			

SURFACE ELEV
DATE STARTED 5/22/87
DATE COMPL. 5/22/87
BORING FOREMAN Felix
INSPECTOR B. Slader
SOILS ENGR. J. Higgins

LOCATION OF BORING. Down gravel path, near catch basin.

Depth	Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	To 12-18	18-24	Moisture Density or Consist	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, type of soil etc. Rock color, type, condition, hardness, Drilling Time, seams and etc.	SAMPLE No	Pen	Rec.
0'									Brown silt and medium sand with a little amount of rounded medium to small cobbles.			
								2'	Orange brown silt with a little fine sand and some fine rounded pebbles.			
								3'	Black-purple ash a little amount of red and buff brick.			
5'								5'	Fibrous asbestos in a green gray silt.			
								6.5'	Black-purple ash.			
								7.5'	Brown silt with some small rounded cobbles			
10'								10'	Green gray clay-wet #6 oil present at this point.			

GROUND SURFACE TO USED CASING THEN

SAMPLE TYPE
D Dry C Cored W Washed
UP Undisturbed Piston TP Test Pit
A Auger V Vane Test
UT Undisturbed Thinwall

Proportions	Used
Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35 to 50%

140 lb wt x 30 fall on 2" O O Sampler

Cohesionless	Density	Cohesive	Consistency
0-10	Loose	0-4	Soft
10-30	Med Dense	4-8	M-Stiff
30-50	Dense	8-15	Stiff
50 +	Very Dense	15-30	V-Stiff
		30+	hard

SUMMARY
Earth Boring 11'
Rock Coring
Samples
HOLE NO TP5

CHI ENVIRONMENTAL ENGINEERING CORP.

325 WOOD ROAD
BRAINTREE, MA 02184
849-1200

SHEET 1 OF 1
DATE 5/22/87
HOLE NO TP6
LINE & STA
OFFSET

ADDRESS South Street
LOCATION Walpole, MA
PROJ NO.
OUR JOB NO.

ROJECT NAME Shaffer Realty
PORT SENT TO
MPLES SENT TO

GROUND WATER OBSERVATIONS

t 9' after TMM Hours
after Hours

	CASING	SAMPLER	CORE BAR
Type			
Size I.D.			
Hammer Wt.			BIT
Hammer Fall			

SURFACE ELEV
DATE STARTED 5/22/87
DATE COMPL. 5/22/87
BORING FOREMAN Felix
INSPECTOR B. Slader
SOILS ENGR. J. Higgins

LOCATION OF BORING: Down gravel path, near lagoon.

Sample Depths From - To	Type of Sample	Blows per 6" on Sampler From 0-6	6-12	12-18	18-24	Moisture Density or Consist	Strata Change Elev.	SOIL IDENTIFICATION Remarks include color, gradation, type of soil etc. Rock color, type, condition, hardness, Drilling Time, seams and etc.	SAMPLE No	Pen	Rec.
								Brown silt and fine sand with some medium pebbles.			
3'							3'	Black-purple ash			
							4'	Brown silk and fine sand with some rounded medium cobbles.			
							7'	Green grey silt and clay, water at this point, no oil present.			

GROUND SURFACE TO 9'

SAMPLE TYPE
D Dry C Cored W Washed
UP Undisturbed Piston TP Test Pit
A Auger V Vane Test
U Undisturbed Thinwall

USED

Proportions	Used
Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
[illegible]	35 to 50%

CASING THEN

140 lb wt x 30" fall on 2" O.D. Sampler

Cohesionless	Density	Cohesive	Consistency
0-10	Loose	0-4	Soft
10-30	Med. Dense	4-8	M. Stiff
30-50	Dense	8-15	Stiff
50+	Very Dense	15-30	V. Stiff
		30+	hard

SUMMARY
Earth Boring
Rock Coring
Samples
HOLE NO TP6

MAJOR DIVISIONS			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY TO SAMPLES:

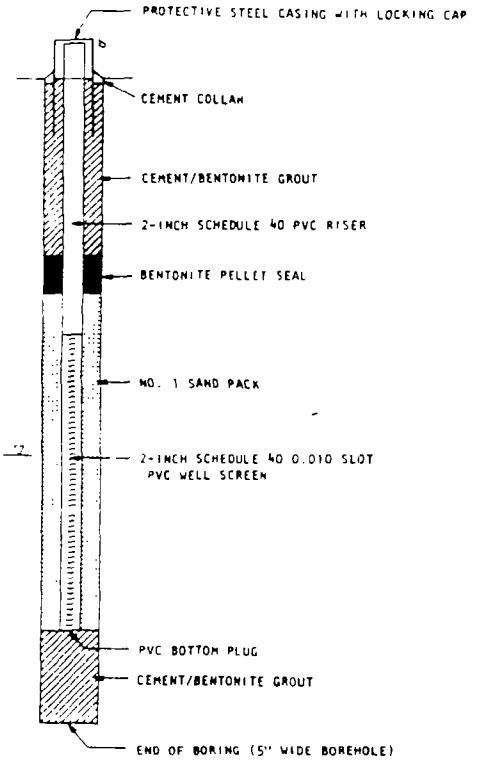
- ■ INDICATES DEPTH OF UNDISTURBED SAMPLE
- ■ INDICATES DEPTH OF DISTURBED SAMPLE
- □ INDICATES DEPTH OF SAMPLING ATTEMPT WITH NO RECOVERY
- ◘ INDICATES DEPTH OF SPLIT-SPOON SAMPLE
- I INDICATES DEPTH AND LENGTH OF CORING RUN

DAMES & MOORE

BORING MW-1

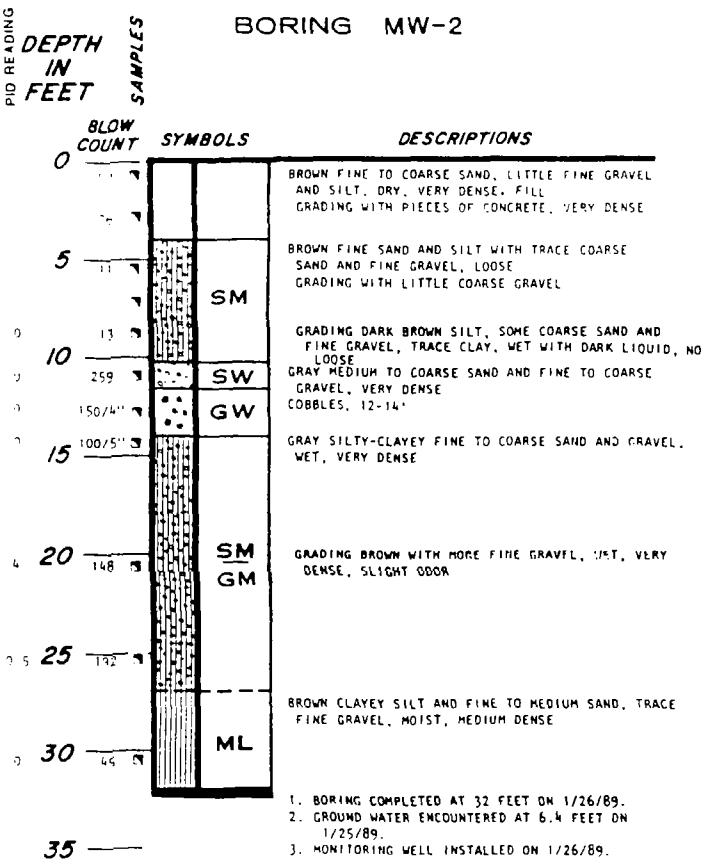
PID READING	DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
0	0		4	ML	BROWN SILT TRACE CLAY, TRACE FINE SAND WITH GRASS AND ROOTS, MOIST, VERY LOOSE GRADING TAN WITH SILTY LAMINAE
0			8		
0	5		25		GRADING GRAY-BROWN WITH TRACE COARSER SAND
0			33		
0			21		
	10			SP	TAN AND GRAY FINE SAND WITH SILTY LAMINAE, TRACE SILT, MEDIUM DENSE, MOIST
0			35		
0			21		GRADING WET, MEDIUM DENSE
0	15		150		GRADING WITH GRAY MEDIUM GRAVEL, SOME FINE SAND AND SILT, MOIST
0			36		GRADING WITH SOME MEDIUM TO COARSE SAND
40			48		
	20			SM	BROWNISH GRAY FINE TO COARSE SILTY SAND, LITTLE COARSE GRAVEL, SLIGHT PETROLEUM ODOR, WET
20			67		GRADING ORANGE-BROWN, WET, VERY DENSE, SLIGHT ODOR
	25				
1			198		
	30			SM	BROWN MOTTLED FINE TO COARSE SAND AND CLAYEY SILT, TRACE FINE GRAVEL, MOIST, DENSE
0			121/4"		
	35				

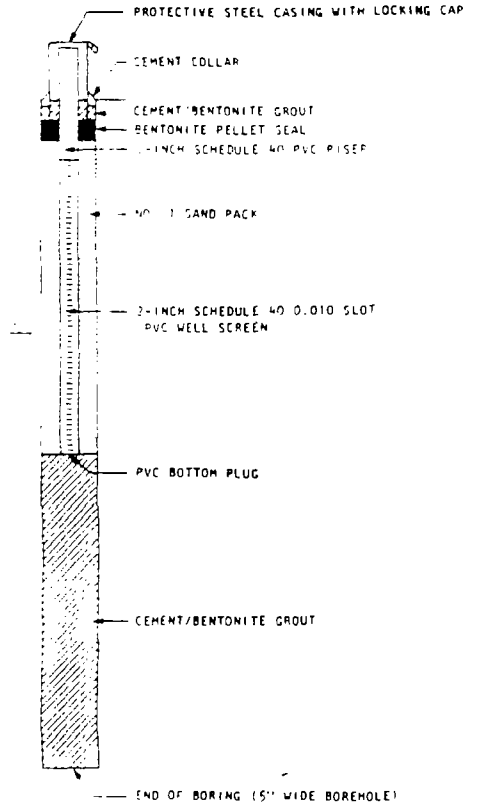
1. BORING COMPLETED AT 32 FEET 10 INCHES ON 1/24/89.
2. GROUND WATER ENCOUNTERED AT 18 FEET 6 INCHES ON 1/24/89.
3. MONITORING WELL INSTALLED ON 1/24/89.



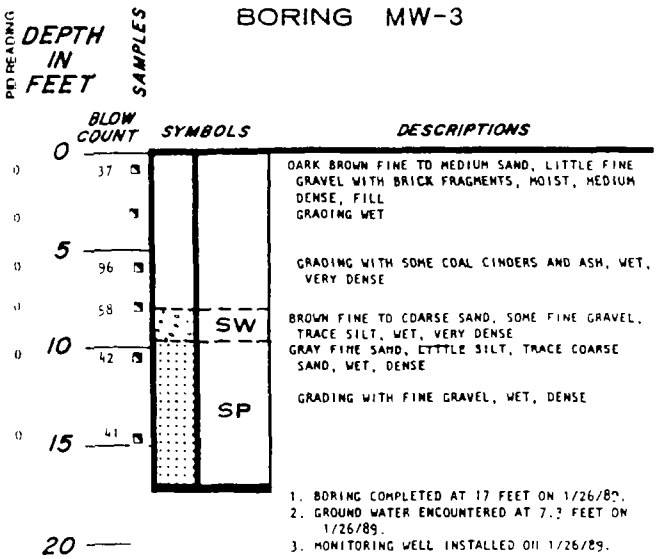
LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

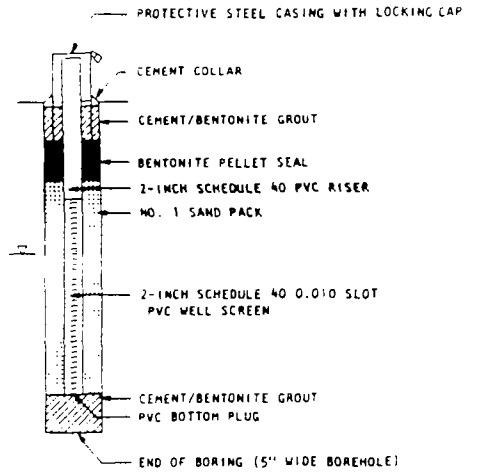
BORING MW-2





BORING MW-3



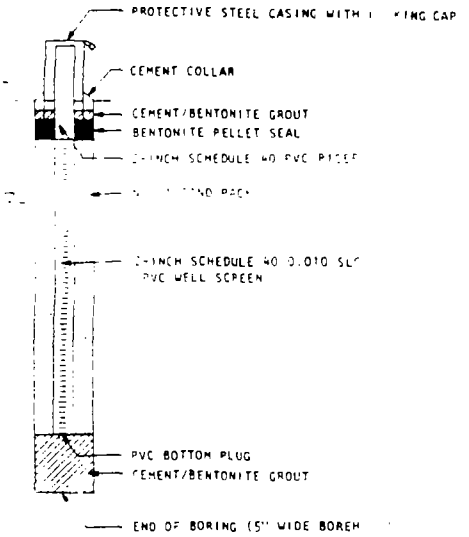


LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

BORING MW-4

PID READING	DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
	0				BROWN FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, FILL GRADING GRAY VERY DENSE WITH SLIGHT ODOR GRADING WET
	5				GRADING BLACK WITH SILT LENSES, VERY DENSE, PETROLEUM ODOR
	10				GRADING WITH GRAVEL, WET, DENSE
	15			GW	COBBLES AND GRAVEL, WET
				SM/GM	MOTTLED BROWN AND TAN FINE TO COARSE SILTY SAND AND FINE GRAVEL, SOME CLAY, WET, VERY DENSE
	20				
	25				

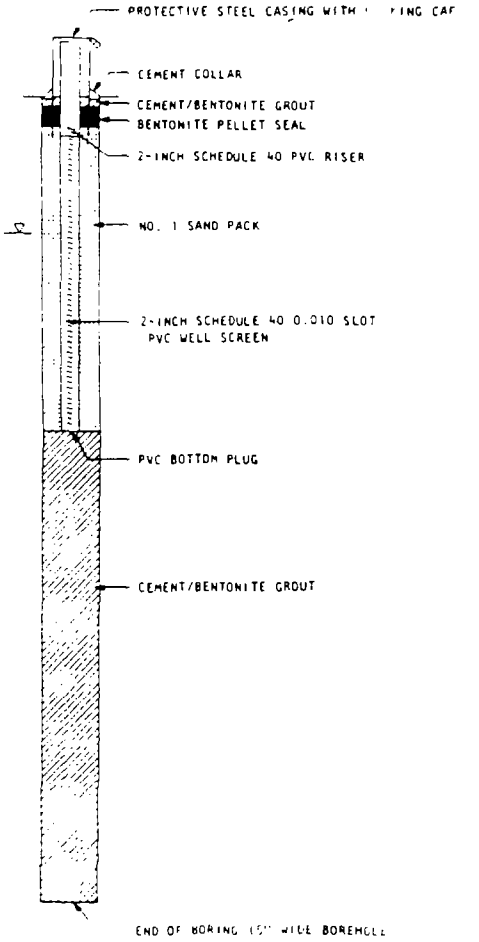
1. BORING COMPLETED AT 20.5 FEET ON 1/30/89.
2. GROUND WATER ENCOUNTERED AT 4 FEET 10 INCHES ON 1/27/89.
3. MONITORING WELL INSTALLED ON 1/30/89.



BORING MW-5

PID READING	DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
	0		9	ML	TOPSOIL, BLACK SILT, LITTLE FINE SAND, LITTLE FINE GRAVEL, CONCRETE FRAGMENTS, MOIST, FILL DARK BROWN SILT WITH FINE SAND, TRACE ORGANIC MATTER, TRACE FINE GRAVEL, MOIST, LOOSE
	5		10	PT/OH	BLACK ORGANIC CLAY AND ORGANIC MATTER, VERY SOFT, NO RECOVERY
	10		15	SP	GRADING WITH FINE SAND LIGHT BROWN TO TAN FINE TO MEDIUM SAND, MOIST, MEDIUM DENSE
	15		31		
	20		46	CL	BROWN AND TAN MOTTLED CLAY AND SILT WITH SOME TAN FINE SAND, TRACE FINE GRAVEL, MOIST, DENSE TAN TO BROWN MOTTLED SILT, CLAY AND FINE TO COARSE SAND, TRACE FINE GRAVEL, MOIST, VERY DENSE
	25		129	SM/ML	GRADING WITH SANDY LENSES
	30		195		GRADING ORANGE-BROWN COLOR, LESS SAND, MOIST, VERY DENSE
	35		115-6"		GRADING MORE CLAY
	40		170/4"		
	45				

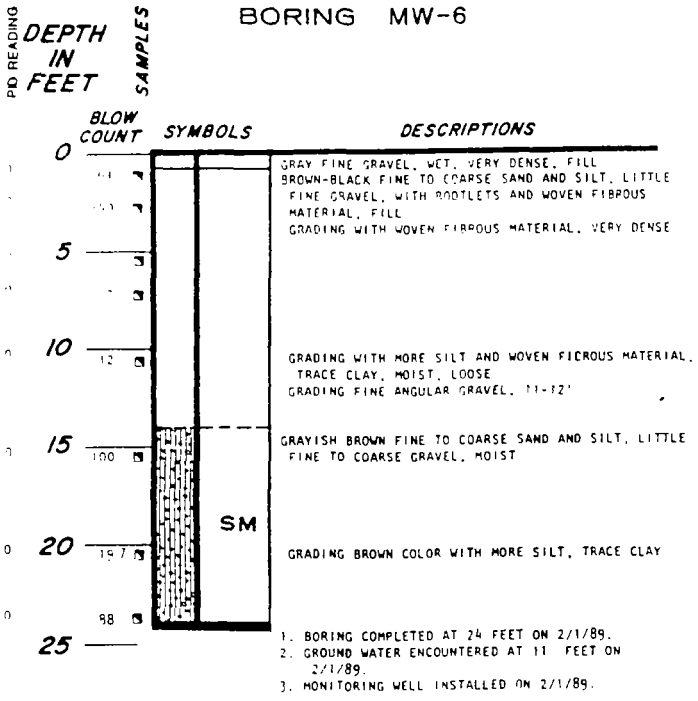
1. BORING COMPLETED AT 41 FEET ON 2/1/89
2. GROUND WATER ENCOUNTERED AT 4.65 FEET.
3. MONITORING WELL INSTALLED ON 2/2/89.

