FIELD INVESTIGATION REPORT
FOR
HAZELTINE CORPORATION
GREENLAWN, NEW YORK

January 1991

Prepared for:

Hazeltine Corporation
Cuba Hill Road
Greenlawn, New York

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RADIAN
CORPORATION

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EXECUTIVE SUMMARY

This report presents results from a site investigation conducted at the Hazeltine Corporation facility in Greenlawn, New York in April and May 1990. Investigation of the site was conducted in accordance with a Consent Order issued by the New York State Department of Environmental Conservation (NYSDEC). The site investigation was designed to evaluate soil and ground-water quality in the vicinity of the facility's State Pollutant Discharge Elimination System (SPDES) permitted wastewater discharges.

The Hazeltine facility has two SPDES permits which cover both industrial and nonindustrial wastewater discharges. Under SPDES Permit NY0075744, Outfall 001 is a leach pool that receives sanitary wastes, and until recently, received industrial wastewaters from Building 1. Under SPDES Permit NY0075752, Outfall 001A is a leach pool that received treated effluent from Building 2 until early 1990. Adjacent to Building 3 is Outfall 004A (SPDES Permit NY0075752), an underground leach pool that presently receives treated effluent and sanitary wastes from Building 3.

Radian Corporation's investigation of the site was conducted in accordance with specifications outlined in the Work Plan (June 30, 1989) approved by NYSDEC and incorporated as an Appendix to the Consent Order. The site investigation included the collection of subsurface soil and ground-water samples adjacent to SPDES permitted wastewater discharges.

The site investigation results indicated that the Hazeltine facility is underlain by predominately sand and gravel deposits. Ground water occurs in these deposits as a perched (ground water separated from an underlying body of ground water by an unsaturated zone) water-bearing zone below a portion of the Hazeltine facility at a depth of approximately 80 to 90 feet below ground surface. The presence of perched ground-water conditions is controlled by the discontinuous occurrence of fine-grained sand and gravel deposits that impede further vertical migration of the ground water. Perched ground-water conditions were not found at the site other than at areas below portions of the Hazeltine facility. Based on the investigation findings, and on data presented in available literature, a laterally extensive water-table aquifer occurs at a deep horizon (approximately 170 feet below ground surface) beneath the Hazeltine site and surrounding areas.

Analytical results of the soil samples indicated relatively minor impacts from the operations of the SPDES wastewater discharges to soils in the vicinity of the discharges. Results from volatile organic analysis of the soil and ground-water samples included the detection of tetrachloroethylene (PCE) in samples collected from two borings adjacent to an underground hazardous waste storage tank currently undergoing RCRA closure, and the detection of toluene, in concentrations not exceeding New York State ambient water quality standards, in a ground-water sample adjacent to a sanitary sewer leach pool.

Inorganic analysis of the soil samples indicated concentrations of some metals and cyanide slightly elevated above similar concentrations in background soils. Analysis of ground-water samples revealed that only the unfiltered ground-water sample from the well adjacent to Building 2 (MW-3X) contained elevated concentrations of selected metals above background ground-water quality. These elevated metal concentrations are attributed to suspended sediment in the ground-water sample which could not be removed after extensive well development efforts. The results of the filtered sample from this well are considered more representative of ground-water quality in the water-table aquifer underlying the site.

Based on the results of this site investigation, concentrations of selected constituents detected in soil and ground-water samples collected at the Hazeltine site do not conclusively indicate that significant impacts to soil and ground-water quality have resulted from facility operations and SPDES permitted wastewater discharges; therefore, further characterization of local ground-water hydrology is not justified.

1.0 INTRODUCTION

This report presents the results of site investigation activities conducted at Hazeltine Corporation's (HC) main facility, located in the Town of Greenlawn, in Suffolk County, New York. The major activity at the HC facility is the assembly of electronic systems and equipment. The HC property consists of two parcels that are bisected by Cuba Hill Road, and covers a total of approximately 23 acres.

The objective of the site investigation was to assess the potential for facility-related environmental impacts on soil and ground-water quality in the vicinity of State Pollutant Discharge Elimination System (SPDES) permitted wastewater discharge points. As a result of the New York State Department of Environmental Conservation's (NYSDEC's) concerns regarding past SPDES-permitted industrial effluent discharges to permitted outfalls on HC property, HC has negotiated an Order on Consent (the Consent Order) with NYSDEC. The Consent Order was signed on December 28, 1989. In accordance with Section I of the Consent Order, Radian Corporation conducted a site investigation at the HC Greenlawn facility.

The scope of work for the site investigation is detailed in the Work Plan dated June 30, 1989, prepared by Fred C. Hart Associates, Inc. (Appendix A). The Work Plan was approved by NYSDEC and was incorporated into the Consent Order by reference, as Appendix A of the Consent Order. In response to comments from

NYSDEC in a letter to Mr. Joseph J. Zedrosser, counsel for Hazeltine Corporation dated July 31, 1989, an Addendum to the Work Plan was prepared on October 24, 1989 and was approved by NYSDEC. Hazeltine then contracted Radian Corporation to implement the approved scope of work. Radian recommended subsequent modifications to the field procedures, also approved by NYSDEC, as detailed in a confirmatory letter to Mr. Barry Lucas of NYSDEC, dated April 17, 1990. As a result of conversations with NYSDEC during the field investigation, further modifications were approved by NYSDEC. These modifications were authorized in a memorandum signed April 30, 1990 by Mr. Barry Lucas of NYSDEC and by Mr. Andy Vecchio, Hazeltine Corporation. Copies of these documents are also included in Appendix A.

As required by Section II of the Consent Order, this report provides a copy of the approved Work Plan and presents information collected during the field investigation. Section 2.0 of this report includes a brief facility history, and an overview of the regional geology and hydrogeology of the area. The scope of the field investigation included the installation of several soil borings and three monitoring wells. Details of the field investigation are given in Section 3.0, with specific field methodology and field data presented in Appendices B and C, respectively. Section 4.0 provides the current understanding of site geology and hydrogeology. Samples collected at the site were submitted to CompuChem Laboratories in Research Triangle Park, North Carolina for Target Compound List (TCL) Volatile Organic and Target Analyte List (TAL) Inorganic analyses as listed in the NYSDEC Contract Laboratory

Protocol (CLP) document. Results of these analyses are discussed in Section 5.0.

Section 6.0 presents conclusions regarding site geology, hydrogeology, and chemistry.

Section 7.0 provides references used in preparing this report.

2.0 BACKGROUND

2.1 Site Description and History

The Hazeltine Corporation (HC) facility is located in the town of Greenlawn, Suffolk County, New York (Figure 2-1), and is involved in the assembly of electronic systems for military applications. (All figures and tables for Section 2.0 are located at the end of this section.) The facility covers approximately 23 acres, and is comprised of two parcels of property separated by a public right-of-way (Cuba Hill Road). There are five main buildings (1 through 5): Building 1 is located on the southwest side of Cuba Hill Road, and Buildings 2 through 5 are located on the northeast side of Cuba Hill Road (Figure 2-2). The topography surrounding the HC facility is generally flat-lying. Portions of both parcels are paved for use as parking lots. The remainder of the land in the parcels is unpaved and/or grassed.

The HC facility was owned and began operations under Republic Aviation during the 1940s. At that time, operations included the manufacture of metal tubing and electrical harnesses for military aircraft in what is now called Building 2. Hazeltine Corporation acquired the facility in 1957, and has used the facility for the fabrication of sheet metal and machine parts, and the assembly of electronic systems for military applications. Buildings 3 through 5 were added between 1960 and 1962. Building 1 was constructed in 1971, and was later expanded in 1986. In 1986, Emerson Electric Co. acquired Hazeltine Corporation, including the Greenlawn facility. Operations at the Greenlawn facility have generally remained the same during this latter period.

Past manufacturing processes at the facility included plating operations, metal working, bench-scale assembly, and photography. Operations conducted in each building are summarized as follows:

Building	Operations
1	Offices, assembly operations, photographic and microelectronics laboratories
2	Offices, plating, metal finishing, painting, deburring
3	Offices, photographic laboratory, environmental test chambers
4	Offices, assembly operations, QA/QC, painting
5	Offices, assembly operations, microelectronics laboratory

In the past, Building 2 operations have included a small printed circuit board plating shop (copper, tin/lead, nickel, and gold plating), and a metal finishing area for conversion coating processes. Current operations in Building 2 include a metal finishing area for deburring and painting processes.

In 1986, NYSDEC cited the HC facility for alleged violations of the facility's SPDES permits. In 1986, a Phase I Investigation Report on the HC facility was prepared by Woodward-Clyde Consultants, Inc., for NYSDEC. The purposes of this investigation were to evaluate previous releases at the HC facility and to compute a preliminary hazardous ranking system (HRS) score for the facility. A preliminary HRS score of 21.4 was calculated, largely derived from the potential migration of hazardous substances from the HC facility via ground water. The results of this investigation were addressed in a negotiated Consent Order signed in late 1989.

The following subsections describe the previous and existing SPDES-permitted wastewater discharges at the HC facility, and describe the wastewater treatment processes associated with the underground and aboveground storage tanks located at Building 2.

2.1.1 Wastewater Discharges

The HC facility's two existing SPDES permits cover many wastewater point source discharges, the majority of which are nonindustrial outfalls (e.g., sanitary outfalls and roof drains). There are several industrial wastewater outfalls at the HC facility, some of which are currently in use, while others have been discontinued. Approximately 200 feet north of Building 1 is a leach pool approximately 10 feet in diameter and 15 feet deep (SPDES Permit NY0075744, Outfall 001). Previously, this outfall discharged sanitary wastes and wastewaters from a microelectronics laboratory and a photographic laboratory located in Building 1. Use of this leach pool as an industrial outfall was discontinued in late 1986. The existing SPDES permit for Building 1 is awaiting state approval for its renewal, and currently covers only nonindustrial discharges. The following constituents are monitored either monthly or quarterly at this outfall under the existing SPDES permit:

Outfall No.	Constituent	Sources
001	Silver, Aluminum, Chromium, Lead, Phenol, Acetone, Trichloroethylene, Methylene Chloride	Photographic Laboratory Microelectronics Laboratory

The second existing SPDES permit (Permit NY0075752), covers the portion of the HC facility where Buildings 2 through 5 are located. From about 1950 until 1979, untreated wastewaters and wastes associated with metal plating and finishing were discharged from Building 2 to a surface recharge basin (see Figure 2-2) via an underground pipeline. This discharge to the surface recharge basin was covered under a SPDES permit at the time this discharge was discontinued in 1979. In 1979, wastewaters previously discharged to the surface recharge basin were processed in a wastewater treatment unit (wastesaver). Treated effluent from this process was discharged into an underground leach pool (Outfall 001A) adjacent to Building 2. The following constituents are monitored either monthly or quarterly at this outfall under the existing SPDES permit:

Outfall No.	Constituent	Source
001A	Fluoride, Chromium, Copper, Iron, Lead, Nickel, Tin	Building 2 Plating/Metal Finishing Wastewaters

Due to the discontinuation of Building 2 plating operations by the fall of 1988 and of conversion coating operations by February 1990, rinsewaters are no longer generated, treated, or discharged from Building 2, and outfall 001A is no longer active.

The other SPDES outfall under Permit NY0075752 associated with industrial discharges is adjacent to Building 3 (Outfall 004A). Before 1985, photographic laboratory wastewater was discharged to the surface recharge basin (via an underground pipe), and also to an underground leach pool located on the east side of Building 3 (Outfall 004A). In 1985, the pipe leading from Building 3 to the surface recharge basin was disconnected, and the photographic laboratory wastewater was treated and discharged exclusively to the underground leach pool. This outfall (004A) also receives sanitary wastes from Building 3. The following constituents are monitored either monthly or quarterly at this outfall under the existing SPDES permit:

Outfall No.	Constituents	Source
004A	Cyanide, Chromium, Silver, Aluminum, pH, Phenol	Photographic Laboratory

2.1.2 Aboveground and Underground Storage Tanks

Two aboveground and three underground storage tanks used to store and treat spent plating baths and rinsewaters are located on the east side of Building 2. Spent plating baths previously were accumulated in a 3,000-gallon underground hazardous waste storage tank ("C" tank or "concentrated" waste tank in Figure 2-2), which was periodically pumped out for off-site disposal. Rinsewaters generated from plating operations in Building 2 were piped into two interconnected 5,000-gallon underground storage tanks ("E" tanks or "equalization" tanks in Figure 2-2). These rinsewaters were then neutralized, fed through a wastewater treatment unit, and the resulting concentrated residue was placed into the underground "C" tank, where spent plating baths also were being accumulated. The distillate from treating the rinsewaters was then discharged (via underground piping) to a leach pool located between Building 2 and the surface recharge basin near Building 2.

In April 1979, the HC facility reported a leak of approximately 2,500 gallons of liquid wastes from the underground "C" tank. The tank was repaired and modified to prevent further leakage, with oversight from Suffolk County Department of Health Services (DHS) and NYSDEC. One of the "E" tanks (nonhazardous) leaked in April 1988. Approximately 6,400 gallons of rinsewater were lost. This spill was reported to NYSDEC and Suffolk County. The pipe to the tank was shut down and waters were transferred directly to a tanker truck for removal.

By 1988, use of the three underground storage tanks was discontinued, and two 4,500-gallon aboveground storage tanks were installed adjacent to Building 2 to handle the rinsewaters and spent plating baths, with treated rinsewaters continuing to be discharged to the underground leach pool (Outfall 001A).

Due to the discontinuation of plating operations in Building 2 in 1988 and ~~conversion~~ Conformal coating operations by February 1990, rinsewaters are no longer generated at Building 2. Therefore, all three of the underground storage tanks and one of the aboveground storage tanks which received spent plating baths and rinsewaters are currently undergoing RCRA closure. Treated rinsewaters are no longer discharged to the leach pool located adjacent to the surface recharge basin.

2.2 Regional Geology and Hydrogeology

As part of the site investigation, Radian reviewed available literature on regional and local geology, and other sources of information, to gain a general understanding of anticipated site conditions. The Hazeltine facility is located in north-central Long Island in Greenlawn, New York, and lies within the northeastern extension of the Atlantic Coastal Plain Physiographic Provence (Lubke, 1964).

2.2.1 Regional and Local Subsurface Geology

The subsurface geology of Long Island is comprised of several deposits of unconsolidated glacial and nonglacial sediments, which rest unconformably upon a crystalline bedrock that dips gently and uniformly towards the southeast. As a result of the position and orientation of the bedrock, the overlying unconsolidated deposits are relatively thin along the northern shore of Long Island (which includes the study area), but thicken towards the Atlantic Ocean.

Immediately overlying the bedrock surface is the Lloyd sand member of the Raritan formation, composed primarily of medium to coarse sand and gravel. In the vicinity of Greenlawn, the upper surface of the Lloyd sand occurs at a depth of about 600 feet below sea level, or at approximately 800 feet below ground surface.

Above the Lloyd sand is the Raritan clay member of the Raritan formation, which is comprised of silty-clays with some interbedded sand. The upper surface of the Raritan clay member is about 400 feet below sea level (600 feet below ground surface) at Greenlawn. Both the Lloyd sand and the Raritan clay are nonglacial, Late-Cretaceous age sediments.

Overlying the Raritan clay is the Magothy formation, which contains beds of gravel, sand, sandy clay, and clay. The Magothy formation is also a nonglacial, Late-Cretaceous age deposit, which was highly dissected and eroded by streams during the Tertiary and possibly Early Pleistocene times. As a result of this erosion, the upper surface of the Magothy contains highly variable relief (up to 500 feet), characterized by hills and valleys subsequently buried by the overlying Pleistocene deposits. In the general vicinity of Greenlawn, the upper surface of the Magothy formation ranges from approximately 250 feet below to 50 feet above sea level (180 to 500 feet below ground surface).

Glacial and interglacial Pleistocene age deposits lie unconformably above the Magothy formation. This sequence consists of glacial moraine, outwash, lacustrine, and marine deposits. The surficial deposits surrounding the Greenlawn area have been mapped as glaciofluvial sediments consisting of stratified (layered) sands and gravels (Lubke, 1964).

Two east-west oriented ridges on Long Island represent the southernmost advances of two separate glacial icesheets. The northernmost of these two ridges is the Harbor Hill end moraine, which was deposited as the most recent glacial advance began to recede. The Harbor Hill end moraine deposits consist of poorly stratified sand and gravel, with boulders and till. The Town of Greenlawn lies immediately south of the Harbor Hill end moraine.

2.2.2 Hydrogeology and Public Water Supply

The lowermost aquifer on Long Island occurs nearly exclusively within the Lloyd sand member of the Raritan formation. The overlying Raritan clay acts as a thick and laterally extensive confining layer in most areas of the deep aquifer. The general direction of ground-water flow in the deep aquifer is towards the north (Lubke, 1964; Jensen and Soren, 1974). No public water supply wells in the Greenlawn area are screened in the deep aquifer.

An intermediate aquifer exists on Long Island within most of the Pleistocene and Magothy (Late-Cretaceous) age deposits. The altitude of the top of the intermediate aquifer ranges from 60 to almost 200 feet below sea level. Water in the aquifer has been described as generally confined, with the confinement being more pronounced in the deeper parts of this aquifer (Lubke, 1964). Like the deep aquifer, the direction of ground-water flow in the intermediate aquifer is towards Long Island

Sound. In 1964, approximately half of the water withdrawn for public use within a two-mile radius of the Greenlawn area was from the intermediate aquifer (Lubke, 1964). Currently, 80% of the public water supply wells in the Greenlawn area are screened at depths corresponding to the Magothy formation (Table 2-1).

Above the intermediate aquifer is the shallow aquifer, which occurs in the coarse sand and gravel of the upper Pleistocene deposits, and in some areas is hydraulically connected to the finer sand and gravel in the upper Magothy formation. The upper limit of the shallow aquifer defines the regional water table on Long Island. The lower limit of the shallow aquifer varies, and is represented by discontinuous clay bodies in both the upper Pleistocene deposits and the Magothy formation. Hydraulic conductivity within the shallow aquifer may change markedly at the contact between the more permeable Pleistocene and the less permeable Magothy deposits (Lubke, 1964). In the general area of the HC facility, this upper limit (i.e., water table) is at approximately 55 feet above sea level, or at 175 feet below ground surface. In 1964, approximately half of the water withdrawn for public use within a two-mile radius of the Greenlawn area was from the shallow aquifer (Lubke, 1964). There are currently two public water supply wells in the Greenlawn area that appear to be screened in the shallow aquifer (Table 2-1).

Previous work in northwestern Suffolk County (Lubke, 1964) has identified fairly common examples of perched water bodies (ground water separated from an underlying body of ground water by an unsaturated zone. These perched zones generally lie on layers of locally impermeable glacial till, or on clays in the Pleistocene deposits or Magothy formation, the latter clays possibly being of glaciolacustrine origin. Previously identified perched water bodies in northwestern Suffolk County (Lubke, 1964) appear to be located in relative proximity to the Harbor Hill end moraine. These perched water bodies are usually not used as public water supplies due to their small yields and undependability.

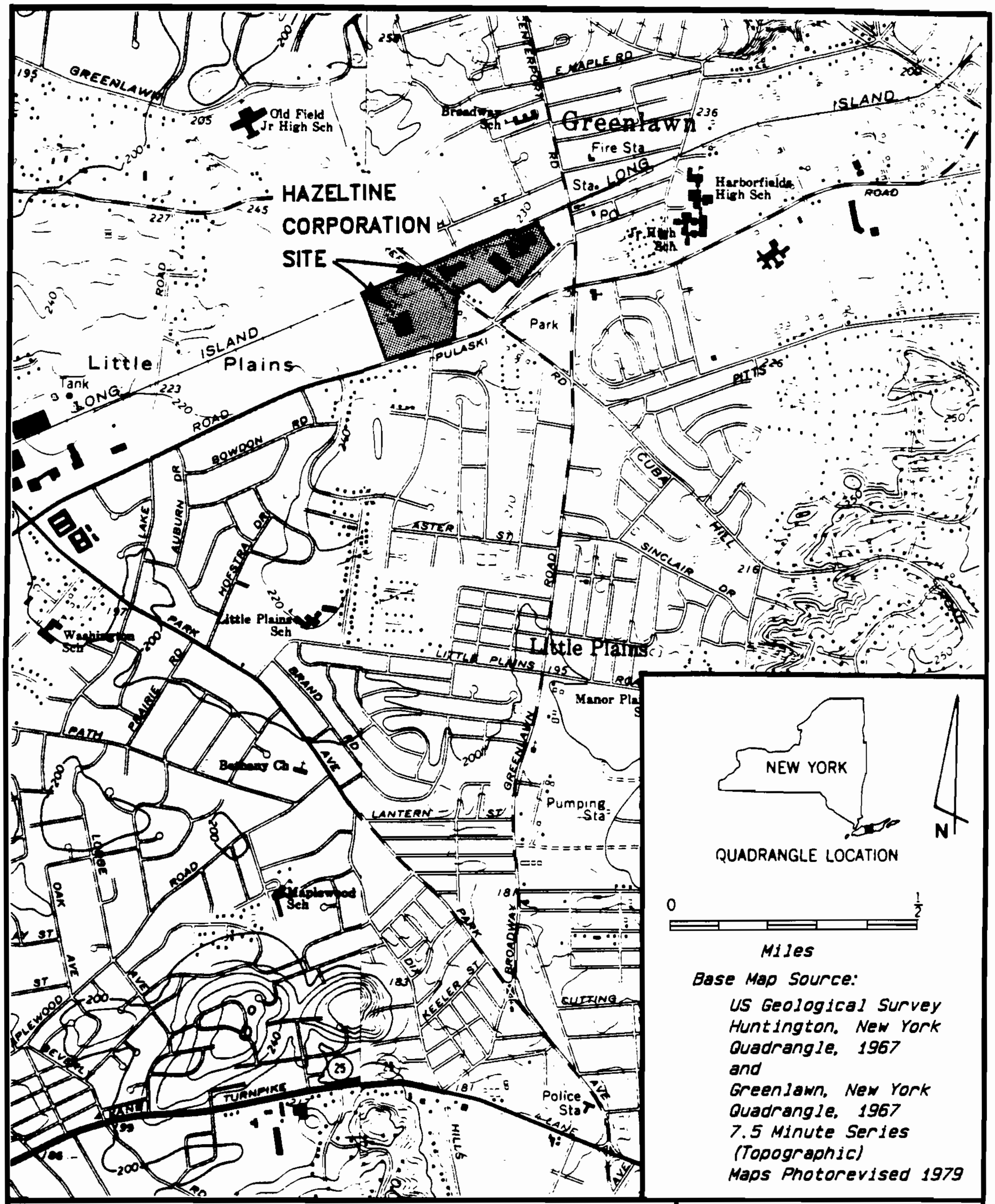

Figure 2-1. Site Location Map, Hazeltine Corporation, Greenlawn, New York

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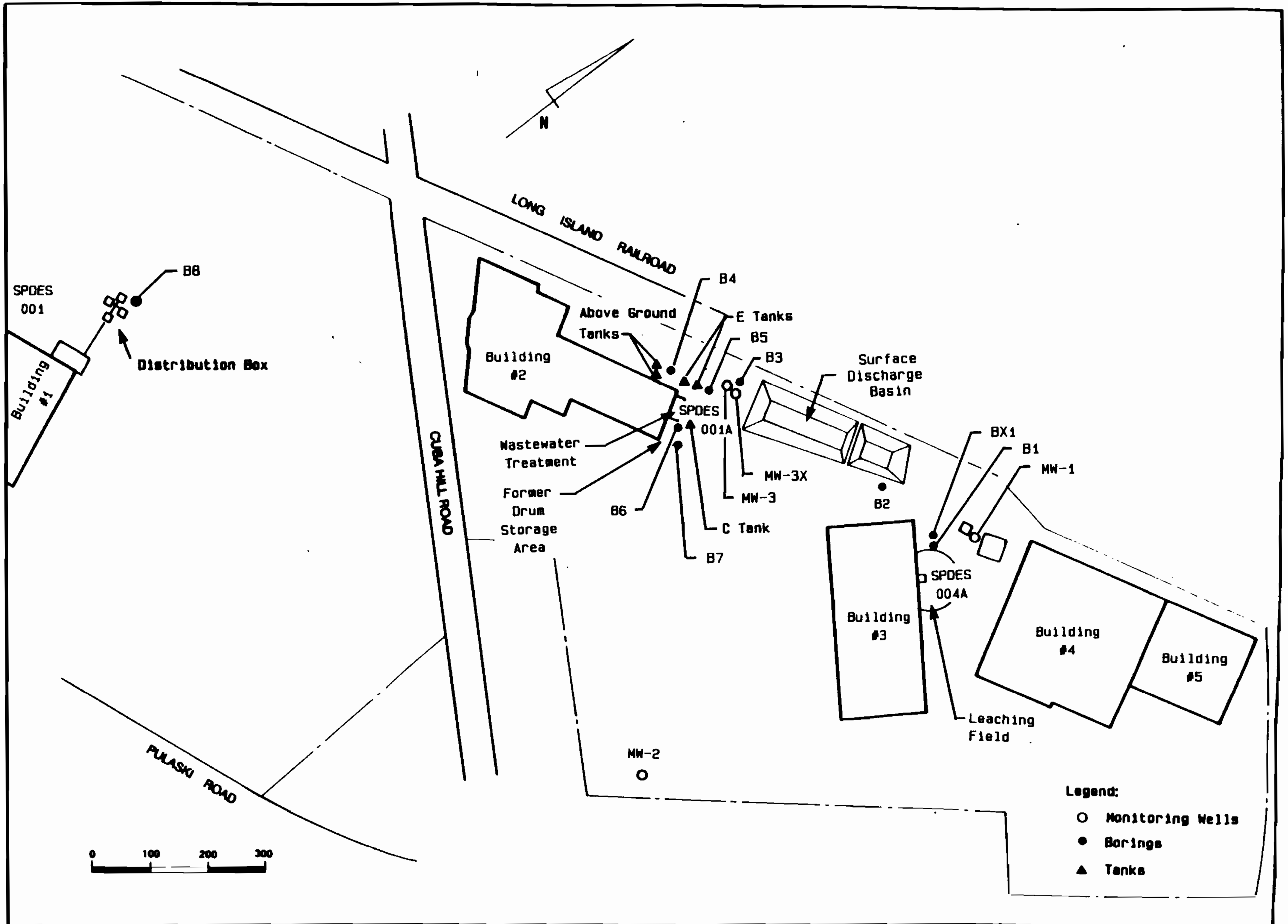

Figure 2-2. Site Plan, Hazeltine Corporation, Greenlawn, New York

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Table 2-1
PUBLIC WATER SUPPLY WELLS LOCATED WITHIN A THREE-MILE RADIUS OF HAZELTINE CORPORATION, GREENLAWN, NEW YORK

Approximate Location	New York State Water Resources Commission No.	Owner	Depth (feet)	Capacity (GPM)	Population Served	Position Relative to Premises
Pulaski Road	S23998	Greenlawn Water District	600	1,200	8,000	Sidegradient
Buttercup Lane	S23145	Greenlawn Water District	600	1,200	8,000	Downgradient
Park Avenue	S11803	Greenlawn Water District	218	NA	NA	Upgradient
Manor Road	S23997	Greenlawn Water District	625	NA	NA	Upgradient
Cuba Hill Road	S37100	Greenlawn Water District	575	NA	NA	Upgradient
Stony Hollow Road	S5068	Greenlawn Water District	192	NA	NA	Downgradient
Washington Street	S45610	South Huntington Water District	313	1,400	3,000[a]	Downgradient

NA - Not available.

[a] This value was calculated by dividing an estimate of the number of people served by the system by the total number of wells contributing to the system.

Source: Field Investigation Work Plan, Fred C. Hart Associates, Inc., June 30, 1989.

Table 2-1 (Continued)
PUBLIC WATER SUPPLY WELLS LOCATED WITHIN A THREE-MILE RADIUS OF HAZELTINE CORPORATION, GREENLAWN, NEW YORK

Approximate Location	New York State Water Resources Commission No.	Owner	Depth (feet)	Capacity (GPM)	Population Served	Position Relative to Premises
Hollywood Place	S66366	South Huntington Water District	478	1,300	3,300[a]	Sidegradient
Laurel Hill Road	S20530	Suffolk County Water Authority	607	1,200	2,600[a]	Sidegradient
Laurel Hill Road	S33970	Suffolk County Water Authority	609	1,200	2,600[a]	Sidegradient
Meade Drive	S67656	Suffolk County Water Authority	468	1,300	2,600[a]	Downgradient

NA - Not available.

[a] This value was calculated by dividing an estimate of the number of people served by the system by the total number of wells contributing to the system.

Source: Field Investigation Work Plan, Fred C. Hart Associates, Inc., June 30, 1989.

3.0 SCOPE OF SITE INVESTIGATION

In accordance with the requirements of the Consent Order and the Work Plan, Radian conducted a field investigation at Hazeltine's Greenlawn facility in April and May 1990. As detailed in the approved Work Plan, the objective of the site investigation was to evaluate the potential for environmental impacts on soil and ground-water quality in the vicinity of SPDES permitted wastewater discharge points. The specific scope of work included the following items:

- Installation of seven shallow test borings with continuous split spoon sampling from the ground surface to a depth of 20 to 25 feet below ground surface (BGS).
- Installation of three deep test borings with sampling at ten-foot intervals and completion of the borings as monitoring wells.
- Field screening of all soil samples collected with: an organic vapor analyzer (OVA) as the split spoon was opened; an OVA of the headspace of a heated sample; and a conductivity meter of a soil/water slurry sample.
- Attempted collection of a single Shelby tube sample from one of the deep test borings.
- Development of three monitoring wells and collection of ground-water samples.
- Laboratory analysis of: two soil samples from each shallow test boring for Target Compound List (TCL) volatiles and metals; one soil sample from each deep test boring for TCL volatiles and metals; two samples from each deep test boring for grain size analysis; and one ground-water sample from each monitoring well for TCL volatiles, TCL total metals, and TCL dissolved metals.

- Laboratory analysis of QA/QC samples for: shallow borings, one replicate and one field blank for TCL volatiles and metals, and two trip blanks for TCL volatiles; for deep borings, one trip blank for TCL volatiles; and for ground water, one replicate and one field blank for TCL total and dissolved metals and TCL volatiles, and one trip blank for TCL volatiles.

Figure 2-2 shows the locations of borings and monitoring wells installed at the Hazeltine site. Well installations and soil borings were conducted by R&L Well Drilling under the direction of Radian personnel. Soil sampling procedures are provided in Appendix B. Well installation, development, and sampling procedures also are provided in Appendix B. Field data are provided in Appendix C, and include boring logs, downhole geophysical logs, grain size analyses, field screening results, monitoring well construction diagrams, and well development records. During the field investigation, air quality was monitored for health and safety considerations with a Century Model 128 Organic Vapor Analyzer (OVA), an HNu, and cyanide-salt (CN-salt) Draeger tubes.

3.1 Modifications to the Approved Work Plan

Modifications to the approved Work Plan were negotiated with NYSDEC before and during the field investigation. Selected modifications are documented; a copy of these modifications is provided in Appendix A. All approved modifications are summarized below:

- Headspace screening was conducted by using an OVA in the survey mode directly in the sample container, not by injecting an aliquot of soil vapor into the instrument in the gas chromatograph mode, as specified in the Work Plan.
- Monitoring well development was conducted by measuring pH and conductivity, as well as observing relative turbidity to determine adequacy, not by measuring turbidity to within 50 Nephlometric Turbidity Units with an instrument, as specified in the Work Plan.
- Decontamination of split spoon samples between intervals within a single borehole was conducted by an Alconox/water wash followed by a potable water rinse and a final distilled water rinse in lieu of acetone and hexane rinses, as required by the Work Plan.
- Clay layers detectable at thicknesses greater than or equal to 2 feet were not to be breached. No clay layers were breached, with the exception of sampling in MW-2, which continued through several feet of silt and clay interbeds. This modification was deemed acceptable because the MW-2 location was not in the vicinity of possible sources of constituents and was assumed to be the upgradient well. In this case, it was desirable to continue sampling to characterize the extent of this clayey unit. This rationale was discussed with and approved by Mr. Barry Lucas of NYSDEC at the site during drilling of this borehole.
- Photoionization detectors were used as well as flame ionization detectors during field screening and varied from location to location; however, the same instrument was used for screening within a single borehole.
- It was agreed that cuttings may be disposed of on site if screening indicates less than or equal to 5 parts per million (ppm). However, to be conservative, it was determined that cutting disposal would be determined after laboratory data had been reviewed.
- Grouting of borings up to 3 feet from ground surface was agreed to be adequate, and in several instances an asphalt patch was placed at the surface to complete a borehole.

3.2 Placement of Soil Borings

All soil borings and monitoring wells were placed as specified in the approved Work Plan. Borings B-1 and BX-1 are located along the perimeter of Hazeltine's permitted leach field east of Building 3. Boring B-1 was drilled and sampled to a depth of 10 feet. B-1 reached refusal at this depth due to the presence of cobbles. Replacement boring BX-1 is located several feet northwest of boring B-1, and was drilled and sampled to a depth of 26 feet.

Borings B-2 and B-3 are located on either side of the surface recharge basin and were sampled to depths of 27 and 25 feet, respectively.

Borings B-4, B-5, and B-6 are located adjacent to the three underground storage tanks formerly used to temporarily store waste plating fluids. Each of these borings was sampled to a depth of 25 feet.

Boring B-7 was drilled and sampled to check for potential impacts which may have resulted from surface runoff from a drum storage area. Boring B-7 is located approximately 20 feet southeast of boring B-6 and was sampled to a depth of 25 feet.

Boring B-8 is located along the perimeter of Hazeltine's permitted leach field (SPDES discharge 001) northeast of Building 1, and was sampled to a depth of 25 feet.

All soil borings were sampled continuously to a minimum depth of 25 feet, as required in the Work Plan.

3.3 Placement of Monitoring Wells

Monitoring well MW-1 is located near a storage area between Buildings 3 and 4. Well MW-1 is located regionally downgradient of the leach field near Building 3 and was placed to detect potential impacts of discharges to the leach field. MW-1 was drilled to a depth of 110 feet, was screened from 85 to 105 feet BGS, and the depth-to-water was measured at 138.39 feet above mean sea level (MSL). Table 3-1 provides monitoring well construction details for all of the wells installed at the Hazeltine site. (All tables for Section 3.0 are located at the end of this section.)