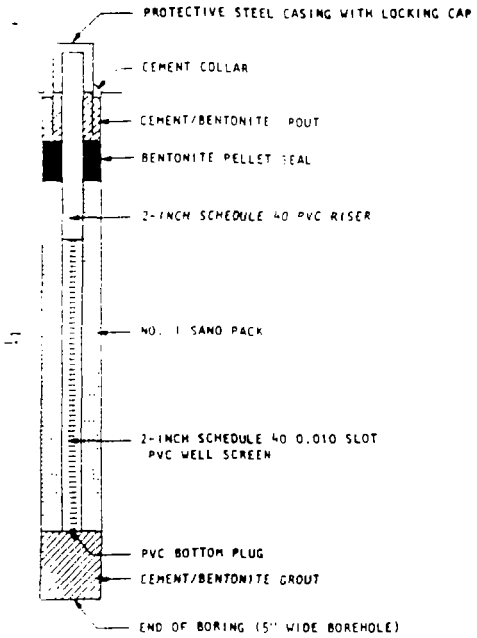


LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

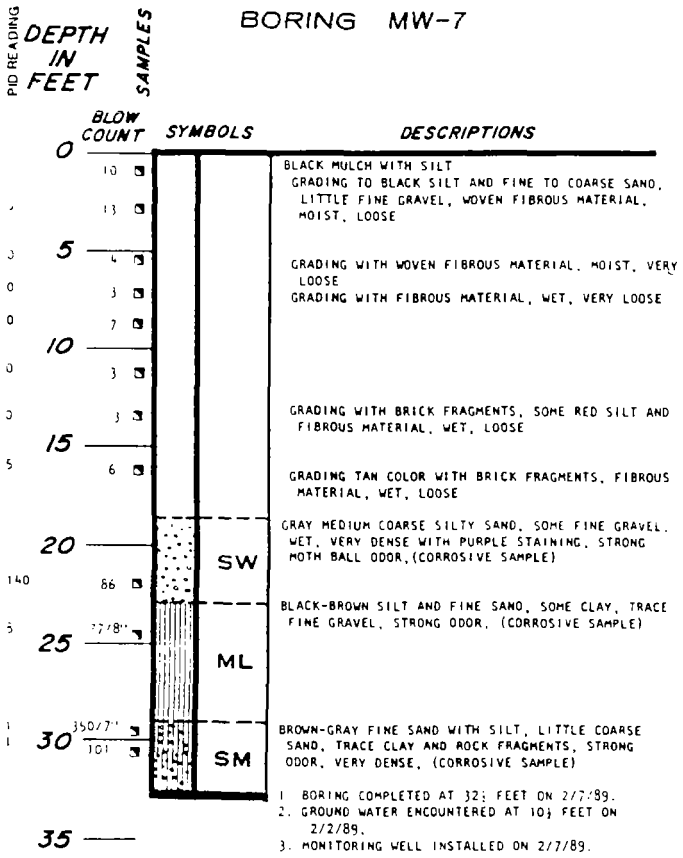
Dames & Moore

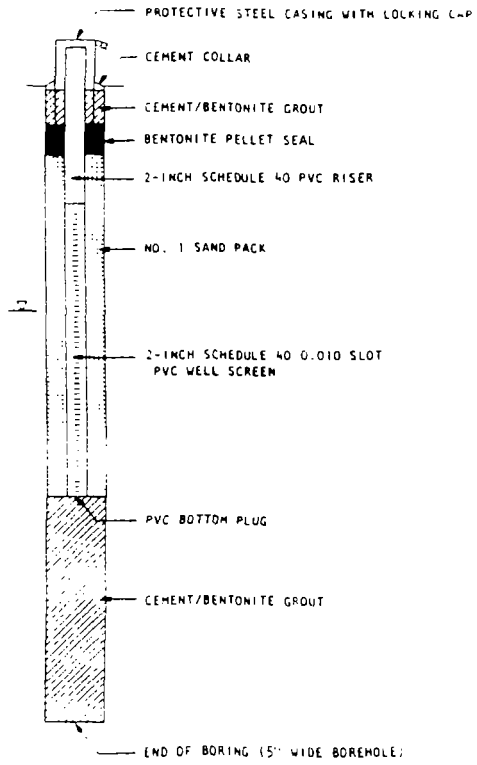
BORING MW-6





BORING MW-7

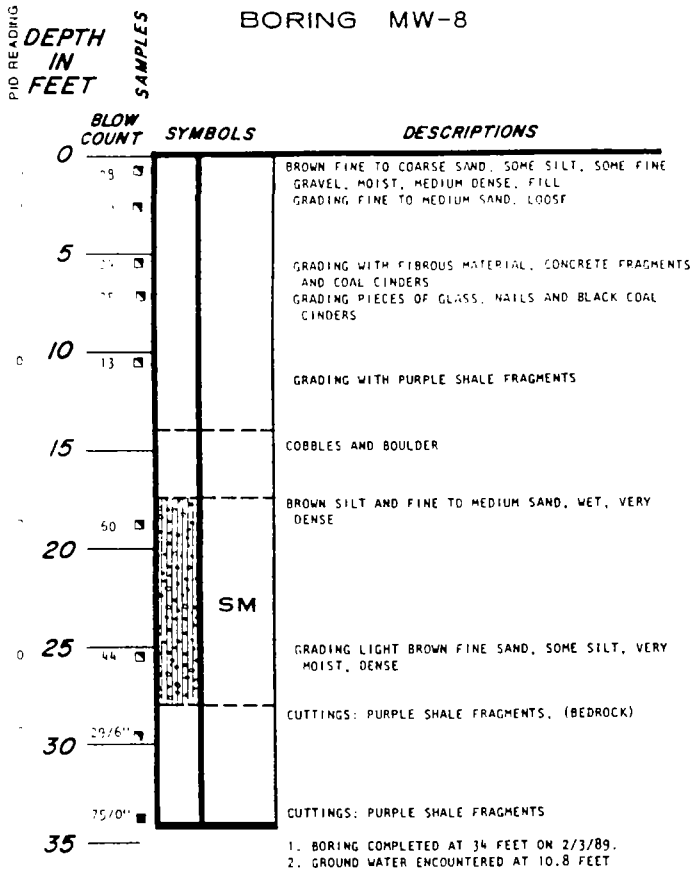


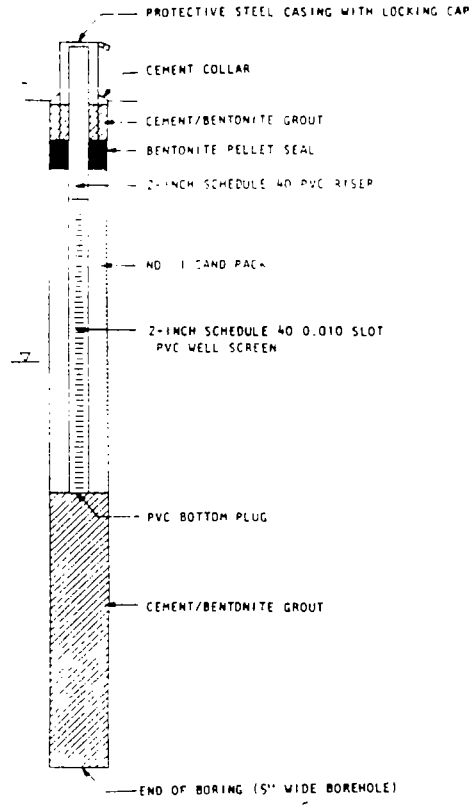


LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

Dames & Moore

BORING MW-8





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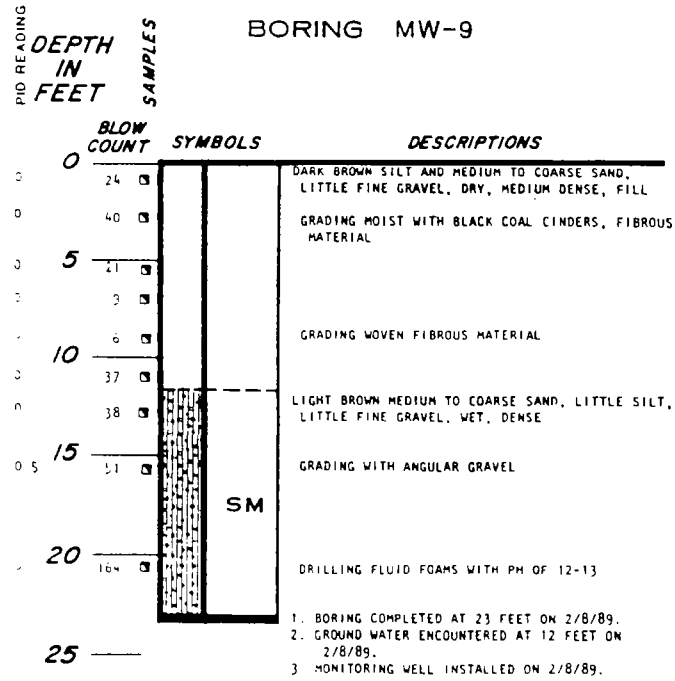
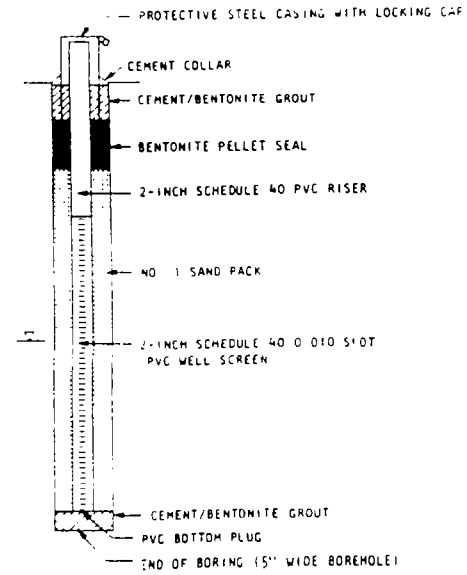




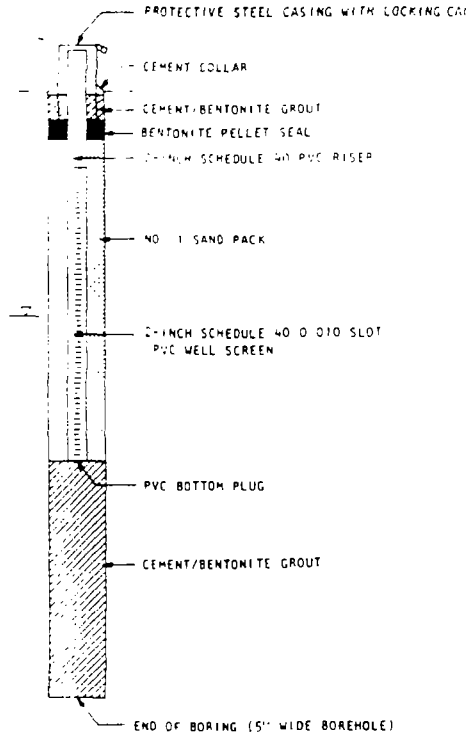
LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

Dames & Moore

BORING MW-10

PID READING	DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
	0				BROWN TO BLACK SILT AND FINE TO MEDIUM SAND WITH REDDISH AND GREENISH FIBROUS MATERIAL. LOOSE. FILL
			12		
			23		GRADING ORANGE WITH FIBROUS MATERIAL
	5		4		GRADING BROWN SILT AND BLACK CINDERS. DRY. LOOSE. FILL
			10		GRADING FIBROUS MATERIAL. MOIST. LOOSE
			13		GRADING WITH FIBROUS MATERIAL AND WOOD CHIPS. LOOSE
	10		37		GRADING FIBROUS MATERIAL
				SM	GRAY-BROWN AND GREENISH MOTTLED FINE TO COARSE SILTY SAND. LITTLE FINE GRAVEL. WET. VERY DENSE
	15		28		GRADING BROWN AND GRAY. WET. VERY DENSE
	20		82		GRADING WITH MORE CLAY AND FINE TO MEDIUM GRAVEL. WITH CLAYEY LENSES
	25		63		
					SHALE FRAGMENTS IN CUTTINGS
			100/1"		NO RECOVERY
	30				
	35				

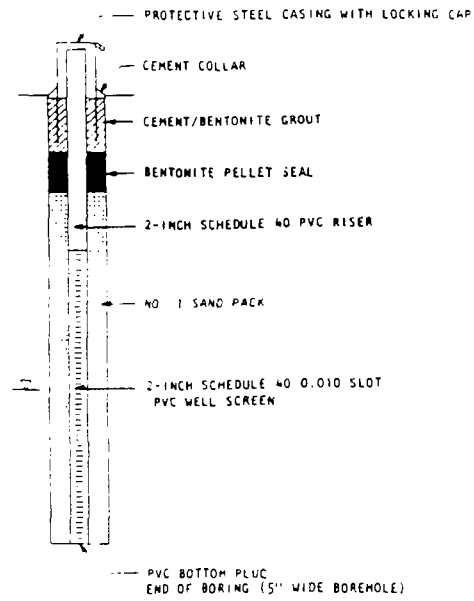
1. BORING COMPLETED AT 31 FEET ON 2/14/89.
2. GROUND WATER ENCOUNTERED AT 9 FEET 11 INCHES ON 2/8/89.
3. MONITORING WELL INSTALLED ON 2/14/89.



BORING MW-11

PID READING	DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
	0		8		TOPSOIL. DARK BROWN SILT. LITTLE FINE SAND WITH ROOTLETS. FILL
			4		GRADING BROWN FINE SAND AND SILT. TRACE COARSE SAND. SLIGHTLY MOIST. VERY LOOSE
	5		13		GRADING WITH LITTLE FINE GRAVEL. TRACE BLACK CINDERS. MOIST. LOOSE
			15		
			38		GRADING TO MOTTLED LIGHT AND DARK BROWN WITH BRICK FRAGMENTS. SLIGHTLY MOIST. MEDIUM DENSE. FILL
	10		22		GRADING TO TAN FINE SAND AND SILT WITH SOME FINE GRAVEL. TRACE PURPLE SHALE. MOIST
			46		
	15		81		GRADING BLACK SILT AND FINE SAND. TRACE CLAY. TRACE FINE GRAVEL AND COAL CINDERS. WET. SLIGHT ODOR. FILL
				SM	STRATIFIED ORANGE-BROWN MEDIUM TO COARSE SILTY SAND AND FINE GRAVEL. WET. VERY DENSE
	20		40	ML CL	ORANGE-BROWN SILT AND CLAY WITH SOME FINE TO COARSE SAND. LITTLE FINE GRAVEL AND CLAY GRADING BROWN. WET. VERY DENSE
	25				

1. BORING COMPLETED AT 23 FEET ON 2/15/89.
2. GROUND WATER ENCOUNTERED AT 13 FEET 4 INCHES ON 2/14/89.
3. MONITORING WELL INSTALLED ON 2/15/89.



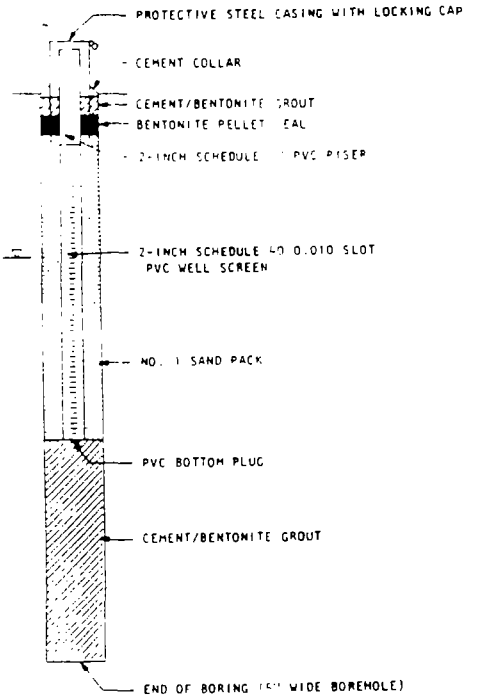
LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

Dames & Moore

BORING MW-12

PID READING	DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
	0				CONCRETE
			30		BLACK-BROWN FINE TO COARSE SAND, SOME SILT, WITH BRICK, BLACK CINDERS AND METAL FRAGMENTS, SLIGHTLY MOIST, DENSE, FILL
			50		
	5		[illegible]		GRADING TRACE COARSE GRAVEL, MOIST, LOOSE, SLIGHT PETROLEUM ODOR
			[illegible]		
0			5		GRADING SATURATED
	10		34		GRADING STRONG PETROLEUM ODOR
			50		BROWN FINE TO COARSE SAND AND GRAVEL, LITTLE SILT, MOIST, DENSE, NO ODOR
	15		31	SW	GRADING WITH PETROLEUM ODOR
	20		108	SM	LIGHT BROWN-GRAY FINE TO COARSE SILTY SAND AND GRAVEL, MOIST, VERY DENSE
	25		120/3"	CL	GRAY TO LIGHT PURPLE SANDY CLAY AND SILT WITH FRAGMENTS OF PURPLE SHALE, WET, HARD
			100		GRADING DRY (WEATHERED BEDROCK)
	30				
	35				

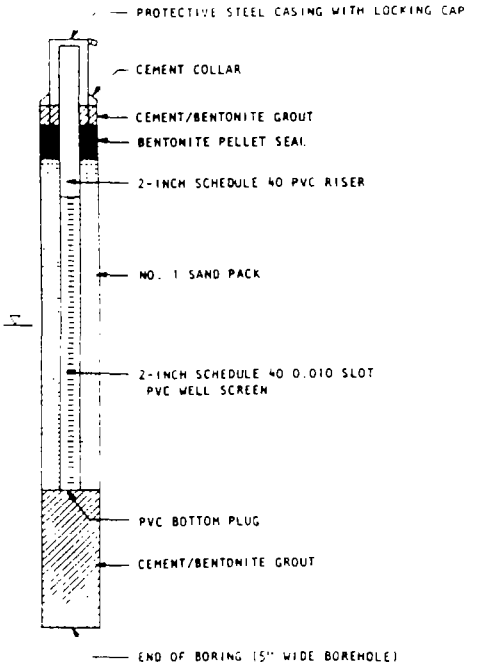
1. BORING COMPLETED AT 29 FEET ON 2/10/89.
2. GROUND WATER ENCOUNTERED AT 4.7 FEET ON 2/10/89.
3. MONITORING WELL INSTALLED ON 2/10/89.
4. 300-POUND DROP HAMMER USED TO ADVANCE SPLIT-SPOON.



BORING MW-13

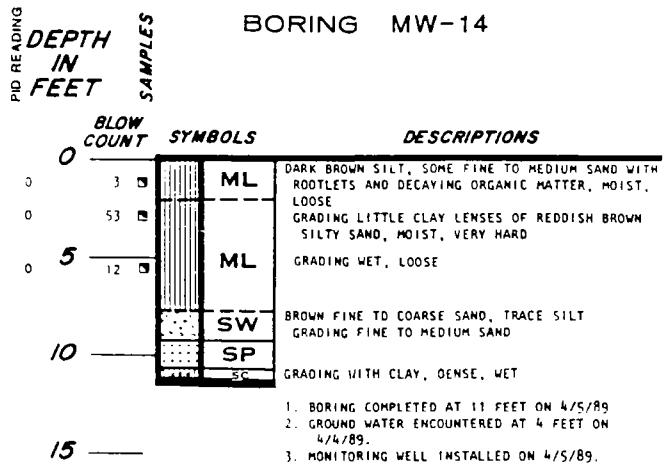
PID READING	DEPTH IN FEET	SAMPLES	BLOW COUNT	SYMBOLS	DESCRIPTIONS
	0				BLACK FINE TO COARSE SAND, LITTLE FINE GRAVEL, LITTLE SILT, COAL ASH AND RUBBERY TAR-LIKE MATERIAL, MOIST, DENSE, FILL
0			31		GRADING WITH FIBROUS MATERIAL, TAR ODOR
0			34		LIGHT BROWN FINE SAND, TRACE SILT, PIECE OF BLACK RUBBERY MATERIAL, SATURATED, LOOSE, FILL
	5				
0.5			8		
0.5			22		
	10				BROWN FINE TO COARSE SAND, SOME FINE TO MEDIUM GRAVEL, LITTLE SILT, WET, MEDIUM DENSE
0.25			38		
0.3			27		
0	15		18	SP/GP	
	20		103		
					BOULDER
	25			SM	LIGHT BROWN SILTY FINE TO COARSE SAND, LITTLE COARSE GRAVEL, WET, VERY DENSE
			2		
	30				

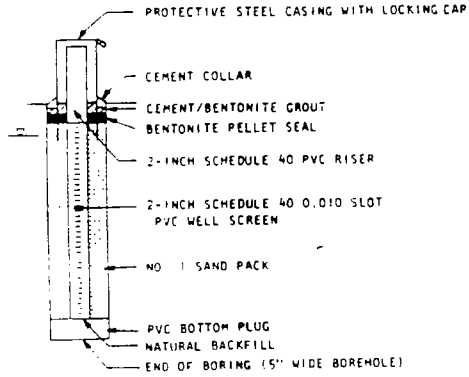
1. BORING COMPLETED AT 27 FEET ON 2/14/89.
2. GROUND WATER ENCOUNTERED AT 9.5 FEET ON 2/13/89.
3. MONITORING WELL INSTALLED ON 2/14/89.
4. 300-POUND HAMMER USED TO ADVANCE SPLIT-SPOON



LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

Dames & Moore





LOG OF BORINGS AND MONITORING WELL DESCRIPTIONS

APPENDIX D

MASS GIS MAP

MA DEP - Bureau of Waste Site Cleanup

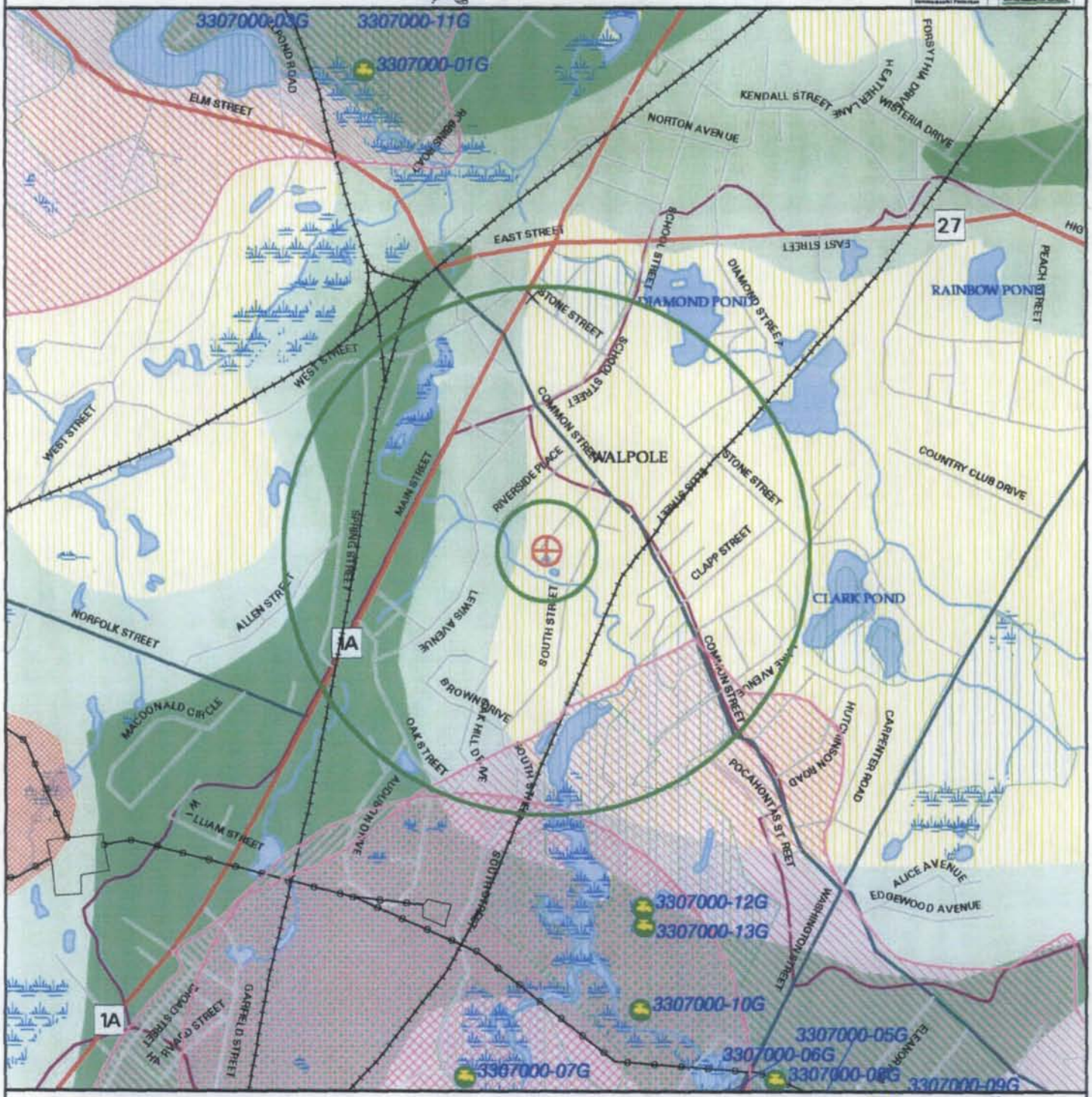
Site Scoring Map: 500 feet & 0.5 Mile Radii

SITE NAME:
South Street
Walpole, MA
4667475n 313824ew

Site Location

The information shown on this map is the best available at the date of printing. Please refer to the data source descriptions document.

MASS GIS — Massachusetts Geographic Information System — Massachusetts Executive Office of Environmental Affairs - 1999



Roads: Limited Access, Divided, Major Road, Connector, Street, Track, Trail
Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct
Basins: Major, Sub; Streams: Perennial, Intermittent, Man Made Shore, Dams
Potentially Productive Aquifers: Medium,High Yield
Non-Potential Drinking Water Source Area: Medium,High Yield

EPA Designated Sole Source Aquifer
Public Water Supplies: Ground,Surface,Non Community
Approved Zone2; IWPA; Surface Water Supply Zone A
Hydrography: Water Features,Public Surface Water Supply
Wetlands: Fresh,Salt,NHESP Wetlands Habitat
Protected Open Space; ACEC
DEP Permitted Solid Waste Facilities; Certified Vernal Pools

N S E W

SCALE 1:15000

0 1/2 MILES
0 1/2 KILOMETERS

April 13, 1999

NRS SCORING MAP DATA SOURCES

AQUIFERS: USGS-WRD/MassGIS, 1:48,000. Automated by MassGIS from the USGS Water Resources Div. Hydrologic Atlas series manuscripts. The definitions of high and medium yield vary among basins. Source dates 1977 to 1983.

SOLE SOURCE AQUIFERS: US EPA/MA DEP/MassGIS, various scales. They are defined by EPA as aquifers that are the 'sole or principal source' of drinking water for a given aquifer service area. Last updated July 1993.

NON POTENTIAL DRINKING WATER SOURCE AREAS: DEP-BWSC (Bureau of Waste Site Cleanup). Those portions of high and medium yield aquifers which may not be considered as areas of groundwater conducive to locations of public water supplies. Please refer to the MCP guidelines for the definitions of these areas.

DEP APPROVED ZONE IIS: MA DEP, 1:25,000. As stated in 310 CMR 22.02 'that area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated.' Digitized from data provided to DEP in approved hydrologic engineering reports. Data is updated continuously.

INTERIM WELLHEAD PROTECTION AREAS: DEP-DWS (Division of Water Supply), 1:25,000. These polygons represent an interim Zone II for a groundwater source until an actual one is approved by the DEP Division of Water Supply. The radius of an IWPA varies according to the approved pumping rate. Updated in parallel with the Public Water Supplies data.

PUBLIC WATER SUPPLIES: DEP-DWS, 1:25,000. Community and non-community surface and withdrawal points were field collected using Global Positioning System receivers. The attributes were added from the DEP Division of Water Supply database. Continuously updated.

HYDROGRAPHY: USGS/MassGIS. 1:25000 USGS Digital Line Graph (DLG) data, modified by MassGIS. Approximately 40% of the data was provided by USGS and the remainder was created by MassGIS to USGS specifications. Source dates 1977-1997.

DRAINAGE BASINS: USGS-WRD/MassGIS, 1:24,000. Automated by MassGIS from USGS Water Resources Division manuscripts with approximately 2400 sub-basins as interpreted from 1:24,000 USGS quadrangle contour lines. 1987-1993.

WETLANDS: UMass Amherst RMP/MassGIS, 1:25,000. Includes nonforested wetlands extracted from the 1971-1991 Land Use datalayer which was photointerpreted from Summer CIR photography. Interpretation was not done in stereo. Also includes, in most areas, forested wetlands from USGS Digital Line Graph (DLG) data.

PROTECTED OPEN SPACE: EOEA (Executive Office of Environmental Affairs) MassGIS, 1:25,000. Includes federal, state, county, municipal, non profit, and protected private conservation and outdoor recreation lands. Ongoing updates.

ACECs: DEM, 1:25,000. Areas of Critical Environmental Concern are areas designated by the Secretary of EOEA as having a number of valuable environmental features coexisting. Projects in ACECs are subject to the highest standards of review and performance. Last updated October 1996.

ROADS: USGS/MassGIS/MHD, 1:100,000. Massgis extracted roads from the USGS Transportation DLG files. MA Highway Dept. updated roads through 1997. MassGIS and MA DEP GIS group further edited this layer. Numbered routes are part of the state, US or Interstate highway systems.

POLITICAL BOUNDARIES: MassGIS/USGS, 1:25,000. This datalayer was digitized by MassGIS from mylar USGS quads. Source date is approximately 1985.

DEP PERMITTED SOLID WASTE FACILITIES: DEP-DSW (Division of Solid Waste), 1:25,000. Includes only facilities regulated since 1971. Data includes sanitary landfills, transfer stations and recycling or composting facilities. Facility boundaries were compiled or approximate facility point locations drafted onto USGS quadrangles and automated by the DEP Division of Solid Waste. Last updated 1997.

NHESP ESTIMATED HABITATS OF RARE WETLANDS WILDLIFE: Polygons show estimated habitats for all processed occurrences of rare wetlands wildlife. Data collected by Natural Heritage & Endangered Species Program and compiled at 1:24000 or 1:25000 scale. For use with Wetlands Protection Act Only. Effective Jan. 1, 1997 through Dec. 31, 1998.

NHESP CERTIFIED VERNAL POOLS: Points show all vernal pools certified by NHESP/MADFW (Fisheries and Wildlife) as of September 25, 1996. Data compiled at 1:24000 or 1:25000 scale. Effective January 1, 1997 through December 31, 1998.

Massachusetts Geographic Information System
Executive Office of Environmental Affairs
20 Somerset Street, 3rd Floor
Boston, MA 02108

Phone: 617-727-5227 *Fax: 617-227-7045* *Order On Line: http://www.state.ma.us/mgis*

INVOICE FOR THE PROVISION OF CARTOGRAPHIC DATA

Order # 2587 PO # 99-121

Requisitioned by: Charlie Head

Order Dated: 4/12/99
Order Received: 4/12/99
Order completed by: Greg Scott
Date Processed: 4/13/99
Shipper: U.S. Mail

Sent to: Sanborn Head & Associates
6 Garvins Falls Rd
Suite 1
Concord,NH 03301

Description of data/services provided:

ITEM	COST
MCPLITE South Street Scale: 1:15000 Coordinates: 4667475 313824	$ 25

Total cost:	$25.00
Amount received:	$0.00
Amount due:	**$25.00**

Please send check to the above address payable to ***Executive Office of Environmental Affairs.***

Thank you!

APPENDIX E

DATA QUALITY ASSESSMENT

New Environmental Horizons, Inc.

Technical Memorandum

To: Charles Head and Nikki Delude, Sanborn Head and Associates, Inc.

From: Susan D. Chapnick and Nancy C. Rothman, New Environmental Horizons, Inc.

Subject: Data Usability Assessment for Existing Data
Blackburn and Union Privileges Site, Walpole, MA

Date: January 11, 2000

Executive Summary - Data Usability Assessment for Existing Data

The goal of this Data Usability Assessment is to provide, to the data users, a complete and understandable report that describes the uncertainties in the results and the effect of these uncertainties on the usability of the data. The primary data quality objective (DQO) defined for this usability assessment was to be able to use the existing data in human health and ecological risk assessments. A secondary DQO was to use the existing data for planning the Site Remedial Investigation (RI). The quality of the existing data were evaluated compared to the quality of data needed to support risk assessment, based on EPA's *Guidance for Data Useability in Risk Assessment* (April 1992), EPA's *Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses* (December 1996), and technical judgment. The approach of the Data Usability Assessment included an evaluation of the available data in terms of the standard data quality indices of accuracy, precision, representativeness, sensitivity, and comparability.