Monitoring well MW-2 is located regionally upgradient of the waste storage and leach field facilities, in the southern corner of Hazeltine's property (i.e., the property located east of Cuba Hill Road). MW-2 was the first well installed during the investigation and was sited to provide background data for the ground-water quality assessment. Due to the uncertainty of the depth-to-water during drilling using mud-rotary methods, MW-2 was installed with a total of 40 feet of screen. Radian discussed this recommendation with Mr. Barry Lucas of NYSDEC on May 1, 1990, and he concurred with the recommendation. The test boring extended to a depth of 181.5 feet, the well screen was installed from 103 to 143 feet BGS and the depth-to-water was measured at 138.8 feet above MSL.

Monitoring well MW-3 is located between the surface recharge basin and the underground storage tanks. MW-3 was located to detect any impacts on the ground-water quality resulting from the operation of these facilities. Ground water was not encountered in MW-3 at the same general depth interval as that encountered in MW-1 and MW-2. Therefore, an additional well (MW-3X) was installed to a depth of 176 feet BGS. This well (MW-3X) was installed at a greater depth and is in a different lithologic interval than that observed in wells MW-1 and MW-2. The well screen extends from 131 to 176 feet BGS with the depth-to-water measured at 56.8 feet above MSL.

3.4 Development of Monitoring Wells

Monitoring wells MW-1 and MW-2 were developed by pumping the wells until a sediment-free condition and stabilized water quality parameters of pH and specific conductance were reached. The well yield observed in MW-2 was higher than other on-site wells, at up to 6.5 gallons per minute (gpm), while MW-1's yield was somewhat less (1.0 gpm). The difference in well yields is likely attributable to the additional 20 feet of screen installed in MW-2.

MW-3X exhibited substantial siltation effects with the ground water remaining turbid after several hours of development efforts. This well was pumped/bailed dry on several occasions and required several hours to recover. Well development log sheets for all of the monitoring wells are provided in Appendix C.

3.5 Sample Collection and Analysis

As required in the Work Plan, two soil samples were selected from each soil boring for laboratory analysis based on OVA headspace screening and soil conductivity measurements. The field screening techniques and results are detailed in Appendix B.

The Work Plan also specified that three deep soil samples should be collected from the monitoring well borings from the ten-foot interval above the water table and analyzed for TCL volatiles and metals. As previously stated, depth-to-water was difficult to determine during drilling using mud-rotary methods; therefore, sampling from these exact intervals was not possible on a consistent basis.

To characterize subsurface soil conditions in the first monitoring well boring installed, MW-2, split spoon samples were collected from three depth intervals and were submitted for analysis based on field screening methods of headspace and conductivity in lieu of depth-to-water criteria. In this manner, more than the minimum number of samples were analyzed and holding times were not exceeded for these samples, as may have been necessary if the depth-to-water determination alone was used. Both field screening and the stabilized water level in MW-2 were used to choose a sample depth in MW-1. An additional soil sample was collected from a depth of 95 feet for volatiles analysis, in the event that the depth-to-water in well MW-1 stabilized at a somewhat deeper elevation that could be anticipated based on regional ground-water flow direction. Due to very low split-spoon sample recoveries encountered during drilling of MW-1, soil samples collected from three intervals had to be composited to provide adequate volume for metals analysis.

Sampling at MW-3 was conducted using hollow-stem auger techniques because it was reasonable to believe that ground water would be encountered less than 100 feet below ground surface, based on water levels measured in newly completed wells MW-1 and MW-2. A soil sample was collected for analysis immediately above a wet interval encountered during drilling of boring MW-3. During drilling of replacement well MW-3X, mud-rotary drilling methods were necessary due to the greater depth of penetration required to encounter a water-bearing unit. As a result, the depth to the water table was again difficult to determine, and a sample from the bottom of the borehole was collected for analysis. Although samples were not collected in the interval immediately above the water table, a sufficient number of samples were collected between the drilling of both MW-3 and MW-3X to allow characterization of subsurface soil conditions in this location.

As specified in the approved Work Plan, grain size analysis was performed on two samples collected from each borehole (shallow and deep) by Hardin-Kight, Inc. of Glen Burnie, Maryland. Results from the grain size analysis are provided in Appendix C.

Ground-water samples from MW-1 and MW-2 were collected on May 25, 1990. Extended well development efforts delayed sampling of MW-3X. Due to the extremely low yield of MW-3X and the volume of water required to split samples with NYSDEC, the ground-water sample from this well was collected on consecutive days (May 31, 1990 and June 1, 1990). Ground-water sampling methodology is described in Appendix B.

Two sample sets, each consisting of one duplicate and one field blank, were also prepared for quality assurance/quality control (QA/QC). One sample set was collected in conjunction with the soil sampling, and one set was associated with the ground-water sampling. A total of four trip blanks also were collected and shipped with the soil and ground-water samples collected during the investigation. All samples were preserved and handled in accordance with the protocols outlined in the approved Work Plan. Samples were shipped to CompuChem Laboratories, Inc. in Research Triangle Park, North Carolina (a NYSDEC-approved laboratory). All samples were labeled and appropriate chain-of-custody procedures were followed. The samples were analyzed for TCL volatiles and metals as listed in the New York State Department of Conservation Contract Lab Protocol (CLP) document (Table 3-2).

Table 3-1

MONITORING WELL CONSTRUCTION DETAILS
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

Well No.	Ground Surface Elevation (ft. above MSL)	Total Depth (ft. BGS)	Casing Interval (ft. BGS)	Screen Interval (ft. BGS)	Gravel Pack Interval (ft. BGS)	Fine Sand Interval (ft. BGS)	Bentonite Pellets Interval (ft. BGS)	Volclay Grout Interval (ft. BGS)
MW-1	226.5	110	0.3-85	85-105	80-110	78-80	74-78	0-74
MW-2	226.5	181.5	0.5-103	103-143	95.25-147.25	92.25-95.25	86.25-92.25 147.25-150.25	0-86.25 150.25-181.5
MW-3	227.8	107	+2.0-78.5	78.5-98.5	73-100.0[a]	71-73	69-71	0-69
MW-3X	227.8	177.5	+2.1-131	131-176	125-177.5	123-125	115-123	0-115

BGS - Below Ground Surface
MSL - Mean Sea Level

[a] Formation collapse from 100-107 feet.

Table 3-2

NYSDEC TARGET COMPOUND LIST (TCL) VOLATILE ORGANIC COMPOUNDS AND METALS, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

Volatile Organic Compound

Chloromethane
Bromomethane
Vinyl Chloride
Chloroethane
Methylene Chloride
Acetone
Carbon Disulfide
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Chloroform
1,2-Dichloroethane
2-Butanone
1,1,1-Trichloroethane
Carbon Tetrachloride
Vinyl Acetate
Bromodichloromethane
1,2-Dichloropropane
cis-1,3-Dichloropropene
Trichloroethene
Dibromochloromethane
1,1,2-Trichloroethane
Bromoform
4-Methyl-2-Pentanone
2-Hexanone
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Styrene
Total Xylenes

Metal

Aluminum
Antimony
Arsenic
Barium
Beryllium
Cadmium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc
Cyanide

4.0 SITE GEOLOGY/HYDROGEOLOGY

4.1 Subsurface Geology

Based on observations recorded during the installation of the boreholes and monitoring wells, the Hazeltine Corporation site is underlain by glacial deposits consisting of gravelly sand, sand, silt, and clay. Although glacial sediments in Long Island generally have been characterized by lateral and vertical heterogeneity, distinct deposits were identified and correlated at the HC facility. A generalized geologic cross section of the HC facility is shown in Figure 4-1. (All figures and tables for Section 4.0 are located at the end of this section.)

In general, a layer of gravelly sand/sandy gravel was found throughout all of the shallow boreholes (0 to 25 feet). Samples from the deeper monitoring well boreholes indicate that the percentage of gravel decreases significantly with depth. Grain size analysis of samples from MW-1 and MW-2 confirm that below approximately 75 feet, the formation grades into a medium to fine sand and coarse silt that is moderately- to well-sorted. At approximately 100 feet below ground surface (BGS), lateral changes begin to appear in the subsurface geology, particularly between the two deep boreholes, MW-2 and MW-3X. Borehole MW-1 ends at about 100 feet BGS.

The sand layer in MW-2 is approximately 70 feet thick, and is characterized by a downward fining to a very fine sand at about 135 feet BGS. Below this sand, the deposits at MW-2 grade into silts and clays, and at approximately 140 to 150 feet BGS, thin coarser interbeds begin to appear in a brown, silty clay. From approximately 150 feet to the bottom of the borehole (180 feet), the formation consists of a brown clay with distinct, rhythmically-laminated coarse-silt and fine-sand interbeds. These interbeds are varve-like in appearance. Whether or not these "varves" represent annual deposition events is not known.

The sand layer at 75 feet BGS in MW-3X (located approximately 640 feet northwest of MW-2), is only about 10 feet thick, and grades into sandy silt and clayey silt starting at about 85 feet BGS, to a depth of about 120 feet BGS. From 120 to 135 feet BGS, a sandy silt with clay interbeds occurs, similar in appearance to the sediments observed immediately above the rhythmically-laminated clay layer in MW-2. Below 135 feet, the sediments become much coarser, and are characterized by repeating layers of silty, fine sand, gravel, and a medium, orange-colored sand. This latter sequence appeared to be continuous from 140 feet down to the completion depth of MW-3X. The rhythmically-laminated clay deposit identified in MW-2 is conspicuously absent from MW-3X.

4.2 Site Hydrogeology

Existing hydrologic information (i.e., previous studies and local water supply well data), indicates that the water table in the Greenlawn area occurs at approximately 170 to 180 feet BGS. Water levels from three monitoring wells measured on May 24, 1990 have been correlated to a mean sea level (MSL) datum and are shown below:

Well	Date	Water Level (feet above MSL)
MW-1	5/24/90	138.39
MW-2	5/24/90	138.80
MW-3X	5/31/90	56.80

These levels indicate that there are two different static water levels beneath the HC facility, at approximately 88 feet BGS or 138 feet above MSL (MW-2 and MW-1) and 171 feet BGS or 56 feet above MSL (MW-3X).

The shallower water levels observed at MW-1 and MW-2 appear to represent a perched water body beneath part of the HC facility. The rhythmically-laminated clay observed in MW-2 most likely represents the lower limit of this perched water body. Samples of this clay were dry, and a grain-size analysis from this interval indicated poorly-sorted, silt- (interbeds) and clay-size sediment. In contrast, the overlying sand was moist, coarser and better sorted. Although the borehole at MW-1 did not penetrate deeper than about 100 feet, it is believed that fine-grained or less permeable sediments are also present at this location, as evidenced by a corresponding water level in MW-1.

The water level measured in MW-3X is consistent with the expected local water-table level (about 170 feet BGS); therefore, the ground water encountered in MW-3X is considered to be part of the water-table aquifer. Another well (MW-3) was initially installed at this location, and was screened from 78.5 to 98.5 feet BGS. This well was expected to produce water based on observations made during drilling (e.g., a wet soil sample at 91 feet), and based on water levels measured from the completed wells MW-1 and MW-2. MW-3 did not produce any water, however, and a deeper well (MW-3X) had to be installed adjacent to it.

Water level data indicate that two of the monitoring wells are screened one saturated zone, while the third well is screened in a separate saturated zone. This trend is consistent with the apparent presence of an areally extensive perched water body beneath part of the HC facility, which precludes the determination of a ground-water flow direction for the site. However, based on the information provided by the three wells, and on the documented aquifer characteristics in northwest Suffolk County (Lubke, 1964; Jensen and Soren, 1974), some inferences can be made regarding the flow of ground water beneath the HC facility. The coarse sand and gravel deposits observed in all well boreholes to depths of at least 100 feet would likely allow downward migration of any surface recharge in unpaved areas. The regional flow direction of the water-table aquifer is towards the north, and it is assumed that the ground water below MW-3X follows this trend.

The hydraulic behavior of the perched zone at the HC facility is not clear. The static water level of the perched water body was 0.40 feet higher at MW-2 than at MW-1. Although the lateral extent of the clay thought to be responsible for the perched zone is not completely known, it appears that this clay either grades into coarser, more permeable deposits, or otherwise pinches out in the direction from MW-1 and MW-2 towards MW-3X (Figure 4-1). This description is consistent with previous work (Lubke, 1964), which describes these clay layers as discontinuous deposits of glaciolacustrine origin, implying that the perched zone may be hydraulically connected to the water-table aquifer in some areas.

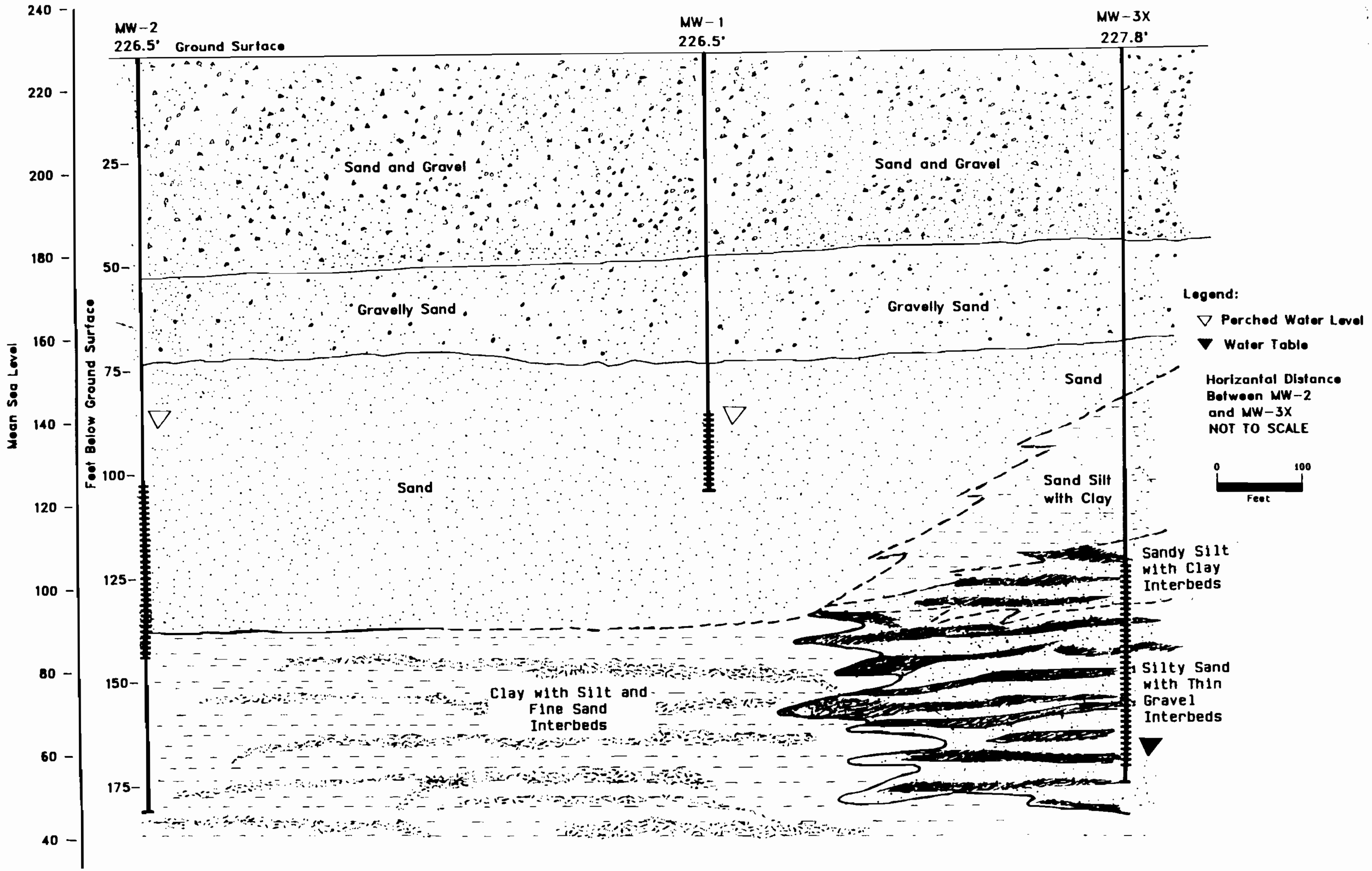

Figure 4-1. Generalized Geologic Cross-Section, Hazeltine Corporation, Greenlawn, New York

RADIAN CORPORATION

5.0 ANALYTICAL RESULTS

5.1 Soil

Soil samples collected from shallow soil borings and monitoring well boreholes were analyzed by CompuChem Laboratories for Target Compound List (TCL) volatile organic compounds and inorganics, as listed in the NYSDEC Contract Laboratory Protocol (CLP) document. Results of these soil sample analyses are summarized in Tables 5-1 and 5-2 and are discussed below. (All tables for Section 5.0 are located at the end of this section.) The data validation report and copies of chain-of-custody forms are included as Appendix D. Copies of laboratory reports with supporting CLP documentation are provided in Appendix E.

Laboratory results (Table 5-1) indicated that soils in the vicinity of the leach fields servicing Buildings 1 and 3, as well as near the plant surface recharge basin and underground storage tanks outside Building 2, are relatively free of volatile organic compounds. Soil collected from boring B-6 indicated elevated concentrations of tetrachloroethylene (PCE). The concentration of PCE appears to decrease with depth from 87 micrograms/kilogram (μg/kg) at a depth of 9 feet to 6 μg/kg at a depth of 25 feet. PCE also was detected at approximately 5 μg/kg in a sample from boring B-4 at a depth of 7 feet. Analysis of the deeper sample (21 feet) from this boring did not indicate the presence of PCE.

As described in Section 2.0, solvents used in the past in Hazeltine Corporation operations included PCE and methylene chloride. Current solvents used in the plant include acetone and methanol, as well as small quantities of 1,1,1-trichloroethane and trichloroethene.

Methylene chloride and acetone have been identified in numerous samples; however, these analytes were similarly detected in laboratory blanks. Since these two compounds appear to be pervasive in most samples, it is reasonable to assume that the source of these constituents is not the soils underlying the site but possibly contamination in the laboratory.

Analytical data of selected soil samples for metals analyses are presented in Table 5-2. Considering past and present facility operations, possible related constituents include copper, lead, iron, nickel, gold, chromium, cadmium and silver. Among these constituents, analytical data indicated possible elevated concentrations of chromium, lead, and nickel.

When reviewing analytical data it is important to note that the occurrence of metals in soils is strongly controlled by lithology. Specifically, a clean gravel and sand deposit would likely exhibit lower concentrations of heavy metals than would a fine-grained silt and clay. Because the site exhibited lithologic variability both laterally and vertically, associated samples collected for analysis were similarly variable in lithology. Therefore, direct comparison of the inorganic analysis between any two soil samples may not be appropriate.

The only location which exhibited concentrations of metals which are likely to be greater than natural metals concentrations was boring B-4. The clayey silt soil sample collected from boring B-4 from a depth of 5 to 7 feet indicated concentrations of several analytes which appeared to be elevated with respect to other soil samples analyzed during the program (e.g., MW-2) and with typical background concentrations of metals in New York state soils (Schacklette, 1984). Subject analytes from boring B-4 include arsenic (11.6 milligrams per kilogram [mg/kg]), iron (16,500 mg/kg), lead (19.3 mg/kg), and nickel (9.3 mg/kg); however, the concentrations are not in excess of the common range of these elements in soils (Lindsay, 1979), and are within the cleanup objectives established in an adjacent state, New Jersey (NJDEP, 1987). Schacklette (1984) reports naturally occurring ranges of these metals in parts per million in the State of New York are: 0.1 to 100 for arsenic; 1 to 700 mg/kg for iron; 10 to 70 mg/kg for lead; and 0.02 to 0.5 mg/kg for nickel. Therefore, the sample collected from boring B-4 is slightly elevated above typical New York soil element concentrations with respect to nickel and iron, but within these ranges for lead and arsenic.

Chromium analyses performed on soil samples yielded chromium concentrations ranging from 15.7 mg/kg to below detection limits. Detected concentrations ranged from 2.4 mg/kg detected in the composite soil sample collected from the borehole of monitoring well MW-1 to 15.7 mg/kg in the sample from boring B-4 at a depth of 7 feet. Other sample locations (and depth horizons) which indicated chromium concentrations that were highest amongst the sample analyzed included: boring B-3 (13.1 mg/kg at 17 feet), MW-3 (10.2 mg/kg at 87 feet), B-7 (12.4 mg/kg at 7 feet) and BX-1 (11.0 mg/kg at 5 feet). According to Lindsay (1979), the common range for chromium in soils is 1 to 1,000 mg/kg. Furthermore, New Jersey has established 100 mg/kg as a cleanup objective for chromium (NJDEP, 1987).

As part of the health and safety protocol, Radian conducted field monitoring by Draeger tube sampling for cyanide salt and cyanide gas during drilling of shallow soil borings BX-1 and B-2 through B-7. Results from this monitoring qualitatively indicated the presence of cyanide salt in BX-1 from 3 to 7 feet, in B-2 at 21 to 23 feet, in B-4 at 9 to 11 feet, in B-5 from 11 to 17 feet, and in B-6 at 7 to 9 feet. In all cases, the cyanide detected was in the form of cyanide salt. Field data correlate with analytical results in two samples: B-2 (19 to 21 feet) and B-5 (11 to 13 feet). Cyanide concentrations detected in these samples were 0.55 and 0.92 mg/kg, respectively, while the samples collected from each of these borings (B-2 and B-5) at the completion depth of the boreholes (25 and 27 feet, respectively) indicated that cyanide was not detected.

5.2 Ground Water

Ground-water samples collected from three on-site monitoring wells were analyzed by CompuChem Laboratories for TCL volatile organic compounds and inorganics in accordance with NYSDEC CLP protocol. These results are summarized in Tables 5-3 and 5-4.

Results from volatile organic analyses indicated that ground water underlying the HC property is relatively free of volatile organic compounds. The ground-water sample from monitoring well MW-1 indicated the presence of toluene in a concentration of 13 micrograms per liter (μg/L). This concentration is well under the New York State ambient water quality standard of 50 μg/L for toluene.

Of the solvents used in past and current HC operations, methylene chloride and acetone were the only halogenated compounds detected in the ground-water samples. These constituents are also commonly used in laboratory procedures, and therefore are often introduced during sample analysis. Detected concentrations of these constituents in the ground water were found to be less than 10 μg/L.

Ground-water samples also were analyzed for metals and cyanide. These samples were collected and one aliquot was filtered for dissolved metals analysis, while the remaining aliquot was analyzed for total metals and cyanide. Analytical results (Table 5-4) indicated that the ground water sampled at MW-3X, installed in the water-table aquifer, contained metals in concentrations which were greater in total and dissolved metals than samples in other on-site monitoring wells. Only concentrations of barium, iron, and lead were in excess of federal primary and secondary standard maximum contaminant limits (MCLs) for drinking water. However, all results are well within New York State ambient water quality standards for ground water, with the exception of antimony (MW-3X dissolved) and iron (MW-1 total, MW-3X total and dissolved), which were above these standards. The antimony concentration detected in MW-3X (dissolved) was less than the contract-required detection limit. It is likely that the source of the metals in the total metals sample from MW-3X is the suspended sediment because these constituents were not elevated in the dissolved metals sample. Table 5-7 contains New York State ambient water quality standards for inorganic constituents in ground water.

5.3 Field Quality Assurance/Quality Control (QA/QC)

To evaluate whether any constituents found in the samples submitted for analysis were due to sampling equipment, transportation, or field conditions, blank samples of distilled, reagent-grade water were collected during the field investigation and were analyzed along with the field samples for the TCL volatile organic compounds and inorganics, as listed in the NYSDEC Contract Laboratory Program

Protocol Document. The results of these analyses are summarized below and are presented in Tables 5-5 and 5-6.

5.3.1 Equipment Blanks

The collection and use of equipment blanks is detailed in Appendix B. Results of the TCL organic compound analysis indicated that methylene chloride and chloroform were detected in the equipment blank at 2 and 3 μg/L, respectively. These are estimated values since they were quantified at less than the quantitation limit for that constituent in that sample. These minor concentrations are attributable to laboratory contamination.

Results of the inorganic analyte analysis indicated that cadmium was detected at 6.7 μg/L, mercury at 0.50 μg/L, and zinc at 33.2 μg/l in the equipment blank. Other elements were measured as well; however, all of these concentrations are estimated since they are below the contract-required detection limit. These results can be attributed to contamination present in reagent-grade water used for the blank sample or to minor equipment contamination before collection of the blank sample. The blank sample was collected with a decontaminated split spoon between soil sampling conducted at boring B-6 and boring BX-1. Soil samples collected from BX-1 did not indicate elevated concentrations of these constituents. The sample collected from boring B-6 at 9 feet indicated 2.0 mg/kg cadmium; however, the deeper sample did not indicate a similar result. Therefore, the blank data does not appear to have an adverse impact on the reliability of the inorganic analytical results.

5.3.2 Trip Blanks

Three trip blanks were collected and analyzed for volatile organic compounds. In two of the trip blanks, chloroform was detected at 13 μg/l, indicating that some contamination occurred either in the reagent water before sample collection, or during equipment packing and transporting. The source of this chloroform is not known. Methylene chloride and acetone also were detected, but at concentrations below the quantitation limit. Because chloroform was not detected in ground water at the site, this minor contamination in the trip blanks does not have an adverse impact on the organic analytical results.

5.3.3 Field Blanks

Field Blanks were collected as described in Appendix B and analyzed for the TCL volatile organic compounds and inorganics. Methylene chloride and chloroform were detected at 1 μg/L and 2 μg/L, respectively, in the field blank. These concentrations are estimated since they are below the quantitation limit for the constituents in the sample. Certain inorganic constituents were detected in the field blank samples, however these results are below the contract-required detection limits and above the instrument detection limits, and are therefore estimated values. These constituents are iron and zinc in the total metals analysis, and calcium, manganese, and zinc in the dissolved metals analysis. Concentrations of these constituents in the field blanks were at least one order of magnitude less than the concentrations detected in ground-water samples, with the exception of manganese and zinc. These latter constituents were detected in the field blanks at concentrations approximately one-half of the lowest values detected in ground water samples. Sodium was detected in the field blank dissolved metals analysis at a concentration of 617 ug/l, which is greater than the contract-required detection limit. The concentration of sodium in the field blank sample represents 1-2% of the sodium concentrations found in ground-water samples. These field blank data indicated that cross-contamination associated with sample collection and handling did not occur, therefore providing confidence in ground-water analytical results.

Copies of chain-of-custody forms and laboratory reports are included in Appendices D and E, respectively.

Table 5-1
VOLATILE ORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B1-C	BX-1-C	BX-1-J	B2-I	B2-J	B3-G	B3-I
SAMPLE DEPTH (feet BGS)	(5-7)	(5-7)	(24-26)	(19-21)	(25-27)	(15-17)	(23-25)
SAMPLE DATE	05/02/90	05/11/90	05/11/90	05/03/90	05/03/90	05/04/90	05/04/90
Volatile Organics (ug/kg)							
Chloromethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bromomethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Vinyl Chloride	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chloroethane	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Methylene Chloride	18 B	23 B	10 B	10 B	21 B	10 B	11 B
Acetone	31 B	29 B	10 J	< 10	20	17 B	19 B
Carbon Disulfide	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethene (total)	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloroform	1 J	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
2-Butanone	< 10	< 10	< 10	< 10	6 J	< 10	< 10
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Vinyl Acetate	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Benzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).

B - Analyte found in the associated blank as well as in the sample. Indicated possible/probable blank contamination and warns the data user to take appropriate action.

J - Indicates an estimated value.

Table 5-1 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B1-C	BX-1-C	BX-1-J	B2-I	B2-J	B3-G	B3-I
SAMPLE DEPTH (feet BGS)	(5-7)	(5-7)	(24-26)	(19-21)	(25-27)	(15-17)	(23-25)
SAMPLE DATE	05/02/90	05/11/90	05/11/90	05/03/90	05/03/90	05/04/90	05/04/90
Volatile Organics (Continued) (ug/kg)							
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5	< 5	< 5
4-Methyl-2-Pentanone	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Hexanone	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Tetrachlorothene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Styrene	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total Xylenes	< 5	2 J	< 5	< 5	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).

J - Indicates an estimated value.

Table 5-1 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS
FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER SAMPLE DEPTH (feet BGS) SAMPLE DATE	B4-B (5-7) 05/07/90	B4-I (19-21) 05/07/90	B5-F (11-13) 05/08/90	B5-K (23-25) 05/08/90	B6-D (7-9) 05/09/90	B6-K (23-25) 05/09/90	B8-F (11-13) 05/01/90	B8-L (23-25) 05/01/90
Volatile Organics (ug/kg)								
Chloromethane	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bromomethane	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Vinyl Chloride	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Chloroethane	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Methylene Chloride	18 B	11 B	9 B	39 B	31 B	42 B	19 B	35 B
Acetone	16 B	13 B	< 10	57 B	36 B	43 B	16 B	46
Carbon Disulfide	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethene (total)	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chloroform	2 J	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
2-Butanone	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
1,1,1-Trichloroethane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Vinyl Acetate	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Benzene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).

B - Analyte found in the associated blank as well as in the sample. Indicated possible/probable blank contamination and warns the data user to take appropriate action.

J - Indicates an estimated value.

Table 5-1 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B4-B	B4-I	B5-F	B5-K	B6-D	B6-K	B8-F	B8-L
SAMPLE DEPTH (feet BGS)	(5-7)	(19-21)	(11-13)	(23-25)	(7-9)	(23-25	(11-13)	(23-25)
SAMPLE DATE	05/07/90	05/07/90	05/08/90	05/08/90	05/09/90	05/09/90	05/01/90	05/01/90
Volatile Organics (ug/kg)								
Trans-1,3-Dichloropropene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Bromoform	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
4-Methyl-2-Pentanone	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
2-Hexanone	< 12	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Tetrachlorothene	5 J	< 5	< 5	< 5	87	6	< 5	< 5
1,1,2,2-Tetrachloroethane	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Styrene	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total Xylenes	< 6	< 5	< 5	< 5	< 5	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).

J - Indicates an estimated value.

Table 5-1 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER SAMPLE DEPTH (feet BGS) SAMPLE DATE	MW1-C (75-76.5) 05/09/90	MW1-D (95-96.5) 05/09/90	MW2 (100-101.5) 04/27/90	MW2 (140-141.5) 04/30/90	MW3-B (35-37) 05/16/90	MW3-G (85-87) 05/16/90	MW3X (176-177.5) 05/24/90
Volatile Organics (ug/kg)							
Chloromethane	< 12	< 12	< 11	< 14	< 11	< 12	< 12
Bromomethane	< 12	< 12	< 11	< 14	< 11	< 12	< 12
Vinyl Chloride	< 12	< 12	< 11	< 14	< 11	< 12	< 12
Chloroethane	< 12	< 12	< 11	< 14	< 11	< 12	< 12
Methylene Chloride	11 B	20 B	16 B	38 B	13 B	16 B	34 B
Acetone	3 J	< 12	< 11	42 B	12 B	13 B	36 B
Carbon Disulfide	< 6	< 6	< 5	< 7	< 5	< 6	< 6
1,1-Dichloroethene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
1,1-Dichloroethane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
1,2-Dichloroethene (total)	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Chloroform	< 6	< 6	< 5	< 7	< 5	< 6	2 J
1,2-Dichloroethane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
2-Butanone	< 12	< 12	< 11	< 14	< 11	< 12	< 12
1,1,1-Trichloroethane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Carbon Tetrachloride	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Vinyl Acetate	< 12	< 12	< 11	< 14	< 11	< 12	< 12
Bromodichloromethane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
1,2-Dichloropropane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
cis-1,3-Dichloropropene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Trichloroethene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Dibromochloromethane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
1,1,2-Trichloroethane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Benzene	< 6	< 6	< 5	< 7	< 5	< 6	< 6

< - Less than the specified instrument detection limit (IDL).

B - Analyte found in the associated blank as well as in the sample. Indicated possible/probable blank contamination and warns the data user to take appropriate action.

J - Indicates an estimated value.

Table 5-1 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS
FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	MW1-C	MW1-D	MW2	MW2	MW3-B	MW3-G	MW3X
SAMPLE DEPTH (feet BGS)	(75-76.5)	(95-96.5)	(100-101.5)	(140-141.5)	(35-37)	(85-87)	(176-177.5)
SAMPLE DATE	05/09/90	05/09/90	04/27/90	04/30/90	05/16/90	05/16/90	05/24/90
Volatile Organics (Continued) (ug/kg)							
Trans-1,3-Dichloropropene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Bromoform	< 6	< 6	< 5	< 7	< 5	< 6	< 6
4-Methyl-2-Pentanone	< 12	< 12	< 11	< 14	< 11	< 12	< 12
2-Hexanone	< 12	< 12	< 11	< 14	< 11	< 12	< 12
Tetrachlorothene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
1,1,2,2-Tetrachloroethane	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Toluene	< 6	< 6	< 5	2 J	< 5	< 6	< 6
Chlorobenzene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Ethylbenzene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Styrene	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Total Xylenes	< 6	< 6	< 5	< 7	< 5	< 6	< 6
Hexane							7.1 J

< - Less than the specified instrument detection limit (IDL).

J - Indicates an estimated value.

Table 5-1 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B7 A/B	B7 B/A*	B7-C	B7-J
SAMPLE DESCRIPTION	(3-7)	(3-7)	(11-13)	(23-25)
SAMPLE DATE	05/14/90	05/14/90	05/14/90	05/14/90
Volatile Organics (ug/kg)				
Chloromethane	< 11	< 10	< 10	< 11
Bromomethane	< 11	< 10	< 10	< 11
Vinyl Chloride	< 11	< 10	< 10	< 11
Chloroethane	< 11	< 10	< 10	< 11
Methylene Chloride	16 B	10 B	23 B	28 B
Acetone	7 BJ	8 BJ	11 B	14 B
Carbon Disulfide	< 5	< 5	< 5	< 6
1,1-Dichloroethene	< 5	< 5	< 5	< 6
1,1-Dichloroethane	< 5	< 5	< 5	< 6
1,2-Dichloroethene (total)	< 5	< 5	< 5	< 6
Chloroform	< 5	< 5	< 5	< 6
1,2-Dichloroethane	< 5	< 5	< 5	< 6
2-Butanone	< 11	< 10	< 10	< 11
1,1,1-Trichloroethane	< 5	< 5	< 5	< 6
Carbon Tetrachloride	< 5	< 5	< 5	< 6
Vinyl Acetate	< 11	< 10	< 10	< 11
Bromodichloromethane	< 5	< 5	< 5	< 6
1,2-Dichloropropane	< 5	< 5	< 5	< 6
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 6
Trichloroethene	< 5	< 5	< 5	< 6
Dibromochloromethane	< 5	< 5	< 5	< 6
1,1,2-Trichloroethane	< 5	< 5	< 5	< 6
Benzene	< 5	< 5	< 5	< 6

< - Less than the specified instrument detection limit (IDL).