A majority of the existing data can be used for planning the Site RI; however, much of the existing data cannot be used in human health or ecological risk assessment because the quality of the data do not support this use and because significant data gaps exist for some compounds (e.g., VOC) due to rejection of results based on the usability assessment. Additionally, non-comparability of methods used to generate the existing data compared to current analytical methods adds to the uncertainty. The potential that estimated (qualified UJ) non-detected results may be false-negatives renders these results inadequate for use in risk assessment. A portion of the existing data can be used, with qualifications and bias as indicated in the usability assessment, for risk assessment. Some of the existing data were rejected as unusable and should not be considered in either risk assessment or Site RI planning. A summary of the key usability issues is listed below. Details are presented in the body of the Data Usability Assessment technical memorandum.

Volatile Organic Carbon (VOC) data – Much of the VOC data are unusable for both risk assessment and RI planning. All non-detected results for VOCs in soil, sediment, and TCLP samples were "rejected" (qualified R) as unusable due to lack of preservation. Recent EPA method updates (method 5035) require preservation of VOCs to prevent losses from the field collection until laboratory analysis can be completed.

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34 Pheasant Run Drive, Skillman, NJ 08558 ◊ 63 College Avenue, Arlington, MA 02474
Phone: (908) 874-5686 ◊ (781) 643-4294 Fax: (908) 874-4786
Email: NCR@ix.netcom.com ◊ Chapnick@mediaone.net

Detected VOC concentrations in soil and sediment were "estimated" (qualified J) and are considered usable as biased low results. All non-detected results for VOCs in caustic groundwater samples, *i.e.*, samples with pH $\geq$ 9, were rejected (qualified R) as unusable due to the expected loss of VOCs when the caustic groundwater was placed in a vial containing acid. Foaming of samples was anecdotally described in some of the data reports (CHIEE, 1987b). The detected VOC results in these samples were estimated (qualified J) and are considered usable as biased low results. Detected and non-detected VOC results in other groundwaters and in surface waters are considered usable for risk assessment and RI planning, with the addition of qualifications for specific VOCs based on quality issues uncovered during the data usability assessment. Non-detected results for VOCs in groundwater or surface water where the sample reporting limit is not recorded in the existing data database have limited usability for risk assessment but may be usable for planning the Site RI.

Semivolatile Organic Compound (SVOC) data – In general, SVOC chemical results in soil, sediment, groundwater, surface water, and TCLP samples are usable, with the following exceptions. Acid extractable compounds for several soil and sediment samples and individual compounds in groundwaters were rejected (qualified R) as unusable where the Dames & Moore data validation review (1989a) identified severe quality control exceedances. Additionally, all sediment SVOC results are considered estimated (qualified J and UJ) due to suspected sediment matrix effects. These estimated results are usable with the understanding that the accuracy, precision, and representativeness of the results may have been adversely affected by the sample matrix. Non-detected results for SVOCs where the sample reporting limit is not recorded in the existing data database have limited usability for risk assessment but may be usable for planning the Site RI.

Tentatively Identified Compound (TIC) data – VOC and SVOC data for TICs that were not previously rejected due to the usability issues stated above (soil/sediment preservation issues and high pH in groundwater), are considered estimated results (qualified J and UJ). There is uncertainty in the estimated VOC and SVOC TIC data in terms of both identification and quantitation. TIC results are screening-level data and are not definitive. Though they may indicate the presence of some classes of compounds, they cannot be used to confirm the presence, absence, or amount of a specific substance.

Metals data – In general, metals results in soil, sediment, groundwater, surface water, and TCLP samples are usable for Site RI planning, with the addition of qualifications added for specific metals due to the potential bias in the results. A sub-set of these results are usable for risk assessment. All results for metals in caustic groundwater samples (pH $\geq$ 9) were estimated (J and UJ) because the accuracy is uncertain in such a basic matrix. While some metals may precipitate at high pH, other metals may still be soluble. Additionally, a majority of the data represent "dissolved" metals results (all Dames & Moore data 1989). The filtration procedure used to obtain dissolved metals may also impact the accuracy of the metals results in caustic groundwaters. The bias in these estimated results is unknown; therefore, the non-detected results may be false-negatives. Risk assessors are cautioned about the use of potential false-negative metals results (i.e., non-detected results that have been estimated, qualified "UJ"). Additionally, all sediment results for metals are considered estimated (qualified J and UJ) due to suspected sediment matrix effects. These estimated results are usable with the understanding that the accuracy, precision, and representativeness of the results may have been adversely affected by the sample matrix. Non-detected results for metals where the sample reporting limits is not recorded in the existing data database have limited usability for risk assessment but may be usable for planning the Site RI.

Cyanide data – In general, cyanide results for soil, sediment, groundwater, and surface water samples are usable for risk assessment and RI planning. Non-detected results for cyanide where the sample reporting limit is not recorded in the existing data database have limited usability for risk assessment but may be usable for planning the Site RI.

Asbestos data – In general, the asbestos results in soil, groundwater, and air are usable with the following exceptions and qualifications. Air monitoring results for asbestos from CHIEE (1987b) were rejected (qualified R) and are unusable for risk assessment due to cumulative effects of quality and method issues. These results may have limited usability in planning the Site RI. All detected asbestos results in groundwater reported by Dames & Moore (1989a) are biased low (qualified J) due to the method-modification of counting "structures" rather than individual "fibers" of asbestos. The different asbestos methods used in the existing data set are non-comparable and have different potential method biases. For example, the phase contrast microscopy method is less accurate and may produce a high bias compared to polarized light microscopy or transmission light microscopy methods.

Total Petroleum Hydrocarbons – All TPH data are considered estimated (qualified J and UJ) and are usable as screening-level results only due to method limitations that will affect the accuracy of the results. These estimated results are usable for planning the Site RI but are unusable for risk assessment.

Documentation and Transcription Errors – The Dames & Moore data which had initially been entered into the SHA's database was obtained from Tables 6-11 through 6-40 of the 1989 Dames & Moore Site Assessment report. The data tables included in the Dames & Moore (1989a) report were found to be deficient in documentation and contained numerous errors. The Dames & Moore tabulated data lacked documentation of reporting levels for all non-detected results and lacked percent solids results for all soil and sediment samples. Additionally, the Dames & Moore tabulated data indicated that 22 metals were analyzed for all media; however, a number of the metals reported in the Dames & Moore as non-detected were actually not analyzed.

SHA received Certified Laboratory Program (CLP) analytical data packages for the 1989 Dames & Moore Site Assessment Report and performed a 100% transcription check of the Dames & Moore data from the laboratory data report forms. Based on this transcription review, SHA determined that 13, not 22 metals had been analyzed, per media, by the laboratory. SHA corrected the existing data by eliminating the non-analyzed metals from the database; in addition, SHA input missing VOC data, and corrected numerous additional transcription errors in the reported results.

Data users should note that the reporting limits for non-detected results and the percent solids can be found in the CLP analytical data packages for the Dames & Moore data (1989a). However, these limits were not entered into the existing data database because the level-of-effort required to hand-enter this information was determined, at least at this time, to exceed any potential benefit to the data user.

The laboratory data reports supporting the 1989 Dames & Moore Site Assessment data (1989a) were complete CLP-type data packages containing sample-specific reporting limits, percent solids for soils and sediments, sample results, and some associated quality control (QC) results. A comprehensive validation of these data was not undertaken due to the level-of-effort that would have been required. However, the laboratory data reports were spot-checked and found to be method-compliant in reporting levels (sensitivity) and QC results, with some observations of bias and imprecision due to the sample matrix.

Sources of the Existing Data Reviewed

The existing data were tabulated in site reports and letters. The sources reviewed (reports and tabulated data) are listed in Table E1 "Summary of Analytical Data Sources," attached to this memorandum.

Usability Qualifiers Defined

NEH applied to the data the EPA standard data qualifiers "J, U, UJ, and R" to help the data user determine, at a glance, the quality and usability of each chemical result. For the Data Usability Assessment of the existing data, the data qualifiers are defined as follows.

J - The associated numerical value is an estimated quantity due to quality control criteria exceedance(s). The value is usable for project decisions as an estimated result.

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 nondetect result at the reporting limit.

UJ - The compound was analyzed for, but was not detected. The associated numerical value is the sample-specific reporting limit and is an estimated quantity. The value is usable for project decisions as a nondetect result at the estimated reporting limit. Data users are cautioned that data qualified UJ may not be usable in risk assessment if the bias is either low or unknown due to the potential for false negatives.

R - Reject data due to severe or cumulative exceedance of quality control criteria. The value is unusable (compound may or may not be present) for risk assessment decisions. Re-sampling and reanalysis is recommended for verification.

In addition to the data qualifiers, a bias ("high" or "low") was also applied, on a chemical-by-chemical basis, for all estimated results for which a bias could be determined. For those estimated results where the bias was unknown, the "bias" column in the database was left blank. Data users are cautioned that for those sample results that are non-detected and estimated (qualified UJ), and where the bias is indicated as either unknown (left blank) or "low," the potential exists for false negatives. In general, "high" bias estimated results are usable in assessment of risk, as this would be protective of human health and the environment. Estimated results that may be false negatives may be unusable in risk assessment (based on EPA guidance, April 1992).

Usability Assessment Approach

The primary DQO defined for this usability assessment was to be able to use the existing data in human health and ecological risk assessment. The secondary DQO was to use the existing data for planning the Site RI. The quality of the existing data were evaluated compared to the quality of data needed to support risk assessment, based on EPA's *Guidance for Data Useability in Risk Assessment* (April 1992), EPA's *Region I EPA-NE Data Validation Functional Guidelines for Evaluating Environmental Analyses* (December 1996), and technical judgment.

Most of the existing data were tabulated in reports. With the exception of the CLP laboratory data reports obtained in December 1999 to support the 1989 Dames and Moore Site Assessment Report (1989a), NEH did not have access to original laboratory data reports. Much of the tabulated data from various reports did not list the associated quality control (QA) results. Exceptions to this include the reporting of field blanks, trip blanks, and field duplicates for the Dames & Moore (1989a) data and some matrix quality control (QC) information for other results.

The CLP laboratory data reports supporting the Dames & Moore data from 1989 were complete CLP-type data packages containing sample-specific reporting limits, percent solids for soils and sediments, sample results, and associated quality control (QC) including results for: laboratory control sample recoveries, method and analytical blanks, surrogate recoveries, and some matrix QC (matrix spike recoveries, matrix spike duplicate recoveries, matrix duplicates). A comprehensive validation of these data was not undertaken due to the level-of-effort that would have been required for such an effort. However, the laboratory data reports were spot-checked and found to be method-compliant in reporting levels (sensitivity) and QC results with observations of bias and imprecision based on matrix QC information.

This usability assessment was based on an evaluation of the method used (for comparability and potential bias), the minimal QC results presented (field blanks, trip blanks, MS, FD, where available), a spot-check of CLP laboratory data reports for the Dames & Moore data (1989), the reporting level (to evaluate sensitivity), and matrix issues that would interfere with the accuracy of the results in the environmental samples (e.g., sediment matrix effects, high pH in groundwaters).

Briefly, the process used to assess the usability of the existing data contained the following components as indicators of data quality. Note that many of these components were available for only a subset of the existing data.

Accuracy

Field blanks, Trip blanks, Laboratory blanks – contamination evaluated (no data were blank-corrected);
Holding Times;
Matrix Spike results; and
Other method QC, as available, including surrogate spike recoveries and laboratory control sample recoveries.

Precision and Representativeness

Field Duplicate (FD) results; and
Method or Matrix Duplicate results, where available.

Sensitivity

Documentation of reporting levels for non-detects;
Compared reporting levels, where available, to method achievable detection levels for appropriate matrix;

Comparability

Methods of analysis were evaluated to assess comparability both within the existing data set and comparability to present-day methods.

The Usability Assessment is presented below in terms of general issues that can affect the usability of all chemicals measured and then specific accuracy, precision, representativeness, sensitivity, and comparability issues for each analytical method (fraction) included in the existing data. These fractions include: volatile organic compounds, semivolatile organic compounds, metals, total petroleum hydrocarbons, cyanide, hazardous waste characteristics, pH, and asbestos. Results for miscellaneous wet chemistry and water quality parameters were tabulated in the existing data and briefly evaluated based on method references and notations in the associated reports. Details concerning the usability of these miscellaneous data are not presented.

Data usability qualifiers, previously defined, were added to individual chemical results in the existing data database, based on this Data Usability Assessment. Other than the CLP laboratory data reports supporting the Dames & Moore 1989 data, only one other data source (Canonie, 1992b) contained more than one key QC indicator of data quality to assess accuracy and sensitivity of the results in applying the qualifiers. The QC indicators presented Canonie (1992b) were surrogate recovery results for VOC and SVOC, method blank results for VOC, SVOC, and metals, laboratory control sample (LCS) results for metals, and matrix spike (MS) results. Most other sources contained only one QC indicator, such as trip blanks or field blanks. As stated above, a comprehensive validation of the CLP laboratory data reports supporting the Dames & Moore 1989 data was not undertaken. Instead, a spot check of the quality of the data was performed to uncover severe quality issues that would cause rejection of the data.

No actions were taken during this usability assessment to qualify results for which one QC indicator met requirements (e.g., field blank results) but for which other QC information was either lacking or not comprehensively reviewed. Therefore, data users are cautioned that "unqualified" results, i.e., results for which a data usability qualifier has not been applied, may have uncertainty in the accuracy, precision, or sensitivity that was not uncovered during this review.

Where evidence of contamination was present, i.e., the compound/analyte was detected in the associated field blank or trip blank ("associated" defined as sampled on the same day as the groundwater or surface water sample), the detected result was considered estimated (qualified J) and biased high. No blank corrections were made to the existing data. For one source where method blank results were available in the existing data set (Canonie, 1992b), qualifications were made to the data for blank contamination observed in the associated method blanks for two metals. Method blank data were available in the CLP laboratory data reports supporting the Dames & Moore 1989 data. No actions were taken to qualify results based on these blanks except where the data validation report, included as an appendix to the Dames & Moore report (1989a), recommended these actions.

Usability Summary of Existing Data – General Issues

The measurement methods used to generate the existing data are 10 years old or more. Modifications to EPA preparation/extraction and cleanup methods have been made over the years to make them more accurate, precise, and sensitive. In addition, the instruments used to measure the compounds of interest have improved in accuracy and sensitivity. Internally, within the existing data database, the methods are, in general, comparable (with the exception of asbestos and pH – see those sections for details). However, combining existing data with current data (planned in RI/FS) may introduce significant comparability issues in method accuracy (bias), precision, and sensitivity. For example, detected VOC results in soils and sediments are not comparable between the existing data set and present-day methods results.

The usability assessment was confounded by the lack of sufficient documentation and errors in the reports. The most serious of which were the lack of reporting levels and percent solids in all Dames & Moore (1989a) tabulated data from the Site Assessment Report (8/18/89) and the numerous errors uncovered by NEH and SHA during the 100% transcription check from the laboratory data report forms to the tabulated Dames & Moore results. The missing documentation for reporting levels and percent solids were not input into the existing data database because the level-of-effort required to hand-enter this information was determined, at least at this time, to exceed any potential benefit to the data user. The usability of non-detected results without the associated level of detection is limited to use in Site RI planning. No compound could be eliminated as a potential risk COC based on non-detect results in cases where the reporting level (detection level) is either not recorded or estimated (qualified UJ) with low or unknown bias. However, given the general non-comparability of analytical

methods from the existing data to present-day methods, such non-detect data may not be useful for risk assessment regardless of the reporting level issues.

The matrix of the environmental sample can have a profound affect on the accuracy, precision, and sensitivity of the results. Standard EPA methods of analysis were not developed to be optimized in complex and unusual matrices, such as sediments and caustic groundwater. The performance of these standard methods in unusual matrices is questionable. In sediments, for example, the low percent solids that may be present and the complexity of the matrix (including heterogeneity) will have a negative affect on the accuracy, precision, representativeness, and sensitivity of the results. Therefore, all sediment data for all compounds/analytes are considered uncertain (qualified J or UJ). The bias is unknown; therefore, there is the potential that the non-detects may be false negatives.

Based on EPA Region I guidance, all non-detected data for sediment samples with %solids less than 30% are rejected as unusable and the detects are estimated (J). Also based on this guidance, if the %solids was less than 10%, all data are rejected as unusable (detects and non-detects). Percent solids information, available in the laboratory data reports for the Dames & Moore 1989 data, and for some other data sources, showed one sample with less than 10% solids. All results for this sample ("Mixing Area") were rejected (qualified R) as unusable due to the extremely low percent solids (5.6%).

Dames & Moore (1989a) had approximately 45% of the data collected in 1989 validated by an outside consultant (data validator). Part of this validation report is included as Appendix D in the Site Assessment Report (8/18/89). The data validation uncovered some technical issues, mostly due to the nature of the samples (matrix) that would cause some results to be rejected as unusable for project decisions. They also suggested estimating (J and UJ) some results with bias due to QA/QC exceedances. Unfortunately, Dames & Moore (1989a) did not apply any of these data validation actions to the data that they tabulated for the project. During this usability assessment, the data validator's actions to reject specific results were applied. However, the specific data validation actions to qualify data as estimated (J or UJ) were not applied due to time constraints of this data usability review and because the usefulness of such an effort was in question given that only 45% of the data were validated. Additionally, other more global data quality issues, such as preservation of soil and sediment VOCs, have a more significant effect on the usability of the Dames & Moore (1989a) data.

Volatile Organic Compound (VOC) Results – Chemical Data from Fixed Laboratory Analyses

Much of the VOC data were rejected as unusable for both risk assessment and RI planning. All non-detected results for VOCs in soil, sediment, and TCLP samples were rejected (qualified R) as unusable due to lack of preservation. Detected VOC concentrations in soil and sediment were "estimated" (qualified J) and are considered usable as biased low results. All non-detected results for VOCs in caustic groundwater samples, i.e., samples with pH ≥ 9, were rejected (qualified R) as unusable due to the expected loss of VOCs when the caustic groundwater was placed in a vial containing acid. Foaming of samples was anecdotally described in some of the data reports (CHIEE, 1987b). The detected VOC results in these samples were estimated (qualified J) and are considered usable as biased low results. Detected and non-detected VOC results in other groundwater and in surface waters are considered usable for risk assessment and RI planning, with the addition of qualifications for specific VOCs based on quality issues uncovered during the data usability assessment, below. Non-detected results for VOCs in groundwater or surface water where the sample reporting limit is not recorded have limited usability for risk assessment but may be usable for planning the Site RI.

VOC Accuracy

Accuracy was severely compromised for all soil and sediment VOC non-detected results because the method of field collection and lack of preservation potentially promoted the loss of VOCs from the soils and sediments. The current field preservation method (EPA Method 5035) requires special sampling equipment to prevent loss of VOCs (e.g., Encore samplers) and/or preservation using methanol or sodium bisulfate to prevent loss of VOC from the field to the laboratory. Therefore, all non-detect VOC results in soils and sediments for all investigations prior to the use of EPA method 5035, which includes all of the existing data, were rejected (qualified R) and are unusable for risk assessment.

All detected soil/sediment data for VOCs must be considered minimum values and usable as screening-level data that are biased low. Detected results for all VOCs in soils and sediments were qualified as estimated (J) in the existing data project database. The identifications of these VOCs are considered accurate; however, the quantitation is inaccurate. Again, this is due to the possible loss of VOCs from the field to the lab prior to analysis in samples that are unpreserved.

Additionally, as previously stated, accuracy was compromised for all sediment data due to suspected matrix effects. Therefore, all detected sediment VOC results were also considered estimated (J) due to uncertainty in the results potentially caused by the sample matrix. The non-detected results were rejected (R) due to lack of preservation.

Accuracy was compromised for all non-detected results for VOCs in groundwater samples in the wells with high pHs. This is because foaming would potentially occur in the sample vials that were pre-preserved with acid (HCl) when they come in contact with highly basic (caustic) water. The foaming would cause a loss of VOCs. As we had no direct information from sampling logs (other than anecdotal evidence of foaming included in some reports, CHIEE, 1987b) about individual groundwater samples and how they may have reacted when collected for VOCs in pre-preserved VOA vials, NEH set a limit of pH $\geq$ 9 as the criterion for considering non-detected results as rejected (qualified R) and unusable for risk assessment.

For the same reason as above, based on the expectation of potential loss of VOCs due to foaming of groundwater samples with high pH coming in contact with the acid preservative, detected VOC results in groundwater with pH $\geq$ 9 are considered minimum values and usable as screening-level data that are biased low. Detected results for all VOCs in groundwater with pH >9 were estimated (qualified J) in the existing data. The identifications of these VOCs are considered accurate; however the quantitation may be inaccurate.

Non-detected and detected VOC data for groundwater and surface water, for samples with pH < 9, were considered usable, in general. Exceptions to this occurred when evidence of contamination for specific VOCs (for example, methylene chloride and acetone) was found based on field blank or trip blank results. Where evidence of contamination was present, i.e., the compound was detected in the associated field blank or trip blank ("associated" defined as sampled on the same day as the groundwater or surface water sample), the detected result was considered estimated (qualified J) and biased high. No blank corrections were made to the existing data.

Accuracy of several acetone results in groundwater was severely compromised in the samples collected by Dames & Moore (1989a) because acetone was used as a solvent rinse in the decontamination procedure in the field. Therefore, several detected acetone results in groundwater were rejected (qualified R) and are unusable due to the severe uncertainty of whether the compound was actually present in the environmental sample or introduced during the decontamination procedure. These rejections were consistent with the recommendations of the data validator, Environmental Standards, as listed in their report dated June 14, 1989, "Quality Assurance

Review The South Street Project," included as Appendix D of the Dames & Moore (1989a) Site Assessment Report (8/18/89). These rejected results are unusable for both risk assessment and Site RI planning.

Accuracy was compromised for some VOC results (e.g., methylene chloride) due to evidence of contamination observed in the laboratory blanks. Laboratory blank information was derived from the "B" qualifier applied by the laboratory to low-level detects. The affected results were estimated (qualified J) and may be biased high for VOC in waters. For the VOCs in soils and sediments that were qualified due to evidence of contamination in a laboratory blank, the bias is unknown due to the conflicting effects of a high bias expected due to contamination and a low bias expected due to loss of VOCs from lack of preservation.

Accuracy was severely compromised for 2-butanone in several groundwater and surface water samples in the Dames & Moore (1989a) data due to low response factors in the initial and/or continuing calibrations as based on information presented in the data validation report (Appendix D of the Site Assessment Report, 8/18/89). These result were rejected (qualified R) and are unusable for both risk assessment and Site RI planning.

Holding time information was not directly available for all results. For results where holding times were available, they met method criteria.

VOC data for Tentatively Identified Compounds (TIC) that were not previously rejected due to usability issues stated above (soil/sediment preservation issues and high pH in groundwater), are considered estimated results (qualified J and UJ). The estimated VOC TIC data have uncertainty in both the identification and the quantitation. TIC results are screening-level data and are not definitive. Though they may give an indication of the presence of some classes of compounds in a general sense, these results are not recommended for use in a risk assessment.

VOC Precision and representativeness:

Precision and Representativeness could not be adequately assessed for VOCs due to the data gaps created by the rejection of all non-detected results for soils and sediments and many non-detected results for groundwater.

VOC Sensitivity:

Reporting limits for VOCs, where available, met method expectations for sensitivity. In the Dames & Moore (1989a) data, reporting limits were not recorded in the existing data database for the non-detected VOC results. The sample-specific reporting limits are available in the laboratory data reports. A spot-check of these reporting levels was performed and they were method-compliant.

All VOC results reported below the sample reporting limit level were considered estimated (qualified J) due to the uncertainty in the quantitation at levels below the reporting limit. The bias in such estimated data is unknown.

VOC Comparability:

The methods used for VOC analyses in the existing data include EPA SW846 Method 8240, EPA Method 624, and EPA CLP methods. These are GC-MS methods with strict QA/QC requirements for calibration, continuing QC checks, accuracy, and sensitivity. Though there are differences in calibration and other QC requirements among these methods, the data produced are considered comparable for environmental investigations. Though the analytical methods are generally comparable, the lack of soil/sediment preservation (EPA Method 5035) makes the soil/sediment VOC data non-comparable to present-day VOC results in solid media.

VOC Results – Chemical Data from On-Site Field Analyses

Accuracy was compromised for all on-site VOC field data due to lack of information on instrument calibration, continuing calibration, and sensitivity. All detected VOC field data were considered estimated (qualified J) because of the uncertainty in the accuracy and sensitivity of the results. Several non-detected results were rejected (qualified R) due to severe uncertainty in the level of detection of the method. The rejected results are unusable. The estimated results can be used as screening level data, not as definitive data. Bias could not be determined. Additionally, several methods were employed for the on-site VOC measurements including H-Nu photoionization, organic vapor analyzer/gas chromatography for total VOCs, and gas chromatography for aromatic and chlorinated VOCs. These methods are non-comparable.

Semivolatile Organic Compound (SVOC) Results – Chemical Data from Fixed Laboratory Analyses

In general, SVOC chemical results in soil, sediment, groundwater, surface water, and TCLP samples are usable, with the following exceptions. Acid extractable compounds for several soil and sediment samples and individual compounds in groundwater were rejected (qualified R) as unusable based on the Dames & Moore data validation review (Appendix D of Site Assessment Report, 1989a) of severe quality control exceedances. Additionally, all sediment SVOC results are considered estimated (qualified J and UJ) due to suspected matrix effects. These estimated results are usable with the understanding that the accuracy, precision, and representativeness of the results may have been adversely affected by the sample matrix. Non-detected results for SVOCs where the sample reporting limit is not recorded have limited usability for risk assessment but may be usable for planning the Site RI.

SVOC Accuracy

Accuracy was compromised for all sediment data due to suspected low percent solids, as stated in the Overall Assessment of Usability. Therefore, all sediment SVOC results were considered estimated (J and UJ) due to low % solids (though the percent solids was not reported for these data in the Dames & Moore (1989a) data tables). The bias is uncertain. However, since the non-detected results are estimated, there is a chance that they may be false negatives. Therefore, these estimated non-detected SVOC results couldn't be used to evaluate the presence or absence of a specific compound for risk assessment COCs.

Accuracy was severely compromised for all acid extractable compounds in the SVOCs in several samples identified in the data validation report attached to the Dames & Moore (1989a) data set (Appendix D of the Site Assessment Report, 8/18/89). Affected results in several soil and sediment samples were rejected (qualified R) due to zero percent recovery of the acid surrogate (indicating a severe matrix suppression of acid compounds). These results are unusable for both risk assessment and Site RI planning.

Additionally, several SVOC compound results (pentachlorophenol and 3,3'-dichlorobenzidine) were rejected (qualified R) in a Tail Race sample and in several groundwater due to severe QC exceedances described in the data validation report associated with the Dames & Moore (1989a) data set (Appendix D of the Site Assessment Report, 8/18/89). These rejected results are unusable for both risk assessment and Site RI planning.

Accuracy was acceptable based on surrogate recoveries for the soil samples reported in Canonie (1992b). However, it did not appear that the results were reported on a dry-weight basis for SVOC. Therefore, all soil SVOC data from Canonie (1992b) were estimated (qualified J and UJ) due to the uncertainty in the accuracy of the results. No information was available on the report forms concerning reporting on a dry-weight basis

(whereas other fractions, including VOC and metals results, indicated reporting on a dry-weight basis in this source). Results used for risk assessment and planning the RI must be on a dry-weight basis to be comparable to ARARs.

SVOC data for Tentatively Identified Compounds (TIC) that have not been rejected, are considered estimated results (qualified J and UJ). The estimated SVOC TIC data have uncertainty in both the identification and the quantitation. These are screening-level data and are not definitive. Though they may give an indication of the presence of some classes of compounds in a general sense, these results are not recommended for use in a risk assessment.

The SVOC TIC identified as 4-hydroxyl-4methyl is actually 4-hydroxy 4-methyl 2-pentanone and is a by-product of the extraction process when acetone and methylene chloride are used to extract solid (soil/sediment) samples. This compound is an aldol condensation product and is not naturally in the sample. All results for this compound, reported as an SVOC-TIC, were rejected (qualified R) and are unusable for both risk assessment and RI planning.

Accuracy was compromised for several SVOCs due to the presence of some compounds in field or laboratory blanks. Field blank contamination was assessed based on the field blank taken on the same date as the sample collection. Laboratory blank information was derived from the "B" qualifier applied by the laboratory to low-level detects (for example, phthalates). Individual SVOC results were estimated (J) and qualified as biased high based on evidence of contamination from the associated blanks.

Holding time information was not directly available for all results. For results where holding times were available, they met method criteria.

SVOC Precision and Representativeness

Based on field duplicate (FD) information, mainly available in the Dames & Moore (1989a) data set, there is evidence of imprecision and heterogeneity in the sample results. Though a comprehensive calculation of the relative percent differences (RPDs) for detected field duplicate results was not performed, the FD data were scanned during the usability assessment and found to exceed 50% for a majority of the FD pairs. This is unacceptable precision based on Region I data validation guidance and is an indication of poor representativeness of the samples collected to the sample location.

SVOC Sensitivity

Based on the reporting limits available for some of the existing data, the sensitivity of the SVOC results was, in general, acceptable based on the methods used for analysis. Reporting limits were unavailable in the Dames & Moore (1989a) tabulated data and, therefore, are not recorded in the existing data database. However, the sample-specific reporting levels are available in the CLP laboratory data reports. A spot check of these reporting levels showed that they were method-compliant, with some observations of higher detection levels due to dilutions performed due to matrix effects. The risk assessor cannot use the non-detect SVOC data presented in the existing data database to eliminate any potential COC because of the potential for false negatives and because the sample-specific reporting level is not recorded.

Reporting limits in two data sets of the existing data were changed because they were not method-compliant and not calculated on a sample-specific dry-weight basis. The SVOC data reported in Canonie Draft Completion of Work Report (1993a) and in Canonie Transmittal of Soil Analytical Data (1992b) had reporting limits that were an order-of-magnitude lower than what the method (EPA method 8270) could achieve with

standard calibrations. As the data set of Canonie (1993a) included the percent solids, it was possible to re-calculate the sample-specific reporting levels. For the data set of Canonie (1992b), the standard reporting limits (not sample-specific) were inserted for the SVOC results because the percent solids were not available in the data reports. All changed reporting levels were considered estimated (qualified UJ) because the preparation factors were assumed to be those defined in the method. If the laboratory used alternate preparation factors, the reporting levels would be different. The bias in the reporting levels is unknown.

All SVOC results reported below the sample reporting limit levels were considered estimated (qualified J) due to the uncertainty in the quantitation at levels below the reporting limit. The bias in such estimated data is unknown.

SVOC Comparability

The method used for SVOC analyses in the existing data was EPA SW846 Method 8270. This GC-MS method has strict QA/QC requirements for tuning, calibration, continuing QC checks, accuracy (e.g., surrogate recoveries), and sensitivity. The SVOC data included in the existing data set are considered comparable based on the consistent use of the same measurement method for the environmental investigations. However, the difference in extraction procedures used in the existing data compared to present-day SVOC extraction and cleanup methods may make the existing data non-comparable to present-day SVOC environmental results especially in complex matrices (e.g., sediments and caustic groundwater).

Metals Results – Chemical Data from Fixed Laboratory Analyses

In general, metals results in soil, sediment, groundwater, surface water, and TCLP samples are usable for Site RI planning, with the addition of qualifications added for specific metals due to the potential bias in the results, as described below. A sub-set of these results are also usable for risk assessment. All results for metals in caustic groundwater samples (pH $\geq$ 9) were estimated (J and UJ) due to the uncertainty in the accuracy of the results. The accuracy of the EPA methods used is uncertain in such a basic matrix. Additionally, the Dames & Moore metals data from 1989 are "dissolved" metals. The filtration procedure may introduce an additional uncertainty in the accuracy of the results in caustic groundwaters. The bias is unknown; therefore, the non-detected results may be false-negatives. Risk assessors are cautioned about the use of potential false-negative metals results (i.e., non-detected results that have been estimated, qualified "UJ"). Additionally, all sediment results for metals are considered estimated (qualified J and UJ) due to suspected matrix effects. These estimated results are usable with the understanding that the accuracy, precision, and representativeness of the results may have been adversely affected by the sample matrix. Non-detected results for metals where the sample reporting limits is not recorded have limited usability for risk assessment but may be usable for planning the Site RI.

Metals Accuracy

Accuracy was compromised for all sediment data due to suspected matrix effects, as stated in the Overall Assessment of Usability. Therefore, all sediment metals results were considered estimated (J and UJ) with an uncertain bias. However, since the non-detected results are estimated, there is a chance that they may be false negatives. Therefore, these estimated non-detected metals results cannot be used to evaluate the presence or absence of a specific metal for risk assessment COCs.

Accuracy was compromised for nine soil results for selenium and silver in the Canonie (1992b) data set. The associated laboratory control sample results were recovered low for these metals; therefore, the soil results may

be biased low. The affected results for selenium and silver were estimated (qualified UJ) and there is the potential for false negatives due to the low bias.

Accuracy was compromised for two copper results in soils reported in the Canonie (1992b) data set. The associated method blank was contaminated for copper. Therefore, the affected results were estimated (qualified J) and may be biased high. These estimated copper values might be false positives.

Accuracy was compromised for all metals data in groundwater with high pH (> 9). These data are considered usable as estimated (qualified UJ and J) results. These estimated results should be considered screening-level - the identification is accurate but the quantitation may be inaccurate. The reason for this qualification is because the EPA methods used for analysis may not work well in matrices with very high pH. It is uncertain the exact effect on individual metals using EPA methods in highly basic waters. As the non-detect values are uncertain, and may be false-negatives, no metal should be eliminated as a potential COC based on non-detect results in the groundwater samples with high pH.

Accuracy was compromised for zinc in several groundwater samples (Dames & Moore (1989a) data set) due to evidence of contamination based on the associated field blank results. An associated field blank was assigned to be the field blank collected on the same date as the field sample. The affected zinc results were estimated (qualified J) and may be biased high.

Numerous transcription errors and incorrect results were found in the Dames & Moore tabulated data (1989a) as compared to the laboratory data reports. These errors, including the addition by Dames & Moore of 22 metals for all media when only 13 metals were analyzed by the laboratory (based on the CLP laboratory data reports), were corrected by NEH and SHA during the 100% transcription check of the Dames & Moore data.