* - Duplicate of B7 A/B

B - Analyte found in the associated blank as well as in the sample. Indicated possible/probable blank contamination and warns the data user to take appropriate action.

J - Indicates an estimated value.

Table 5-1 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B7 A/B	B7 B/A*	B7-C	B7-J
SAMPLE DESCRIPTION	(3-7)	(3-7)	(11-13)	(23-25)
SAMPLE DATE	05/14/90	05/14/90	05/14/90	05/14/90
Volatile Organics (Continued) (ug/kg)				
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 6
Bromoform	< 5	< 5	< 5	< 6
4-Methyl-2-Pentanone	< 11	< 10	< 10	< 11
2-Hexanone	< 11	< 10	< 10	< 11
Tetrachlorothene	< 5	< 5	< 5	< 6
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 6
Toluene	< 5	< 5	< 5	< 6
Chlorobenzene	< 5	< 5	< 5	< 6
Ethylbenzene	< 5	< 5	< 5	< 6
Styrene	< 5	< 5	< 5	< 6
Total Xylenes	< 5	< 5	< 5	< 6

< - Less than the specified instrument detection limit (IDL).

* - Duplicate of B7 A/B

Table 5-2
INORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B1-C	BX-1-B	BX-1-J	B2-I	B2-J	B3-G	B3-I
SAMPLE DEPTH (feet BGS)	(5-7)	(3-5)	(24-26)	(19-21)	(25-27)	(15-17)	(23-25)
SAMPLE DATE	05/02/90	05/11/90	05/11/90	05/03/90	05/03/90	05/04/90	05/04/90
Metals (mg/kg)							
Aluminum	1840	709	434	715	296	1450	622
Antimony	< 8.0 N	< 7.9 N	< 8.0 N	< 8.0 N	< 8.0 N	< 8.7 N	< 8.2 N
Arsenic	0.96	<0.61	<0.62	<0.62	<0.62	1.1 B	<0.63
Barium	6.4 B	3.5 B	3.0 B	3.8 B	3.0 B	3.9 B	3.0 B
Beryllium	<0.20	<0.20	<0.21	<0.21	<0.21	<0.22	<0.21
Cadmium	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.1	< 1.1
Calcium	92.0 B	39.3 B	19.8 B	41.9 B	19.9 B	90.3 B	25.2 B
Chromium	3.1	11.0	< 1.4	1.6 B	< 1.4	13.1	8.8
Cobalt	1.8 B	< 1.4	< 1.4	< 1.4	< 1.4	2.3 B	< 1.5
Copper	2.5 B	5.1	2.7 B	2.6 B	< 1.0	7.9	2.7 B
Iron	3760	2690	829	2220	938	7710	6490
Lead	1.6 *	0.85	0.59 B	0.49 B*	<0.41 *	1.0 *	<0.42 *
Magnesium	810 B	168 B	105 B	231 B	64.9 B	546 B	50.5 B
Manganese	52.9	34.2	20.2	46.8	31.1	84.0	44.5
Mercury	<0.10 N	<0.10	<0.10	<0.10 N	<0.10 N	<0.11 N	<0.11 N
Nickel	< 6.9	< 6.9	< 7.0	< 7.0	< 7.0	< 7.6	< 7.2
Potassium	< 811	< 809	< 818	< 819	< 818	< 889	< 840
Selenium	<0.41 WN	<0.41 WN	<0.41 WN	<0.41 WN	<0.41 WN	<0.45 WN	<0.42 WN
Silver	<0.82	<0.81	<0.82	<0.82	<0.82	<0.89	<0.85
Sodium	<51.8	<51.7	<52.3	<52.4	<52.3	<56.8	< 5.7
Thallium	<0.61	<0.61	<0.62	<0.62	<0.62	<0.67	<0.63
Vanadium	5.2 B	4.2 B	< 1.0	< 2.9	1.5 B	7.0 B	15.5
Zinc	10.3	4.7	5.3	7.9 B	2.6 B	9.9	4.2 B
Cyanide	<0.51	<0.51	0.81	0.55	<0.51	<0.56	<0.53

< - Less than the specified instrument detection limit (IDL).
* - Duplicate analyses not within control limit.
B - Less than Contract Required Detection Limit (CRDL) but greater than instrument detection limit (IDL).
N - Spike sample recovery not within control limit.
W The post digestion spike for Furnace AA analyses is outside of the 85-100% control limit, while sample absorbence is less than 50% of the spike absorbence.

Table 5-2 (continued)
INORGANIC ANALYTICAL RESULTS FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B4-B	B4-I	B5-F	B5-K	B6-D	B6-K	B8-B	B8-I
SAMPLE DEPTH (feet BGS)	(5-7)	(19-21)	(11-13)	(23-75)	(5-7)	(23-25)	(3-5)	(17-19)
SAMPLE DATE	05/07/90	05/07/90	05/08/90	05/08/90	05/09/90	05/09/90	05/01/90	05/01/90
Metals (mg/kg)								
Aluminum	14600	922	556	424	2160	432	890	549
Antimony	< 8.9 N	< 8.2 N	< 8.0 N	< 8.1 N	< 8.0 N	< 8.1 N	< 8.0 N	< 8.1 N
Arsenic	11.6	1.2 B	<0.61	0.77 B	1.4 BW	<0.62	<0.62	<0.62
Barium	40.8 B	5.9 B	3.0 B	2.7 B	10.9 B	3.4 B	3.9 B	4.2 B
Beryllium	0.48 B	<0.21	<0.20	<0.21	<0.21	<0.21	<0.21	<0.21
Cadmium	< 1.1	< 1.0	< 1.0	< 1.0	2.0	< 1.0	< 1.0	< 1.0
Calcium	589 B	75.0 B	39.8 B	38.2 B	275 B	52.8 B	71.6 B	279 B
Chromium	15.7	7.0	< 1.4	5.6	4.0	< 1.4	2.0 B	5.6
Cobalt	6.9 B	< 1.5	< 1.4	< 1.4	2.0 B	< 1.4	< 1.4	< 1.5
Copper	20.5	13.8	1.6 B	4.2 B	3.5 B	5.8	2.0 B	2.3 B
Iron	16500	2860	2240	2090	3290	1170	2230	1890
Lead	19.3 S*	1.1 *	<0.41 *	0.51 B*	2.0 *	<0.41 W*	0.84 *	0.49 B*
Magnesium	1830	277 B	152 B	124 B	632 B	110 B	293 B	165 B
Manganese	250	69.0	38.7	18.1	65.0	23.2	66.1	54.4
Mercury	0.35 N	<0.10 N	<0.10 N	<0.10 N	<0.10 N	<0.10 N	<0.10 N	<0.10 N
Nickel	9.3	< 7.1	< 7.0	< 7.0	< 7.0	< 7.0	< 7.0	< 7.1
Potassium	< 909	< 831	< 813	< 821	< 816	< 823	< 816	< 824
Selenium	< 2.3 WN	<0.42 WN	<0.41 WN	<0.41 WN	<0.41 WN	<0.41 WN	<0.41 WN	<0.41 WN
Silver	< 0.92	<0.84	<0.82	<0.83	<0.82	<0.83	0.90 B	<0.83
Sodium	< 58.1	<53.1	<51.9	<52.5	<52.2	<52.6	<52.2	<52.7
Thallium	< 0.69	<0.63	<0.61	<0.62	<0.62	<0.62	<0.62	<0.62
Vanadium	25.2	4.3 B	1.4 B	3.7 B	5.6 B	1.9 B	2.8 B	2.5 B
Zinc	30.8	13.8	9.4	2.9 B	10.4	4.0 B	6.1	3.8 B
Cyanide	< 0.57	<0.52	0.92	<0.52	<0.51	<0.52	<0.51	<0.52

< - Less than the specified instrument detection limit (IDL).
* - Duplicate analyses not within control limit.
B - Less than Contract Required Detection Limit (CRDL) but greater than instrument detection limit (IDL).
N - Spike sample recovery not within control limit.
S - Calculated by Method of Standard Additions.
W - The post digestion spike for Furnace AA analyses is outside of the 85-100% control limit, while sample absorbeance is less than 50% of the spike absorbence.

Table 5-2 (continued)
INORGANIC ANALYTICAL RESULTS
FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	B7 A/B	B7 B/A	B7-C	B7-J
SAMPLE DEPTH (feet BGS)	(3-7)	(3-7)	(11-13)	(23-25)
SAMPLE DATE	05/14/90	05/14/90	05/14/90	05/14/90
Metals (mg/kg)				
Aluminum	1260	5000	520	437
Antimony	< 8.1 N	< 8.1 N	< 8.2 N	< 8.3 N
Arsenic	0.66 B	<0.62	<0.63	<0.64 W
Barium	3.7 B	39.7 B	2.4 B	1.8 B
Beryllium	<0.21	0.24 B	<0.21	<0.21
Cadmium	< 1.0	< 1.0	< 1.1	< 1.1
Calcium	152 B	111 B	19.8 B	11.8 B
Chromium	2.6	12.4	< 1.5	< 1.5
Cobalt	< 1.5	4.6 B	< 1.5	< 1.5
Copper	4.1 B	4.7 B	2.4 B	3.0 B
Iron	2190	8290	1310	957
Lead	1.0	0.99	0.70	0.68
Magnesium	312 B	2710	169 B	106 B
Manganese	39.8	100	30.5	17.2
Mercury	<0.10	<0.10	<0.11	<0.11
Nickel	< 7.1	< 7.1	< 7.1	< 7.3
Potassium	< 824	2570	< 835	< 849
Selenium	<0.41 WN	<0.42 WN	<0.42 WN	<0.43 N
Silver	<0.83	<0.83	<0.84	<0.85
Sodium	<52.7	<52.8	<53.4	<54.3
Thallium	<0.62	<0.62	<0.63	<0.64
Vanadium	2.3 B	15.6	1.4 B	< 1.1
Zinc	9.4	19.0	4.3	3.6 B
Cyanide	<0.52	<0.52	<0.53	<0.53

< - Less than the specified instrument detection limit (IDL).
* - Duplicate analyses not within control limit.
B - Less than Contract Required Detection Limit (CRDL) but greater than instrument detection limit (IDL).
N - Spike sample recovery not within control limit.
W - The post digestion spike for Furnace AA analyses is outside of the 85-100% control limit, while sample absorbence is less than 50% of the spike absorbence.

Table 5-2 (continued)
INORGANIC ANALYTICAL RESULTS
FOR SOIL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	MW1-B/C/D	MW2	MW2	MW2	MW3-B	MW3-G	MW3X
SAMPLE DEPTH (feet BGS)	(Composite **)	(20-22)	(100-101.5)	(130-131.5)	(35-37)	(85-87)	(176-177.5)
SAMPLE DATE	05/09/90	04/26/90	04/27/90	04/30/90	05/16/90	05/16/90	05/24/90
Metals (mg/kg)							
Aluminum	1040	527	724	3070	456	7290	1810
Antimony	< 9.4 N	< 9.5 N	< 8.3 N	< 9.8 N	< 8.2 N	< 9.5 N	< 8.9
Arsenic	1.0 B	<0.73	< 0.64 U	2.6	0.78 B	1.3 B	1.9 B
Barium	10.2 B	5.1 B	6.9 B	23.8 B	3.0 B	143	11.6 B
Beryllium	<0.24	<0.24	< 0.21 U	< 0.25	<0.21	0.30 B	<0.23
Cadmium	< 1.2	< 1.2	< 1.1 U	< 1.3	< 1.0	< 1.2	< 1.1
Calcium	289 B	111 B	154 B	3110	46.6 B	957 B	184 B
Chromium	2.4	2.0 B	1.9 B	7.0	< 1.5	10.2	4.9
Cobalt	< 1.7	4.2 B	< 1.5 U	4.2 B	< 1.5	6.3 B	2.4 B
Copper	8.6	2.5 B	1.3 B	6.2 B	2.7 B	11.0	8.5
Iron	3330	1760	2200	7950	1500	11500	7310 *
Lead	1.3	1.6 *	11.6 W*	2.1 *	<0.84	3.7	6.2 N*
Magnesium	330 B	177 B	300 B	2110	121 B	1990	236 B
Manganese	107	41.2	30.1	166	32.2	305	199 N*
Mercury	<0.12	<0.12 N	< 0.11 N	< 0.13 N	<0.10	< 0.12	<0.11
Nickel	< 8.2	< 8.3	< 7.2	< 8.6	< 7.1	< 8.3	< 7.8
Potassium	< 955	< 965	< 842	< 1000	< 831	1050 B	< 908
Selenium	<0.48 WN	<0.49 WN	< 0.42 WN	< 0.51 WN	<0.42 WN	< 0.49 WN	<0.46 WN
Silver	<0.96	<0.97	< 0.85	< 1.0	<0.84	< 0.97	<0.91
Sodium	291 B	84.6 B	< 53.8	106 B	<53.1	< 61.7	102 B
Thallium	<0.72	<0.73	< 0.64	< 0.76	<0.63	< 0.73 W	<0.69
Vanadium	3.3 B	< 1.2	2.2 B	10.4 B	< 1.0	14.4	10.3 B
Zinc	8.1	5.2	5.9	19.3	4.9	25.1	11.1
Cyanide	<0.60	<0.61	< 0.53	< 0.63	<0.52	< 0.61	<0.57

< - Less than the specified instrument detection limit (IDL).
* - Duplicate analyses not within control limit.
** - B = 55-56.5; C = 75-76.5; D = 95-96.5.
B - Less than Contract Required Detection Limit (CRDL) but greater than instrument detection limit (IDL).
N - Spike sample recovery not within control limit.
W - The post digestion spike for Furnace AA analyses is outside of the 85-100% control limit, while sample absorbence is less than 50% of the spike absorbence.

Table 5-3
VOLATILE ORGANIC ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	MW1	MW2	MW3X
SAMPLE DATE	05/25/90	05/25/90	05/24/90
Volatile Organics (ug/L)			
Chloromethane	< 10	< 10	< 10
Bromomethane	< 10	< 10	< 10
Vinyl Chloride	< 10	< 10	< 10
Chloroethane	< 10	< 10	< 10
Methylene Chloride	2 J	1 J	2 BJ
Acetone	< 10	< 10	9 J
Carbon Disulfide	2 J	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5
1,2-Dichloroethene (total)	< 5	< 5	< 5
Chloroform	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5
2-Butanone	< 10	< 10	< 10
1,1,1-Trichloroethane	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5
Vinyl Acetate	< 10	< 10	< 10
Bromodichloromethane	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5
Benzene	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).

B - Analyte found in the associated blank as well as in the sample. Indicated possible/probable blank contamination and warns the data user to take appropriate action.

J - Indicates an estimated value.

Table 5-3 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS
FOR GROUND-WATER SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER SAMPLE DATE	MW1 05/25/90	MW2 05/25/90	MW3X 05/24/90
Volatile Organic (Continued) (ug/L)			
Trans-1,3-Dichloropropene	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5
4-Methyl-2-Pentanone	< 10	< 10	< 10
2-Hexanone	< 10	< 10	< 10
Tetrachlorothene	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5
Toluene	13	4 J	< 5
Chlorobenzene	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5
Styrene	< 5	< 5	< 5
Total Xylenes	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).
J - Indicates an estimated value.

Table 5-4
INORGANIC ANALYTICAL RESULTS FOR GROUND-WATER SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	MW1	MW1	MW2	MW2	MW3X	MW3X
ANALYSES	TOTAL	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED
SAMPLE DATE	05/25/90	05/25/90	05/25/90	05/25/90	05/31/90	06/01/90
Metals (ug/L)						
Aluminum	1480 N*	53.2 B	140 BN*	576	164000 N*	396
Antimony	< 39.0	< 39.0	< 39.0	< 39.0	< 39.0	51.8 B
Arsenic	< 3.0 W	< 3.0	< 3.0 W	< 3.0 W	< 15.0	< 3.0 W
Barium	28.8	42.7 B	44.2 B	3.0 B	1850	3.0 B
Beryllium	< 1.0	< 1.0	< 1.0	< 1.0	13.8	< 1.0
Cadmium	6.2 *	< 5.0	< 5.0 *	< 5.0	< 5.0 *	< 5.0
Calcium	3110 B	13200	13000	1660 B	50200	447 B
Chromium	< 7.0 *	< 7.0	< 7.0 *	< 7.0	340 *	< 7.0
Cobalt	< 7.0	< 7.0	< 7.0	< 7.0	159	< 7.0
Copper	15.8 B	18.0 B	6.8 B	7.5 B	451	30.9
Iron	1560 N*	74.5 B	202 N*	156	258000 N*	616
Lead	3.2 S*	< 2.0 W	< 2.0 W*	< 2.0	1670	4.0
Magnesium	1070 B	3430 B	3300 B	595 B	50800	273 B
Manganese	52.6	124	119	16.2	8830	32.1
Mercury	< 0.20	< 0.20	< 0.20	< 0.20	0.28	< 0.20
Nickel	< 34.0	< 34.0	< 34.0	< 34.0	519	< 34.0
Potassium	< 3970	< 3970	< 3970	< 3970	25500	< 3970
Selenium	< 10.0 WN	< 2.0 WN	< 10.0 WN	< 2.0 WN	< 40.0 EN	< 2.0 WN
Silver	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Sodium	38000	42100	39300	42500	73400	53100
Thallium	< 3.0 WN	< 3.0 WN	< 3.0 WN	< 3.0 WN	< 3.0 WN	< 3.0 WN
Vanadium	< 5.0	< 5.0	< 5.0	< 5.0	295	< 5.0
Zinc	64.6	120	66.3	13.7 B*	1460	16.4 B*
Cyanide	< 10.0	NR	< 10.0	NR	< 10.0	NR

< - Less than the specified instrument detection limit (IDL).
* - Duplicate analyses not within control limit.
B - Less than Contract Required Detection Limit (CRDL) but greater than instrument detection limit (IDL).
E - Estimated due to interference.
N - Spike sample recovery not within control limit.
NR - Not required. S - Calculated by Method of Standard Additions.
W - The post digestion spike for Furnace AA analyses is outside of the 85-100% control limit, while sample absorbence is less than 50% of the spike absorbence.

Table 5-5
VOLATILE ORGANIC ANALYTICAL RESULTS FOR QUALITY ASSURANCE/QUALITY CONTROL SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	EB-1	TB1	TB2	TB3	FB
SAMPLE DESCRIPTION	Equipment Blank	Trip Blank	Trip Blank	Trip Blank	Field Blank
SAMPLE DATE	05/09/90	05/15/90	05/17/90	05/23/90	05/25/90
Volatile Organics (ug/L)					
Chloromethane	< 10	< 10	39	< 10	< 10
Bromomethane	< 10	< 10	< 10	< 10	< 10
Vinyl Chloride	< 10	< 10	< 10	< 10	< 10
Chloroethane	< 10	< 10	< 10	< 10	< 10
Methylene Chloride	2 J	1 BJ	1 BJ	3 J	1 J
Acetone	< 10	< 10	< 10	8 J	< 10
Carbon Disulfide	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethene (total)	< 5	< 5	< 5	< 5	< 5
Chloroform	3 J	13	13	< 5	2 J
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
2-Butanone	< 10	< 10	< 10	< 10	< 10
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Vinyl Acetate	< 10	< 10	< 10	< 10	< 10
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Benzene	< 5	< 5	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).

B - Analyte found in the associated blank as well as in the sample. Indicated possible/probable blank contamination and warns the data user to take appropriate action.

J - Indicates an estimated value.

Table 5-5 (continued)
VOLATILE ORGANIC ANALYTICAL RESULTS
FOR QUALITY ASSURANCE/QUALITY CONTROL SAMPLES,
HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	EB-1	TB1	TB2	TB3	FB
SAMPLE DESCRIPTION	Equipment Blank	Trip Blank	Trip Blank	Trip Blank	Field Blank
SAMPLE DATE	05/09/90	05/15/90	05/17/90	05/23/90	05/25/90
Volatile Organics (ug/L)					
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
4-Methyl-2-Pentanone	< 10	< 10	< 10	< 10	< 10
2-Hexanone	< 10	< 10	< 10	< 10	< 10
Tetrachlorothene	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Styrene	< 5	< 5	< 5	< 5	< 5
Total Xylenes	< 5	< 5	< 5	< 5	< 5

< - Less than the specified instrument detection limit (IDL).

Table 5-6
INORGANIC ANALYTICAL RESULTS FOR QUALITY ASSURANCE/QUALITY CONTROL SAMPLES, HAZELTINE CORPORATION, GREENLAWN, NEW YORK

SAMPLE NUMBER	FB	FB	EB-1
ANALYSES	TOTAL	DISSOLVED	
SAMPLE DATE	05/25/90	05/25/90	05/09/90
Metals (ug/L)			
Aluminum	<23.0 N*	<23.0	< 23.0
Antimony	<39.0	<39.0	< 39.0
Arsenic	< 3.0	< 3.0	< 3.0 W
Barium	< 2.0	< 2.0	3.2 B
Beryllium	< 1.0	< 1.0	< 1.0
Cadmium	< 5.0 *	< 5.0	6.7 *
Calcium	<20.0	34.7 B	92.5 B
Chromium	< 7.0 *	< 7.0	< 7.0
Cobalt	< 7.0	< 7.0	< 7.0
Copper	< 5.0	< 5.0	< 5.0
Iron	31.8 BN*	< 5.0	16.6 B
Lead	< 2.0	< 2.0	< 2.0
Magnesium	< 144	< 144	< 144
Manganese	< 4.0	10.9 B	< 4.0
Mercury	<0.20	<0.20	0.50
Nickel	<34.0	<34.0	< 34.0
Potassium	<3970	<3970	< 3970
Selenium	< 2.0 N	< 2.0 N	< 2.0 W
Silver	< 4.0	< 4.0	< 4.0
Sodium	< 254	617	< 254
Thallium	< 3.0 N	< 3.0 WN	< 3.0
Vanadium	< 5.0	< 5.0	< 5.0
Zinc	7.0 B	6.2 B*	33.2
Cyanide	<10.0	NR	< 10.0

< - Less than the specified instrument detection limit (IDL).
* - Duplicate analyses not within control limit.
B - Less than Contract Required Detection Limit (CRDL) but greater than instrument detection limit (IDL).
N - Spike sample recovery not within control limit.
NR - Not required.
W - The post digestion spike for Furnace AA analyses is outside of the 85-100% control limit, while sample absorbence is less than 50% of the spike absorbence.

Table 5-7

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION AMBIENT WATER QUALITY STANDARDS AND GUIDANCE VALUES FOR INORGANIC CONSTITUENTS IN GROUND WATER

Inorganic Constituent	Standard (s) or Guidance (g) (ug/l)
Al	None
Sb	3 (g)
As	25 (s)
Ba	1,000 (s)
Be	3 (g)
Cd	10 (s)
Cr (total)	50 (s)
Cr (VI)	50 (s)
Cu	1,000 (s)
Fe	300 (s)
Pb	25 (s)
Mg	35,000 (g)
Mn	300 (s)
Hg	2 (s)
Ni	None
Se	20 (s)
Ag	50 (s)
Tl	4 (g)
V	None
Zn	5,000 (s)

Source: NYSDEC Division of Water Technical and Operation Guidance Series 1.1.1.

6.0 CONCLUSIONS

Based on Radian's investigation of the Hazeltine Corporation's Greenlawn site, the following conclusions can be made.

6.1 Geology/Hydrogeology

(1) Sand and gravel deposits predominate to a depth of approximately 50 feet across the site. Deposits of this nature are generally very permeable. In areas of the site that are not paved, these deposits provide for vertical recharge to water-bearing units underlying the site.

(2) Ground water occurs in a perched zone underneath portions of the site. Perched ground water is locally isolated from the regional water-table aquifer by fine-grained deposits of probable glaciolacustrine origin. Published reports confirm the presence of isolated clay units of this nature in various locations throughout northwest Suffolk County. Perched ground water is not present underlying the northwest property boundary near Building 2. Fine-grained deposits grade into coarser, more permeable deposits in the direction from MW-1 and MW-2 toward MW-3. Wells MW-1 and MW-2 are screened in the perched zone.

(3) Based on the investigation findings and on data presented in available literature, a laterally extensive water-table aquifer occurs at a deep horizon (approximately 170 feet below ground surface) beneath the site and surrounding areas. Detailed review of previous hydrogeological investigations in this region indicates that a northern ground-water flow direction is likely for the water-table aquifer underlying the site. The generally accepted depth-to-water in the regional water-table aquifer correlates with water levels measured in the deep well installed on site (MW-3X), implying that MW-3X is located directly downgradient from the underground storage tanks (USTs) outside Building 2.

(4) Although the hydraulic behavior of the perched water zone is not clear, geologic observations and published reports suggest that the perched water zone may be hydraulically connected to the water-table aquifer in some areas underlying the site.

(5) Water levels measured on May 24, 1990 indicate that the perched water is relatively flat-lying. The elevation of the top of the water is approximately 0.5 foot higher at monitoring well MW-2 than at MW-1. This difference may be attributed to greater infiltration capability of rainwater at MW-2 than at MW-1 because the ground surface is not paved at MW-2.

(6) Substantial siltation of monitoring well MW-3X is apparent despite considerable attempts to develop the well to yield sediment-free ground water. The source of these silts is likely drilling fluid, formation materials, or a combination of both. This silt is the probable source of elevated concentrations of selected inorganic constituents detected in the total metals (unfiltered) ground-water sample. The well was bailed dry several times before sampling; therefore, it is believed to be representative of ground-water quality in this area.

(7) Based on similar elevations of the perched water observed in wells MW-1 and MW-2, it is apparent that the surface recharge basin is not causing a ground-water mounding effect on the perched water zone. Good correlation between water levels measured in well MW-3X and those in nearby wells, as reported in available literature, suggests the lack of mounding effects of the surface recharge basin on the water-table aquifer.

(8) Unsaturated conditions in the near surface horizon and the permeable nature of materials encountered suggest that vertical percolation of recharging surface water would be the primary mechanism of hydraulic transport in the upper reaches of the unconsolidated deposits underlying the site. Any waste constituents introduced at or near the surface of the ground would migrate vertically downward. The aquitard that is located at a depth of approximately 135 feet below ground surface (as observed in well MW-2) and that provides for the accumulation of

perched water, would limit the maximum extent of vertical migration possible in that area.

6.2 Chemistry

(1) Local clayey silt lens sampled in boring B-6 at a depth of approximately 8 feet, adjacent to underground storage tank C, did not indicate residual metal constituents attributable to any release(s) from this tank; however, PCE was detected in this horizon. The concentration of PCE in this boring decreased with depth. These depths generally correlate with the depth of the underground (C & E) storage tanks which lie approximately 6 feet to 10 feet below ground surface.

(2) Monitoring well MW-2, assumed to be upgradient, does not appear to be impacted by any on-site sources and therefore is thought to be indicative of background perched ground-water quality.

(3) Toluene detected in ground water sampled from MW-1 is within New York State ambient water quality standards and is therefore not of major concern. There are no known sources for toluene at the facility other than toluene associated with gasoline in cars and parking lot areas.

(4) The presence of selected inorganic constituents in soil and ground water is evident; however, the concentrations of these constituents are relatively low in comparison with acceptable federal drinking water standards, with naturally occurring concentrations in the state, and with clean-up criteria established for nearby sites. Furthermore, the concentrations of these constituents do not exceed acceptable state drinking water standards. The occurrence of constituents in soils is characteristically strongly controlled by lithology. Specifically, a clean gravel and sand deposit would likely exhibit lower concentrations of heavy metals than would a fine-grained silt and clay. Because the site exhibited lithologic variability both laterally and vertically, associated samples collected for analysis were similarly variable in lithology. Therefore, direct comparison of the analysis between any two soil samples may not be appropriate.

(5) Total metals concentrations in ground water (unfiltered) from MW-3X are greater than total metals concentrations in MW-1 and MW-2 ground-water samples. Siltation of MW-3X is believed to be the cause of these elevated levels, since development of this well to a sediment-free condition was not possible. This assumption is further substantiated by the lack of similarly elevated concentrations of these or any other constituents in the corresponding filtered (dissolved metals) ground-water sample.

(6) The leach field outside of Building 1 has not caused any apparent adverse impacts to the soil chemistry in this area.

In summary, based on information available to date, site conditions do not conclusively indicate that significant impacts to the soil and ground water have occurred from facility operations and SPDES permitted wastewater discharges. Performance of current RCRA closure activities would likely remove possible sources of constituents found during the investigation. Based on available analytical data and on ground-water conditions at the site and vicinity, further characterization of site-specific ground-water hydrology or potential impacts of the SPDES wastewater discharges is not justified.

7.0 REFERENCES

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Jensen, H.M. and J. Soren. 1974. Hydrogeology of Suffolk County, Long Island, New York. U.S. Geological Survey Hydrologic Investigations Atlas HA-501, United States Geological Survey, Reston, Virginia.

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United States Geological Survey. 1964. Hydrology of the Huntington-Smithtown Area, Suffolk County, New York. U.S. Geological Survey Water-Supply Paper 1669-D, United States Government Printing Office, Washington, D.C.

The undersigned authorize the following modifications to the Field Investigation Work Plan (WP) dated June 30, 1989 and amended October 24, 1989. This Work Plan is Appendix A to the NY Dept. of Environmental Conservation Order on Consent with Hazeltine Corporation."

Modifications:

1. Split spoon samples will be decontaminated between sample horizons with an Alconox/potable water wash, followed by a potable water rinse and a final distilled water rinse. This procedure supercedes that specified in the WP which also called for acetone and hexane rinses.

2. Clay layers detectable at thicknesses greater than or equal to two feet will not be breached.

3. PID (photo) it in lieu of FID (flame) acceptable for field screening

4. Cuttings may be disposed of on site if screening indicates ≤ 5 ppm. Must be ≤ taken offsite or treated if > 5ppm

5. Grouting of borings up to 3' from ground surface is adequate

Barry C. Lucas 4/30/90
NYSDEC Date
B. LUCAS

4/30/90
Hazeltine Date
F. Patton

A. Vecchio

Appendix A

BACKGROUND DOCUMENTS

A.4 NYSDEC CORRESPONDENCE

RCVD 3/6/90
BMW

STATE OF NEW YORK

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

- -x

In the Matter of the Alleged Violation of
Article 17 of the New York State
Environmental Conservation Law

HAZELTINE CORPORATION

Respondent

- -x

ORDER ON CONSENT

FILE NO. ______

SPDES NO. NY0075744
SPDES NO. NY0075752

WHEREAS:

1. The New York Department of Environmental Conservation (the "Department") is responsible for carrying out the environmental policy of the State of New York as set forth in the Environmental Conservation Law ("ECL").

2. Hazeltine Corporation ("Hazeltine") is a corporation organized and existing under the laws of the State of Delaware.

3. The Department has asserted jurisdiction over the Hazeltine property located in the vicinity of Cuba Hill Road, Greenlawn, New York (the "Premises") as delineated on Figure 1-1 of the Field Investigation Work Plan (the "Work Plan") that is attached hereto as Appendix A.

4. Pursuant to ECL Article 17, and regulations promulgated thereunder, the Department has asserted jurisdiction over Hazeltine's industrial point source discharges at the Premises and regulates those point source discharges under two State Pollution Discharge Elimination System ("SPDES") permits, No. NY0075744 for the facility known as the Research Laboratory,

and No. NY0075752 for the facility known as the Government Products Manufacturing Building and for the facility known as Building 3, which the Department issued to Hazeltine.

5. The Department is satisfied that Hazeltine has violated Article 17 of the ECL, regulations promulgated thereunder and the aforementioned SPDES permits granted to Hazeltine.

6. Hazeltine, as a good corporate citizen, has agreed to conduct a field investigation at the Premises in accordance with the terms of this Order. The field investigation is more particularly described in the Work Plan.

7. Hazeltine consents to the issuance of this Order and agrees to be bound by its terms. Hazeltine waives its right to a public hearing only to the extent that it does not request a public hearing with respect to the actions that Hazeltine has consented to take under this Order. Notwithstanding Hazeltine's consent to this Order, Hazeltine does not admit or acknowledge any liability, fault or wrongdoing or violation of law, regulation or permit relating to the Premises. Moreover, Hazeltine reserves its right to oppose any action the State of New York or the Department may undertake with regard to the Premises or any point source discharges thereat.

THEREFORE, having considered this matter and being duly advised, it is hereby ORDERED that:

I. Hazeltine shall conduct a Field Investigation of the Premises in accordance with the Work Plan that is attached hereto as Appendix A.

II. After the completion of the Field Investigation, Hazeltine shall submit to the Department a Field Investigation Report (the "Report"). The Report will include a copy of the Work Plan and all data obtained during the Field Investigation.

III. Hazeltine shall permit any duly designated officer or employee of the Department to enter upon the Premises during normal business hours and upon reasonable advance notice to conduct such sampling and tests as the Department deems necessary for the purpose of ascertaining Hazeltine's compliance with this Order, provided, however, that all such persons must comply with all provisions of the applicable health and safety procedure as provided in the Work Plan and all requirements of Hazeltine pertaining to facility security.

IV. The Department shall have the right to obtain, at the Department's expense for the purpose of comparative analysis, "split samples" or "duplicate samples", at the Department's option, of all substances and materials sampled by Hazeltine pursuant to the terms of this Order. At the time that it obtains such "split samples" or "duplicate samples", the Department shall notify Hazeltine of the analytical parameters of any tests of the samples to be conducted by the Department.

V. Hazeltine shall have the right to obtain, at Hazeltine's expense for the purpose of comparative analysis, "split samples" or "duplicate samples" at Hazeltine's option, of all substances and materials sampled by the Department in the course of the Department's oversight of the Field Investigation.

At the time that the Department obtains samples in the course of the Department's oversight of the Field Investigation, the Department shall notify Hazeltine of the analytical parameters of any tests of the samples to be conducted by the Department.

VI. Hazeltine shall provide five business days' notice to the Department prior to any required field work including, but not limited to, any boring, drilling or sampling to be conducted pursuant to the terms of this Order.

VII. Hazeltine shall apply for whatever permits, easements, rights-of-way, rights-of-entry, approvals or authorizations which may be necessary in order to perform the Field Investigation.