Metals Precision and Representativeness

Based on field duplicate (FD) information, mainly available in the Dames & Moore (1989a) data set, there is evidence of imprecision and heterogeneity in the sample results. Though a comprehensive calculation of the relative percent differences (RPDs) for detected field duplicate results was not performed, the FD data were scanned during the usability assessment and found to exceed 50% for a majority of the FD pairs collected in the Dames & Moore (1989a) data (Site Assessment Report, 8/19/89). This is unacceptable precision based on Region I data validation guidance and is an indication of poor representativeness of the samples collected to the sample location. An exception to this is the acceptable precision found between matrix duplicate (laboratory duplicate) results presented in Canonie (1992b) soil data. For this soil data set comprising nine samples, the precision met acceptable criteria for use in risk assessment.

Metals Sensitivity

Based on the reporting limits available for some of the existing data, the sensitivity of the metals results was, in general, acceptable based on the methods used for analysis. Reporting limits were unavailable in the Dames & Moore (1989a) tabulated data and are not recorded in the existing data database. However, the sample-specific reporting limits are available in the CLP laboratory data reports. A spot check of these levels showed they were method-compliant, with some increased reporting limits due to dilutions performed due to matrix effects. These data are usable for Site RI planning. The risk assessor cannot use the non-detect metals data in the existing data database to eliminate any potential COC because of the potential for false negatives in some of the data and because the reporting limits are not recorded.

Reporting limits for some samples in one data set of the existing data were changed because they were not method-compliant and not calculated on a sample-specific dry-weight basis. Some of the metals data reported in Canonie Draft Completion of Work Report (Canonie, 1993a) had reporting limits that were inconsistent with the method-achievable limits. In addition, it appeared that the sample-specific reporting limits for some metals were not on a dry-weight basis. As the data set included the percent solids, it was possible to re-calculate the sample-specific reporting levels. All changed reporting levels for antimony, selenium, and thallium were considered estimated (qualified UJ) because the preparation factors were assumed to be those defined in the method. If the laboratory used alternate preparation factors, the reporting levels would be different. The bias in the reporting levels is unknown.

All metals results reported below the sample reporting limit level, and qualified "B" by the laboratory, were considered estimated (qualified J) due to the uncertainty in the quantitation at levels below the reporting limit. The "B" qualifier for metals data is used in the EPA CLP program to designate results that are reported between the laboratory Instrument Detection Limit (IDL) and the Contract Required Detection Limit (CRDL) defined in the CLP method. Note that Dames & Moore (1989a) incorrectly defined this "B" qualifier in their data tables (Site Assessment Report, 8/18/89) to mean the same as a "B" qualifier for organic data – namely that the compound was also observed in an associated laboratory blank. The metals qualifier "B" is not associated with blank contamination. The bias in such estimated data is unknown.

Metals Comparability

The methods used for metals analyses in the existing data include EPA SW846 Methods 6010 (ICP) and 7470 (CVAA), EPA Method reference 600/4-79-020 (assumed to be the metals Water and Wastewater methods), EPA 200 series methods (also Water and Wastewater methods) which include 200.7 (ICP), 245.1 (CVAA) and various GFAA methods, and EPA CLP ICP, GFAA, and CVAA methods. These are the standard metals methods with strict QA/QC requirements for calibration, continuing QC checks, accuracy, and sensitivity. Though there are differences in calibration and other QC requirements among these methods, the data produced are considered comparable for environmental investigations. Though the analytical methods are generally comparable, present-day methods, especially for ICP elements, are more sensitive (can achieve lower reporting limits).

Total Petroleum Hydrocarbon (TPH) Results – Chemical Data from Fixed Laboratory Analyses

All TPH data are considered estimated (qualified J and UJ) and are usable as screening-level results only due to method limitations that will affect the accuracy of the results. These estimated results are usable for planning the Site RI but are unusable for risk assessment.

TPH Accuracy and Sensitivity

All results for Total Petroleum Hydrocarbons (TPH) were estimated (J and UJ) due to the uncertainty in the accuracy and sensitivity of the results based on the lack of a definitive TPH standard for this EPA analysis (Method 418.1). The usability of these estimated results is limited to a screening-level indication of petroleum hydrocarbons in the samples.

TPH Precision and Representativeness

Precision and representativeness of the TPH results could not be evaluated due to insufficient information.

TPH Comparability

The method used for analysis of TPH in the existing data set was EPA Method 418.1. This is an infrared spectroscopy method that has been shown to be very qualitative and not quantitatively accurate. This method is unable to identify the source of the TPH. As stated above, the method lacks a definitive standard. Present-day methods for the analysis of petroleum hydrocarbons include the MADEP methods for volatile petroleum hydrocarbons (VPH) and extractable petroleum hydrocarbons (EPH). These methods use gas chromatography for analysis, rather than infrared spectroscopy. The VPH/EPH method is more definitive in giving both target chemical concentrations and concentrations for aliphatic and aromatic hydrocarbon ranges. The different hydrocarbon ranges have different toxicity factors allowing an assessment of risk to human health. The TPH data in the existing data set are non-comparable to present-day results for petroleum hydrocarbons (e.g., VPH/EPH) that give the risk assessor more complete and accurate (quantitative) data.

Cyanide Results – Chemical Data from Fixed Laboratory Analyses

In general, cyanide results for soil, sediment, groundwater, and surface water samples are usable for risk assessment and RI planning with minor qualifications. All cyanide results in sediments were considered estimated due to suspected matrix effects. Non-detected results for cyanide where the sample reporting limit is not recorded have limited usability for risk assessment but may be usable for planning the Site RI.

Cyanide Accuracy

Accuracy was compromised for cyanide results in sediments, as for other analyses, due to the suspected matrix effects. All sediment cyanide results were estimated (J and UJ). The bias is uncertain. As with the other compounds, the uncertainty in the level of detection does not allow for the elimination of cyanide as a risk COC.

Cyanide Sensitivity

Dames & Moore (1989a) did not include the reporting limits for the non-detected results for cyanide in their tabulated data. These reporting limits are available in the CLP laboratory data reports. A spot check of these reports indicated method-compliant sensitivity for cyanide. These results are usable for planning the Site RI. However, these results have limited usability in risk assessment because of the potential for false negatives and because the reporting limits are not recorded in the existing data database.

Sensitivity for cyanide results in Weston & Sampson (1990a) data was acceptable based on the EPA method performed.

Cyanide Precision and Representativeness

Insufficient information was available to evaluate precision and representativeness of cyanide results.

Cyanide Comparability

The methods used for total cyanide analysis included EPA SW846 (assumed method 9010) and EPA Water and Wastewater method 335.2. These methods should produce comparable data. Total cyanide methods have not changed much during the past 10 years. Therefore, the cyanide data in the existing data set should be comparable to present-day total cyanide results.

Hazardous Characteristics Testing: Toxicity Characteristic Leaching Procedure (TCLP), Extraction Procedure (EP) Toxicity, and Ignitability Results

The TCLP Metals, TCLP Pesticide, and TCLP Herbicide results were accepted without qualification. This usability assessment assumed that the laboratory was compliant in following the TCLP method (EPA SW846) requirements. The QC information available for review, including matrix spike recoveries, were acceptable for project DQOs, with the exceptions noted below. The TCLP VOC data were rejected as unusable for both risk assessment and RI planning.

Hazardous Characteristics Accuracy

The accuracy of the TCLP VOC results was severely compromised by mixing and compositing of samples prior to analysis and/or the lack of preservation. The physical process of compositing will cause the loss of volatile compounds and the lack of preservation, as previously discussed, also causes a potential loss of VOCs. All TCLP VOC results were non-detected. All of TCLP VOC results were rejected (qualified R) and are unusable for risk assessment and RI planning.

Results for the TCLP SVOC compound pyridine were rejected (qualified R) in three TCLP samples reported in Canonie (1992b) due to severely low matrix spike recovery. The rejected TCLP SVOC results are unusable for risk assessment and RI planning.

Several TCLP SVOC results were estimated (qualified UJ) due to evidence of a low bias (potential for false negatives) base on QC (matrix spike) results. Low bias was generally observed in the acid extractable fraction, based on low surrogate recoveries (see Canonie, 1992b).

The TCLP Metals, TCLP Pesticide, and TCLP Herbicide results were accepted without qualification. This usability assessment assumed that the laboratory was compliant in following the TCLP method (EPA SW846) requirements. The QC information available for review, including matrix spike recoveries, were acceptable for project DQOs, with the exceptions noted below.

All EP Toxicity results were estimated (J or UJ). This estimation was applied because the EP Toxicity method was difficult to perform correctly which would introduce uncertainty in the results. Furthermore, it is no longer the regulated method for evaluating whether a waste is hazardous under RCRA regulations. Therefore, the EP Toxicity data are of limited usability.

Accuracy of the ignitability (flashpoint) results was considered acceptable assuming compliant method procedures were used in the laboratory.

Hazardous Characteristics Precision and Representativeness

Precision and Representativeness of the hazardous characteristics results could not be evaluated based on limited data.

Hazardous Characteristics Sensitivity

The reporting limits for the non-detected results for TCLP and EP Toxicity met the requirements of the RCRA methods. The ignitability level of >200 °F is compliant with the method and RCRA regulations.

Hazardous Characteristics Comparability

The TCLP method (included in EPA SW846) has not changed, other than for minor QC requirements, since its promulgation. Therefore, the TCLP results in the existing data are comparable to present-day results. However, the EP Toxicity results are non-comparable as this method is no longer accepted for evaluation of RCRA hazardous waste. Ignitability methods EPA SW846 1010 and D1310-84 (ASTM method) were used. These are comparable methods for ignitability.

Reactive cyanide and reactive sulfide were also measured in one sample (Grace, 1992). The results were non-detected and no information was available other than the sample detection limits. Data users should note that the reactive cyanide and sulfide methods can give false negatives due to method limitations. No qualification of the data were made, however, because the method reference was not given.

pH Results – Fixed Laboratory and On-Site Field Monitoring

The accuracy and sensitivity of some pH results were compromised based on the use of pH paper as the measurement procedure. All pH results that were measured by pH paper were estimated (J) due to inaccuracies of this method compared to the more definitive electrode/probe/meter method. The pH paper method is also less sensitive than the electrode method. The bias in these estimated pH results is unknown.

Several pH results in the Dames & Moore (1989a) data set were reported as non-detected, qualified "U". These are erroneous results as pH cannot be "non-detected." The CLP laboratory data reports contained pH results for these samples. Corrected results for pH were input into the existing data database during the transcription review performed by SHA.

The method reference was not documented for many of the pH measurements. Some measurements were performed using EPA Method 209. Others were either pH paper, as discussed above, or electrode/meter device. It is unclear what the level of calibration of the pH meter would have been for those analyses that were not performed using the EPA method. Therefore, the pH results in the existing data set are considered to be non-comparable as different results (on the order of 0.1 to 2 pH units) can be obtained by these different methods.

Asbestos Results – Fixed Laboratory and Monitoring

Generally, the asbestos results in soil, groundwater, and air are usable with the following exceptions and qualifications. Air monitoring results for asbestos from CHIEE (1987b) were rejected (qualified R) and are unusable for risk assessment due to cumulative effects of quality and method issues. These results may have limited usability in planning the Site RI. All detected asbestos results in groundwater reported by Dames & Moore (1989a) are biased low (qualified J) due to the method-modification of counting "structures" rather than individual "fibers" of asbestos. The different asbestos methods used in the existing data set are non-comparable and have different potential method biases, as described below.

Asbestos Accuracy

Accuracy was compromised for the groundwater asbestos data from the Dames & Moore (1989a) Supplemental Investigation Report (8/30/90) due to the modification of the counting method. Instead of counting asbestos fibers (units of millions of fibers per liter), the laboratory counted asbestos "structures" (units of millions of structures per liter). The report states that the asbestos fibers were bundled together and could not be counted

individually. Due to this method modification, the detected asbestos results were estimated (J) and are biased low because a single asbestos "structure" may contain many asbestos fibers. These estimated results are considered minimum values.

Accuracy was severely compromised in the air measurements presented in the CHI Environmental Engineering 9/87 Asbestos and Hazardous Materials Report (CHIEE, 1987b). The NIOSH method used was an older method that has a subjective counting protocol and poorer sensitivity and reproducibility than the updated method. Furthermore, this phase contrast microscopy (PCM) method does not differentiate between asbestos fibers and other fibers (such as cellulose); therefore, confounding the uncertainty in the results. In addition, the levels of asbestos reported as fibers per cc of air are orders of magnitude lower than the achievable method detection levels listed in the NIOSH 7400 method. The cumulative effects of these discrepancies render these asbestos results unusable for risk assessment. Therefore, the results were rejected (qualified R). These asbestos results may have limited use as qualitative values for other non-risk assessment project decisions.

Air measurements performed in 1990 by Dames & Moore (1989a) used the updated NIOSH method 7400 and the reporting levels were consistent with method expectations. Therefore, the data were considered acceptable. However, the PCM method will still measure asbestos and non-asbestos fibers. Therefore, the detected results were estimated (qualified J) and considered biased high (potential for false positives exists).

Soil asbestos data were measured using EPA's method employing polarized light microscopy (PLM) rather than PCM. The PLM method distinguishes between different types of asbestos fibers and is more accurate than the PCM method.

Several asbestos results in soils presented in the Dames & Moore (1989a) Site Assessment Report 8/18/90 were rejected (qualified R) because only a visual observation of asbestos was made. These samples were not submitted to the laboratory. A visual observation of asbestos can be very uncertain due to the fact that alternate fibers in the sample may be considered as asbestos. Therefore, these data are unusable as definitive data for risk assessment. However, these visual asbestos results may have limited usability as qualitative results for planning the Site RI.

Asbestos Precision and Representativeness

The precision of the soil data was compromised based on poor reproducibility between the known and blind field duplicate pair results for the data collected in 1990 by Dames & Moore (1989a) (Supplemental Investigation Report 8/30/90). Therefore, these soil asbestos data were estimated (J and UJ) due to poor precision. This poor precision can be caused by sample heterogeneity. Sample heterogeneity will have a negative effect on the representativeness of the sample result to the site location.

Two soil asbestos results were rejected (qualified R) based on unknown integrity of the sample due to confusion in the data concerning the sample identification. Results that cannot be definitively identified are not usable for risk assessment.

Asbestos Sensitivity and Comparability

Sensitivity and comparability of the asbestos data are tied together because the sensitivity is dependent on the measurement method. For groundwater measurements, EPA method 600/4-80-005 was used. However, the method modification described above, of counting asbestos structures rather than fibers, decreased the sensitivity of the measurement (increased the achievable reporting level) and made the data non-comparable to other EPA asbestos data that would be reported in compliant units of millions of fibers per liter.

The reporting level (sensitivity) of the PLM measurements in soil is 1% for each type of asbestos and for total asbestos. This level is consistent with risk assessment requirements in soils.

Some of the asbestos measurements in air were performed by NIOSH Method 7400-B. This is an older NIOSH method that was later replaced by an updated method 7400 for greater sensitivity and reproducibility (5/15/89). Air measurements performed in 1990 by Dames & Moore (1989a) used the updated NIOSH method 7400 and the reporting levels were consistent with method expectations.

Based on the different potential method biases as described above, the asbestos results in the existing data set are considered non-comparable.

TABLE E.1
Summary of Analytical Data Sources
South Street Site
Walpole, Massachusetts

1/11/00
****DRAFT****

Reference	Type of Data
GZA, 1985a	**Soil** - Headspace GC Screen **Groundwater and Surface Water** - pH, Specific Conductance, GC Screen
GZA, 1985b	**Soil** - Headspace GC Screen **Groundwater and Surface Water** - pH, Specific Conductance, GC Screen
Weston–SPER, 1986a	**Soil** - Surficial Soil Bulk Sample Asbestos Analyses (includes samples for 10/30/86, 11/14/86, 11/20/86, and 11/21/86)
CHIEE, 1987a	**Soil pile** (1 composite sample) - pH, Total solids, Flashpoint, Oil & Grease, Metals
CHIEE, 1987b	**Groundwater** - VOCs, Oil & Grease, pH **Surface Water** - pH, Conductivity **Air** - Asbestos **Soil Stockpile** - VOCs, Metals (total & EP Tox), PCBs, Flashpoint
Weston Geophysical, 1988	**Soil** - Asbestos
Dames & Moore, 1989a	**Shallow Soil** - Asbestos, GC Headspace Screen, VOCs, SVOCs, TPH, Inorganics, pH **Deep Soil** - GC Headspace Screen, VOCs, SVOCs, TPH, Inorganics **Groundwater, Surface Water, Sediment** - Asbestos, VOCs, SVOCs, TPH, Inorganics (Enseco Incorporated laboratory analytical data packages for Dames & Moore chemical analyses dated 4/25/89 [Erco project no. 2789] through 5/30/89 [Erco project no. 3416])
Weston & Sampson, 1990a	**On-Site Containers/Tanks** - Total Metals, Total Cyanide, pH, Total Sulfide, Flashpoint, EPTox Metals
Dames & Moore, 1990	**Soil** - Asbestos **Air** - Asbestos

TABLE E.1
Summary of Analytical Data Sources
South Street Site
Walpole, Massachusetts

1/11/00
****DRAFT****

Reference	Type of Data
Canonie, 1991c	**Groundwater and Surface Water** - pH
Canonie, 1992b	**Soil** - Asbestos
Normandeau, 1992b	**Groundwater and Surface Water** - Elevation, pH, Dissolved Oxygen, Conductivity, Temperature, TPH, Metals, VOCs, Chloride, Turbidity, Alkalinity, Hardness
Grace, 1992	**Soil (oil-contaminated pile)** - VOCs, Extractable Organics, PCBs, Metals, TPH, TCLP VOCs, TCLP SVOCs, TCLP Metals, Ignitability, Reactivity, Field Screen for Asbestos
Canonie, 1993a	**Soil** - Asbestos
	Sand Borrow for Backfill - VOCs, SVOCs, Metals
	Air - Asbestos
Normandeau, 1993b	**Groundwater** - Elevation
Normandeau, undated	**Groundwater** - Elevation, pH
Normandeau, 1995	**Groundwater** - Elevation

APPENDIX F

CONCEPTUAL RISK MODEL

Appendix F

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MEMORANDUM

Date: January 12, 2000
File: 656B
To: Nikki Delude, Charlie Head
From: Jerry Cura, Jo Anne Shatkin, Cheri Butler, and Alissa Weaver
Subject: Conceptual models for human health and ecological risk assessment

This memorandum provides the ecological and human health risk assessment conceptual models for the Blackburn and Union Privileges Superfund site. These models are part of an iterative process that we will refine as site work proceeds.

The objectives are to:

- Present conceptual models for the ecological and human health risk assessments that specify the pathways, receptors, and exposure scenarios that might occur in a baseline risk assessment.
- Develop a framework to inform the RI/FS work plan and sampling plans.

The conceptual models will:

- Allow us to focus the RI on the most likely areas of concern;
- Anticipate concerns and acquire the data necessary to address them.

1.0 Site Conceptual Model

Figure F-1 illustrates a site conceptual model that specifies:

- Release mechanisms from source areas (i.e. the various industrial processes on site);
- Exposure locations (i.e. the areas to which release mechanisms deliver chemicals);
- Fate and transport mechanisms (physical and chemical processes that partition chemicals among various environmental media at the exposure locations);
- Exposure media (those environmental media from which organisms or humans may be exposed to chemicals).

Appendix F

1.1 Release Mechanisms

Figure F-1 shows four likely release mechanisms that may have operated at the South Street site. These are: disposal of solid material; industrial liquid spills or leaks; on-site discharge to the settling basins and potentially the tailrace; and on-site discharges to the Neponset River.

The first mechanism is on-site land-based deposition of contaminated material. This includes: historical placement of contaminated fill soils; historical disposal of solid materials; deposition of residue from historical Site operations such as coal burning; and any other mechanism whereby solid-phase contaminants have come to be present in soils at the Site. Chemicals in soils may be taken up by soil invertebrates or plants, or may leach into the groundwater and migrate with the groundwater flow to other receptors.

The second mechanism involves accidental releases of liquids that may have occurred historically. Liquid wastes containing acids, bases and various hydrocarbon products may have been released from the facility (including underground and above ground storage tanks) to locations accessible to ecological receptors.

The third mechanism of chemical migration from the facility is historical discharge to the settling basins, and possibly tailrace. Chemicals released to the unlined settling basins may have leached into the groundwater and migrated with the groundwater flow to ecological receptors. Chemicals released to the tailrace could adhere to sediments or migrate with surface water into the Neponset River.

The fourth mechanism of contamination migration from the facility is possible historical discharge into the Neponset River, including former Lower Mill Pond.

1.2 Fate and Transport Mechanisms

In those exposure locations in or near aquatic system such as the Neponset River and its bordering wetlands and floodplains, various physical, chemical, and biological transport mechanisms will affect the fate of chemicals. These include:

- **Deposition** of particles in runoff from exposure locations to sluggishly flowing waters (e.g., Lewis Pond) and the floodplain;
- **Dissolution** of chemicals from sediments or suspended sediments to surface water in aquatic environments, or from soil to groundwater with subsequent migration;
- **Erosion** of particulates from sediments or soil into surface water of faster moving river segments;
- **Recharge** of groundwater carrying chemicals dissolved from fill;
- **Leaching** of chemicals through the soil to groundwater;
- **Migration** of contaminated groundwater;
- **Retention** of chemicals in soil.

2.0 Ecological Conceptual Model

The foundation of an Ecological Risk Assessment is the conceptual model. It integrates information derived during the preliminary observations at the site (usually incorporated into the screening level risk assessment). According to EPA guidance, the conceptual model addresses:

- Environmental setting and chemicals known or suspected to exist at the site;
- Chemical fate and transport mechanisms;
- Mechanisms of ecotoxicity and likely categories of potentially affected receptors;
- Complete exposure pathways.

The conceptual model includes a chemical fate and transport diagram that illustrates the chemical's movement from the sources of contamination through the potentially affected habitats to important ecological receptors (Figure F-1). Figure F-2 illustrates the ecological conceptual model that shows how chemicals move from environmental media to ecological receptors and habitats.

2.1 Environmental Setting

Habitats of Rare Wildlife and Certified Vernal Pools & Priority Sites of Rare Species Habitats and Exemplary Natural Communities

According to the Massachusetts Natural Heritage Atlas 1997-1998 edition, there are no habitats of rare wildlife or certified vernal pools near the site area. The nearest habitat of rare wildlife is approximately 1 mile southeast of the site. The site is unlikely to affect this habitat because the Neponset River flows northwest from the site.

Massachusetts Areas of Critical Environmental Concern

The site is not in a Massachusetts Area of Critical Environmental Concern. The site is unlikely to influence the nearest such area, The Fowl Meadow / Ponkapoag Bog that is approximately 3.5 miles northeast of the site.

Ecological Site Description

This ecological site description relies upon Normandeau Associates' 1992 report, *Assessment of Asbestos Removal Plan Effects on Wetland Resources of the South Street Site,* augmented by SHA's interpretation of the site geology.

The site is a mix of industrial and residential development. The Neponset River flows from east to west across the site in a culvert for much of its length. After exiting the culvert the river flows through residential areas into Lewis Pond downstream of the site. The regional soil is a deep glacial outwash deposit overlying stratified sands and gravels of the Neponset River valley; however, the on-site soils may consist of fill over glacial till. Soils along the riverbed are recent alluvial deposits over sand.

There are wetlands on- and off-facility and on residential Lots 1245-8 and 1245-9 that Normandeau Associates mapped and delineated in 1990, 1991 and 1992 according to criteria in the "Corps of Engineers Wetlands Delineation Manual." With the exception of the culvert, a strip of forested upland and wetland habitat borders both banks of the Neponset River throughout most of its course to Lewis Pond. This strip is a possible travel corridor as well as foraging and breeding habitat.

An approximate 54,000 square feet marsh/wet meadow area composed of a mixture of silty and organic materials occurs along the Neponset River between the railroad easement and South Street. These wetlands contain a 33,200 square foot sedge and cattail marsh on the north side of the river and two small (<0.2 acre) red maple seepage swamps on the south side of the river. The bank of the Neponset in this area shows evidence of muskrat burrows and trails. This area is a potential habitat for animals such as turtles, frogs, birds, and mammals.

Approximately 500 feet downstream of the South Street culvert, south of the Neponset River is a 1.1 acre red maple swamp. Groundwater seeps from the slopes, saturating the soils. The swamp has various trees, shrubs and herbaceous plants including red maple, American elm, winterberry, arrowwood, cinnamon fern and sphagnum moss. This area is potential habitat for animals such as raccoons, frogs, newts, snakes, and birds.

A tail race located on the western portion of the site contains shallow standing water. It is within the vegetated corridor along the Neponset River, and therefore has some wildlife habitat value. A 1.5 foot high concrete dam with a 12" culvert restricts flow in and out of the tailrace near the lower end.

The soils on terraces or steep slopes in and above the upland portions of the 100-year floodplain support old-field and young hardwood forest habitats which include oaks, white pine and ash. They are composed of diverse layers of vegetation and may provide habitat for wildlife species such as salamanders, toads, birds, and mammals.

2.2 Chemicals of Concern

Likely chemical classes include those mentioned in the National Priorities Listing Document (USEPA, 1994):

- asbestos;
- inorganics (including metals, e.g. lead, arsenic, and nickel); and,
- volatile and semi-volatile organic compounds.

In addition, pH is a master variable affecting chemistry and bioavailability of chemicals. Table 4 of the Existing Data Review and Analysis Report provides an evaluation of chemicals of concern based on chemicals analyzed in groundwater, soil, and surface water at or adjacent to the site. The table shows:

- the potential source of a chemical based on site history;
- the range of concentrations in these media;
- some human health and ecological properties of each chemical.

Ultimately, the risk assessment will select chemicals of ecological concern from future data collections efforts based on: frequency of occurrence within a particular media, likely bioavailability, evidence for bioaccumulation, toxicity to likely receptors, and comparison of concentrations to a reference area. Obviously, this anticipated re-evaluation, may require changes in the conceptual model for the baseline risk assessment depending upon the fate, transport, and biological properties of these chemicals. The EPA guidance recognizes and encourages this iterative process.

2.3 Biological Exposure Routes

The major biological mechanisms affecting fate and transport are:

- **Ingestion of chemicals bound to sediment** by bottom dwelling invertebrates (benthic invertebrates) or forage fish in aquatic environments;
- **Absorption of chemicals** from sediment, surface water, shallow groundwater, and soil with subsequent translocation through roots in aquatic and terrestrial plants;

- **Uptake of dissolved chemicals** through the tissues of benthic invertebrates or the leaves and stems of aquatic plants;

- **Ingestion of chemicals bound to soil** by soil invertebrates, mammals, and birds.

Several of the chemicals are subject to one or all of these biological fate and transport mechanisms. For example, volatile compounds are unlikely to bioaccumulate or biomagnify, although organisms may take them up.

2.4 Potential Receptors

Potential chemicals may affect the survival and reproductive capacity of benthic biota, plants, fish, soil invertebrates, birds, and mammals. The categories of potentially affected receptors and representatives of those categories for the Blackburn and Union Privileges site include:

- benthic macroinvertebrate community in Neponset River and associated wetlands;

- soil invertebrates in upland areas (earthworms);

- aquatic and terrestrial plants;

- warm water fish (fathead minnow and bluegill sunfish);

- piscivorous birds (kingfisher);

- semi-aquatic mammals (muskrat, raccoon);

- birds in wetland and upland areas (robin);

- small mammals in upland areas (shrew);

- raptors (red-tailed hawk).

Benthic Invertebrates

Oligochaetes (aquatic worms), chironomids (midges), and amphipods (freshwater crustaceans) represent the benthic invertebrate population. Benthic invertebrates are prey for fish and aquatic birds and may biomagnify chemicals through the food chain.

Soil Invertebrates

Earthworms represent the soil invertebrate population. Soil invertebrates, like benthic invertebrates, are prey may bioaccumulate and biomagnify. Chemicals through the food chain.

Plants

Rooted vegetation in wetlands, macrophytes in wetlands and the river, phytoplankton (small floating plants) in the ponds, and terrestrial vegetation in the uplands represent the various plant species near or adjacent to the site. Plants tend to take up metals over organic compounds. They are a food source, and therefore a source of chemical exposure to herbivorous and omnivorous animals.

Warm water fish

The Neponset River is a warm water fishery. Forage fish in such a fishery include bluegill sunfish and fathead minnow that feed on benthic invertebrates and / or aquatic vegetation. They would be more likely

to be exposed to chemicals in the sediment through bioaccumulation in their diet, or direct contact while feeding. Piscivorous fish, like the largemouth bass, would be exposed to chemicals that bioaccumulate. Some chemicals may biomagnify (increase in concentration up the food chain).

Piscivorous birds

The belted kingfisher represents piscivorous birds along the Neponset River. The vast majority of their diet is fish, which they catch by diving from a perch or in flight. They are found along rivers and edges of ponds and lakes. They prefer water without a lot of vegetation that obscures their view. Kingfishers nest in burrows dug into the banks and generally feed in the water bodies close to their burrows. Kingfishers would be exposed to chemicals that bioaccumulate in fish.

Semi-aquatic mammals

Muskrat and raccoon represent semi-aquatic mammals. Muskrats can dig dens in the banks of or construct lodges with plant material, but prefer dens. Muskrats' diet consists primarily of aquatic plants, of which they prefer the roots and tubers. Muskrats may be exposed to chemicals through their diet, or through ingestion of sediments while digging up the roots or excavating their dens. Raccoons are omnivores. They will eat fruits, nuts, insects, frogs, mussels, and more. They usually eat more animal matter in the spring and early summer. They will den in hollow trees or use burrows of other animals. Raccoons may be exposed to chemicals through their food or ingestion of soil.

Terrestrial song birds

The American Robin represents foraging songbirds in the wetlands and upland. During the breeding season they are mostly insectivorous, while the rest of the year, they become mostly frugivorous (eating fruits and berries). They raise multiple broods in one year. They may be exposed to chemicals through their diet, or through ingestion of soil while digging for insects and worms.

Small upland mammals

Upland mammals include the Short-tailed Shrew. Shrews are mostly insectivorous, but may eat birds and small mammals. They dig burrows with connecting runways. They could be exposed to bioaccumulated chemicals in their food source and chemicals in the soil.

Raptors

Red-tail hawks are representative of raptors. Red-tails are found in woods, fields, and wetlands. They nest in the tops of trees. Their diet is mostly composed of rodents, like mice, shrews, squirrels, and rabbits, but may include birds and snakes. Red-tail hawks may be exposed to chemicals through bioaccumulation in their prey.

2.5 Complete Exposure Pathways

USEPA guidance indicates that the risk assessment should identify complete exposure pathways before conducting a quantitative evaluation of toxicity. Identification of complete exposure pathways focuses the risk assessment on those chemicals that can reach ecological receptors. Potentially complete exposure pathways for the South Street site are:

- sediment to benthic invertebrates via direct contact and ingestion;
- sediment and surface water to aquatic plants via uptake;
- surface water to invertebrates and fish through direct contact and ingestion;

- plants and benthic biota to higher order predators (e.g. fish and mammals) through the food chain;
- soil to soil invertebrates via direct contact and ingestion;
- soil to terrestrial plants via uptake;
- soil invertebrates to mammals and birds;
- soil ingestion by higher order predators;
- mammals, birds, and fish to higher order predators (e.g., piscivorous fish, piscivorous birds, and raptors) through the food chain.

3.0 Human Health Conceptual Model

Figure F-3, the human health conceptual model, illustrates potential human exposures from chemicals associated with sediment, surface water, groundwater, and soil.

3.1 Human Exposure Media

Sediments and surface water in the Neponset River may be contaminated from historical releases directly from an industrial process, via surface water run-off from a manufacturing or disposal area, and/or by groundwater-assisted migration of compounds from areas such as the landfill. Human receptors may come into direct contact with compounds in surface water and sediment, or may be exposed via ingestion of fish caught in local water bodies.

On- and off-site groundwater may be contaminated from historical spills or leaks or by compounds leaching out of soil or sediment. Groundwater can impact human receptors via ingestion from a contaminated drinking water well (although none are currently believed to exist in the vicinity of the site), by direct dermal contact, or by inhalation of volatile compound vapors if the groundwater is sufficiently shallow and the receptor is in a semi-enclosed space, such as a home, or a trench. Groundwater can also assist in the vertical and horizontal migration of compounds.

Surface and subsurface soil may be contaminated from fill disposed of on-site, from spills or leaks, or from migration of fill to off-site locations by historical flooding of the Neponset River. These source areas could impact human receptors directly through dermal contact, ingestion, and inhalation of dust and vapors. Soil compounds may also be absorbed into the roots of plants and affect human receptors via ingestion of homegrown produce.

3.2 Human Exposure Routes

The Baseline Human Health Risk Assessment will evaluate scenarios for which a complete pathway to a current or future receptor is likely. A complete pathway must have a route of exposure from the source to the receptor. The exposure routes in Figure F-3 identify the likely pathways from compounds in media to current and future receptors.

The exposure routes include ingestion, inhalation, and direct skin contact (dermal contact) with contaminated media. Various activities bring the receptors in contact with the media of concern. For example, an angler or recreational user of the Neponset River or associated wetlands may be exposed to compounds via dermal contact with surface water and sediment. A resident may be exposed via dermal contact with compounds in surface soil or groundwater, ingestion of compounds in drinking water or locally grown or caught food, incidental ingestion of compounds in soil, or inhalation of volatile compounds from soil or groundwater.

The exposure routes are described for each potential receptor below.

3.3 Human Receptors

The human health conceptual model in Figure F-3 identifies six potential receptors and considers the pathways for each receptor to be exposed to contaminated media. These six receptors include:

- current angler/wader;
- current trespasser;
- current off-site resident;
- future on-site resident;
- future construction worker; and,
- current/future site worker.

Receptors may be exposed to compounds directly (via incidental ingestion or dermal contact), through inhalation of dust particles or vapors from soil or groundwater, or via food chain ingestion.

Current Angler/Wader

The angler/wader represents a receptor who might wade or consume fish caught in the Neponset River, the tailrace (wading, not fishing), or in downstream areas. The angler/wader could make dermal contact with compounds in sediment and surface water, or might ingest compounds in recreationally caught fish (Neponset River Watershed Assn, 1999).