VIII. Within 45 days of the receipt by Hazeltine of this Order, after it has been signed by the Commissioner or his designee, Hazeltine shall pay $50,000 by corporate check to the New York State Department of Environmental Conservation - Region 1, Building 40, S.U.N.Y., Stony Brook, New York 11794. Upon payment of the amount set forth in the preceding sentence, the State of New York shall give to Hazeltine a release of Hazeltine and its officers, directors and employees from any liability for any fine and penalty that may arise out of or relate to any point source industrial discharges regulated under SPDES permits No. NY0075744 and No. NY0075752 and occurring before the date that the Commissioner or his designee has signed this Order.

IX. Hazeltine has taken the measures set forth in Appendix B attached hereto in order to improve the systems designed to meet the discharge limitations set forth in SPDES permits No. NY0075744 and No. NY0075752. The Department acknowledges that these measures are an adequate and appropriate response to the alleged violations.

X. The Department may enforce this Order against Hazeltine, if during the Field Investigation the Department believes that Hazeltine has failed to comply with this Order. However, prior to commencing any proceeding or action to enforce this Order, the Department shall give Hazeltine written notice of any such alleged failure to comply and thereafter Hazeltine shall have the right to cure the alleged failure to comply within a reasonable time after receipt of said notice.

XI. Hazeltine will not suffer any penalty or be subject to any proceeding or action for any remedy or relief, if it cannot comply with any provision of this Agreement because of an act of God, war, riot, weather, an act of a person or entity other than Hazeltine, its consultant or contractors or other condition as to which the negligence or willful misconduct of Hazeltine, its consultant or its contractors was not a proximate cause, provided that Hazeltine notifies the Department in a timely fashion and in writing when Hazeltine obtains knowledge of any such condition and that Hazeltine requests an appropriate extension or modification of this Order and takes all appropriate steps to mitigate further non-compliance with this Order.

XII. Within thirty (30) days after its receipt of the Report, the Department shall provide written notification to

Hazeltine stating whether or not the Department acknowledges that Hazeltine has complied with the terms of this Order. If the Department does not acknowledge such compliance, it shall set forth in writing with specificity the ground(s) on which it believes that there was lack of compliance with this Order.

XIII. Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting any legal or equitable rights or claims, actions, suits, causes of action or demands whatsoever that the Department may have against anyone other than Hazeltine and its officers, directors and employees.

XIV. Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting any right the Department may have to bring any action at law or in equity against Hazeltine with respect to areas or resources that may have been affected as a result of Hazeltine activities at the Premises occurring after this Order is signed by the Commissioner or his designee, provided that the Department may not commence any such action, except an action or proceeding to enforce this Order, during the period that this Order remains in effect, unless the Commissioner or his duly authorized representative exercises summary abatement powers, granted pursuant to statute or regulation.

XV. Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting any rights the Department may have to use any information obtained as a result of Hazeltine's execution of the Work Plan in any action or proceeding pursuant to Article 17 or any other provision of the ECL or common law, including but not limited to, the Commissioner's powers of summary abatement. The terms of this Order shall not be construed to prohibit Hazeltine from raising any available defense at law or equity in any action or in any summary abatement or other proceeding.

XVI. Notwithstanding Hazeltine's execution of this Order, Hazeltine does not admit or acknowledge any liability, fault, wrongdoing or violation of law or regulation relating to the Premises. This Order shall not constitute or be construed as an adjudication or finding with respect to any questions of law or fact. This Order shall not be used against Hazeltine as evidence, as an admission or for any other purpose in any action or proceeding, except that this Order may be admitted into evidence for the purpose of enforcing this Order in an action brought for that purpose. Hazeltine reserves its right to oppose any action the State of New York or the Department may undertake with regard to the Premises.

XVII. The effective date of this Order shall be the date that this Order is received by Hazeltine after it has been signed by the Commissioner or his designee.

XVIII. A. All communications required hereby to be made between the Department and Hazeltine shall be made in writing and transmitted by United States Postal Service, return receipt requested, by Federal Express, or by hand delivery to the addresses in subparagraph B.

B. Communication to be made from Hazeltine to the Department shall be made to:

Regional Director
New York State Department of Environmental Conservation
Region 1
Building 40
State University of New York at Stony Brook
Stony Brook, New York 11794

C. Communication to be made from the Department to Hazeltine shall be made as follows:

Edward A. Onders, Esq.
Associate General Counsel
Hazeltine Corporation
Mail Stop 1-32
450 E. Pulaski Road
Greenlawn, New York 11740.

D. The Department and Hazeltine respectively reserve the right to designate different addresses on notice to the other.

XIX. The provisions of this Order shall be deemed to bind Hazeltine and the State of New York.

XX. The provisions hereof, including Appendices A and B attached hereto, constitute the complete and entire Order concerning the Premises. If, for any reason, either party desires that any provision of this Order be changed, the party requesting the change shall make written request therefor to the other party and set forth reasonable grounds for the change sought. No terms, conditions, understandings or agreements purporting to modify or vary the terms hereof shall be binding unless made in writing and subscribed by the parties, provided that representatives of the Department, in the course of exercising oversight of the conduct of the Field Investigation, may from time to time provide guidance or approval to Hazeltine and its consultants and contractors in matters of field judgment regarding the conduct of the Field Investigation. Any such guidance or approval by the Department's representatives shall bind the Department. If Hazeltine agrees to accept such guidance or approval, Hazeltine shall be bound by its agreement. However, any such guidance or approval by the Department and any such agreement thereto by Hazeltine shall be confirmed in writing by Hazeltine and the Department as soon as possible.

Dated: Stony Brook, New York
, 1989

THOMAS C. JORLING
Commissioner of
Environmental Conservation

By______________________________
Harold D. Berger
Regional Director

CONSENT BY RESPONDENT

Hazeltine Corporation hereby consents to the issuance of this Order and agrees to be bound by terms contained therein.

Dated: Greenlawn, New York
December 15 , 1989

HAZELTINE CORPORATION

By____________________________
James A. Kennedy
Vice President

STATE OF NEW YORK)
) SS.:
COUNTY OF SUFFOLK)

On the 15th day of December , 1989, before me personally came James A. Kennedy , to me known, and by me being duly sworn, who did depose and say that he resides at 11 Stafford Dr., South Huntington, NY 11746 ; that he is the Vice President of Hazeltine Corporation, the Corporation described in and which consented to the foregoing Order; that he knows the seal of said Corporation; that the seal affixed to said instrument is such Corporate seal; that it was so affixed in accordance with the By-Laws of said Corporation, and that he signed his name thereto in accordance with the authority granted him by such By-Laws as a duly elected officer of said Corporation.

Mechelina Strongin
NOTARY PUBLIC

MECHELINA STRONGIN
[illegible] S[illegible] York
[illegible]
Q[illegible] Suffolk County
C[illegible] Nov 30, 19[illegible]

RELEASE

This Release executed on the ___ day of ________, 1989, by the State of New York (hereinafter referred to as the "State") to Hazeltine Corporation, a corporation organized and existing under the laws of the State of Delaware, having its principal place of business at Greenlawn, New York (hereinafter referred to as Hazeltine).

WITNESETH:

WHEREAS, the State has sought from Hazeltine penalties relating to industrial point source discharges regulated under SPDES permits No. NY0075744 and NY0075752; and

WHEREAS, the State has accepted from Hazeltine and Hazeltine has paid to the State the sum of fifty thousand ($50,000.00) dollars.

NOW, THEREFORE, in consideration of the above set forth herein:

1. The State, as the RELEASOR, hereby releases and discharges Hazeltine, its past and present officers, directors and employees and their heirs, executors, administrators, successors and assigns, as the RELEASEES, from all liability for penalties and fines whatsoever, in law, admiralty or equity, which against the RELEASEES, the RELEASOR or its successors and assigns ever had, now have or hereafter can, shall or may have arising out of, or relating to, any industrial point source discharges

regulated under SPDES permits No. NY0075744 and No. NY0075752 occurring on or before ________________ , 1989.

2. This Release shall inure to the benefit of and shall be binding upon the parties hereto and their successors and assigns.

3. This Release shall not be changed orally.

IN WITNESS WHEREOF, the RELEASOR has executed this Release in duplicate original at ________________________, New York, as of the date first above written.

STATE OF NEW YORK

by____________________________
Harold D. Berger
Regional Director
New York State Department of
Environmental Conservation

State of New York)
County of Suffolk) SS.:

On , 1989, before me personally came Harold D. Berger, to me known and known to me to be Regional Director of the New York State Department of Environmental Conservation and the individual who executed the foregoing release on behalf of the State of New York and duly acknowledged to me that he executed the same.

____
Notary Public

RCVD 3/6/

WORK PLAN
FIELD INVESTIGATION
HAZELTINE CORPORATION PREMISES
GREENLAWN, NEW YORK

June 30, 1989

Prepared By:

Fred C. Hart Associates, Inc.
530 Fifth
New York, New York 10036

(0337n-61)

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1.0 SUMMARY OF BACKGROUND INFORMATION

1.1 Premises Setting

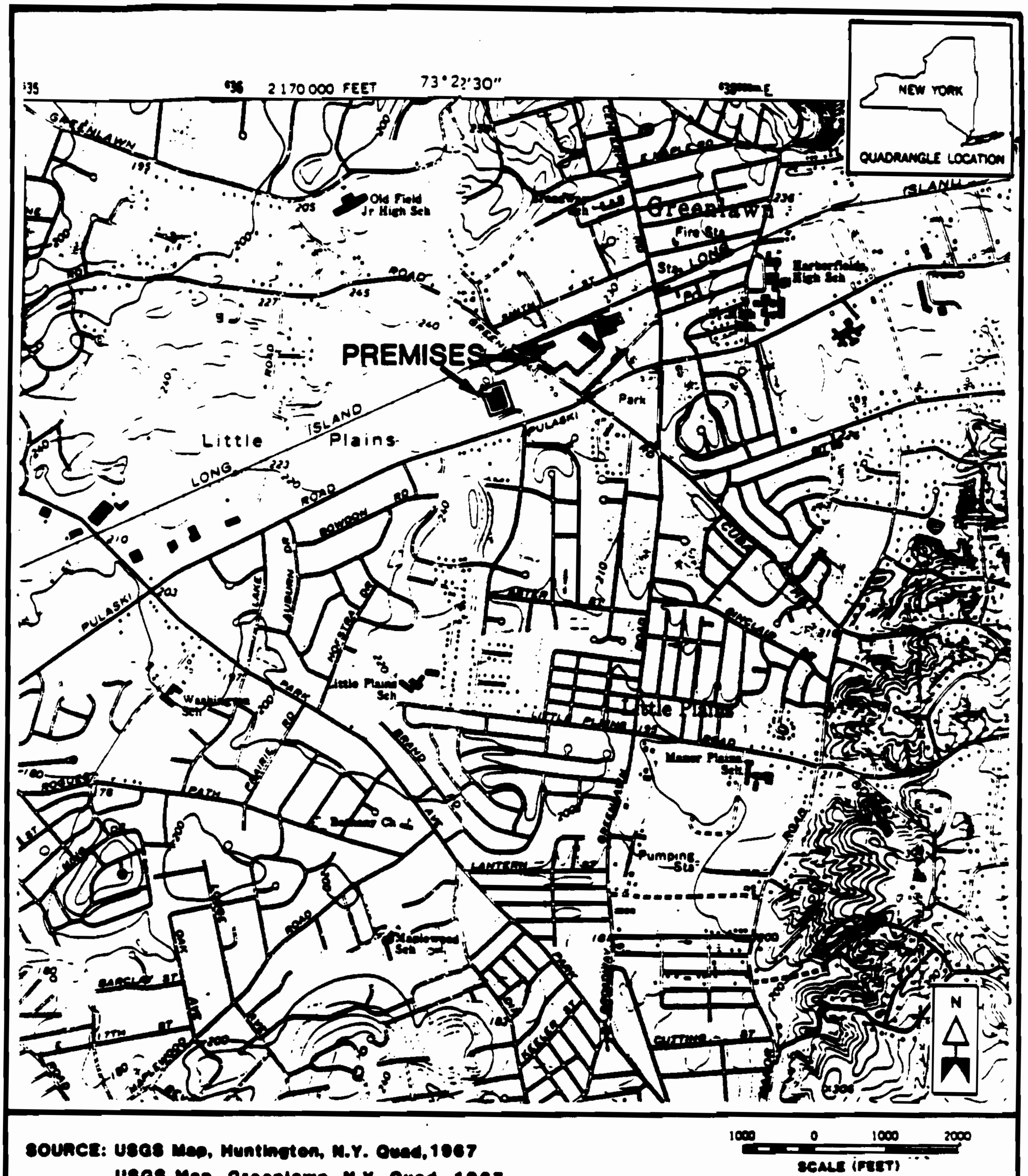
The involved Hazeltine Corporation (HC) premises (HCP) are located in the southwestern part of Greenlawn, New York (Figure 1-1). HC manufactures electronic systems and equipment. HCP is approximately 23 acres in size and the surrounding topography is generally flat-lying. The premises are partially fenced and 24 hour surveillance is maintained by security guards and controlled entry.

1.2 Description of Effluent Related Activities

Industrial effluent generated by HC has been discharged at HCP. The point sources are specified in current and past SPDES Permit Nos. NY0075752 and NY0075744. In April of 1979, an underground tank, regulated under the SPDES Permit No. NY0075752 permit, leaked an estimated 2,500 gallons of material. Under the supervision of the State and County, the tank was repaired and modified to prevent further leakage.

1.3 Hydrogeologic Setting

1.3.1 Geology. The area around HCP is mantled with glacial outwash deposits up to 175 feet in thickness. These deposits are composed primarily of sand and gravel and have a permeability of 200 ft/day. Based on a review of the report "Hydrogeology of the Huntington-Smithtown area, Suffolk County, New York" (USGS Water Supply Paper 1669-D, by E.R. Lubke, 1964), it does not appear that either Smithtown clay or any localized clay units are present in the glacial deposits underlying the site. Glacial moraines are also present to the north, south and southwest. Underlying the glacial deposits is the Magothy Formation which consists of alternating layers of sand, silt and clay. The permeability of the Magothy is about 50-70 ft/day, which is lower than that of the upper glacial aquifer. The contact between the upper glacial aquifer and the Magothy is quite variable. In some areas, glacial deposits fill buried



SOURCE: USGS Map, Huntington, N.Y. Quad, 1967
USGS Map, Greenlawn, N.Y. Quad, 1967,
Revised 1979

FIGURE 1-1
PREMISES LOCATION
HAZELTINE CORPORATION
GREENLAWN, NY

FRED C. HART ASSOCIATES, INC.

valleys that were cut into the Magothy. Approximately 200 feet of Raritan clay and 250 to 300 feet of sand and gravel underlie the Magothy. The entire sequence of unconsolidated material is approximately 1,000 feet and rests on crystalline bedrock.

1.3.2 Hydrology. Groundwater at HCP is under water table conditions at approximately 160 feet below ground surface. Based on the geological information reviewed, it is unlikely that there are any perched water zones at HCP. The general direction of groundwater movement in the vicinity of HCP is to the north toward Long Island Sound.

Two other considerably deeper aquifers are also found beneath the premises: the Magothy Aquifer and the Lloyd Aquifer. The Lloyd Aquifer is confined by the Raritan Clay.

1.4 Local Water Use

A summary table of the public water supply wells, their locations and population served within a three mile radius of HCP is shown in Table 1-1. Based on conversations with the Suffolk County Department of Health, there are eight public water supply wells within this radius in the Greenlawn and Huntington Water Districts, and three wells belonging to the Suffolk County Water Authority. Four of these wells are hydrogeologically downgradient of the site, and three are upgradient. The potentiometric surfaces at the remaining wells are approximately the same elevation as at HCP, but appear to be separated from the site by groundwater divides. These are listed as "sidegradient" in Table 1-1.

1.5 Summary of Previous Investigative Activities

HC has collected a variety of water and soil samples on the premises, primarily from the surface impoundments and in conjunction with the SPDES permits. The laboratory data for Buildings 2 and 3 is contained in the Phase I Investigation Report prepared by Woodward-Clyde Consultants, Inc. in 1986.

TABLE 1-1

PUBLIC WATER SUPPLY WELLS WITHIN A THREE MILE RADIUS OF HCP

Approximate Location	New York State Water Resources Commission Number	Owner	Depth (feet)	Capacity (GPM)	Population Served	Position Relative to Premisis
Pulaski Road	S23998	Greenlawn Water District	600	1,200	8,000	Sidegradient
Buttercup Lane	S23145	Greenlawn Water District	600	1,200	8,000	Downgradient
Park Avenue	S11803	Greenlawn Water District	218			Upgradient
Manor Road	S23997	Greenlawn Water District	625			Upgradient
Cuba Hill Road	S37100	Greenlawn Water District	575			Upgradient
Stony Hollow Road	S5068	Greenlawn Water District	192			Downgradient
Washington Street	S45610	South Huntington Water District	313	1,400	3,300*	Downgradient
Hollywood Place	S66366	South Huntington Water District	478	1,300	3,300*	Sidegradient
Laurel Hill Road	S20530	Suffolk County Water Authority	607	1,200	2,600*	Sidegradient
Laurel Hill Road	S33970	Suffolk County Water Authority	609	1,200	2,600*	Sidegradient
Meade Drive	S67656	Suffolk County Water Authority	468	1,300	2,600*	Downgradient

* These values were calculated by dividing an estimate of the number of people served by the system by the total number of wells contributing to the system.

2.0 FIELD INVESTIGATIVE ACTIVITIES

2.1 Objectives

The purpose of conducting field investigative activities at HCP is to evaluate whether potential soil, groundwater or air contamination may have resulted from operations regulated under the aforementioned SPDES permits at the premises.

The purpose of this work plan is to provide more detailed information about the field investigative activities proposed for the premises. These activities will include:

- Test Borings and Soil Sampling
- Monitor Well Installation and Sampling
- Air Monitoring
- Report

2.2 Premises Reconnaissance

A preliminary premises visit will be made to finalize the test boring and monitoring well locations and ensure that all locations are accessible to a drilling rig.

2.3 Geophysical Survey

Although the application of geophysical survey methods for detecting subsurface plumes has been successful in some field investigations, the specific characteristics at HCP are such that surface geophysics will not provide useful data. Groundwater at HCP is anticipated to be at 160 feet, a depth which is beyond the range of most geophysical instruments. Furthermore, given the distance potential contamination must travel to reach the groundwater table, it is likely that, if a plume is present, it will contain very low levels of contaminants. At such dilute concentrations, any plume would be difficult to distinguish from background. In addition, surface interference at HCP from the high tension wires, underground tanks and the railroad tracks will heavily distort any data obtained from a geophysical survey. More than adequate data is available from background work performed by Woodward-Clyde to allow for the identification of locations for test borings and wells. Test borings and monitoring well locations will be screened with a metal detector prior to drilling operations to check the locations for buried obstacles.

2.4 Test Borings

2.4.1 Installation of Borings. Based upon available background documentation, and after consultation with NYSDEC, seven test boring locations are proposed at HCP and are shown in Figures 2-1 and 2-2. One boring will be placed in the vicinity of the underground holding tank (C tank), two borings will be placed on either side of the surface impoundment, two borings will be placed on either side of the underground storage tanks (E tanks), one boring will be placed adjacent to the leaching field outside of Building 3 (Figure 2-1), which is regulated under SPDES Permit No. NY0075752, and one boring will be placed adjacent to SPDES discharge point 001, regulated under SPDES Permit No. NY0075744, at Building 1 (Figure 2-2).

The depth to the bottom of the tanks is ten feet, and therefore, the borings around the tanks are anticipated to be 20 feet in depth. The leaching ring outside of Building 1 is nine feet in diameter and 15 feet deep; therefore the boring at this location will be 25 feet deep. The borings will be drilled with a hollow stem auger rig. Each boring will be sampled continuously (every two feet) with a three inch split spoon sampler from the ground surface to 20-25 feet. The split spoon samples will be visually inspected and logged in detail including:

a. soil characteristics (type, thickness, color, etc)
b. material characteristics (odor, texture, material, etc)
c. visual contamination description
d. approximate water content
e. results of OVA and conductivity screenings.

The contents of each split spoon will initially be screened with a Century Model 128 Organic Vapor Analyzer (OVA) in survey mode for worker safety. Samples will be obtained from each split spoon with a clean knife

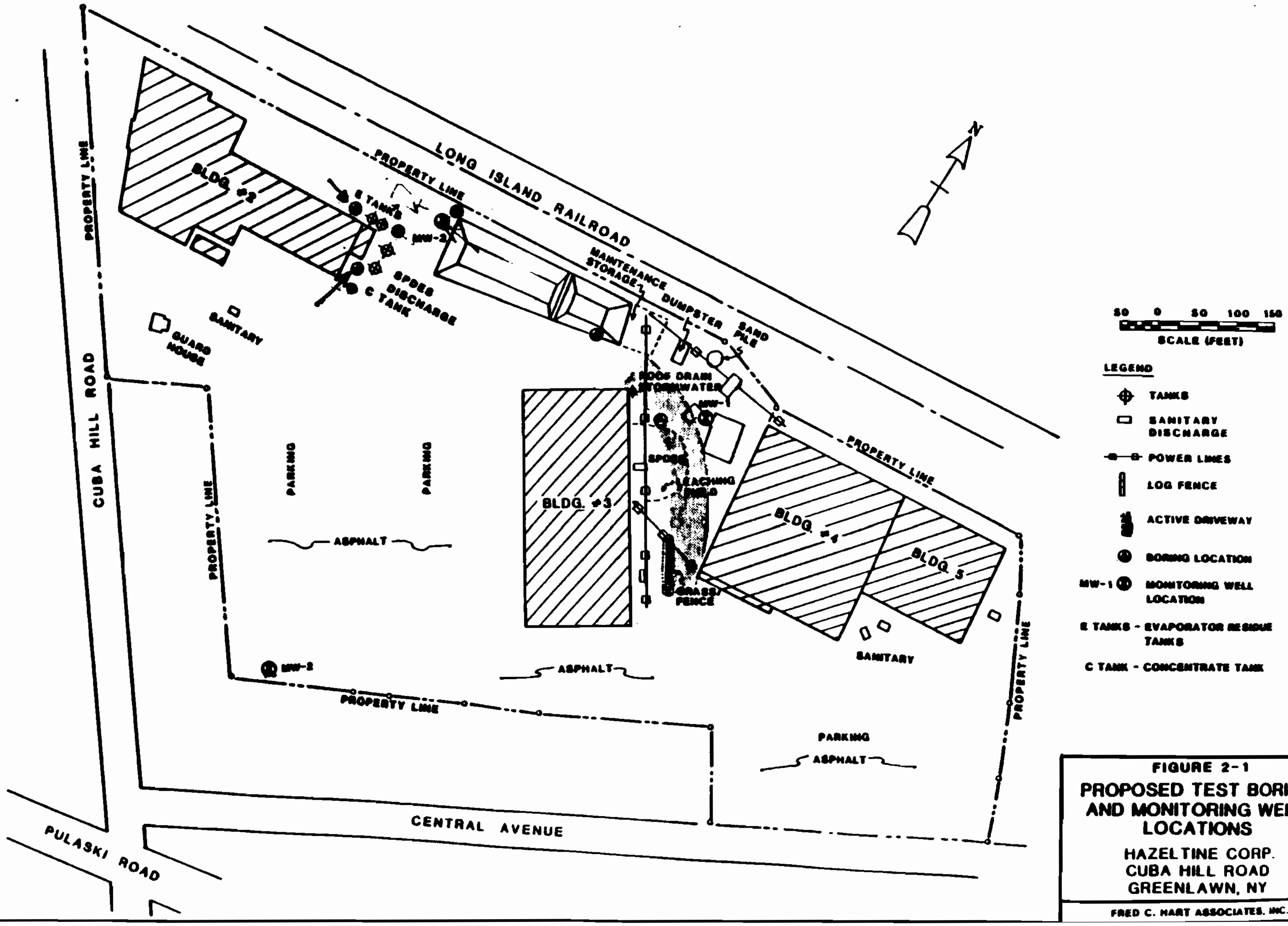


FIGURE 2-1

PROPOSED TEST BORING AND MONITORING WELL LOCATIONS

HAZELTINE CORP.
CUBA HILL ROAD
GREENLAWN, NY

FRED C. HART ASSOCIATES, INC.

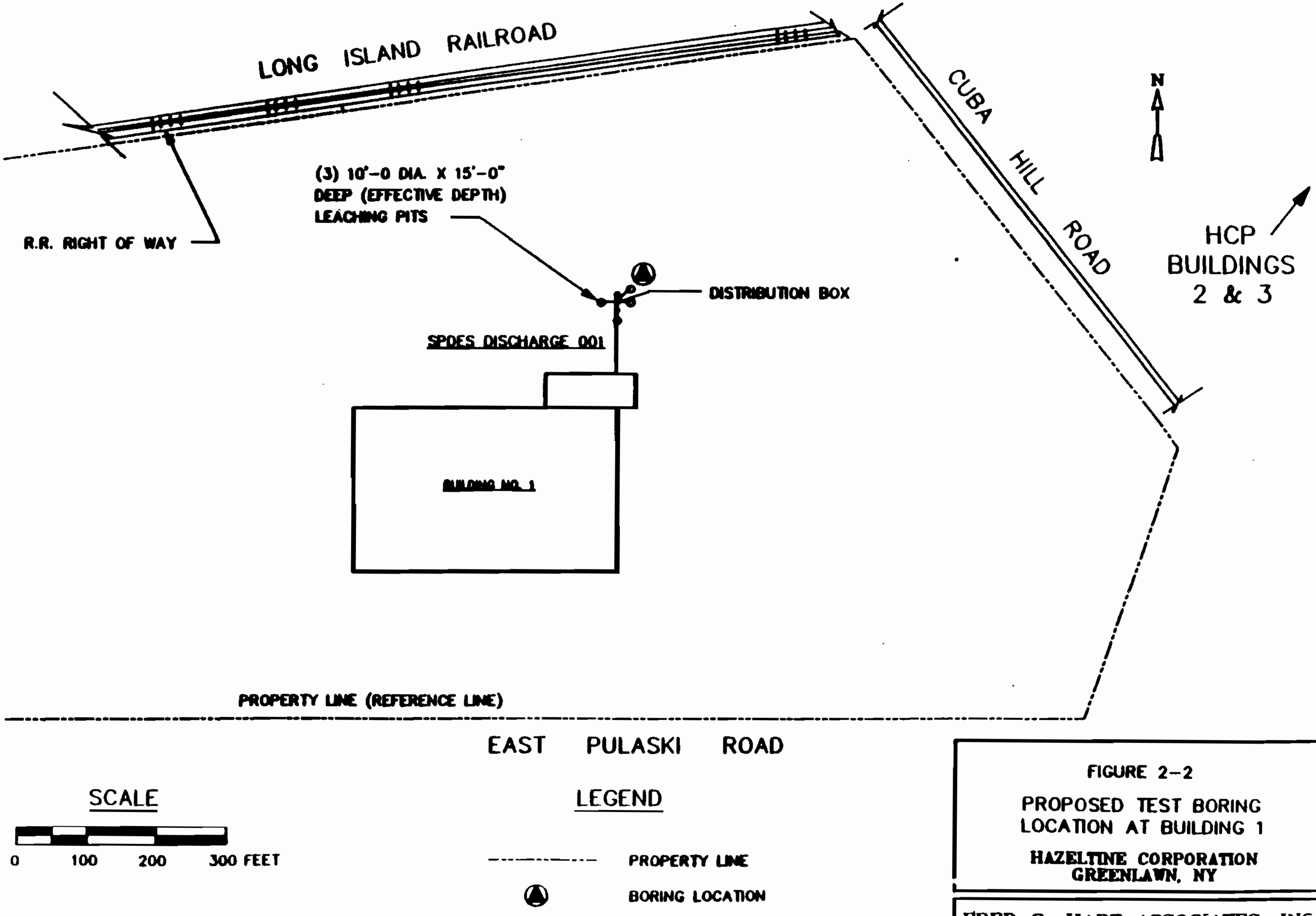


FIGURE 2-2

PROPOSED TEST BORING LOCATION AT BUILDING 1

HAZELTINE CORPORATION
GREENLAWN, NY

FRED C. HART ASSOCIATES, INC

and separate samples will be collected for conductivity screenings, headspace analyses, visual observation and potential laboratory use.

During drilling, visual observations, OVA measurements or conductivity screening may suggest that contaminants have migrated deeper than 20-25 feet. At the discretion of the field team leader, the depth of the test borings may be extended. Soil samples will be collected every two feet in the borehole as described above and will be screened with the OVA and conductivity meter.

Upon completion of all the sampling activities, all the borings will be grouted to the surface with a cement-bentonite grout. This procedure will reduce the possibility of introducing surface soil contamination into the subsurface soils and will eliminate vertical migration pathways for surface water.

2.4.2 Soil Sampling. In order to select samples from the shallow test borings for laboratory analyses, samples will be screened for conductivity and total volatile organics. A soil slurry will be prepared for conductivity measurements by mixing a portion of soil from each spoon in a 1:1 ratio with distilled water. The conductivity probe will then be inserted into the slurry for conductivity measurements. In addition, soil samples will be screened for total volatile organics by operating the OVA in GC mode. A soil sample from each spoon will be collected in a 40 ml VOA vial and the vials will be heated in a 50°C hot water bath for ten minutes. An aliquot of air from the headspace within the vial will then be withdrawn by syringe for direct injection into the OVA. The screening data, in addition to visual observations of the samples (such as coincidence with a clay layer), will facilitate the selection of two soil samples from each boring for laboratory analyses. If the screening data does not indicate any localized areas in the borings that require sampling, one sample will be collected from the bottom of each boring to confirm that the soil is clean at depth. All soil samples will be stored on ice for preservation until the selection of samples for laboratory analysis is made. The samples will be analyzed for Target Compound List (TCL) volatiles and metals as listed in the Department of Environmental

Conservation Contract Lab Protocol document. The samples will be analyzed by Compuchem Laboratories of Research Triangle Park, NC, which is an approved NYSDEC Laboratory. One trip blank for each shipment of samples, one duplicate sample, and one field blank will also be collected.

In addition to the seven shallow borings, three deep test borings will be drilled at the location of the monitoring wells (Figure 2-1). These boreholes will be drilled with a Barber rig and three inch split spoon samples will be collected at ten foot intervals to evaluate the lithologic characteristics of the glacial till. In the event a confining layer is encountered, the layer will not be breached and the deep well location will be moved. All the split spoon samples will be screened with an OVA and a conductivity meter and logged as described above. One split spoon sample from each deep boring will be collected from the ten foot interval above the water table and analyzed for TCL metals and volatiles. The analyses of these three deep soil samples will allow for identification of the downward migration, if any, of contaminants. In addition, two representative samples will be obtained from each deep boring for grain size analyses.

It is recognized that NYSDEC may exercise its option to obtain split or duplicate samples during the field activities. At the time of sampling, NYSDEC will notify the Field Team Leader as to the parameters for which the samples will be analyzed. HC may analyze split or duplicate samples for the same parameters selected by NYSDEC.

An attempt will be made to collect one shelby tube sample from one of the deep test borings. However, given the nature of the unconsolidated material at the premises, it may be difficult to retrieve such a sample. For example, the glacial material may be too cobbly and too hard to collect a tube, and if sand is encountered, it is generally difficult to retain it in a shelby tube. If such is the case, permeability data may be derived from blow counts and grain size analyses. Otherwise, permeability data may be collected through a literature search.

In order to prevent any possible cross-contamination between samples, the split spoon samples will be cleaned with soap and water and rinsed in distilled water, followed by an acetone rinse and a final hexane rinse. In addition, the augers will be steam-cleaned between each boring to remove any soil or waste debris from the auger flights.

2.5 Monitoring Wells

2.5.1 Installation. In order to identify groundwater contamination, if any, at HCP, three deep monitoring wells will be installed at locations shown in Figure 2-1. These locations were chosen to provide spatial coverage of the premises and to provide coverage of upgradient and downgradient locations. MW-2 was located in an upgradient position to provide data on background conditions and/or groundwater entering HCP. MW-3 was located between the surface impoundment and two of the underground tanks to indicate the impacts, if any, that these features may have had on the groundwater. MW-1 was located to provide proper spatial coverage for determining groundwater flow directions and to indicate the impact, if any, that the leaching rings at Building 3 may have had on the groundwater. Based upon available data, it is anticipated that the total depth of the monitoring wells will be 170 feet. In the event that geologic conditions are different from those anticipated, the depth of the wells will be extended ten feet below the water table. Furthermore, if it is deemed appropriate, HCP will consider installing an additional deep monitoring well. All deep boreholes will be drilled with a Barber rig and split-spoon samples will be collected at ten foot intervals to evaluate the lithologic characteristics of the glacial till as described in Section 2.4.2.

The monitoring wells will be constructed of 10 foot 4 inch ID, 10 slot screens and approximately 160 feet of threaded 4 inch, schedule 40 PVC riser pipe. Well construction specifications are provided in Figure 2-3. All of the well materials will be steam-cleaned prior to installation in the borehole.

Upon completion of the borings, the screen and riser pipe will be introduced into the borehole. The annular space around and below the screen will be backfilled with a suitable grade of sand to a level two feet above the top of the screen. A two foot bentonite seal will be placed on top of the gravel pack. An attempt will be made to tremie the bentonite pellets into the annular space above the gravel pack. However, if the Field Team Leader determines that the technique is jeopardizing the well installation procedure, the bentonite pellets will be poured into the holes and careful measurements will be taken to ensure that a two foot bentonite seal is emplaced around the well above the gravel pack. The remainder of the hole will be backfilled to the surface through a tremie pipe with a bentonite-cement grout. Each well will be fitted with an outer security casing and locking cap to prevent tampering and damage to the well. The outer casing will be constructed of four inch steel and will be set a minimum of approximately two feet above the ground surface.

After allowing a period of 24 hours for the grout to set, the wells will be developed with a submersible pump. The monitoring wells will be developed to create a good hydraulic connection between the well and the aquifer in which it is screened. This connection is important to the collection of reliable groundwater data and representative groundwater samples. Well development is achieved by forcing fine-grained sediments out of the well screen by either removing water from the well or jetting with water or air. The development of each well will continue until the turbidity of the recovered water is 50 Nephelometric Turbidity units (NTUs), or a satisfactory equivalent of that standard. Following development, the wells will be allowed to reach equilibrium before any groundwater samples are collected.

Although background data indicates that the water table is at 160 feet, the possibility exists that there are zones of perched water in the glacial till. In the event that a zone of perched water is encountered in one of the test borings, consideration will be given to the need for the installation of one shallow well at HCP. The location of the well will be determined after evaluating all of the geologic data. The construction specifications for the shallow well will be similar to those for the deep wells. However, depending upon the depth at which the perched zone is encountered, a 5 foot screen may be used in place of a 10 foot screen.

2.5.2 Water Level Elevations. At the completion of all well installation activities, the elevations of the top of each well casing, as well as their horizontal location, will be surveyed. The measurements will be surveyed to the nearest hundredth of a foot relative to a datum established at HCP. Several rounds of water level measurements will also be collected during and after well development and during sampling. The water level elevations will be plotted and used to develop a contour map of the water table and to determine the direction(s) of groundwater flow.

2.5.3 Aquifer Testing. Based on available background information, slug testing will be impractical at HCP. Even under ideal conditions, slug testing results are only good within an order of magnitude and at HCP, the depth to the water table will make accurate slug testing extremely difficult. The length of time required to physically remove a slug of water from 160 feet will make it difficult to take any accurate measurements during the test.

An attempt will be made to collect one shelby tube sample from one of the deep test borings. However, given the nature of the unconsolidated material at the premises, it may be difficult to retrieve such a sample. For example, the glacial material may be too cobbly and too hard to collect a tube, and if sand is encountered, it is generally difficult to retain it in a Shelby tube. If such is the case, permeability data may be derived from blow counts and grain size analyses. Otherwise, permeability data may be collected through a literature search.

2.5.4 Groundwater Sampling. Prior to sampling, the amount of water in each well will be calculated and three to five well volumes of water will be removed from the well. The water will be removed so as to ensure the collection of a representative sample of groundwater. Either a decontaminated stainless steel bailer or a decontaminated stainless steel two inch bladder pump will be used to evacuate the wells. Once the appropriate volume of water has been removed from the well, subsequent bails will be poured directly into the appropriate glassware for laboratory analyses. The sample aliquots for dissolved metals analyses will be field filtered through a Geotech 2.4 liter barrel filter equipped with a 0.45 micron filter. The sample aliquots for total metals analysis will be placed directly into the appropriate glassware. The groundwater samples will be analyzed for TCL volatiles and total and dissolved metals by Compuchem Laboratories of Research Triangle Park, NC. One field blank and one trip blank will also be collected during groundwater sampling. The field blank will be analyzed for volatiles and metals and the trip blank will be analyzed for volatiles. Immediately after collection, all samples will be placed on ice and delivered to the laboratory. All samples will be labeled and appropriate chain of custody procedures will be followed.

In order to avoid cross-contamination between sampling, strict decontamination procedures will be followed. All evacuation and sampling equipment will be decontaminated between each use. The decontamination procedure will consist of the following: detergent and water wash, distilled water rinse, acetone wash and a final hexane rinse.

2.6 Air Monitoring

Based on data collected at the premises, an extensive air investigation is not necessary at HCP. An initial OVA scan of the perimeter of the premises will be conducted prior to drilling. Air monitoring will also continue during drilling and groundwater sampling for health and safety purposes.

2.7 Sampling and Analysis Summary

A summary of the number and types of samples that will be collected at HCP, as well as the laboratory analyses, is shown in Table 2-1.

2.8 Final Report

Upon completion of all investigative tasks at HCP, the data from each task will be compiled and analyzed. Laboratory data will be checked by a Quality Assurance officer prior to use in the report. After review of the draft materials by HC, a final report will be prepared summarizing all investigative efforts and data analyses and will be submitted to HC. All data collected throughout the course of this study, including test boring logs and laboratory and QA/QC data, will be tabulated and included in the report.

TABLE 2-1

SUMMARY OF ANALYTICAL PARAMETERS FOR SOIL AND GROUNDWATER SAMPLING

Matrix	Number of Samples	Analysis	Replicates	Field Blanks	Trip* Blanks
Subsurface Soils					
Shallow Borings	14	TCL metals	1	1	0
	14	TCL volatiles	1	1	2
Deep Borings	3	TCL metals	0	0	0
	3	TCL volatiles	0	0	1
	6	Grain size analyses	0	0	0
Groundwater	3	TCL total metals	1	1	0
	3	TCL dissolved metals	1	1	0
	3	TCL volatiles	1	1	1

* Trip Blanks will be analyzed for TCL volatile organics only.

3.0 PROJECT ORGANIZATION

The following sections describe the proposed project organization for the investigation of the Hazeltine Corporation premises in Greenlawn, NY. The project organization chart is shown in Figure 3-1.

3.1 Project Management

The following positions have been identified as necessary to implement an investigation at HCP:

Project Director	Michael Barbara, P.E.
Technical Reviewer	James Perazzo
Project Manager	Laura Truettner
Quality Assurance Officer	Don Anné
Field Team Leader	Peter Conde
Premises Safety Officer	John Persico

3.2 Subcontractors

The following subcontractors will be working on the investigation at HCP:

- Test Borings and Monitor Well Installation:

  Hydro-Group, Inc.
  Layne Well and Pump Division
  P.O. Box J
  Smithtown, NY 11787

- Surveying:

  William Ruzenski
  P.O. Box 39
  Levittown, New York 11756

- Grain Size Analysis:

J&L Testing Co., Inc.
938 South Central Avenue
Canonsburg, PA 15317

- Soil and Water Analyses:

Compuchem Laboratories, Inc.
P.O. Box 12652
3308 Chapel Hill/Nelson Highway
Research Triangle Park, NC 27709

3.3 Reporting

Monthly progress reports will be prepared by the Project Manager in consultation with the Field Team Leader and will be submitted to HC. When appropriate, the progress reports shall include the results of sampling and analysis upon completion of the QA/QC review.

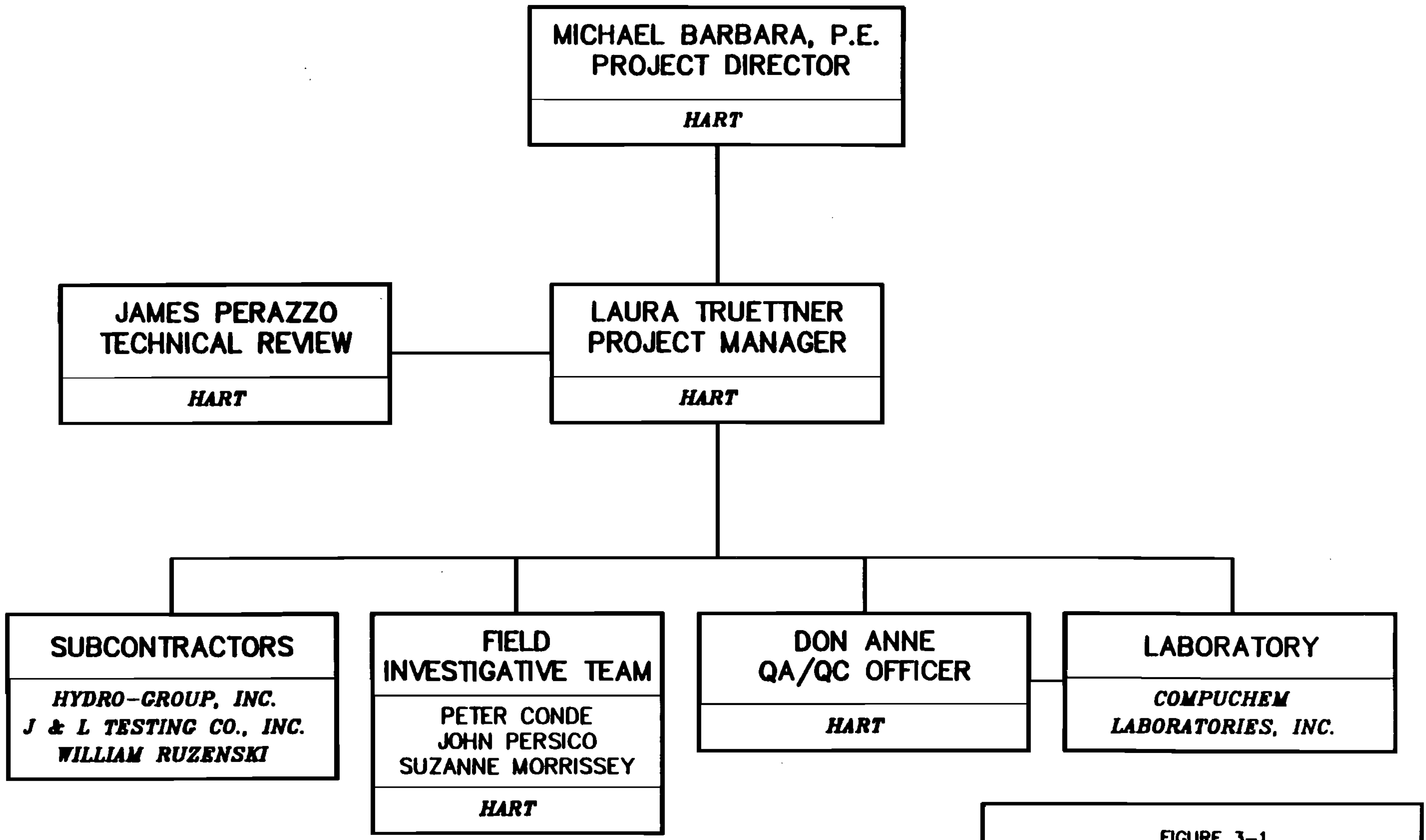


FIGURE 3-1

HART PROJECT ORGANIZATION

HAZELTINE CORPORATION
GREENLAWN, NEW YORK

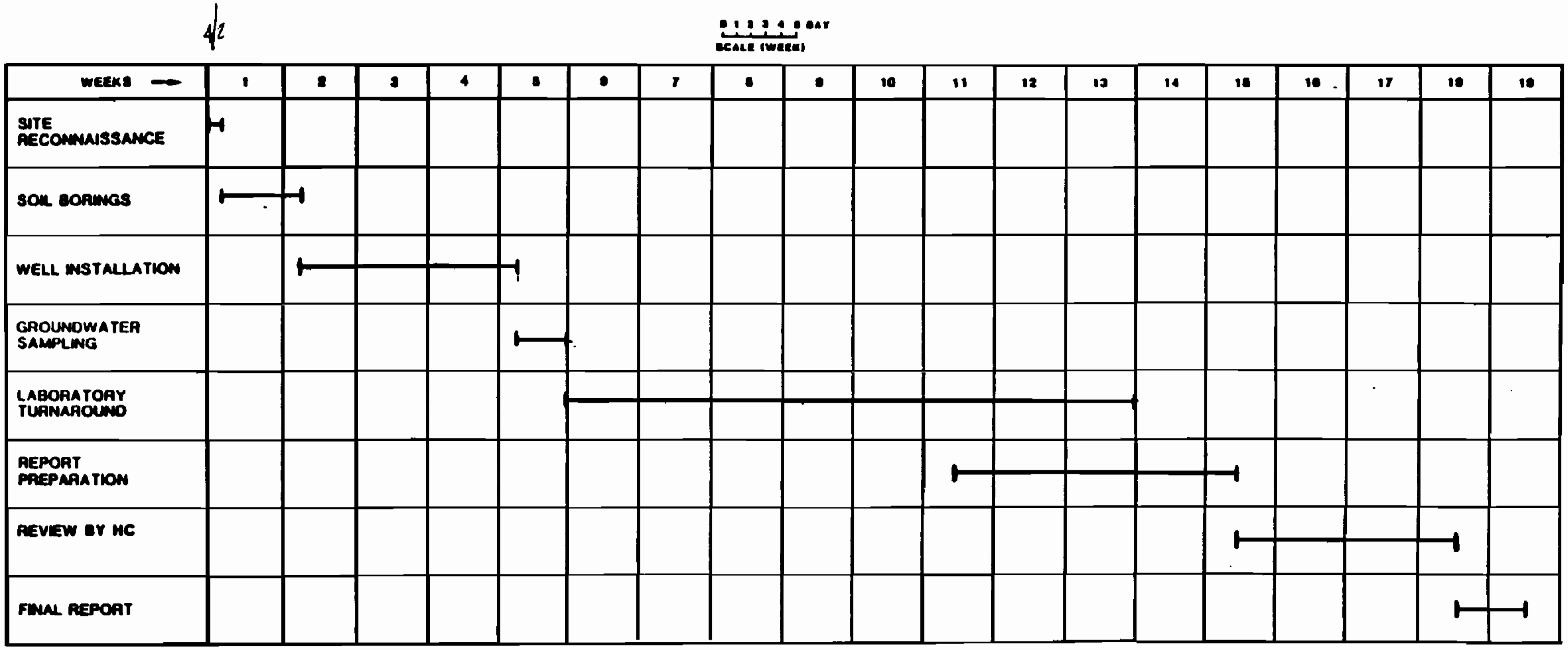
FRED C. HART ASSOCIATES, INC.

4.0 SCHEDULE OF IMPLEMENTATION

The Estimated Schedule of Implementation for the investigative activities at HCP in Greenlawn, NY, is provided in Figure 4-1.

FIGURE 4-1

ESTIMATED SCHEDULE OF IMPLEMENTATION
HYDROGEOLOGICAL INVESTIGATION
HAZELTINE CORPORATION



5.0 HEALTH & SAFETY PLAN
HAZELTINE CORPORATION PREMISES
Greenlawn, New York

Project Manager

Michael Barbara

Michael Barbara, P.E.

Office Safety Director

Lawrence Kaufman

Lawrence Kaufman, Ph.D.

5.0 HEALTH AND SAFETY PLAN

This Health and Safety Program exists to protect field personnel from the hazards encountered during field investigations. It is the result of experience, as well as consideration of all applicable government regulations and guidelines, and consultation with health and safety experts.

This Health and Safety Program is intended to comply with Section 111(c) of CERCLA; EPA's Standard Operating Safety Guides, May 1984; the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities prepared by NIOSH, OSHA, USCG and EPA, October, 1985; the Occupational Health and Safety Act (OSHA) of 1970; 5 U.S.C. 7902(c)(1) and any applicable NYSDEC Health Statutes.

5.1 Safety Considerations For Investigations

This section describes the administrative policies and procedures applicable to this investigation.

Although the degree and type of hazard encountered by field teams varies greatly depending on the type of field work and the detail of the field activity (e.g., preliminary premises inspection or multimedia sampling), certain administrative policies and procedures must be adhered to. These include use of properly trained personnel, specific criteria for field team organization and size, premises characterization to establish hazard level, proper selection, use and maintenance of personal protective equipment, and basic safety procedures.

5.2 Field Investigation Team

The size of an investigation team is determined by the hazard level of the investigation, the level of protection employed, the investigation, objectives, and the premises characteristics and type. The team must be large enough to ensure safety, but not so excessively large as to sacrifice economy.

A minimum of a two-person team will be used at the premises to collect samples. A two-person team is appropriate for field work where extensive personal decontamination is not required and where the likelihood of emergency rescue is minimal. The two-person team is suitable when up to Level C protection is required. At HCP, a determination has been made that Level D will be appropriate for the field personnel. In the event of an emergency, the team member can summon outside assistance. Team responsibilities for the study are identified in the enclosed Premises Safety Plan.

5.3 Selection, Use, and Maintenance of Personal Protective Equipment

Proper selection, use and maintenance of respiratory protective equipment and other personal protective equipment is extremely important in protecting the health and safety of field investigation personnel. An inadequate level of protection may result in unnecessary exposure to toxic chemicals or other hazards. An excessively high level of protection may encumber field personnel unnecessarily and result in decreased efficiency, fatigue, and other hazards. Improper use or maintenance of protective equipment also exposes field personnel to unnecessary risks.

Level D has been selected as appropriate for the premises. This level of protective clothing includes coveralls, steel-toed leather work boots, safety glasses, hard hat and gloves. In the event that it is necessary to upgrade to Level C, tyvek suits, steel-toed rubber boots and a full-face respirator will be required.

5.3.1 Protective Clothing. Protective clothing must be worn by all personnel during field investigations to prevent skin exposure and to minimize spread of contamination. All on-premises operations require protective clothing. Protective clothing may include, but is not limited to, chemical-resistant pants and jackets or coveralls, disposable coveralls, steel toe and shank boots, protective gloves, hard hats, face shields or chemical safety glasses. Once adequate protective clothing is chosen, employees must also note that alertness is a significant safety factor. Since protective clothing is cumbersome, it hastens the on-set of fatigue and heat exhaustion, it can decrease alertness, and it limits stay-time.

The following section describes Level D protective equipment which is appropriate for the HCP.

5.3.1.1 Level D. Level D is the basic work uniform and is used where significant exposure to hazardous materials is unlikely.

Level D protection consists of:

- Coveralls, cotton
- Boots/shoes, safety, with steel toe and shank
- Safety glasses
- Hard hat with optional face-shield
- Gloves

5.3.2 Respiratory Protection. The selection of adequate respiratory protection depends primarily on the type of hazardous substances to be encountered. The use of respiratory protection is not anticipated based on preliminary information. However, the decision to upgrade to respirator use will follow standard HART procedures. Proper respirator use requires formal training and continued maintenance of the equipment, in accordance with the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985. OSHA regulations pertaining to respiratory protection require a training program that encompasses user responsibilities, training for proper use, and respirator maintenance. OSHA also requires qualitative fit testing of face-pieces. Facial hair (beards) and wearing contact lenses is prohibited.

5.3.2.1 Air-Purifying Respirator (APR). The APR, which will be available to team members and may be used at the premises, if necessary, removes contaminants from the atmosphere to some degree and can be used only in atmospheres containing sufficient oxygen to sustain life (in open air this is usually not a problem) and when other criteria, discussed below, are met.

Specific concentration limitations exist for specific devices. The chemical-cartridge respirator provides respiratory protection against certain gases and vapors in concentrations not to exceed those labeled on the cartridge. An APR can only be used in an area where minimal concentrations might occur and where a self-contained breathing apparatus (SCBA) has been determined unnecessary. Many types of cartridges are available and field personnel should select the appropriate one for the contaminants expected.

Air purifying respirators or cartridge respirators are worn when:

- Any unidentified and potentially hazardous odor is detected.

- Hazardous materials in the air are not greater than 10 times the permissible exposure limit (PEL), and have good warning properties.

- The Project Manager judges that respirators are needed as a precaution against generation of low levels of toxic substances in air due to sampling, handling, decontaminating or other operations.

- The capacity of the cartridge will not be exceeded by extended periods of use on-premises. (If used for extended periods, cartridges must be changed.)

Users of air purifying respirators must comply with the following:

- At least 19.5 percent oxygen must be present for respirator use, or unprotected breathing.

- Cartridge respirators do not supply oxygen. They are of no use in oxygen-deficient atmospheres.

- Air purifying respirators provide less protection than SCBAs and supplied air devices.

- Air purifying respirators must be NIOSH-approved.

- Cartridges must also be NIOSH-approved and should be matched to the respirator by the manufacturer.

- Cartridges must not be used past the expiration date.

- Air purifying respirators will provide adequate protection only if they have good face seals. A qualitative fit test is required for each employee using these respirators.

- Upon experiencing any warning property such as difficulty breathing, dizziness, other distress, strong taste, or smell, the user must immediately leave the premises. The Field Team Leader or Premises Safety Officer may require that a user of an air purifying respirator carry an emergency escape air mask.

- Users of air purifying respirators must follow the manufacturer's instructions on the donning and use of the equipment.

- Cartridges must sometimes be replaced as often as each hour of use, or when the user senses or smells the vapor. If the contaminant of interest does not have warning properties, the APR cartridge must not be used.

5.4 Basic Safety Practice

Field personnel will observe basic safety practices. The Health and Safety Director will be responsible for informing all field personnel of these practices. They will include, but not be limited to, the following:

- Observe the buddy system (work in pairs)

- Eating, drinking, and smoking are prohibited on-premises

- Alcohol consumption is prohibited 24 hours prior to and 24 hours after being on the premises.

- Contact lenses cannot be worn with any respirators

- Practice contamination avoidance by avoiding obviously contaminated objects/areas and by not sitting or kneeling on the ground

- Do not climb over drums or obstacles

- Maintain contact with the Premises Safety Officer

5.5 Premises Safety Plan

A written Premises Safety Plan has been prepared for HCP. The purpose of the form is to provide information about the premises being investigated, an evaluation of the hazards present, and the plan is developed to protect the field personnel and to prepare for emergency action. The plan is prepared by the Project Manager and submitted to the Health and Safety Director for review and approval prior to the operation.

A standard form is used for the Premises Safety Plan which has five parts. The first part provides general information, including the name and location of the premises and the objective(s) of the investigation. The second part provides information on the premises and materials characteristics, including a description of the facility and its history. The third part of the form is a hazard evaluation, which assesses the potential hazards to inspection personnel, based on available information. The fourth part of the form is the work plan itself. It establishes the work area, the personal protection (level of protection and equipment) to be used, decontamination procedures, premises entry procedures, the premises entry team members and their responsibilities, and work limitations. The last part of the form provides emergency information, including emergency contacts and resources, and emergency routes to hospitals or other facilities.

The Premises Safety Plan must contain specific information describing the safety precautions and procedures to be used and justification for them. The hazard evaluation is a key part of the form, since the plan must be developed on the basis of the evaluation of known or potential hazards. If hazard information (e.g., possibility of explosive or toxic atmospheres) is not available, the safety plan must include a procedure for obtaining the necessary information or for protecting personnel from unknown but potential hazards.

5.5.1 Reporting Incidents Involving Personal Injury or Exposure to Hazardous Materials. All incidents involving personal injury or exposure to potentially hazardous materials during any field activity must be documented and reported immediately to the Health and Safety Director. A standardized incident report is used for this purpose.

It is important to report all exposures and injuries, even though the incident is not considered serious or no adverse health effects or symptoms are apparent at the time. Often exposure to a toxic agent may have delayed or latent effects which may only be detected by specific diagnostic tests. Documenting an exposure may aid in identifying the cause of symptoms or changes in health status indicators (diagnostic blood tests or pulmonary function, for example) at a later time. Likewise, an injury, such as an eye injury caused by dust particles, may result in delayed damage to the eye.

5.5.2 Premises-Specific Safety Plan. The Premises-Specific Safety Plan for HCP is detailed in Table 5-1. The safety plan provides information on premises/materials characteristics, hazards, work plan, investigation-derived material disposal plan and emergency/contingency information. An emergency route is shown in Figure 5-1.

Level D protection will be adequate during all field activities including the sampling and soil borings activities. Investigation activities will be performed in Level D protection with constant Organic Vapor Analyzer (OVA) Model 128 monitoring to warn against the sudden release of volatile organics into the air. A sudden significant increase in volatile organic emissions may require immediate withdrawal of field personnel and re-evaluation of protection levels. If OVA readings in excess of 50 ppm in the breathing zone are obtained, the OVA will be run in the gas chromatograph (GC) mode to estimate the percentages of methane

TABLE 5-1

FIELD INVESTIGATION TEAM
PREMISES SAFETY PLAN

A. GENERAL INFORMATION

PREMISES: Hazeltine Corporation PROJECT NO.: 01201-00-86001-02

LOCATION: Greenlawn, New York

PREPARED BY: Laura Truettner DATE: June 26, 1989

APPROVED BY: Lawrence Kaufman DATE: June 26, 1989

OBJECTIVE(S): Drill test borings, install groundwater monitoring wells and conduct subsurface soil and groundwater sampling to identify soil and groundwater contamination, if any.

PROPOSED DATE(S) OF INVESTIGATION: 1989

BACKGROUND REVIEW: PRELIMINARY COMPLETE X

DOCUMENTATION/SUMMARY: OVERALL HAZARD: SERIOUS MODERATE LOW X UNKNOWN

B. PREMISES/MATERIAL CHARACTERISTICS

MATERIAL TYPE(S): LIQUID X SOLID X SLUDGE X GAS

CHARACTERISTIC(S): CORROSIVE IGNITABLE RADIOACTIVE VOLATILE X TOXIC X REACTIVE UNKNOWN OTHER (NAME):

FACILITY DESCRIPTION: The facility has been operating as an electronic systems and equipment manufacturer.

TABLE 5-1 (CONTINUED)

PRINCIPAL DISPOSAL METHOD (type and location): Point source discharges subject to Article 17 of the ECL.

STATUS (active, inactive, unknown): Active

HISTORY: Previous soil and water samples collected in 1980 from a surface impoundment at HCP show low levels of metals and volatiles. In 1979, an underground holding tank leaked approximately 2,500 gallons of material into subsurface.

C. HAZARD EVALUATION

Based on the 1980 samples mentioned above, the bottom of the surface impoundment showed the presence of low levels of metals and volatile compounds. Subsurface soil in vicinity of the underground holding tank may show the presence of similar compounds. Therefore, a low potential exists for exposure to soils through ingestion and direct contact during on-premises sampling activities.

D. PREMISES SAFETY WORK PLAN

PERIMETER ESTABLISHMENT: MAP/SKETCH ATTACHED X PREMISES SECURED? Yes

PERIMETER IDENTIFIED Yes ZONE(S) OF CONTAMINATION IDENTIFIED? No

PERSONNEL PROTECTION

LEVEL OF PROTECTION: D. If OVA readings in excess of 50 ppm in the breathing zone are obtained, the OVA will be run in gas chromatographic (GC) mode to estimate percentages of methane and non-methane hydrocarbons. If non-methane hydrocarbons exceed 50 ppm in the breathing

TABLE 5-1 (CONTINUED)

zone at any location, personnel will don air purifying respirators with HEPA/organic vapor cartridges. If non-methane hydrocarbons exceed 200 ppm for 30 minutes or more, work will be temporarily suspended in order to allow the work crew to evaluate the current work practices and personal protection.

SURVEILLANCE EQUIPMENT AND MATERIALS: Organic Vapor Analyzer

DECONTAMINATION PROCEDURES: All sampling equipment will be decontaminated between each use with the following procedure: detergent and water wash, distilled water rinse, acetone or methanol rinse, hexane rinse, air dry. A separate decontamination area on-premises will be established for steam cleaning.

SPECIAL EQUIPMENT, FACILITIES, OR PROCEDURES: None

PREMISES ENTRY PROCEDURES: To be arranged with Hazeltine Corporation.

<u>TEAM MEMBER</u> (Major)	<u>RESPONSIBILITY</u>
Michael Barbara, P.E.	Project Director
James Perazzo	Technical Review
Laura Truettner	Project Manager
Donald Anné	Quality Assurance Officer
Peter Conde	Team Leader
John Persico	Premises Safety Officer

WORK LIMITATIONS (time of day, etc.): Daylight hours

TABLE 5-1 (CONTINUED)

INVESTIGATION-DERIVED MATERIAL DISPOSAL: Decontamination water and drill cuttings will be handled on-premises, or as appropriate.

E. EMERGENCY INFORMATION

LOCAL RESOURCES

AMBULANCE: 516-261-1616 (dispatched by Fire Dept)

HOSPITAL EMERGENCY ROOM: Huntington Hospital 516-351-2000

POISON CONTROL CENTER: Nassau County Medical Center, Uniondale, (516) 542-2323

POLICE: Suffolk County Police 516-351-4400

FIRE DEPARTMENT: Greenlawn Fire Dept. 516-261-1616

AIRPORT: Long Island-MacArthur Airport, Islip, (516) 588-8062

EXPLOSIVES UNIT: 911 (Police Dept)

NYSDEC CONTACT: ______________________________
[TO BE INSERTED BY NYSDEC]

TABLE 5-1 (CONTINUED)

PREMISES RESOURCES

WATER SUPPLY:	HCP
TELEPHONE:	HCP
RADIO:	n/a
OTHER:	n/a

EMERGENCY CONTACTS

POSITION	PERSONNEL	PHONE
CORPORATE SAFETY DIRECTOR	Lawrence Kaufman	(609) 663-0440
PROJECT MANAGER	Laura Truettner	(212) 840-3990
HAZELTINE CONTACT	Anthony Germinario	(516) 261-7000
NYSDEC CONTACT	______________________ [TO BE INSERTED BY NYSDEC]	

F. EMERGENCY ROUTES

(give road or other directions; attach map)

HOSPITAL: West on Cuba Hill Road which becomes Greenlawn Road, straight onto Dunlop Road, right (north) onto Park Ave, across Rt. 25A (E. Main St), hospital is 1/2 mile past E. Main St, on right hand side. Map provided in Figure 5-1.

OTHER:

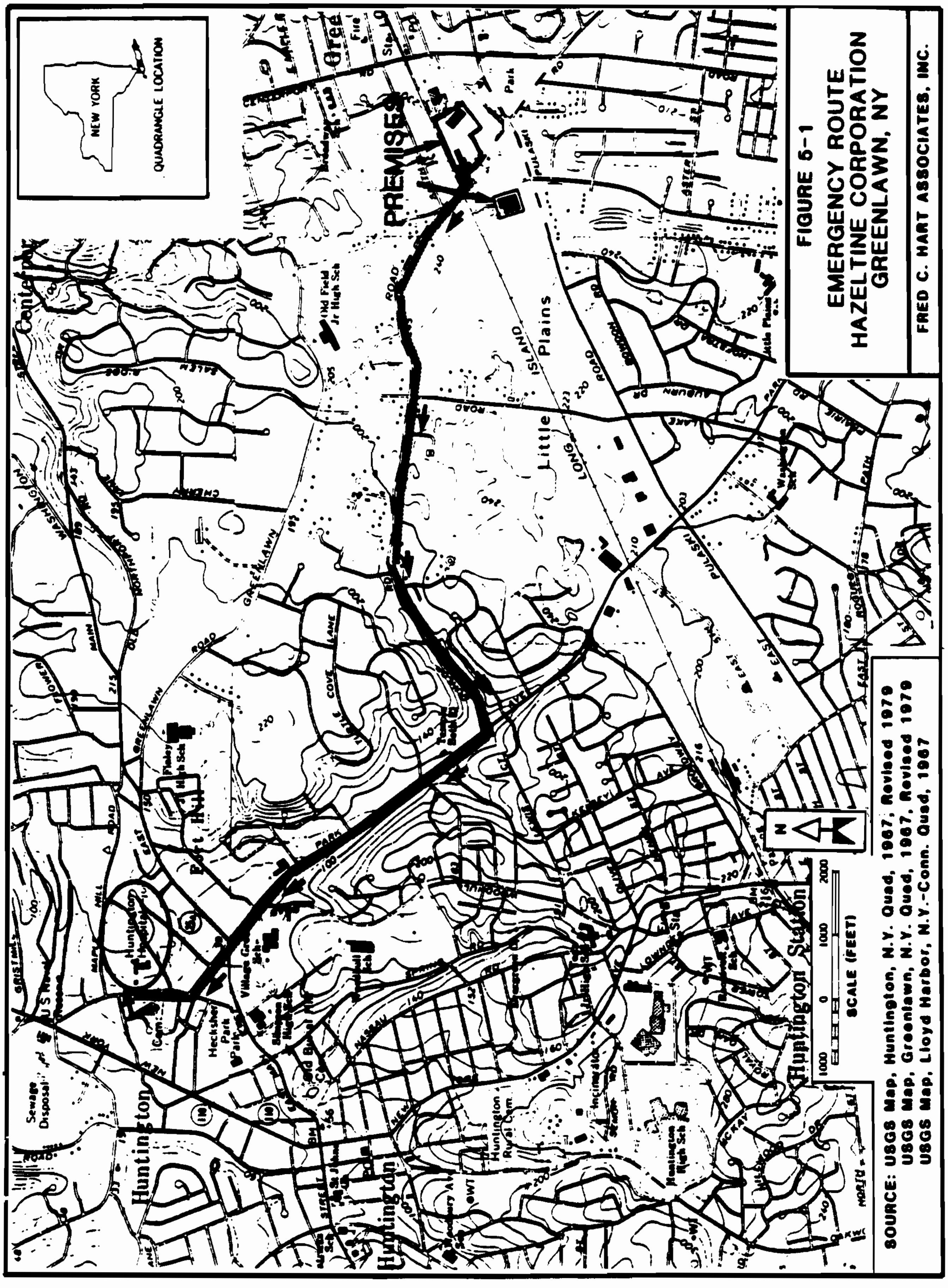


FIGURE 6-1
EMERGENCY ROUTE
HAZELTINE CORPORATION
GREENLAWN, NY

FRED C. HART ASSOCIATES, INC.

SOURCE: USGS Map, Huntington, N.Y. Quad, 1967, Revised 1979
USGS Map, Greenlawn, N.Y. Quad, 1967, Revised 1979
USGS Map, Lloyd Harbor, N.Y.-Conn. Quad, 1967

and non-methane hydrocarbons. If non-methane hydrocarbons exceed 50 ppm in the breathing zone at any location, personnel will don air-purifying respirators with HEPA/ organic vapor cartridges. If non-methane hydrocarbons exceed 200 ppm in the breathing zone for 30 minutes or more, work will be temporarily suspended in order to allow the work crew to evaluate the current work practices and personal protection.

Field investigations and sampling activities can result in the generation of contaminated materials. Proper presampling planning must include a management plan for the disposal of materials encountered during field investigations in order to minimize the impact to the environment and the risk to public health. The potentially contaminated materials that will be generated include decontamination rinse water and drill cuttings. All equipment decontamination will be accomplished on the premises in a clean staging area where decontaminated equipment can be properly stored. Decontamination rinse water and drill cuttings will be handled on the premises or as appropriate.

6.0 CONTINGENCY PLAN

The objective of the contingency plan is to minimize hazards to human health and the environment from fires, explosions or any unplanned releases of hazardous material into the air, soil, or surface water that may occur during the investigation. In the event that a fire, spill or other emergency situation develops, the emergency coordinator will be responsible for coordinating all emergency response measures. This person has the authority to commit all resources necessary to carry out the contingency plan.

6.1 Implementation of Contingency Plan

In case of an emergency situation, the emergency coordinator has full authority to make the decision concerning the implementation of the contingency plan. Depending on the degree of seriousness, the following potential emergencies might call for the implementation of the contingency plan at HCP.

Spills. With the exception of samples to be collected for laboratory analysis, it is not anticipated that large quantities of water will be collected. Therefore, large spills are not likely to occur. Spills of small quantities of material will be allowed to percolate back into the soil on the premises.

Fire. Due to the nature of the materials the likelihood that a fire will occur is low. However, "clean" soils from an adjacent area may be placed with a backhoe or front-end loader over the fire.

Explosions. Due to the nature of the materials it is unlikely that an explosion will occur.