Current Trespasser

While the portion of the site west of South Street is fenced, the eastern portion is easily accessible. A trespasser in this area may be exposed to compounds in on-site soils, sediment, and surface water via direct contact or inhalation of fugitive dust and vapors.

Current Off-site Resident

A current off-site resident may be exposed to compounds in accessible soils and groundwater. Walpole's well fields are currently anticipated to be too distant from the site to be impacted by site contamination. Further review of potential groundwater use will be completed as part of the RI.

Exposure routes for a current off-site resident include:

- Ingestion of compounds in drinking water drawn from wells in the area;
- Inhalation of volatile compounds migrating from groundwater or subsurface soil to indoor air;
- Incidental ingestion, dermal contact, and inhalation of dust and vapors from surface soil; and,
- Ingestion of compounds in homegrown produce;

Future On-Site Resident

For the purposes of the Baseline Human Health Risk Assessment, we assume the industrial portions of the site may be redeveloped for residential use in the future. We evaluate the following exposure pathways for the future site resident:

- Ingestion of and dermal contact with compounds in drinking water drawn from wells dug on-site;

- Inhalation of volatile compounds migrating from groundwater or soil to the indoor air of a future home;
- Incidental ingestion, dermal contact, and inhalation of dust and vapors from on-site soils; and,
- Ingestion of compounds in soils via ingestion of homegrown produce.

Future Construction Worker

If the site is redeveloped, a construction worker may directly contact or inhale dust and vapors from on-site soils. In addition, the construction worker may directly contact or inhale vapors from groundwater, depending on the groundwater depth in the area of excavation.

Current/Future Site Worker

A current/future site worker may inhale volatile compounds from sub-surface soil or groundwater in indoor air. Current site workers could be exposed to compounds in currently accessible surface soils. Future site workers could be exposed to site compounds in on-site surface and reworked subsurface soil (assuming compounds were located near the surface) through direct contact, and inhalation of fugitive dust. The site worker may also inhale compounds on airborne particulates from off-site soil.

4.0 References

MDPH. 1995. *Preliminary Public Health Assessment Blackburn and Union Privileges*.

National Priorities Listing Document (USEPA, 1994).

Neponset River Watershed Ass'n, 1999 webpage at www.walpole.ma.us/eneponsetwalpole.htm. "Exploring the Neponset River in Walpole."

Normandeau Associates' 1992 report, *Assessment of Asbestos Removal Plan Effects on Wetland Resources of the South Street Site*.

Figure F-1: Blackburn and Union Privileges Site Conceptual Model

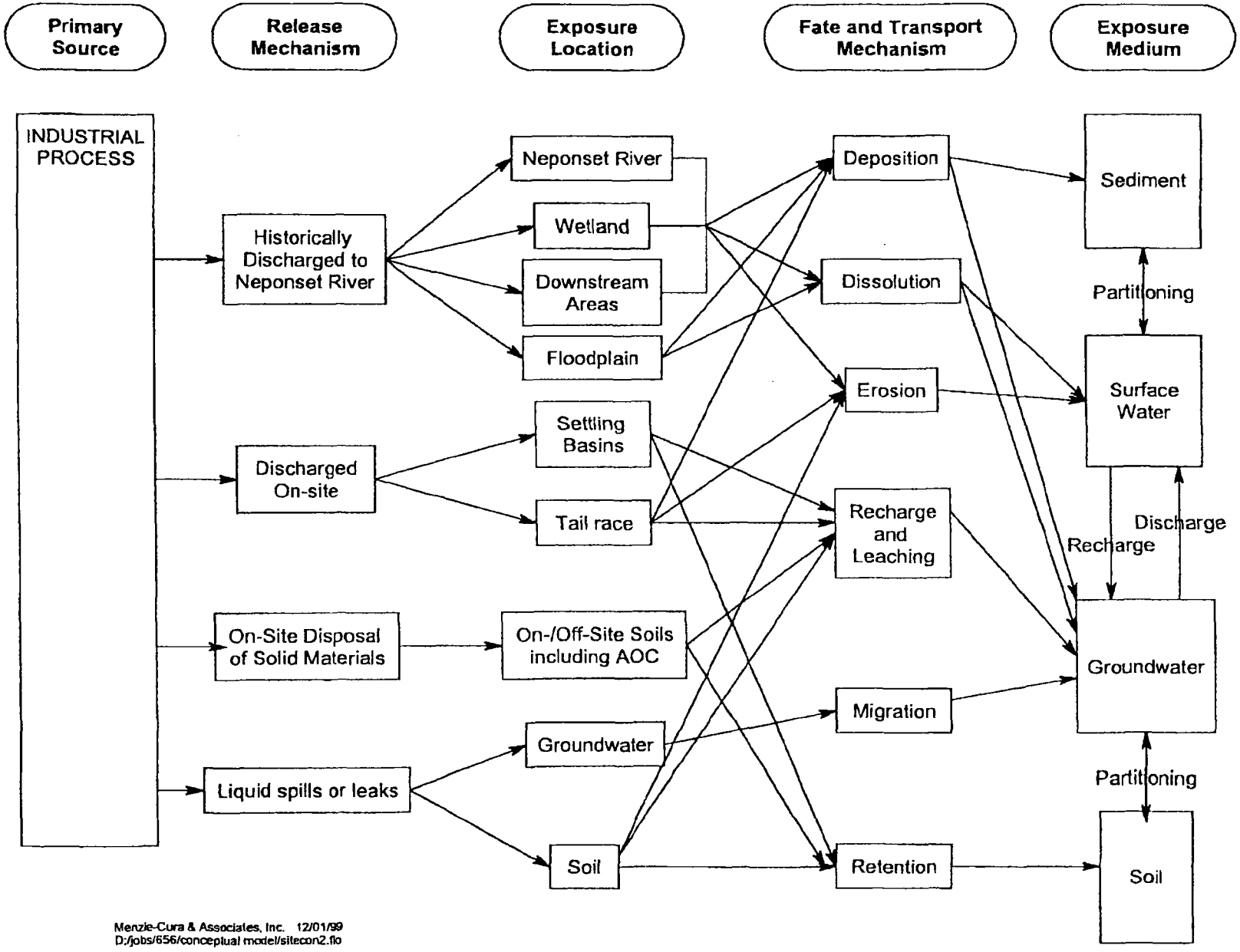

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Figure F-2: Blackburn and Union Privileges Preliminary Ecological Conceptual Model

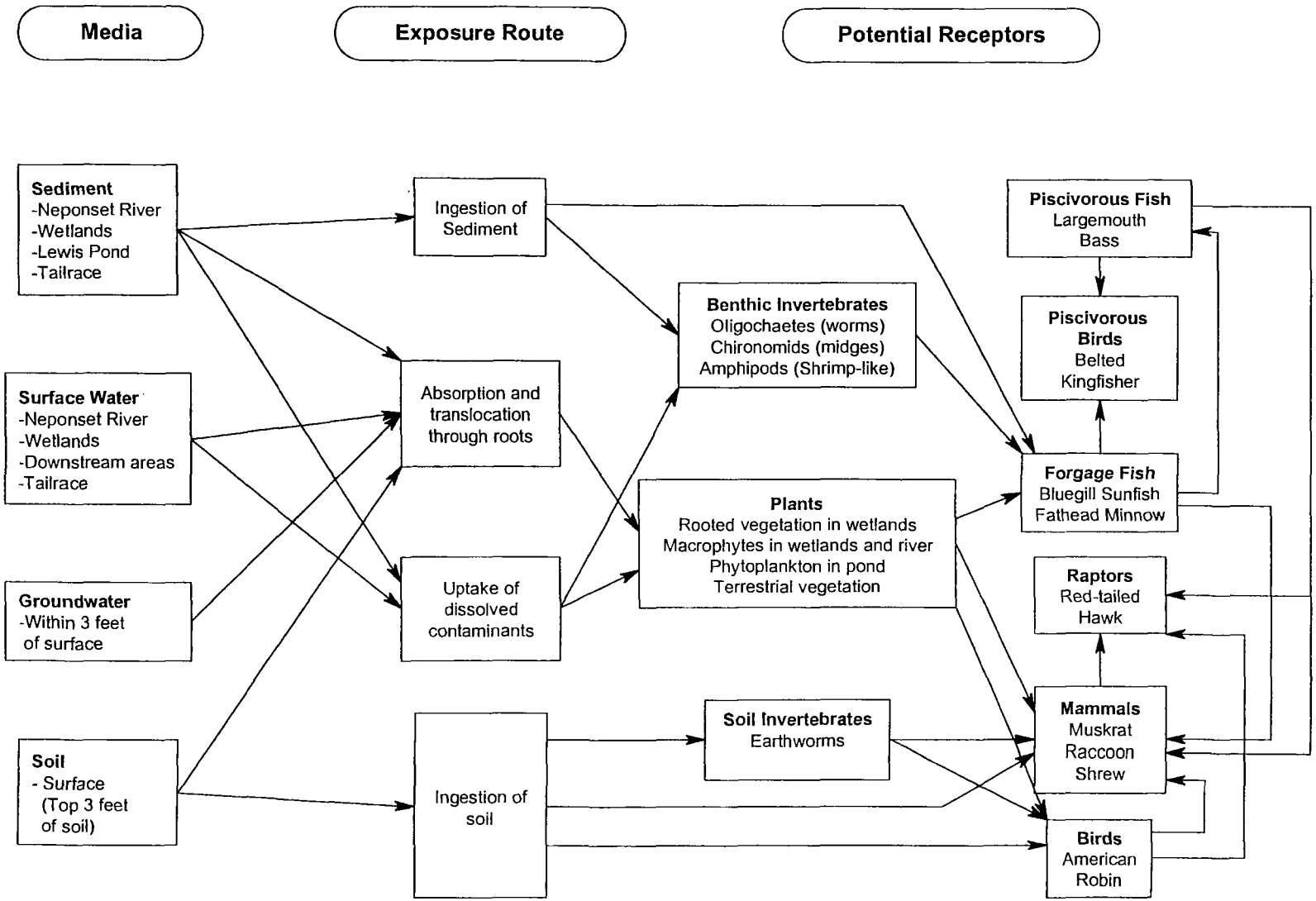

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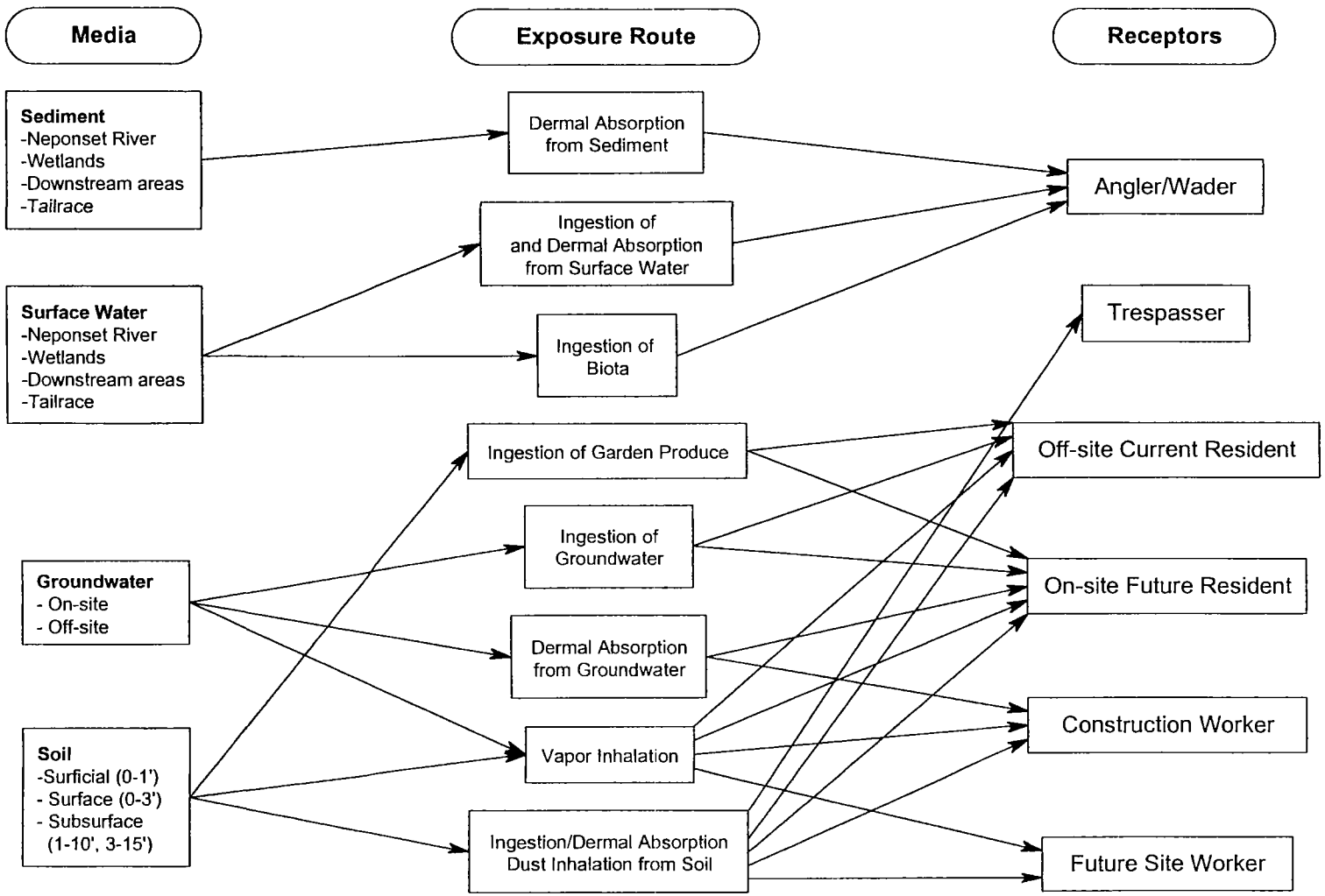
Figure F-3: Blackburn and Union Privileges
Human Health Risk Conceptual Model



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MEMORANDUM

Date: November 29, 1999
File: 656B
To: Nikki Delude, Charlie Head
From: Jo Anne Shatkin, Cheri Butler
Subject: COC Table

The attached compounds of potential concern (COPC) table evaluates the existing data relative to human health risk endpoints in soil and groundwater and ecological endpoints in soil and surface water.

Human Health Risk Information

Two columns list risk-based concentrations for soil and drinking water, respectively, from the EPA Region 9 Preliminary Remediation Goal (PRG) Table, which EPA Region 1 requires be used for screening of COPCs (EPA, 1999). The Human Health Risk Info column describes the adverse health effects noted in human epidemiological or laboratory toxicological studies with the compound used to derive toxicity values.

While the site data are of poor quality for representing conditions at the site, it is helpful to compare the detected concentrations with the PRGs to give a general indication of the potential importance of each COPC to human health risk from site soils and water. Because of data quality issues, compounds with concentrations below the risk-based levels can not be interpreted to mean they will not be evaluated as COPCs. However, COPCs that were measured at concentrations very high relative to the PRGs are likely to require further assessment.

From this initial evaluation, compounds that initially are of concern relative to human health include those associated with carcinogenicity, or present at concentrations well above the Region 9 PRG. Arsenic was measured in soil and groundwater at levels that may be significant if there is repeated human exposure. Lead levels are elevated relative to human health benchmarks. For semi-volatile compounds, carcinogenic polycyclic aromatic hydrocarbons (cPAH) range from non-detected levels to elevated levels in soil. The existing data does not indicate any elevated concentrations of volatile organic compounds (VOCs). VOCs in soil are likely to be present at levels higher than measured, because samples were not preserved. Benzene was measured in groundwater at a concentration significant relative to human exposure.

Ecological Risk Information

The Ecological Risk Info column describes some qualitative attributes of the chemicals for which we have existing data. Examples of chemical attributes are persistence in environmental media, bioavailability, potential for bioaccumulation and biomagnification, and toxicity (e.g., acute and chronic). We gathered chemical-specific information from a series of reports by Ronald Eisler at the U.S. Fish and Wildlife Service and from the "Draft Prioritized Chemical List" published by the USEPA Office of Solid Waste and Emergency Response. The Eisler reports are available for the following chemicals in the COC table: arsenic, cadmium, chromium, cyanide, lead, mercury, selenium, and zinc. These reports are a synopsis of

hazards to fish, wildlife, and invertebrates gathered from the primary literature. The Draft Prioritized Chemical List is a "relative ranking of chemicals based on their tendency to persist in the environment once released, their tendency to accumulate in animal tissues (i.e., bioaccumulate), and their toxicity (i.e. their potential to cause adverse effects in aquatic ecosystems.)" Numerical rankings (1, 2, or 3) given in the Draft Prioritized Chemical List table were translated into words (low, moderate, or high, respectively) in the Ecological Risk Info column in this table. Compounds initially of concern in terms of ecological risk are those compounds which are highly persistent, highly bioaccumulative, and highly toxic. Examples of such compounds are metals such as cadmium and lead, and PAHs such as benzo(a)pyrene and dibenz(a,h)anthracene.

References:

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Biological Report 85(1.2). Contaminant Hazard Reviews . July 1985. Report No. 2. Cadmium Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review by Ronald Eisler, U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel MD.

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USEPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. United States Environmental Protection Agency, Office of Health and Environmental Assessment. EPA/600/R-93/089. July 1993.