6.2 Emergency Response Procedures

In the event of a nonacute emergency, the procedures listed below will be followed:

1. Any employee discovering or causing a nonacute emergency situation must immediately contact the emergency coordinator.

2. The emergency coordinator in conjunction with the Team Leader will assess the situation and contact the appropriate personnel to respond to the emergency situation.

3. The emergency coordinator in conjunction with the Team Leader will take all necessary measures to contain the hazard and to prevent its spread to the environment and to adjacent homes.

4. Safety measures will be taken to ensure maximum protection of emergency personnel and will include the use of appropriate protection equipment.

5. All nonemergency personnel will be removed from the hazard area until the hazard has been contained and controlled.

6. Following containment and control of the emergency, the emergency coordinator will assess the situation to determine if all contaminated materials generated by the emergency personnel have been collected and disposed of on the premises.

7. The emergency coordinator in conjunction with the Team Leader will ensure that all emergency equipment is restored to full operational status by the emergency personnel.

8. The emergency coordinator in conjunction with the Team Leader will investigate the cause of the emergency and will take steps to prevent the recurrence of such an incident.

9. The emergency coordinator will notify HC, which will notify the NYSDEC.

10. If necessary, the emergency coordinator will submit a written report of the incident to HC, which will submit the report to NYSDEC.

7.0 QUALITY ASSURANCE PROJECT PLAN
HAZELTINE CORPORATION - FIELD INVESTIGATION
GREENLAWN, NEW YORK

Prepared by:

Fred C. Hart Associates, Inc.
530 Fifth Avenue
New York, New York 10036

Project Manager Michael Barbara 6/30/89
Michael Barbara, P.E. Date

Quality Assurance Officer Don Anné 6-30-89
Don Anné Date

PROJECT NAME:	Hazeltine Corporation Greenlawn, New York
PROJECT REQUESTED BY:	New York State Department of Environmental Conservation
DATE OF PROJECT INITIATION:	1989
PROJECT MANAGER:	Laura Truettner
QUALITY ASSURANCE OFFICER:	Don Anné

7.1 Project Description

The involved Hazeltine Corporation (HC) premises (HCP) are located in the southwestern part of Greenlawn, New York. HC manufactures electronic systems and equipment. HCP is approximately 23 acres in size and the surrounding topography is generally flat-lying.

Industrial effluent generated by HC has been discharged at HCP. The point sources are specified in current and past SPDES Permit Nos. NY0075752 and NY0075744. In April of 1979, an underground tank, regulated under the SPDES Permit No. NY0075752 permit, leaked an estimated 2,500 gallons of material. Under the supervision of the State and County, the tank was repaired and modified to prevent further leakage.

The investigative activities include seven shallow borings in the vicinity of the surface impoundment, the underground holding tank, the underground storage tanks and the leaching field. Soil samples will be collected from these borings and analyzed for TCL metals and volatiles. In addition, three deep borings will be drilled and sampled to approximately 170 feet. Upon completion of drilling, three deep monitoring wells will be installed. Water samples will be collected to indicate groundwater contamination, if any, and water level measurements will be taken to determine the direction of groundwater flow.

7.2 Project Organization and Responsibility

7.2.1 Sampling Operations.

7.2.1.1 Subsurface Sampling. The field team leader will make the field decisions regarding drilling operations and sampling procedures. In addition he will be responsible for describing the contents of each split-spoon, maintaining boring logs, and sample collection. He will also assist in sample collection and decontamination procedures.

7.2.1.2 Monitoring Well Installation and Groundwater Sampling. The field team leader will make the field decisions regarding well installation and groundwater sampling procedures. In addition, he will be responsible for overseeing that proper well installation procedures are followed, and that the most effective well development technique is implemented. He will also be responsible for collecting groundwater samples and maintaining proper sampling procedures.

7.2.2 Sampling QC. HART's premises safety officer will be responsible for quality control in the field. His responsibilities will include maintenance of chain-of-custody on all samples collected, verification with sampling team personnel of sampling techniques and quality control procedures before on-premises activities. He will also be responsible for prompt review of any quality control deviation on the premises.

7.2.3 Laboratory Analyses/QC. The Laboratory QC Officer's responsibilities will include sample analyses on soil and groundwater samples. He will also be responsible for quality control procedures and QC checks in the laboratory for this project.

7.2.4 Data Processing Activities/QC. Designated laboratory personnel, under the laboratory QC officer's supervision, will schedule and log the movement of each sample by computer from the time the sampling program begins until the final analytical data are assembled in a report. Test result reports and data management reports, including analytical results, quality control data, the chain-of-custody, the appropriate chromatograms and spectra, and any historical data, will be assembled by computer. All calculations will be given a final check by designated laboratory personnel.

7.2.5 Systems Auditing. HART's quality assurance officer will complete and sign the performance audit and evidence audit checklists as presented in Section 8.9.

7.2.6 Project Manager. HART's project manager is responsible for the overall management of the project, including the progress of field activities, the resolution of field problems and the review of technical findings.

7.2.7 Overall QA/QC. The responsibilities of HART's quality assurance officer will be to review any changes in sampling protocol, deviation in quality control, and corrective action for laboratory analyses.

7.3 QA Objectives for Measurement Data

7.3.1 Precision and Accuracy. The QA targets will meet the specific QA/QC conditions stipulated in the 1987 or the most recent "Statement of Work of the NYSDEC Contract Lab Program."

7.3.2 Data Representativeness. Subsurface sampling locations have been chosen to provide a valid approximation of the types and quantities of materials at HCP. Shallow test borings will be drilled and subsurface samples will be collected in locations next to the surface impoundment, the underground storage and holding tanks and the leaching field. Deep test borings will be located in upgradient and downgradient areas to provide good coverage of the premises and ensure the proper spacing for determination of groundwater flow directions.

7.3.3 Data Comparability. All aqueous sample data will be reported in ug/l (ppb) or mg/l (ppm). All soil samples will be reported in ug/kg (ppb) or mg/kg (ppm).

7.3.4 Data Completeness. Less than 100 percent of the samples may be collected or analyzed. The valid data required from the laboratory will be 90 percent of the projected number of samples to be collected.

7.4 Sampling and Analytical Procedures

7.4.1 Sampling Program. Sampling activities will include collection of subsurface soil and groundwater samples. A summary of the number of samples to be analyzed, the analytical parameters, and the number of QA/QC samples are provided in Table 7-1.

7.4.1.1 Test Borings - Installation. Based upon available background documentation, and after consultation with NYSDEC, seven test boring locations are proposed at HCP. One boring will be placed in the vicinity of the underground holding tank (C tank), two borings will be placed on either side of the surface impoundment, two borings will be placed on either side of the underground storage tanks (E tanks), one boring will be placed adjacent to the leaching field outside of Building 3, which is regulated under SPDES Permit No. NY0075752, and one boring will be placed adjacent to SPDES discharge point 001, regulated under SPDES Permit No. NY0075744 at Building 1.

The depth to the bottom of the tanks is ten feet, and therefore, the borings around the tanks are anticipated to be 20 feet in depth. The leaching ring outside of Building 1 is nine feet in diameter and 15 feet deep; therefore, the boring at this location will be 25 feet deep. The borings will be drilled with a hollow stem auger rig. Each boring will be sampled continuously with a three inch split spoon sampler from the ground surface to 20-25 feet. The split spoon samples will be visually inspected and logged in detail including:

a. soil characteristics (type, thickness, color, etc)
b. material characteristics (odor, texture, material, etc)
c. visual contamination description
d. approximate water content
e. results of OVA and conductivity screenings.

TABLE 7-1

SUMMARY OF SAMPLING PROGRAM
Hazeltine Corporation Premises

Matrix	Number of Samples	Parameters	Replicates	Field Blanks	Trip Blanks *
Subsurface Soils					
Shallow Borings	14	TCL metals	1	1	0
	14	TCL volatiles	1	1	2
Deep Borings	3	TCL metals	0	0	0
	3	TCL volatiles	0	0	1
	6	Grain size analyses	0	0	0
Groundwater	3	TCL total metals	1	1	0
	3	TCL dissolved metals	1	1	0
	3	TCL volatiles	1	1	1

* Trip blanks will be analyzed for TCL volatile organics only.

The contents of each split spoon will initially be screened with a Century Model 128 Organic Vapor Analyzer (OVA) in survey mode for safety. Samples will be obtained from each split spoon with a clean knife and separate samples will be collected for conductivity screenings, headspace analyses, visual observation and potential laboratory use.

During drilling, visual observations, OVA measurements and conductivity screening may suggest that contaminants have migrated deeper than 20 feet. At the discretion of the Field Team Leader, the depth of the test borings may be extended. Soil samples will be collected every two feet and screened as described below.

Upon completion of all the sampling activities, all the borings will be grouted to the surface with a cement-bentonite grout. This procedure will reduce the possibility of introducing surface soil contamination into the subsurface soils and will eliminate vertical migration pathways for surface water.

7.4.1.2 Test Borings - Sampling. In order to select samples from the shallow test borings for laboratory analyses, samples will be screened for conductivity and total volatile organics. A soil slurry will be prepared for conductivity measurements by mixing a portion of soil from each spoon in a 1:1 ratio with distilled water. The conductivity probe will then be inserted into the slurry for conductivity measurements. In addition, soil samples will be screened for total volatile organics by operating the OVA in GC mode. A soil sample from each spoon will be collected in a 40 ml VOA vial and the vials will be heated in a 50° C hot water bath for ten minutes. An aliquot of air from the headspace within the vial will then be withdrawn by syringe for direct injection into the OVA. The screening data, in addition to visual observations of the samples (such as coincidence with a clay layer), will facilitate the selection of two soil samples from each boring for laboratory analyses. If the screening data does not indicate any localized areas in the borings that require sampling, one sample will be collected from the bottom of each boring to confirm that the soil is clean at depth. All soil samples will be stored on ice for preservation until the selection of samples for laboratory analysis is made. The samples will be analyzed for Target Compound List

(TCL) volatiles and metals as listed in the Department of Environmental Conservation Contract Lab Protocol document. The samples will be analyzed by Compuchem Laboratories of Research Triangle Park, NC, which is an approved NYSDEC Laboratory. One duplicate sample, one field blank as well as one trip blank for each shipment of samples will also be collected.

In addition to the seven shallow borings, three deep test borings will be drilled at the location of the monitoring wells. These boreholes will be drilled with a Barber rig and three inch split spoon samples will be collected at ten foot intervals to evaluate the lithologic characteristics of the glacial till. In the event a confining layer is encountered, the layer will not be breached and the well location will be moved. All the split spoon samples will be screened with an OVA and a conductivity meter and logged as described above. One split spoon sample from each deep boring will be collected from the ten foot interval above the water table and analyzed for TCL metals and volatiles. The analyses of the these three deep soil samples will allow for identification of the downward migration, if any, of contaminants. In addition, two representative samples will be obtained from each deep boring for grain size analyses.

It is recognized that NYSDEC may exercise its option to obtain split or duplicate samples during the field activities. At the time of sampling, NYSDEC will notify the Field Team Leader as to the parameters for which the samples will be analyzed. HC may analyze split or duplicate samples for the same parameters selected by NYSDEC.

An attempt will be made to collect one shelby tube sample from one of the deep test borings. However, given the nature of the unconsolidated material at the premises, it may be difficult to retrieve such a sample. For example, the glacial material may be too cobbly and too hard to collect a tube, and if sand is encountered, it is generally difficult to retain it in a shelby tube. If such is the case, permeability data may be derived from blow counts and grain size analyses. Otherwise, permeability data may be collected through a literature search.

In order to prevent any possible cross-contamination between samples, the split spoon samples will be cleaned with soap and water and rinsed in distilled water, followed by an acetone rinse and a final hexane rinse. In addition, the augers will be steam-cleaned between each boring to remove any soil or waste debris from the auger flights.

7.4.1.3 Monitoring Wells - Installation. In order to identify groundwater contamination, if any, at HCP, three deep monitoring wells will be installed. The locations will be chosen to provide spatial coverage of the premises and to provide coverage of upgradient and downgradient locations. MW-2 was located in an upgradient position to provide data on background conditions and/or groundwater entering HCP. MW-3 was located between the surface impoundment and two of the underground tanks to indicate the impacts, if any, that these features may have had on the groundwater. MW-1 was located to provide proper spatial coverage for determining groundwater flow directions and to indicate the impact, if any, that the leaching rings at Building 3 may have had on the groundwater. Based upon available data, it is anticipated that the total depth of the monitoring wells will be 170 feet. In the event that geologic conditions are different from those anticipated, the depth of the wells will be extended ten feet below the water table. Furthermore, if it is deemed appropriate, HCP will consider installing an additional deep monitoring well. All deep boreholes will be drilled with a Barber rig and split-spoon samples will be collected at ten foot intervals to evaluate the lithologic characteristics of the glacial till as described in Section 7.4.1.1.

The monitoring wells will be constructed of 10 foot 4 inch ID, 10 slot screens and approximately 160 feet of threaded 4-inch, schedule 40 PVC riser pipe. All of the well materials will be steam-cleaned prior to installation in the borehole.

Upon completion of the borings, the screen and riser pipe will be introduced into the borehole. The annular space around and below the screen will be backfilled with a suitable grade of sand to a level two feet above the top of the screen. A two foot bentonite seal will be placed on top of the gravel pack. An attempt will be made to tremie the bentonite pellets into the annular space above the gravel pack. However, if the tremie pipe becomes clogged or if the Field Team Leader determines that the technique is jeopardizing the well installation procedure, the bentonite pellets will be poured into the holes and careful measurements will be taken to ensure that a two foot bentonite seal is emplaced around the well above the gravel pack. The remainder of the hole will be backfilled to the surface through a tremie pipe with a bentonite-cement grout. Each well will be fitted with an outer security casing and locking cap to prevent tampering and damage to the well. The outer casing will be constructed of four inch steel and will be set a minimum of approximately two feet above the ground surface.

After allowing a period of 24 hours for the grout to set, the wells will be developed with a submersible pump. The monitoring wells will be developed to create a good hydraulic connection between the well and the aquifer in which it is screened. This connection is important to the collection of reliable groundwater data and representative groundwater samples. Well development is achieved by forcing fine-grained sediments out of the well screen by either removing water from the well or jetting with water or air. The development of each well will continue until the turbidity of the recovered water is 50 Nephelometric Turbidity units (NTUs), or a satisfactory equivalent of that standard. Following development, the wells will be allowed to reach equilibrium before any groundwater samples are collected.

Although background data indicates that the water table is at 160 feet, the possibility exists that there are zones of perched water in the glacial till. In the event that a zone of perched water is encountered in one of the test borings, consideration will be given to the need for the installation of one shallow well at HCP. The location of the well will be determined after evaluating all of the geologic data. The construction specifications for the shallow well will be similar to those for the deep wells. However, depending upon the depth at which the perched zone is encountered, a 5 foot screen may be used in place of a 10 foot screen.

At the completion of all well installation activities, the elevations of the top of each well casing, as well as their horizontal location, will be surveyed. The measurements will be surveyed to the nearest hundredth of a foot relative to a datum established at HCP. Several rounds of water level measurements will also be collected during and after well development and during sampling. The water level elevations will be plotted and used to develop a contour map of the water table and to determine the direction(s) of groundwater flow.

Based on available background information, slug testing may be impractical at HCP. Even under ideal conditions, slug testing results are only good within an order of magnitude and at HCP, the depth to the water table will make accurate slug testing extremely difficult. The length of time required to physically remove a slug of water from 160 feet will make it difficult to take any accurate measurements during the test. Instead of slug testing, an attempt will be made to collect one shelby tube sample from one of the deep test borings. However, given the nature of the unconsolidated material at the premises, it may be difficult to retrieve such a sample. For example, the glacial material may be too cobbly and too hard to collect a tube, and if sand is encountered, it is generally difficult to retain it in a shelby tube. If such is the case, permeability data may be derived from blow counts and grain size analyses. Otherwise, permeability data may be collected through a literature search.

7.4.1.4 Groundwater Sampling. Prior to sampling, the amount of water in each well will be calculated and three to five well volumes of water will be removed from the well. The water will be removed so as to ensure the collection of a representative sample of groundwater. Either a decontaminated stainless steel bailer or a decontaminated stainless steel two inch bladder pump will be used to evacuate the wells. Once the appropriate volume of water has been removed from the well, subsequent bails will be poured directly into the appropriate glassware for laboratory analyses. The sample aliquots for dissolved metals analyses will be field filtered through a Geotech 2.4 liter barrel filter equipped with a 0.45 micron filter. The sample aliquots for total metals analysis will be placed directly into the appropriate glassware. The groundwater samples will be analyzed for TCL volatiles and total and dissolved metals by Compuchem Laboratories of Research Triangle Park, NC. One field blank and one trip blank will also be collected during groundwater sampling. The field blank will be analyzed for volatiles and metals and the trip blank will be analyzed for volatiles. Immediately after collection, all samples will be placed on ice and delivered to the laboratory. All samples will be labeled and appropriate chain of custody procedures will be followed.

7.4.2 Analytical Procedures. A summary of the analytical procedures to be used by the laboratory is provided in Table 7-2.

7.5 Sample Custody Procedures

Sampling team personnel will perform all sampling and will retain custody until shipment to the laboratory. One chain-of-custody form will be used for each sample shuttle shipped to the laboratory. Figure 7-1 provides a sample of the chain-of-custody form.

The field activities will be recorded daily in a serialized field logbook. The following information will be recorded in the logbook used at this premises:

1. Where, exactly, was the sample taken?
2. Who took the sample, and who witnessed it?
3. Date and time of sample collection.
4. Sample number, airbill number, seal number.
5. All sampling conditions, i.e., type of material, weather, type of sampling container and preparation, description of sampling procedure, preservation, and shipping.
6. Field measurements of conductivity and total volatiles.

Compuchem Laboratories will provide the field personnel with sample shuttles containing all sample containers necessary for completing field sampling and QC requirements. Each lot of sample containers will be checked for cleanliness by the laboratory and closed to prevent contamination. Each bottle will be labeled to indicate sample number and the type of analysis to be performed on the sample and packaged to prevent breakage. Field blanks, preservatives, etc. will be added as required by the analytical procedures.

TABLE 7-2

ANALYTICAL PROCEDURES

Parameter	Number of Samples	Sample Matrix	Analytical Method Reference	Sample Preservation	Holding Time	Container
TCL Metals +CN	18	Soil	NYSDEC CLP Protocols	Cool, 4°C	6 months	8 oz glass bottles
TCL Volatiles	18	Soil	NYSDEC CLP Protocols	Cool, 4°C	10 days	2 40 ml vials, Teflon lined septum
TCL Total Metals	6	Water	NYSDEC CLP Protocols	Acidify all samples with HNO_3 to pH 2	6 months*	1 l linear poly-ethylene bottle
	total CN				NaOH	1-liter poly
TCL Dissolved Metals	5	Water	NYSDEC CLP Protocols	Acidify all samples with HNO_3 to pH 2	6 months*	1 l linear poly-ethylene bottle
TCL Volatiles	10	Water	NYSDEC CLP Protocols	Cool, 4°C	7 days	2 40 ml vials, Teflon lined septum

* The holding time for mercury is 30 days
CLP - Contract Laboratory Program
TCL - Target Compound List

FIGURE 7-1

SAMPLE COLLECTION AND CHAIN OF CUSTODY RECORD

Project Name:

Project Number:

Sampler: (Signature)

Field Sample #	Laboratory Sample #	Location	Date	Time (1)	Sample Type						Containers			Remarks
					composite	grab	solid	liquid	gas	multiphase	number	glass	plastic	

Storage Conditions:

Shipping Conditions:

Preservatives:

Time of Validity: (2)

Analyses Required:

Relinquished by: (Signature)	Date	Time (1)	Received by: (Signature)
Relinquished by: (Signature)	Date	Time (1)	Received by: (Signature)
Relinquished by: (Signature)	Date	Time (1)	Received by: (Signature)
Relinquished by: (Signature)	Date	Time (1)	Received for laboratory by: (Signature)
Relinquished by laboratory by: (Signature)	Date	Time (1)	Received by: (Signature)

(1) Use 0100-2400 Clock

(2) For perishable samples

Sheet __ of _

Samples will be received at Compuchem Laboratories by the sample custodian who will examine each sample to ensure that it is the expected sample, inspect the sample containers for possible damage, and ensure that the documentation is complete and adequate. The sample custodians will ensure that each sample has been preserved in the manner required by the particular test to be conducted and stored according to the correct procedure. Preservation and storage will require maintenance of 4°C until analysis begins.

7.6 Calibration Procedures and Frequency

A maintenance, calibration, and operation program will be implemented to ensure that routine calibration and maintenance is performed on all field instruments. The program will be administered by the Quality Assurance Officer and the team members. The Equipment Specialist performs the scheduled monthly and annual calibration and maintenance; and trained team members perform field calibrations, checks, and instrument maintenance prior to use.

Team members are familiar with the field calibration, operation, and maintenance of the equipment, and will perform the prescribed field operating procedures outlined in the Operation and Field Manuals accompanying the respective instruments. They will keep records of all field instrument calibrations and field checks in the field logbooks.

If on-premises monitoring equipment should fail, the Premises Safety Officer will be contacted immediately. He will either provide replacement equipment or have the malfunction repaired immediately.

The Century Systems OVA Model 128 will be calibrated prior to shipment to the job premises. A trained team member will perform daily field checks and instrument maintenance prior to use. The conductivity meter will be calibrated using standard calibration solutions by a trained team member. Maintenance, calibration and equipment operation follow the procedures outlined in the Operation and Field Manuals accompanying the respective instruments.

7.7 Data Reduction, Validation and Reporting

All field data will be entered into bound serialized notebooks. Originals of field notebooks, chain-of-custody forms, field data sheets, and lab reports will be filed and stored at HC, or their designee. These documents are tracked during a periodic inventory on a Document Control Sheet (Figure 7-2) which is submitted as part of the QA/QC report.

7.7.1 Data Reduction and Reporting. Data reduction at the laboratory level has already been discussed in Section 7.2.4, Data Processing Activities/QC. Data reduction will be effected by providing to the Quality Assurance Officer periodically updated summary tables with the headings:

- Collection Date
- Sample Identification Number
- Sample Description
- Lab No
- Analysis Date
- Parameter Concentration

7.7.2 Data Validation. The efficacy of the sampling methods will be checked by comparing the analytical results of samples and their corresponding duplicates, where duplicates have been collected. Large discrepancies in results between samples and their duplicates may also be used, in conjunction with other QA/QC data, to assess the validity of certain aspects of the analytical work itself. Analytical results of the field blanks will be used to determine whether sample cross-contamination could have occurred. Trip blank analyses will indicate whether contamination of samples with VOCs could have occurred during shipment or storage.

The laboratory will critique its own analytical program by the use of spike addition recoveries, the establishment of detection limits for each matrix, precision and accuracy control charts, and keeping accurate records of instrument calibrations. The laboratory establishes average

FIGURE 7-2

DOCUMENT CONTROL SHEET

PROJECT NO.

DOCUMENT CONTROL SHEET
PREMISES:
LOCATION:

Document No.	Title	In Custody of	Dates	Comments
1				
2				
3				
4				
5				
6				
7				

recoveries for surrogates over time, standard deviations, and control and warning limits. When a sample recovery is outside the control limit, the sample analysis is repeated. If upon repetition the sample recovery is outside the control limits, the sample will be deemed unsuitable for the method and no further analysis will be conducted on the sample.

The analytical results will be accompanied by a complete CLP deliverables package in order to allow the consultant to audit the data. Data validation will be the responsibility of the QA/QC officer in conjunction with the laboratory's QA officer. Protocols from the following documents will be used to validate the inorganic and organic data for all matrices:

1. Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analysis, May 28, 1985.

2. Laboratory Data Validation, Functional Guidelines for Evaluating Organics Analysis, April 11, 1985

3. Laboratory Data Validation, Functional Guidelines for Evaluating Pesticides/PCBs Analyses, May 28, 1985 (Supplemented on June 24, 1985).

A QA/QC evaluation of laboratory data and sampling and analytical procedures used for the samples obtained will be completed and submitted to HC in a timely manner.

7.8 Internal Quality Control Checks

Quality control checks on sampling procedures and laboratory analyses will be performed as discussed in Section 7.7.2 and Section 7.9. Quality control procedures set out for the NYSDEC Contract Laboratory Protocol for TCL compounds will be employed. Field replicates, field blanks and trip blanks will be collected as described in Table 7-1 to check the validity of laboratory data. Performance audits will be conducted as discussed in Section 7.9. All data analysis and tabulation will be checked by the

QA/QC Officer. QA checks on data processing will be conducted by designated laboratory personnel.

7.9 Performance and Systems Audits

The HART quality assurance officer will be responsible for auditing the field team. One performance audit will be conducted during the investigation to ensure proper procedures and that subsequent data will be valid.

The audits will focus on the details of the QA program. This audit will evaluate:

- Project Responsibilities
- Sample Custody Procedures
- Document Control
- Sample Identification System
- QC Corrective Action Procedures

The audits will evaluate the implementation of the project QA program. The audit checklist for field procedures is shown in Figure 7-3. This document will serve as the guide for the audit. The document control audit, presented in Figure 7-4, will be performed by designated field personnel. A written summary performance audit will be submitted to as part of the final report.

7.10 Preventive Maintenance Procedures

For preventive maintenance procedures in the field, see Section 7.6 on Calibration Procedures. Maintenance of equipment will follow the procedures outlined in the Operation and Field Manuals accompanying the respective instruments.

FIGURE 7-3

PERFORMANCE AUDIT CHECKLIST

Field Investigation Audit

Project No.: ______________________________ Date: __________________

Project Location: __________________________ Signature: ______________

Team Members: ______________________________

Yes ___ No ___ 1) Has a project coordinator been appointed?
Comments ______________________________
____
____

Yes ___ No ___ 2) Was a project plan prepared?
Comments ______________________________
____
____

Yes ___ No ___ 3) Was a briefing held for project participants?
Comments ______________________________
____
____

Yes ___ No ___ 4) Were additional instructions given to project participants?
Comments ______________________________
____
____

Yes ___ No ___ 5) Is there a written list of sampling locations and descriptions?
Comments ______________________________
____
____

Yes ___ No ___ 6) Is there a list of accountable field documents checked out to the project coordinator?
Comments ______________________________
____
____

FIGURE 7-3 (CONTINUED)

PERFORMANCE AUDIT CHECKLIST

Yes ___ No ___ 7) Is the transfer of field documents from the coordinator to field participants documented in a logbook?
Comments ______________________________
____
____

Yes ___ No ___ 8) Are samples collected as stated in the project plan or as directed by the coordinator?
Comments ______________________________
____
____

Yes ___ No ___ 9) Are samples collected in the type of containers specified in the project plan or as directed by the coordinator?
Comments ______________________________
____
____

Yes ___ No ___ 10) Are samples preserved as specified in the project plan or as directed by the coordinator?
Comments ______________________________
____
____

Yes ___ No ___ 11) Are the number, frequency, and type of samples collected as specified in the project plan or as directed by the coordinator?
Comments ______________________________
____
____

Yes ___ No ___ 12) Are the number, frequency, and type of measurements and observations taken as specified in the project plan or as directed by the coordinator?
Comments ______________________________
____
____

Yes ___ No ___ 13) Are samples identified with sample tags?
Comments ______________________________
____
____

Yes ___ No ___ 14) Are blank and duplicate samples properly identified?
Comments ______________________________
____
____

FIGURE 7-3 (CONTINUED)

PERFORMANCE AUDIT CHECKLIST

Yes ___ No ___ 15) Are sample and serial numbers for samples split with other organizations recorded in a logbook or on a chain-of-custody record?
Comments ______________________________

Yes ___ No ___ 16) Are samples listed on a chain-of-custody record?
Comments ______________________________

Yes ___ No ___ 17) Is chain-of-custody documented and maintained?
Comments ______________________________

Yes ___ No ___ 18) Are quality assurance checks performed as directed?
Comments ______________________________

Yes ___ No ___ 19) Are photographs documented in logbooks as required
Comments ______________________________

Yes ___ No ___ 20) Have any accountable documents been lost?
Comments ______________________________

Yes ___ No ___ 21) Have any accountable documents been voided?
Comments ______________________________

Yes ___ No ___ 22) Have any accountable documents been disposed of?
Comments ______________________________

FIGURE 7-4

EVIDENCE AUDIT CHECKLIST

Document Control Audit

Project No.: ______________________________

Project Location: __________________________ Date: ____________

File Location: ____________________________ Signature: ________

Yes ___ No ___ 1) Have the individual files been assembled (field investigation, laboratory)?

Comments ____________________________________

Yes ___ No ___ 2) Is there a list of accountable field documents?

Comments ____________________________________

Yes ___ No ___ 3) Are all accountable field documents present or accounted for? (Fill out additional checklist.)

Comments ____________________________________

7.11 Specific Routine Procedures to Assess Precision, Accuracy and Completeness of Data

For detailed description of these procedures, refer to Section 7.7.2 of this report. It will be the responsibility of the QA/QC Officer and the laboratory QA/QC officer to ensure that these procedures are followed.

7.12 Corrective Action

Corrective action on a day-to-day basis for field sampling will be handled by consultation between the team members and the Team Leader. The Team Leader will make immediate decisions with the team members on new protocols to be followed. All changes in field sampling procedures will be documented in the field logbook and reported in the final report.

Corrective actions for laboratory analyses will be handled by consultation between the laboratory QA/QC Officer and the selected consultant's QA/QC Officer. The Project Manager will make immediate decisions on new protocols to be followed based on consultation with the QA/QC Officer. All changes in laboratory procedures will be discussed with the QA/QC Officer and will be documented and reported in the final report.

7.13 Quality Assurance Reports

Monthly reports will be issued to Hazeltine Corporation by the Project Manager in consultation with the QA/QC Officer. The reports will include assessment of the status of the project in relation to the agreed upon time table. The reports will also include, as appropriate, the results of the performance audit and document audits, when they are completed, and any necessary corrective action procedures. A data quality assessment will be incorporated into the final report.

A.3 WORK PLAN ADDENDUM

HART

ADDENDUM
to the

Work Plan
Field Investigation
Hazeltine Corporation Premises
Greenlawn, New York

Prepared by:

Fred C. Hart Associates, Inc.
530 Fifth Avenue
New York, NY 10036

October 24, 1989

(2207n-1)

This addendum was prepared to address comments on the Work Plan for the Hazeltine Corporation Premises (HCP) made by the New York State Department of Environmental Conservation in a letter dated July 31, 1989 (Attachment 1). The issues raised in the comment letter were resolved in a conference call on August 30, 1989 and this addendum summarizes the agreed upon changes to the Work Plan.

First Comment: Work Plan, page 6, para. 2. The soil borings will be located as close as reasonably possible to the potential sources at HCP, as indicated on Figure 2-1.

Second Comment: Work Plan, page 6, para. 4. The samples for volatile organic analysis will be collected as soon as the split-spoon samplers are opened.

Third Comment: Work Plan, page 9, para. 4. Soil slurry conductivity measurements will be used to screen the soil samples for changes in inorganic concentrations with depth. This technique is not quantitative and will be used as a screening tool to aid in the selection of soil samples for laboratory analysis.

Fourth Comment: Work Plan, page 11, para. 2. Since, in all likelihood, recharge from the surface impoundment to the water table will cause some mounding, it is likely that groundwater flow directions in the vicinity of the impoundment do not follow the regional flow direction. Accordingly, MW-3 will be moved to a point indicated on Figure 2-1 attached hereto, which is approximately 50 feet west of its previous location. As originally stated on p. 11 in the Work Plan, HCP will consider installing an additional deep monitoring well, if appropriate, once the data from the first three wells has been analyzed. All deep boreholes will be drilled with a mud rotary rig.

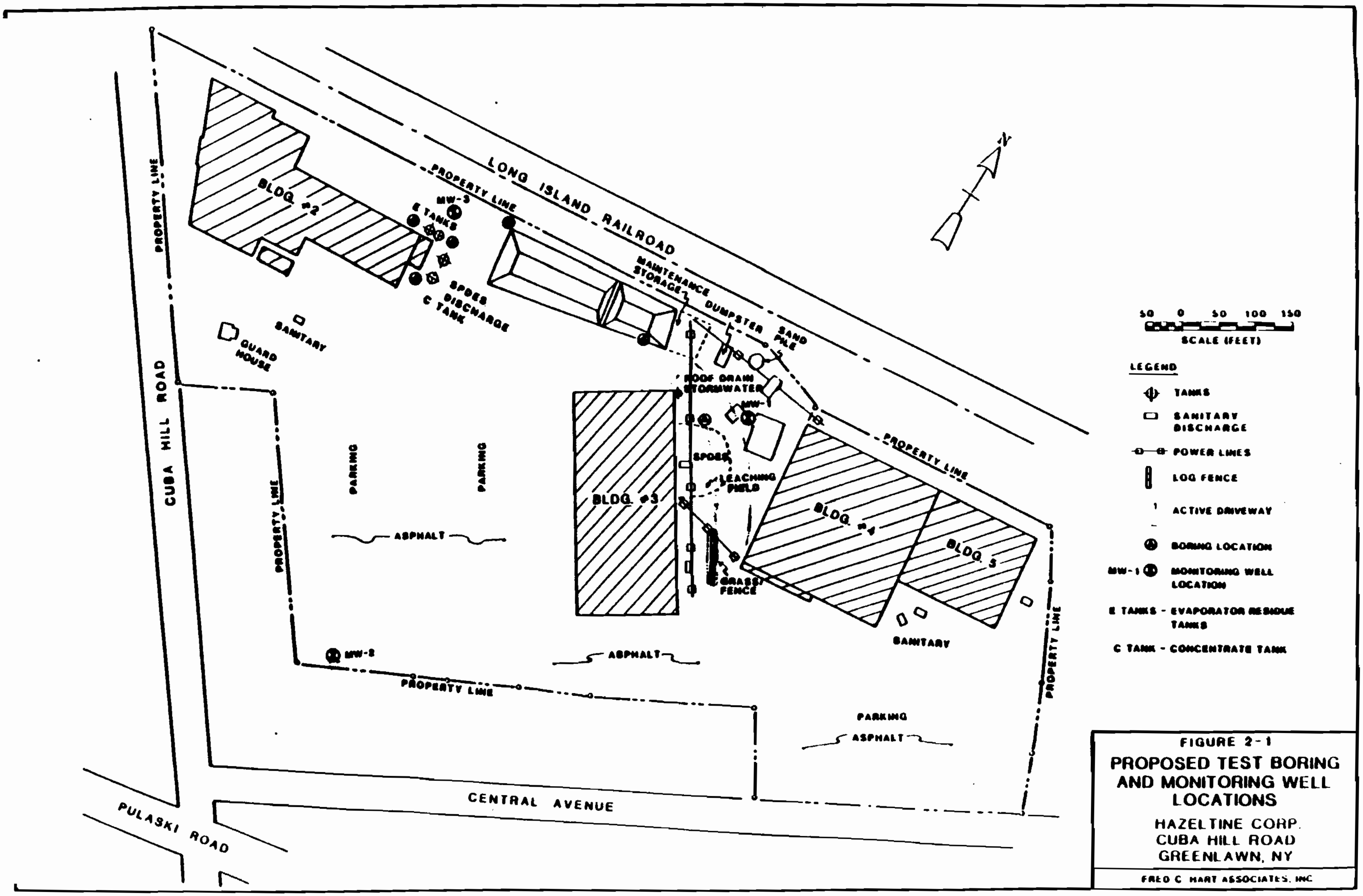


FIGURE 2-1

PROPOSED TEST BORING AND MONITORING WELL LOCATIONS

HAZELTINE CORP.
CUBA HILL ROAD
GREENLAWN, NY

FRED C. HART ASSOCIATES, INC

Fifth Comment: Work Plan, page 11, para. 3. The deep monitoring wells will be constructed with 10 foot screens; the screens will be placed so that approximately four feet of the screen is above the water table.

Sixth Comment: Work Plan, page 11, para. 4 and Figure 2-3. A five foot layer of silica sand (sand pack) will be placed on top of the gravel pack in place of the two foot layer of bentonite pellets originally specified. A revised well construction diagram is shown in Figure 2-3.

Seventh Comment: Work Plan, page 13, para. 1. The outer casings will be set flush with the ground in high traffic areas.

Eighth Comment: Work Plan, page 14, para. 1. Three rounds of water level measurements with climatological observations will be collected. A dry period of not less than four days will precede the collection of water level measurements on at least two of the three occasions. HART will try to collect the measurements during the implementation of the Work Plan. If weather conditions are such that HART cannot collect the measurements, trained Hazeltine Corporation personnel will collect the data.

Ninth Comment: Work Plan, page 14, para. 4. One round of groundwater samples will be collected from HCP. Based upon the results of these samples, HCP will consider the need for additional sampling and testing.

Attachment 1

Comment Letter from
New York State Department of
Environmental Conservation

July 31, 1989

[illegible]

Thomas C. Jorling
Commissioner

July 31, 1989

Mr. Joseph J. Zedrosser
Rivkin, Radler, Dunne & Bay L
EAB Plaza
Uniondale, NY 11556-0111

Re: Hazeltine Corporation - Work Plan, June 30, 1989

Dear Mr. Zedrosser:

The Department has reviewed the above referenced document prepared by Fred C. Hart Associates, Inc. as Hazeltine Corporation's submittal of a plan for the investigation of soil and groundwater contamination. In order to ensure timely implementation of the investigation in accordance with the work schedule (Figure 4-1, Page 21 of the Work Plan), the Work Plan is hereby conditionally approved.

The condition for approval is revision of the plan in accordance with the following comments (specific pages and paragraphs from the document are referenced where appropriate):

<u>Page 6., para. 2</u> - The soil borings must be located as close to sources as possible (1.2 horizontal feet).

<u>Page 6, para. 4</u> - The volatile organic analysis (VOA) samples must be collected as soon as split spoon samplers are opened.

<u>Page 9, para. 4</u> - The purpose of obtaining soil slurry conductivity measurements must be stated, and documentation of historic use of this method and its applicability to this project must be provided to the State in the Work Plan.

<u>Page 11, para. 2</u> - The horizontal and vertical hydraulic gradients in the vicinity of outfall 001 and the C - Tank are likely variable, controlled by recharge of stormwater at the recharge basin. Migration of potential contamination from either out fall 001 or C- Tank could be, for example, west, under the influence of a recharge basin mound, and then eventually north with regional flow. Therefore, at a minimum, a second down-hydraulic gradient well, near outfall 001 and C - Tank is required. The well should be 50-100 feet west of MW-3. Such a well, used with MW-3, will also provide important water level information to evaluate the degree of mounding near the recharge basin.

Page 11, para. 3 - The monitoring wells must be constructed with a minimum of 15 foot screens with 5 feet above the water table to accommodate water table fluctuations noted in this area.

Page 11, para. 4 and Figure 2-3 - A two (2) foot layer of fine silica sand pack must be placed on top of the gravel pack instead of bentonite pellets.

Page 13, para. 1 - The outer casing should be set flush with ground in high traffic areas.

Page 14, para. 1 - A minimum of three rounds of water level measurements with climatological observations is required. On at least two of the three occasions, a dry period (no rain) of not less than four days should precede the readings.

Page 14, para. 4 - A minimum of two rounds of groundwater quality sampling is required. NYS DEC will split on at least one round.

Upon your acceptance of the above condition for approval, you may commence implementation of the Work Plan in accordance with the approved work schedule. Please further confirm your acceptance in writing by August 11, 1989. If the condition for approval is unacceptable, please so notify me as soon as possible.

Upon incorporation of the above comments, please forward two copies of the revised Work Plan to me.

You must provide me with a minimum of five days advance notice of all field work to allow oversight of well drilling, construction and sampling.

If you have any questions, please contact me at (516) 751-7725.

Sincerely yours,

Karen J. Gomez
Assistant Sanitary Engineer

KJG:jbp
cc: Laura Truettner, Hart Assoc.
Anthony Germinario, Hazeltine
J. Maloney, SCDHS
M. Greco, L. Riley, T. Sanford, W. Spitz

Appendix B

FIELD METHODOLOGY

Appendix B

FIELD METHODOLOGY

B.1 Boring Installation and Soil Sampling

Soil samples were collected by R&L Well Drilling at Hazeltine Corporation's Greenlawn, New York facility during May 1 to May 11, 1990 under the supervision of Radian Corporation personnel. The soil borings were advanced with an AMCA International Speedstar Ministar drill rig equipped with 8-inch diameter hollow-stem augers. The borings were continuously sampled using 3-inch diameter split barrel (split spoon) samplers. The drill rig, augers, and split barrel samplers were cleaned between boreholes with a high pressure steam cleaner. The split barrel samplers were washed with a laboratory-grade detergent and were rinsed with potable water followed by distilled water between sampling events. All wash and rinse water was collected for later disposal.

Soil samples were prepared by a Radian geologist in a manner designed to prevent cross-contamination of samples. Sample handlers wore a new pair of PVC or latex gloves to prepare each sample, and used gloves were discarded after use. Each sample was prepared on a fresh piece of aluminum foil which had been laid upon a larger sheet of plastic inside a van. Samples were prepared inside the van to prevent contamination of the samples by blowing dust. The exterior of each soil core was trimmed with a decontaminated stainless steel knife or spatula. Samples were then collected for Target Compound List (TCL) volatile analysis and OVA headspace analysis (including conductivity screening) using a decontaminated stainless steel spoon or spatula. A sample was then collected for analysis of TCL metals and cyanide.

Samples were collected in 250-mL and 500-mL laboratory-cleaned sample jars with Teflon®-lined lids for TCL and cyanide analyses. Headspace samples were collected in either 1-quart mason jars or in laboratory-cleaned 500-mL sample jars and were capped with aluminum foil. All sample containers were then placed in a cooler with ice. Sample utensils were decontaminated with a laboratory-grade detergent and were rinsed with potable water followed by distilled water. Samples were then described and classified by a Radian geologist. The soil boring logs are included in Appendix C. Soil cuttings and decontamination wash water were collected and stored temporarily on site in labeled 55-gallon drums for later disposal.

Upon completion of the borehole and appropriate field screening protocol, a Volclay™/water slurry was pumped into the hole from the bottom of the borehole to the ground surface to reduce the possibility of introducing surface soil contamination into the subsurface soils and to eliminate vertical migration pathways for surface water.

B.2 Monitoring Well Installation/Development and Ground-Water Sampling

Monitoring wells were installed by R&L Well Drilling at the Hazeltine Greenlawn facility during May 1 to May 25, 1990, under the supervision of Radian personnel. The well boreholes were drilled using a Failing 1250 mud rotary drill rig. Soil samples were obtained using a 2-inch split spoon sampler. The soil samples were taken at 10-foot intervals, or more frequently at the discretion of the Radian geologist. The soil samples were field screened and processed in the same manner as the shallow soil boring samples described in Section B.1.

Monitoring wells were constructed of 4-inch ID, flush-joint threaded polyvinyl chloride (PVC) casing and screen. The screens consisted of ten-foot sections of No. 10 slot screen. To the extent possible, screens were placed such that minor water table fluctuations would be monitored within the screened interval. A filter pack was placed from the bottom of the screen up to 1 to 2 feet above the top of the screen. Filter packs consisted of a coarse, clean quartz sand. In lieu of 5 feet of fine sand above the filter pack, 2 to 3 feet of fine sand was added above the filter pack, followed by a minimum of 2 to 3 feet of bentonite pellets (hydrated with potable water). The remaining annulus was sealed from the bottom to the surface with a Volclay™/water slurry.

Two wells, MW-1 and MW-2, were installed below grade with a manhole cover and a locking well cap. Wells MW-3 and MW-3X were completed by placing a locking steel protective casing with a sloped concrete pad to provide drainage away from the well. Well construction details are summarized in Appendix C.

The wells were developed by bailing with a clean, stainless steel submersible pump until water quality parameters of pH and specific conductance stabilized, and the water was free of turbidity based on visual inspection. Well development records are provided in Appendix C. Stabilized ground-water levels were measured before sampling and are presented in Table 4-1. Generally, three or more well volumes were purged before sampling, unless the well was bailed dry. In cases where the wells bailed dry, the wells were sampled after being bailed dry and allowed to recover at least twice.

Well MW-3 did not produce any significant yield, and a second deeper well (MW-3X) was installed adjacent to it. Water withdrawn from well MW-3X during development was turbid, and the bottom 4 feet of MW-3X appeared to contain some drilling mud and/or formation materials that were not successfully removed during development. MW-3X was initially developed on May 25, 1990, and a second attempt to clear out the bottom sediment using a stainless steel hand-bailer was made on May 30, 1990. The well was bailed dry twice by hand.

Ground-water samples were collected using a stainless steel bailer pre-cleaned with Alconox and distilled water, followed by a distilled water rinse, followed by a hexane rinse. An equipment blank was obtained from the bailer (after using this cleaning procedure) by pouring high purity HPLC water into the bailer, then emptying the bailer into a sample container. Before collecting ground-water samples, approximately three well volumes of water were purged from each well (except for MW-3X, which was bailed dry twice) using a steam-cleaned, stainless steel submersible pump. MW-1 and MW-2 were purged and sampled on May 24, 1990, and were sampled 24 hours later, on May 25, 1990 (NYSDEC received split samples). Ground water from MW-3X was bailed dry twice on May 30, 1990, and was sampled on May 31, 1990 (NYSDEC received split samples). Because of the volume of sample needed, it was necessary to wait an additional 24 hours (until June 1, 1990) for MW-3X to recover before continuing sampling; the ground-water samples obtained on June 1, 1990 were analyzed for specific constituents (filtered metals and cyanides) for which NYSDEC did not request split samples.

Water samples were preserved with either nitric acid, hydrochloric acid, or sodium hydroxide (for metals, volatile organic compounds, and cyanide analyses, respectively), and were cooled to 4°C. Ground-water samples to be analyzed for dissolved metals constituents were filtered in the field using a peristaltic pump equipped with a 0.45 micron filter.

B.3 Field Screening Techniques

Soil samples were screened for volatile organics and conductivity to select samples for laboratory analysis. For the volatile organic screening, aluminum foil-sealed sample jars containing the soil samples were placed in a 50°C hot water bath for approximately 15 minutes to allow volatile compounds to collect in the headspace of the jar. The probe of a Century Model 128 Organic Vapor Analyzer (OVA) or a HNu photoionization detector was then placed in each sample jar and the measurements were recorded.

For the soil conductivity screening, a soil slurry was prepared for conductivity measurement by mixing a portion of soil from each sample in a 1:1 ratio with distilled water. New plastic cups and spoons were used to prepare each sample. After stirring the soil slurry, the samples were allowed to sit approximately 5 minutes. A conductivity probe was then inserted in each sample and the conductivity measurements were recorded.

Samples which indicated elevated readings from the screening procedure were flagged for possible laboratory analysis. Sampling depth interval, as well as field screening data, were used as criteria for selecting samples to be submitted for analysis. Field screening data are provided in Appendix C.

B.4 Quality Assurance/Quality Control (QA/QC)

Standard Radian quality assurance/quality control procedures were followed for this sampling program. The quality assurance and quality control of the sampling program was ensured in several ways. All downhole equipment was decontaminated between sampling events to minimize the potential for cross-contamination. Equipment and field blanks were collected to verify that decontamination and shipping procedures were adequate. All samples were preserved according to EPA protocols and were packaged to avoid breakage and cross-contamination. Finally, strict chain-of-custody procedures were followed.

The hollow stem auger and mud rotary drilling rigs, as well as all downhole equipment, were steam-cleaned before drilling at each location. A decontamination area was constructed with plastic sheeting to retain wash waters and residual soils. Drums were used to containerize these wash waters and the plastic sheeting. All cuttings generated during drilling activities were containerized in labeled 55-gallon drums and were retained on site.

All downhole equipment was decontaminated with an Alconox/potable water wash and potable water rinse between sampling horizons to minimize the potential for cross-contamination. To verify the adequacy of the decontamination procedures associated with soil and ground-water sampling, equipment blanks were collected by pouring HPLC water through the decontaminated sampling equipment, and then into sample containers (EB-1 for split spoon; FB for bailer). All QA/QC samples were analyzed for the same parameter or set of parameters for which the corresponding environmental sample was analyzed.

Trip blanks were collected by pouring HPLC water directly into sample vials to investigate if shipping procedures affected the integrity of the samples. The trip blanks were analyzed for TCL volatile organic compounds.

Laboratory blanks were analyzed by measuring the concentration of volatile organic compounds in the reagent water. Laboratory blanks indicate whether any contaminants are introduced into a sample in the laboratory.

All of the samples were preserved according to EPA protocols. Water samples collected for total and dissolved metals analysis were preserved with nitric acid to a pH of less than 2. Water samples collected for cyanide analysis were preserved with sodium hydroxide to a pH of greater than 12. Water samples designated for TCL volatile organic compound analyses were preserved with hydrochloric acid to a pH of less than 2. All ground-water and soil samples were cooled to 4°C.

All sample bottles were wrapped in bubble wrap, placed in sealable plastic bags, and then packed in coolers with ice. Chain-of-custody forms, documenting each sample number, were placed in the coolers with the samples. The coolers were shipped overnight to CompuChem Laboratories, Inc. in Research Triangle Park, North Carolina.

Appendix C

FIELD DATA

BORING WELL # MW-1
PROJECT Hazeltine-Greenlawn
LOCATION Behind Building 1
DATE OF DRILLING 05/07/90
LOG RECORDED BY S. Stinger
GROUND SURFACE EVAL. (ft. MSL) 226.5
TYPE OF WELL RIG Failing 1250, R&L

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0 -	5-6.5' 1125	30%	26/48/31	SP gravelly sand, tan, subrounded, poor sorting, loose, med-coarse gr
10 -	15-16.5 1300	50%	24/69/ 100:2"	SP as above, v. gravelly (no samples - gravelly no recovery due to cobble float settling when mud pump cut off to sample)
20 -				
30 -				
40 -				
50 -	56-57.5 1120	20%	20/27/73	SP coarse-med sand, few gravels <4 mm diam tan-white, mod-sorting, subrounded
60 -	65-66.5 1330	10%	25/33/35	SP coarse-med sand few gravels tan-white w/blk rx fragments, subangular, med. sort (driller notes poss. clay seam @ 67 ~ 1 ft. thick) circulation showed no fluid loss, immed. back into sand
70 -	75-76.5 1450	20%	36/28/50	SP/W med-fine sand - trace gravel, tan-yellow-brown, trace mica coarsing downward, tight
80 -	85-86 1535	5%	30/100 11"	SP/W med-fine sand, tight, brown grey, subrounded, angular rock frags, trace silt, med. sort.
90 -	95-96.5 1750	60%	25/34/44	SP/W as above attempt to drive well point into forma. below to ck. WL WL @ 46
100 -				
110 -	110	-	No sample	SP/SW as above TD = 110
120 -				
130 -				
140				

BORING WELL # MW-2 p. 1 of 2
PROJECT Hazeltine-Greenlawn
LOCATION SW corner by residences
DATE OF DRILLING 04/26-27/90
LOG RECORDED BY S. Stinger
GROUND SURFACE EVAL. (ft. MSL) 226.5
TYPE OF WELL RIG Failing 1250 - mud rotary, R&L

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0			6"/6"/6" 50- refusal	
- 10	0820 10-12	4"	-	GW gravel w/sand grvl up to 4 mm diam. v. poorly sorted, sand med to v. coarse, v. loose, well rounded qtz. grvl. tan/black w/white grains
- 20	0915 20-22	8"	-	GP/W grvl w/sand med sorted grvl ~5 mm 80% med to coarse sand 20% white w/tank/black frags rounded v. loose
- 30	1150 30-32	4"	-	GW gravel w/sand as above, with/inc. sand content ~30% sd rounded v. loose
- 40				no sample - lost hole during attempt
- 50	1710 50-52	4"	22/50/-	GW/P gravel w/little sand, qtz. grvl, subrounded, v. loose, mod. sorting
- 60	1020 60-62	4"	65/65/-	SW/P sand w/some gravel, white sd., subrounded, v. loose, mod sorting. ~65' less gravel - predomin. v. coarse
- 70	1150 70-72	3" 3"	16/100 100/103	70-70.5 SP c. sand, subrounded, v. loose 70.5-71 SW sand w/some grvl., subrounded, v. loose, white
- 80	1330 80-81	5"	103/105	SP c-m. sand, subrounded, v. loose, 2" fine sand stringer @ ~80'
- 90	1415 90-92	3"	33/51/ 105	SP/W m. sand, subrounded, v. loose, mod. sorting
- 100	1600 100-102	6"	63/100/ 46	SP/W as above - cemented, m. dense, tan
- 110	1630 110- 111.5	8"	27/37/42	SP/W as above - cemented slightly, tan
- 120	1700 120- 121.5	7"	42/60/ 110	SP fine to m. sand, subrounded dense, tan, mod. sorting
- 130				
-				

BORING WELL # MW-2 p 2 of 2

PROJECT Hazeltine-Greenlawn

LOCATION SW corner

DATE OF DRILLING 04/30/90

LOG RECORDED BY R. Elliott

GROUND SURFACE EVAL. (ft. MSL) 226.5

TYPE OF WELL RIG Failing 1250 - mud rotary, R&L

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
130	-	Full	31/48/56	SP/W - Fine to v. fine sand, micaceous, lt. brown (tan), has
	1140	(~18")		fines, moderate sorting, subrounded
-	130-			
	131.5			
140		12"	25/29/60	SM - v. silty-fine sand to silt,light grey clay, e.g., silt
	140-			with interbeds of darker grey color, medium stiff, ~2 mm
-	141.5			thick bands of clayey silt throughout
150		14"	11/15/43	CL - silty clay w/coarse silt/f. sand interbeds (~3-4 mm
	150-			thick), interbeds more common in lower 3". Light brown/grey,
				micaceous flakes, silty clay is brittle/slightly dry
	151.5	14"	11/31/43	CL - upper 10" silty clay w/fine sand interbeds; (varves)--
	151.5-			interbeds are 1-2 mm thick, fairly frequent; clay "friable,"
-				dry
	153	14"	24/38/81	CL - upper 3" sandy silt w/v. fine sand and coarse silt;
	153.5-			varves - interlayered clay w/silt sand laminae, 1-2 m thick
				layers gray w/few brown layers - dry, friable
155	155			
-				
				CL - 160-161.5 - fine sand interbeds (~1-3 mm thick) between
160	160-	12"		med. brown clay, slightly moist, stiff clay
	161.5			
-				
165		13"		CL - 165-166.5 - Overall larger % sand than previous spoon,
				slightly moister also. Bottom 4" of spoon fine micaceous
				sand, very moist. Middle 7" is fairly stiff, moist clay
-				w/more c. silt and f. sand varved interbeds; the interbeds
				are thin (1-2 mm) and very freq. (more freq. than previous
				spoon). Upper 2" is same as bottom 4" (f. sand)
170		12"	16/32/61	as above - sl. moist
-				
		14"	11/41/57	as above - drier
175	1358			
	175-			
-	175.6			
		12"	13/44/56	as above
180	180-			TD - 181.5
	181.5			
-				
-				
-				
-				
-				
-				
-				

BORING WELL # MW-3 PROJECT Hazeltine-Greenlawn

LOCATION By recharge basins, behind Bldg. 2 DATE OF DRILLING 05/16/90

LOG RECORDED BY S. Stinger GROUND SURFACE EVAL. (ft. MSL) 227.8

TYPE OF WELL RIG Canterra 350 - Marine Pollution Control - subc to R&L

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				
-				
10				See B-3 log for 0-25'
-				
20				
-	A/25-27 930	20%	6/13/17/24	G-SP - Gravelly sand, tan, dry, loose
30				
-	B/35-37 1010	30%	8/10/10/12	G-SP - Gravelly sand, tan, dry, loose
40				
-	C/45-47 1050	10%	8/11/17/50	SP - Sl. gravelly sand, clayey-silt pocket, tan sand, dark brown cly silt, dry, loose
50				
-	55-57	0%		No sample - retry 2' down
60	D/57-59 1150	80%	6/13/17/41	SP - sl. gravelly sand, med-coarse gr., tan, loose, dry
-	E/65-67 1215	80%	6/20/22/24	SP - sand, med-gr., tan-yellow, dry, loose, few gravels
70				
-	F/75-77 1330	10%	5/11/17/31	SP - sand, med-gr., tan-yellow, dry loose, few gravels
80				
-	G/85-87 1418	60%	4/7/17/41	SP - sand, med-gr. (85-86), fine sandy silt (86-87) tan sand, brown, sandy silt, loose-med-dense, sl. moist
90	H/90-92 1440	60%	7/10/14/24	SM - silt, w/fine sand, trace clay, dark brown, wet @ ~91' dry below, dense, mica flakes throughout
-	I/95-97 1516	60%	4/7/19/30	SM - silt w/fine sand, trace clay brown, moist, mica dense
100	J/100-02 1555	50%	6/11/17/19	SM - sandy silt (fine-gr) w/clay micaceous grey-brown, moist, dense, 1" thick, sand seam @101'
-	K/105-07 1610	50%	8/12/10/22	SM-CL - clayey silt w/fine sand, brown to grey, moist, dense
110				TD - 107'
-				
120				
-				
130				
-				

BORING WELL # MW-3X PROJECT Hazeltine-Greenlawn

LOCATION Rechg basins behind Bldg 2 DATE OF DRILLING 05/22-24/90

LOG RECORDED BY S. Stinger GROUND SURFACE EVAL. (ft. MSL) 227.8

TYPE OF WELL RIG Failing 1250 - R&L

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
80				0-96 - See log for MW-3
-				Driller notes chg @ 82' - color chg to brown in mud also * correlates w/86' chg noted in MW-3 log
-				
-				Clay balls coming up through mud - brown 88-92
-				
90				
-				
-				
-	96-98 1820	20%	10/5/2/ 50:2"	SP - sand, med-coarse-gr., brown-gray, dense
-				
100				
-				
-				Driller notes rig chg - coarser mat'l - stop for spoon
-	106-108 1920	30%	6/12/16/ 80	SM - 5" med-fine sand, tan-brown w/white stringers, 1-2 mm thick, @ 101, 107.5' fine brown sandy silt, trace clay, mica
-				
110				
-				
-	114-116 2030 5/23/90	60%	14/75/ 100/3"	SM silt, some fine sand, trace clay (mica) brown, dense
-				118' driller notes chg in formation-coarser gravel-size frag circulating out being cut w/bit-angular w/sandy clay balls intermixed. circulate for 20 min, set up SS cable breaks w/spoon downhole
-				
120	119-121 1000	90%	39/100/ 100:3"	ML-SM - clay silt and interbedded fine sand, 70% cly silt ~ 30% fine interbedded sand, brown cly silt, clay lens < 5 mm, 4" interbedded whitish-tan and brownish-black fine sand, sand interbeds ~1 mm thick
-				
-				
-				
-				
130	129-131 1900	80%	37/50/76	SM-ML - same as 119'-121' interbedded silt sand and clay 134' - fm chg - coarse sand, w/some clay and gravel, poorly sorted, subangular, clear qtz, Fe-coated, tan/white/orange, dark rx frags
-				
-	5/24/90 135-137 0820	60%	36/61/ 100:2"	CL-SC - sand and clay - orange-brown cly sand med-coarse gr., mod. sorting w/1-2 cm thick gravelly clay (gravels ~/cm size) interbeds, thicker bedding and orange color differs
-				
-				
140				

BORING WELL # MW-3X PROJECT Hazeltine-Greenlawn
LOCATION W of rechg basins, behind Bldg 2 DATE OF DRILLING 05/22-24/90
LOG RECORDED BY S. Stinger GROUND SURFACE EVAL. (ft. MSL) 227.8
TYPE OF WELL RIG Failing 1250

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
150	150-152 1000	30%	55/85/ 100:2"	SP - 150-150.2 grey-brown cly sand, fine-med. gr, with ~1 cm thick gravel pebbles SP - 150.2-151 orange coarse-med. gr. sand, some clay, subrounded, dark minerals, slightly cemented
-				
-				
-				
-				
160	160-161	40%	57/100/ 100:3"	160-160.2 SM - grey-brown silty sand, fine-med. gr. 160.2-160.3 SW - v. coarse sand to gravelly layer - gravels sands (2-5 mm), grey-brown matrix, 160.3-161 SP - orange coarse-med. gr. sand, trace silt/clay, subrounded black staining, Fe lignite
-				
-				
-				
-				
170	170-171	30%	49/90/ 100:3"	Similar to previous two samples: SP - grey-br. silty sand SW - v. coarse sand, gravel (8 mm) SP - orange, coarse-med. sand, w/a distinct band (darker red br) ~2 mm thick
-				
-				
-	176- 177.5	30%	47/60/60	Red/orange, very coarse sand and small gravel (~1-4 mm dia), more small gravel than in previous spoons; no grey/brown sand seen here
-				
180				TD 177.5
-				
-				
-				
-				
190				
-				
-				
-				
-				
200				
-				
-				
-				
-				
210				

BORING WELL # B-1 PROJECT Hazeltine-Greenlawn

LOCATION Behind Bldg. 1 DATE OF DRILLING 05/11/90

LOG RECORDED BY S. Hall GROUND SURFACE EVAL. (ft. MSL)

TYPE OF WELL RIG Speedstar Ministar/Crew Bob & Ben/R&L Well Drilling hollow stem - split spoon (split barrel)

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				Asphalt at surface
	810	100%	3/15/22/	Silty loam w/some sand and gravel, brown
-	1-3		15	Cobbles, 1"-2" dia
	B1-A			Gravelly sand, tan, poorly sorted, v. fine to v. coarse
-				w/gravel, predominantly med. to coarse, angular to
	820	100%	8/20/22/	subangular, principally qtz
-	3-5		35	Gravelly sand to sandy gravel, tan, poorly sorted,
	B1-B			predominantly coarse to v. coarse sand, dark minerals; gravel
-				and cobbles - rounded to subrounded, predominant qtz, some
	835	100%	10/22/26	ignit. mat.
5	5-7		/30	Sandy gravel, tan to white (white possible due to broken qtz
	B1-C			from driving split barrel), numerous cobbles and coarse
-		Not		gravel, poorly sorted
		sampled		Not sampled
-				
-				
-	9-10	0%	89/100	Apparently hit a large cobble
10				TD = 10' BGL
-				
-				
-				
-				
15				
-				
-				
-				
-				
20				
-				
-				
-				
-				
25				
-				
-				

BORING WELL # BX-1 PROJECT Hazeltine-Greenlawn

LOCATION Redrill of Boring B-1 DATE OF DRILLING 05/11/90

LOG RECORDED BY S. Hall GROUND SURFACE EVAL. (ft. MSL)

TYPE OF WELL RIG Speedstar Ministar - Hollow stem auger/R&L Well Drilling/Bob & Normbert

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				Asphalt clay loam soil, brown
- -	BX1-A 1-3 912	100%	8/21/30/ 40	Gravelly sand, brown, poorly sorted, pred. med. grained, ranges fine to cobbles; sand-angular to subangular, qtz w/some dark minerals and mica; gravel to cobbles - rounded to subrounded, qtz w/some igneous and metamorphic rocks, some weathering of iron minerals
- -	BX1-B 3-5 925	100%	5/21/35/ 50	Gravelly sand to sandy gravel, similar to 1-3, CN-salt = 2 ppm in augers
5 -	BX1-C 5-7 940	100%	20/45/33 /36	Sandy gravel to gravel, similar in general to 1-3 but coarser, abundant cobbles 3"-5" dia
-		0%		Hit rock at 7' will drill to 8' and retry
- -	BX1-D 8-10 1012	80%	11/17/16 /19	Gravelly sand, similar to 1-3
10		0%		Hit rock at 10'
- -	BX1-E 11-13 1055	100%	42/9/9/ 11	Sand, medium to v. coarse w/sparse pebbles, tan, med. to poor sorting
- -	13-15 1125	0%	39/50/40 /50	Cuttings indicate sand w/some pebbles and rare cobbles, tan, poor sorting; gravelly sand
15 -	BX1-F 15-17 1150	100%	no count	Gravelly sand, similar to 1-3
- -	BX1-G 17-19 1325	80%	10/16/16 /32	Sand w/interlayered gravel, tan, sand similar to 11-13
-		0%		No recovery - couldn't drive split spoon
20 -	BX1-H 20-22 1355	50%	17/21/10 /9	Gravelly sand, similar to 1-3, tan
- -	BX1-I 22-24 1410	100%	8/34/9/ 12	Gravelly sand to sandy gravel, similar to 1-3, tan
- 25	BX1-J 24-26 1425	100%	27/21/20 /20	Sand, tan, similar to 11-13
-				TD = 26' BGL
-				

BORING WELL # B-2 PROJECT Hazeltine-Greenlawn

LOCATION By Bldg. 3 and the impoundment DATE OF DRILLING 05/03/90

LOG RECORDED BY S. Hall GROUND SURFACE EVAL. (ft. MSL)

TYPE OF WELL RIG Speedstar Ministar/R&L Well Drilling/Bob & Phil

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0 - -	B2-A 1-3 825	100%	16/22/21 /29	Asphalt Gravelly loam w/some asphalt, dark brown to black Gravelly sand, w/some cobbles, tan, fine to med. sand predominant, qtz. of same dark minerals, subangular to angular, cobbles are rounded, OVA = 16 ppm
- -	B2-B 3-5 845	100%	12/22/35 /40	Gravelly sand, similar to 1'-3'; 1" clayey sand layer above heavy cobble-gravel layer at 4.5'
5 -	B2-C 5-6.5 920	100%	23/33/50 /29	Gravelly sand to sandy gravel, tan, poorly sorted, fine to cobbles, predominantly coarse to v. coarse and gravel; rock prevented recovery of 6.5-7.0
- -	B2-D 7-9 1010	0%	9/25/28/ 49	Gravelly sand to sandy gravel, similar to 5-6.5
- 10	B2-E 9-11 1045	30%	15/38/67 /60	Gravelly sand to sandy gravel - moist similar to 5-6.5
- -	B2-F 11-13 1105	100%	10/13/15 /26	Gravelly sand to sandy gravel- moist similar to 5-6.5
- -	13-15 1120	0%	19/30/40 /72	No recovery - cutting indicate similar to above
15 -	B2-G 15-17 1135	100%	8/10/13/ 16	Gravelly-sand to sandy gravel similar to 5-6.5'
- -	B2-H 17-19 1155	100%	12/29/32 /25	Gravelly sand to sandy gravel similar to 5-6.5'
- 20	B2-I 19-21 1205	100%	13/18/15 /19	Ditto
- -	21-23	0%	22/40/55	No recovery, hit rock; positive reading (2 mg/m^3) of CN- salts on auger during spoon sampling
- -	23-25	0%	27/48/31 /30	No recovery, hit rock
25 - -	B2-J 25-27 1700	100%	8/25/20/ 24	Gravelly sand, tan, poorly sorted, v. fine to cobbles TD = 27' BGL

BORING WELL # B-3

PROJECT Hazeltine-Greenlawn

LOCATION

DATE OF DRILLING 05/04/90

LOG RECORDED BY S. Hall

GROUND SURFACE EVAL. (ft. MSL)

TYPE OF WELL RIG Speedstar Ministar/R&L Well Drilling/Bob & Ritchie

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0 - -	B3-A 1-3 1350	100%	16/22/21 /29	Sandy clayey silt (loam soil), brown to tan (moist) 1 1/4' Gravelly sand, brown to tan, poorly sorted predominantly med. to coarse grained, ranges fine to small cobbles, qtz w/some dark minerals, occasional meta or igneous pebbles
- -	B3-B 3-5 1410	100%	12/22/35 /40	Gravelly sand grading to sandy gravel, brown to tan, poorly sorted, fine to small cobbles
5 -	B3-C 5-7 1420	100%	23/33/50 /29	Sandy gravel, tan, poorly sorted, fine to cobbles, sand-angular to subangular, pebbles and cobbles - rounded to subrounded, qtz. w/some dark minerals, some meta pebbles are highly weathered, moist
- -	7-9 1440	0%	9/25/28/ 29	Split spoon got caught on something and bent, sample lost
- 10	B3-D 9-11 1455	100%	15/38/67 /60	Sandy gravel, similar to 5-7
- -	B3-E 11-13 1510	100%	10/13/15 /26	Sandy gravel, similar to 5-7
- -	B3-F 13-15 1530	100%	19/30/40 /72	Sandy gravel to gravelly sand, similar to 5-7
15 -	B3-G 15-17 1550	100%	8/10/13/ 16	Sandy gravel to gravelly sand, similar to 5-7
- -	B3-H 17-19 1600	100%	12/29/32 /25	Sandy gravel to gravelly sand, similar to 5-7
- 20	19-21 1620	0%	13/18/15 /19	No recovery, hit rock
- -	21-23 1630	0%	22/40/55	No recovery, hit rock
- -	B3-I 23-25 1640	100%	27/48/31 /30	Sandy gravel to gravelly sand, similar to 5-7
25 - -				TD = 25' BGL

BORING WELL # B-4 PROJECT Hazeltine-Greenlawn

LOCATION DATE OF DRILLING 05/07/90

LOG RECORDED BY S. Hall GROUND SURFACE EVAL. (ft. MSL)

TYPE OF WELL RIG Speedstar Ministar/R&L Well Drilling/Bob & Ritchie

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				Asphalt
- -	B4-A 1-3 920	100%	8/5/2/5	Gravelly sand, tan, poorly sorted, fine to cobbles, coarse dominant, sand-angular to subangular, pebbles and cobbles - rounded to subrounded, qtz. w/some dark minerals, some pebbles and cobbles are igneous or meta, most are qtz., moist below 2.5'
- -	3-5 935	0%	3/3/3/5	Gravelly sand, similar to 1-3'
5 -	B4-B 5-7 950	100%	4/4/6/9	5 1/4: Clayey silt, tan to brown, mod. strength, crumbles, dry 6 1/4: Gravelly sand, similar to 1-3'
- -	B4-C 7-9 1010	100%	7/7/7/7	Gravelly sand, similar to 1-3', dry
- 10	B4-D 9-11 1030	100%	6/10/11/14	Gravelly sand, similar to 1-3', dry, CN-salt = 1 to 1.5 ppm in augers
- -	B4-E 11-13 1040	100%	5/10/14/12	Gravelly sand to sandy gravel, general description similar to 1-3' but coarser, dry
- -	B4-F 13-15 1055	100%	6/10/11/18	Gravelly sand to sandy gravel, similar to 11-13'
15 -	B4-G 15-17 1103	100%	6/10/12/20	Sand, tan, medium to fine, mod. sorting, angular to subangular, qtz. with some dark minerals
- -	B4-H 17-19 1125	100%	4/12/19/18	Gravelly sand to sandy gravel, similar to 11-13'
- 20	B4-I 19-21 1137	100%	11/17/20/18	Gravelly sand, similar to 1-3'
- -	B4-J 21-23 1147	100%	8/10/12/14	Gravelly sand to sandy gravel, similar to 11-13'
- -	B4-K 23-25 1210	100%	18/17/17/17	Gravel sand to sandy gravel, similar to 11-13'
				TD = 25' BGL
25 - -				

BORING WELL # B-5

PROJECT Hazeltine-Greenlawn

LOCATION Near UST C (C of C&E)

DATE OF DRILLING 05/08/90

LOG RECORDED BY S. Hall

GROUND SURFACE EVAL. (ft. MSL)

TYPE OF WELL RIG Speedstar Ministar/R&L Well Drilling/Bob & Ritchie

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				
- -	B5-A 1-3 840	100%	4/11/12/ 20	Silt, brown, mod strength, crumbly, dry Sandy silt, brown, moist 2.5 Gravel layer - 2-3" thick Gravelly sand, brown, pred. medium grained, moist
- -	B5-B 3-5 850	100%	4/11/16/ 22	Gravelly sand to sandy gravel; brown to tan; fine to cobble size; pred. medium to v. coarse; sand - qtz w/some dark minerals, angular to subangular; pebbles and cobbles - qtz w/some igneous and metamorphic, rounded to subrounded
5 -	B5-C 5-7 950	100%	11/14/16 /25	Sandy gravel to gravel, brown to tan, poorly sorted, fine to cobble, sand - pred. coarse to v. coarse
- -	B5-D 7-9 920	100%	6/10/15/ 19	Gravelly sand to sandy gravel, similar to 3-5'
- 10	B5-E 9-11 935	100%	9/11/12/ 12	Gravelly sand to sandy gravel, similar to 3-5'
- -	B5-F 11-13 955	100%	10/7/12/ 13	Gravelly sand to sandy gravel, similar to 3-5', CN-salt = 1 ppm in augers
- -	B5-G 13-15 1030	100%	3/6/11/ 13	Gravelly sand, otherwise similar to 3-5', CN-salt = 2 ppm in augers
15 -	B5-H 15-17 1100	100%	5/9/14/ 15	Gravelly sand to sandy gravel, similar to 3-5', CN-salt = 3 ppm in augers
- -	B5-I 17-19 1130	100%	10/15/17 /15	<u>SP</u> - Coarse sand, some cobbles, tan, dry, v. loose
- 20	B5-J 19-21 1430	100%	17/20/20 /30	<u>SP</u> - Coarse sand, some cobbles, as above
- -	21-23 1440	0%	No count	No recovery
- -	B5-K 23-25 1445	100%	No count	<u>SP</u> - Coarse sand, w/cobbles, as above dry
25				TD = 25' BGL
- -				

BORING WELL # B-6 PROJECT Hazeltine-Greenlawn

LOCATION By A Tank (Condensed) DATE OF DRILLING 05/08/90

LOG RECORDED BY S. Hall GROUND SURFACE EVAL. (ft. MSL) __________

TYPE OF WELL RIG Speedstar Ministar, Hollow-Stem/R&L Well Drilling/Bob & Ritchie

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				Concrete, OVA = 40 ppm while drilling through concrete
	B6-A	100%	15/20/20	Clayey silt, brown, mod. stiff, dry, crumbly
-	1-3		/17	Gravel layer, gravel to cobble size w/sandy clay silt matrix
	850			Gravelly sand, brown, poorly sorted, fine to cobbles
-				
-	B6-B	100%	10/15/15	Sand to gravelly sand, poorly sorted, sand pred. med. to
	3-5		/25	coarse grained, qtz w/some dark minerals; angular to
-	910			subangular; gravel - up to cobble size, qtz w/some meta and
				igneous fragments, some weathering, rounded to subrounded
5	B6-C	100%	11/12/16	Sandy gravel to gravel, poorly sorted, subrounded to rounded
	5-7		/21	
-	940			
-	B6-D	100%	6/16/13/	Sand and clayey silt interlayered, brown to tank, sand - mod.
	7-9		12	grained, mod. sorting; silt - approx. thickness 6-8"
-	1010			Sandy gravel to gravelly sand, similar to 3-5', CN-salt =
				3 ppm on cuttings, OVA = 20 ppm
-	B6-E	100%	4/9/9/10	Sandy gravel to gravelly sand, similar to 3-7' w/1" clayey
	9-11			sand layer at 10.5 BGL, OVA = 15 ppm
10	1040			
-	B6-F	100%	3/8/9/10	Sandy gravel to gravelly sand, similar to 3-7', OVA = 15 ppm
	11-13			
-	1205			
-	B6-G	100%	4/6/10/	Sandy gravel to gravelly sand, similar to 3-7', OVA = 20 ppm
	13-15		10	
-	1410			
15	B6-H	100%	3/5/10/	Gravelly sand, similar to 3-5', OVA = 20 ppm
	15-17		12	
-	1425			
-	B6-I	100%	7/9/9/12	Gravelly sand, similar to 3-5', OVA = 5 ppm
	17-19			
-	1445			
-	B6-J	80%	5/14/12/	Gravelly sand, med. coarse-gr. sand, brown-tan, subangular,
	19-21		12	large cobbles, 3 cm v. rounded, lg quartzite cobble @ top
20	1515			(19') ~8 cm, Fe-stains @ 21' - coating on sand grains
-	21-23	0%	14/10/15	Hit cobble @ 21' drill down and retry, @ 22' keep butting
			/16	rocks - drill down to 23' and retry
-				
-	B6-K	100%	6/8/6/15	Gravelly sand med. coarse, sand
	23-25			
-	1645			
25				TD = 25' BGL
-				
-				

BORING WELL # B-7 PROJECT Hazeltine-Greenlawn

LOCATION Drum Storage Pad Corner - Bldg. 2 DATE OF DRILLING 05/14/90

LOG RECORDED BY S. Hall GROUND SURFACE EVAL. (ft. MSL)

TYPE OF WELL RIG Speedstar Ministar, Hollow-Stem/R&L Well Drilling/Bob & Norbert

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				
- -	1-3 1012	0%	12/24/40 /34	Asphalt
- -	B7-A 3-5 1020	80%	5/12/13/ 24	Gravelly sand, poorly sorted, sand med-coarse gr. - qtz w/rock frags subangular, gravel to 2 cm, rounded, dry, tan
5 -	B7-B 5-7 1035	100%	7/15/15/ 21	Gravelly sand as above - cobbles smaller, generally less gravel by 6.5', tan, dry
- -	7-9 1040	0%	20/40/50 /-	As above
- 10	9-11	0%	10/17/28 /40	Gravelly sand, light tan color, med-gr., little % cobbley/gravelly, dry
- -	B7-C 11-13 1100	100%	7/7/9/14	Gravelly sand, light tan, moist, med-coarse-gr., subangular, sm. oily stain @ 10.5', Fe(orange)-staining
- -	B7-D 13-15 1120	100%	5/8/14/ 20	As above
15 -	B7-E 15-17 1135	100%	19/18/16 /18	As above
- -	B7-F 17-19 1142	100%	8/10/12/ 16	As above
- 20	B7-G 19-21 1150	100%	9/14/8/8	As above
- -	B7-H 21-23 1158	100%	6/9/13/ 12	Sand, few gravels, light tan, mod. sorting, subrounded, dry, med-coarse-gr.
- -	B7-I 23-25 1210	100%	9/9/9/19	Sand - fine-med gr. @ 24', as above 23-24', trace gravels, light tan, well sorted @ base, dry
25 - -				TD = 25' BGL

BORING WELL # B-8 PROJECT Hazeltine-Greenlawn

LOCATION West side Hazeltine - by Bldg. 1 DATE OF DRILLING 05/01/90

LOG RECORDED BY S. Hall GROUND SURFACE EVAL. (ft. MSL) ____

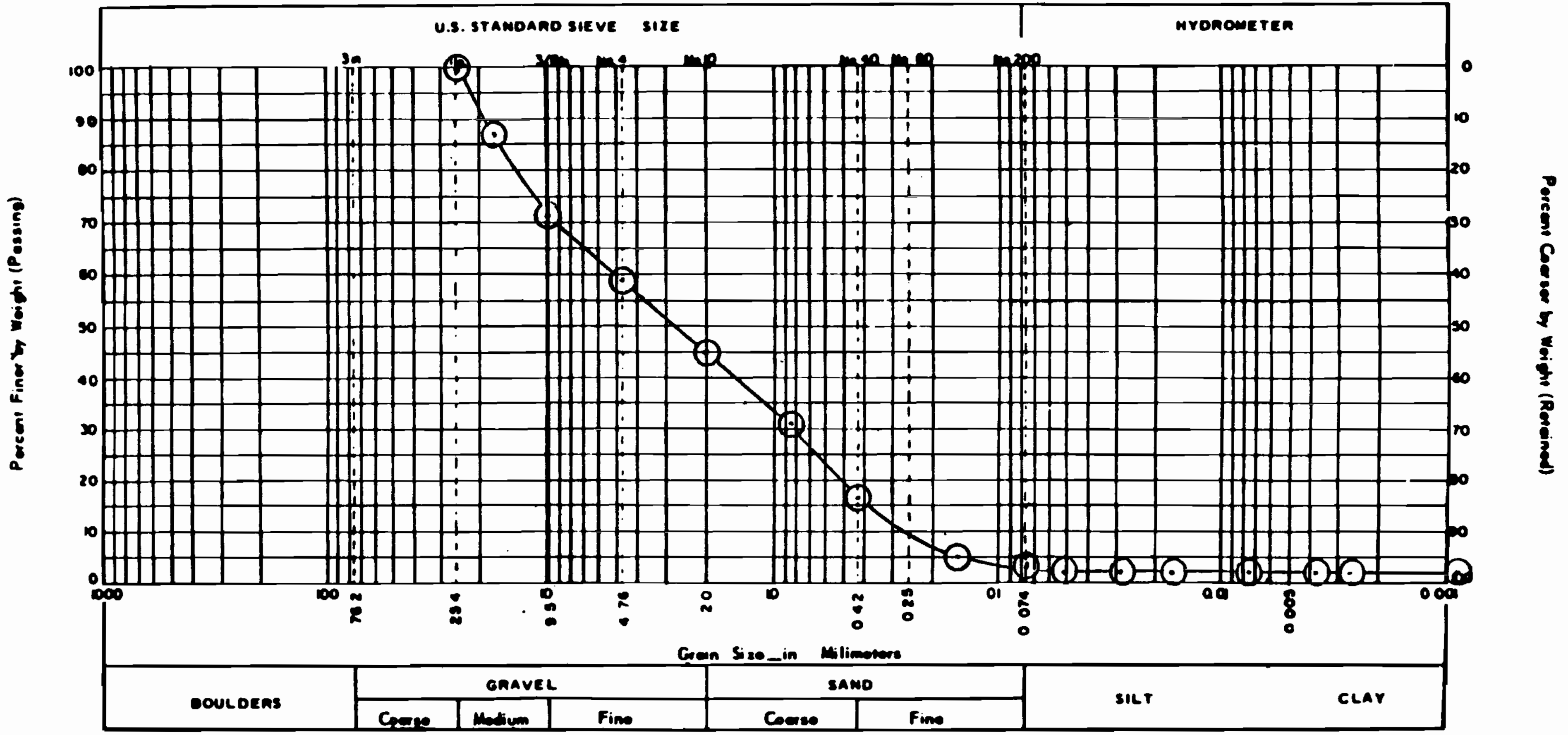
TYPE OF WELL RIG Speedstar Ministar, AMCA Int'l./R&L Well Drilling/Bob & Tim
Hollow Stem Auger, 3" split spoon

Depth	Sample Time/ Depth	Sample Recovery	Blow Counts	Description
0				Sandy clayey silt (loam), brown, rooting, trace gravel (soil)
- -	B8-A 1-3 800	100%	3/10/17/ 21	2' - Gravelly sand, w/cobbles, poorly sorted, predominant coarse, some med.-fine, abundant gravel, tan, qtz, some feldspar, cobbles 3.5" dia, granitic
- -	B8-B 3-5 817	100%	2/5/15/ 15	Sand, tan, mod. sorting, coarse pred. w/some med., trace gravel, subangular, qtz, minor ferro-magnesium minerals
5 -	B8-C 5-7 835	100%	3/8/10/ 11	Sand w/some coarse gravel and small cobbles (1" dia. cobbles), coarse w/range fine to v. coarse, poorly sorted, tan
- -	B8-D 7-9 847	100%	6/9/11/ 15	Gravelly sand, similar to 5-7' but slightly coarser
- 10	B8-E 9-11 858	100%	5/10/13/ 13	Gravelly sand, poorly sorted, fine to cobbles, predominantly med-coarse sand, subangular, qtz, minor dark minerals
- -	B8-F 11-13 935	100%	5/10/13/ 15	Gravelly sand, similar to 9-11'
- -	B8-G 13-15 945	100%	7/12/9/ 12	Interbedded sand and sandy gravel; sand (13.7-14.5') med. grained, well sorted; sandy gravel elsewhere; poorly sorted, fine grained sand to cobbles (1.5" dia.), subangular
15 -	B8-H 15-17 955	75%	18/15/15 /13	Sandy gravel, abundant gravel and cobbles (1-3" dia.), tan, qtz dominant, some granitic or gneissic cobbles, sand is subangular, cobbles are subrounded to rounded, poorly sorted, sand: fine to v. coarse, some weathered hematite
- -	B8-I 17-19 1008	100%	8/10/12/ 11	Sandy gravel, similar to 15-17'
- 20	B8-J 19-21 1022	0%	18/23/21 /23	No recovery - possibly hit a large rock
- -	B8-K 21-23 1035	100%	12/28/23 /15	Sandy gravel similar to 15-17', large granitic cobble at top (3" dia.), sides broken by split spoon
- -	B8-L 23-25 1150	100%	19/15/25 /29	Sandy gravel, similar to 15-17'
25				TD = 25' BGL
- -				

C.1 BORING LOGS, GRAIN SIZE ANALYSES, AND GEOPHYSICAL LOGS

PROJECT:		LOCATION:	
HAZELTINE GREENLAWN		N/A	
BORING NO.	SAMPLE NO.	DEPTH:	CONTRACT NO.
MW-1	A	15-16.5	90240

MECHANICAL ANALYSIS (A.A.S.H.O. DESIGNATIONS M. 146-60 & T.88-57)



SAMPLE NO.	MOISTURE CONTENT	L.L.	P.L.	P.I.	CLASSIFICATION M.S.H.A.	CLASSIFICATION U.S.C.	REMARKS
901386	11.1					GP	USDA: SAND
						CU=13.1	
						CC=0.33	

HARDIN - KIGHT ASSOCIATES, INC.
Consulting Engineers

MATERIALS TESTING,
SOILS AND FOUNDATIONS DIVISION

TESTED BY: JGP

DATE: 7/90

CHECKED BY:

SHEET NO. ______ OF ______

PROJECT: HAZELTINE GREENLAWN

LOCATION: N/A

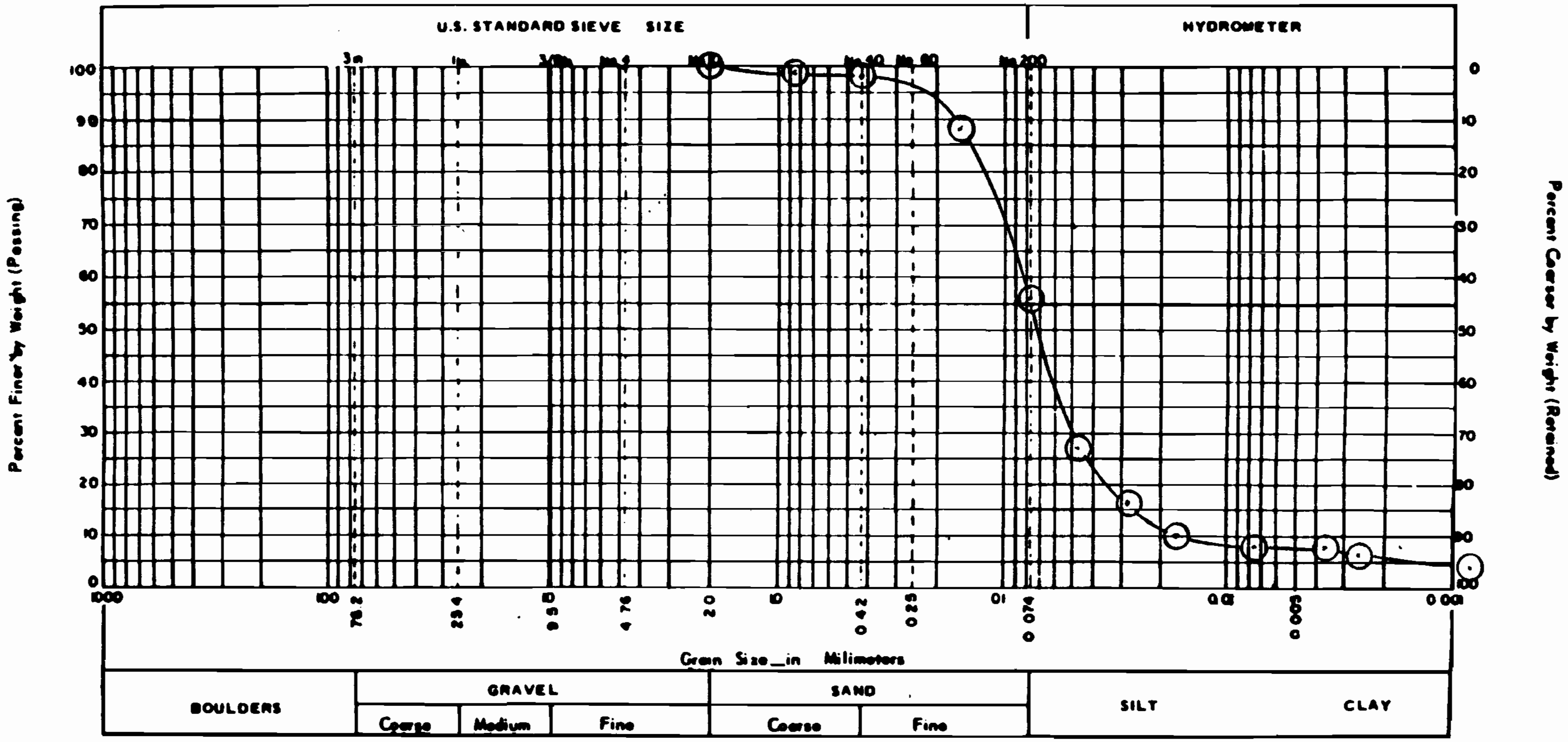
BORING NO. MW - 1

SAMPLE NO. B

DEPTH: 95 - 96.5

CONTRACT NO. 90240

MECHANICAL ANALYSIS (A.A.S.H.O. DESIGNATIONS M. 146-60 & T.88-57)



SAMPLE NO.	MOISTURE CONTENT	L.L.	P.L.	P.I.	CLASSIFICATION M.S.H.A.	CLASSIFICATION U.S.C.	REMARKS
901387	20.7					(ML)	USDA: SANDY LOAM

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Consulting Engineers

MATERIALS TESTING,
SOILS AND FOUNDATIONS DIVISION

TESTED BY: JGP

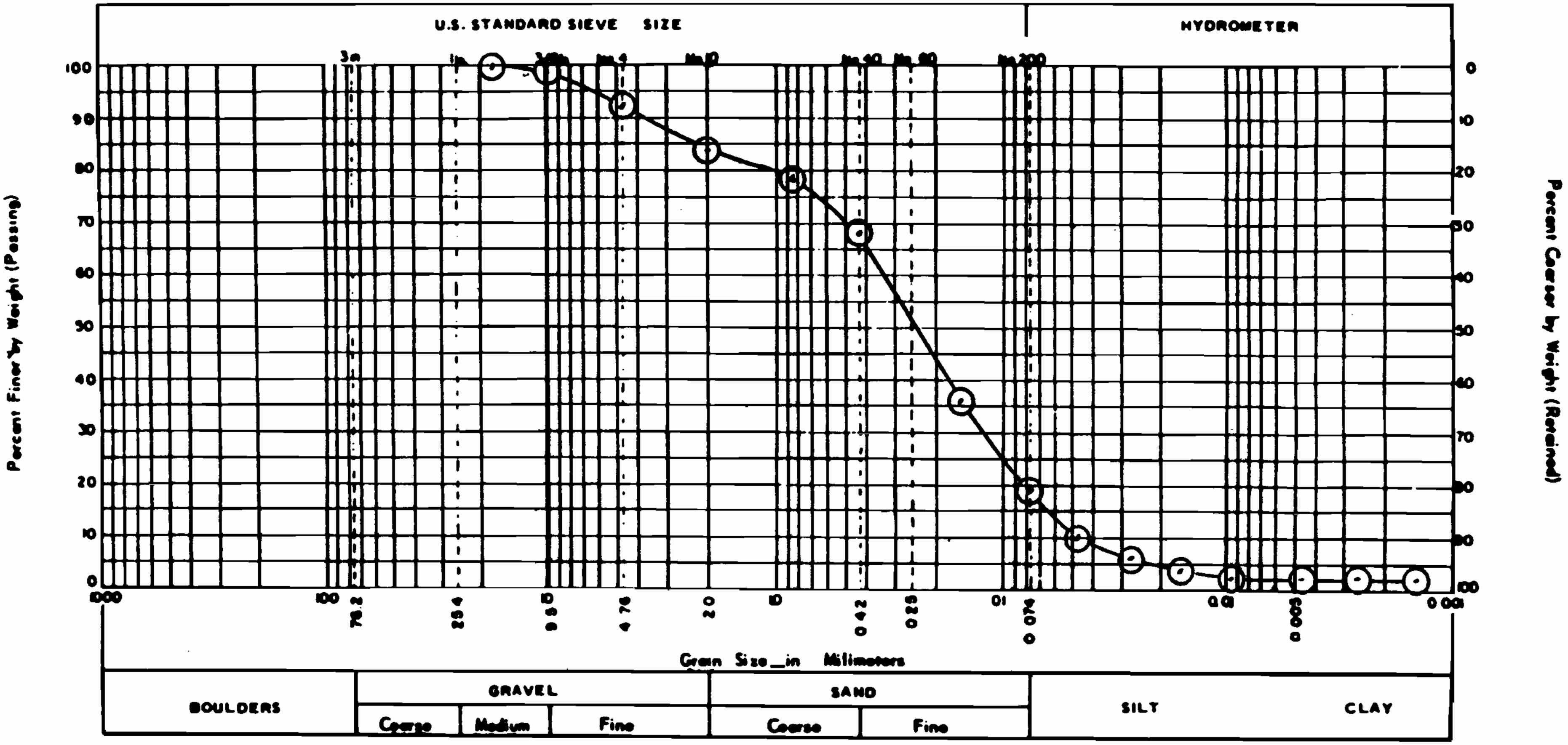
DATE: 7/90

CHECKED BY:

SHEET NO. _____ **OF** _____

PROJECT: HAZELTINE GREENLAWN		LOCATION: N/A	
BORING NO. MW-2	SAMPLE NO. A	DEPTH: 80-82'	CONTRACT NO. 90240

MECHANICAL ANALYSIS (A.A.S.H.O. DESIGNATIONS M. 146-60 & T.88-57)



SAMPLE NO.	MOISTURE CONTENT	L.L.	P.L.	P.I.	CLASSIFICATION		REMARKS
					M.S.H.A.	U.S.C.	
901175	18.0					(SM)	

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Consulting Engineers

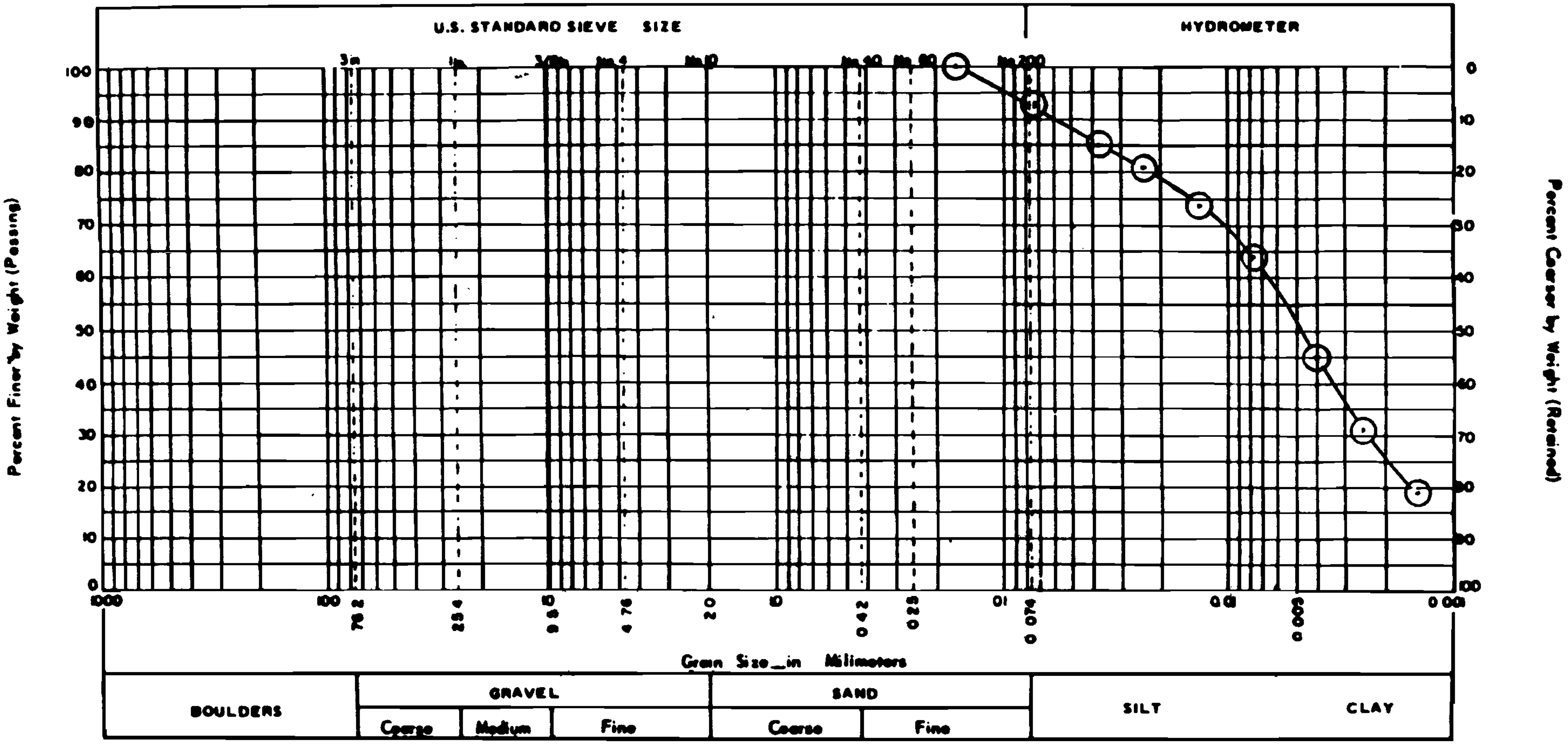
MATERIALS TESTING,
SOILS AND FOUNDATIONS DIVISION

TESTED BY: JGP	DATE: 6/90
CHECKED BY:	SHEET NO. ____ OF ____

PROJECT: HAZELTINE GREENLAWN	**LOCATION:** N/A

BORING NO. MW-2	**SAMPLE NO.** B	**DEPTH:** 175-176.5'	**CONTRACT NO.** 90240

MECHANICAL ANALYSIS (A.A.S.H.O. DESIGNATIONS M. 146-60 & T.88-57)



SAMPLE NO.	MOISTURE CONTENT	L.L.	P.L.	P.I.	CLASSIFICATION M.S.H.A.	CLASSIFICATION U.S.C.	REMARKS
901176	32.5					(CL)	

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MATERIALS TESTING,
SOILS AND FOUNDATIONS DIVISION

TESTED BY: JGP	DATE: 6/90
CHECKED BY:	SHEET NO. ____ OF ____

PROJECT: HAZELTINE GREENLAWN

LOCATION: N/A

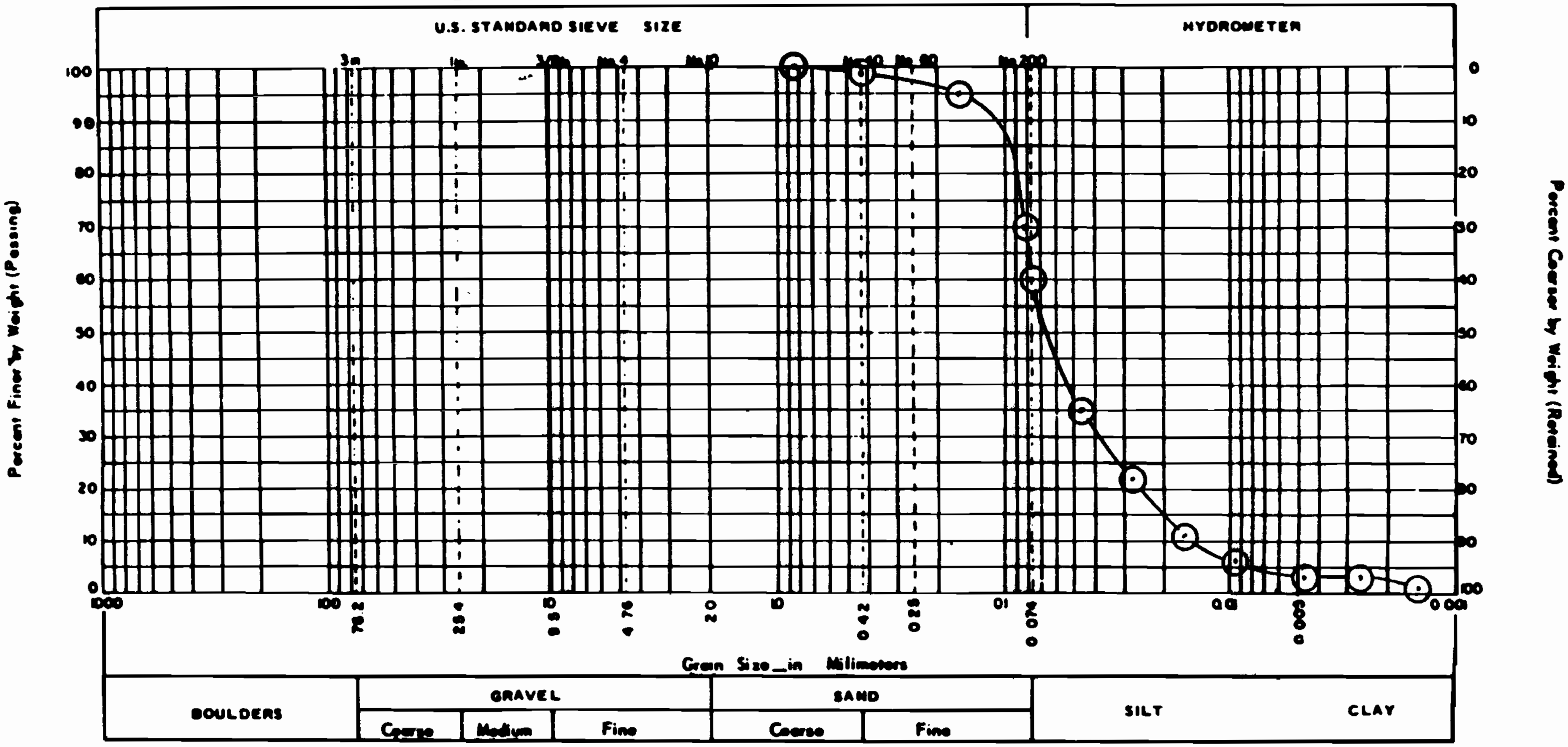
BORING NO. MW-3

SAMPLE NO. A

DEPTH: 95-97'

CONTRACT NO. 90240

MECHANICAL ANALYSIS (A.A.S.H.O. DESIGNATIONS M. 146-60 & T.88-57)



SAMPLE NO.	MOISTURE CONTENT	L.L.	P.L.	P.I.	CLASSIFICATION M.S.H.A.	CLASSIFICATION U.S.C.	REMARKS
901177	25.2					(ML)	

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Consulting Engineers

MATERIALS TESTING,
SOILS AND FOUNDATIONS DIVISION

TESTED BY: JGP

DATE: 6/90

CHECKED BY:

SHEET NO. ______ **OF** ______

PROJECT: HAZELTINE GREENLAWN

LOCATION: N/A

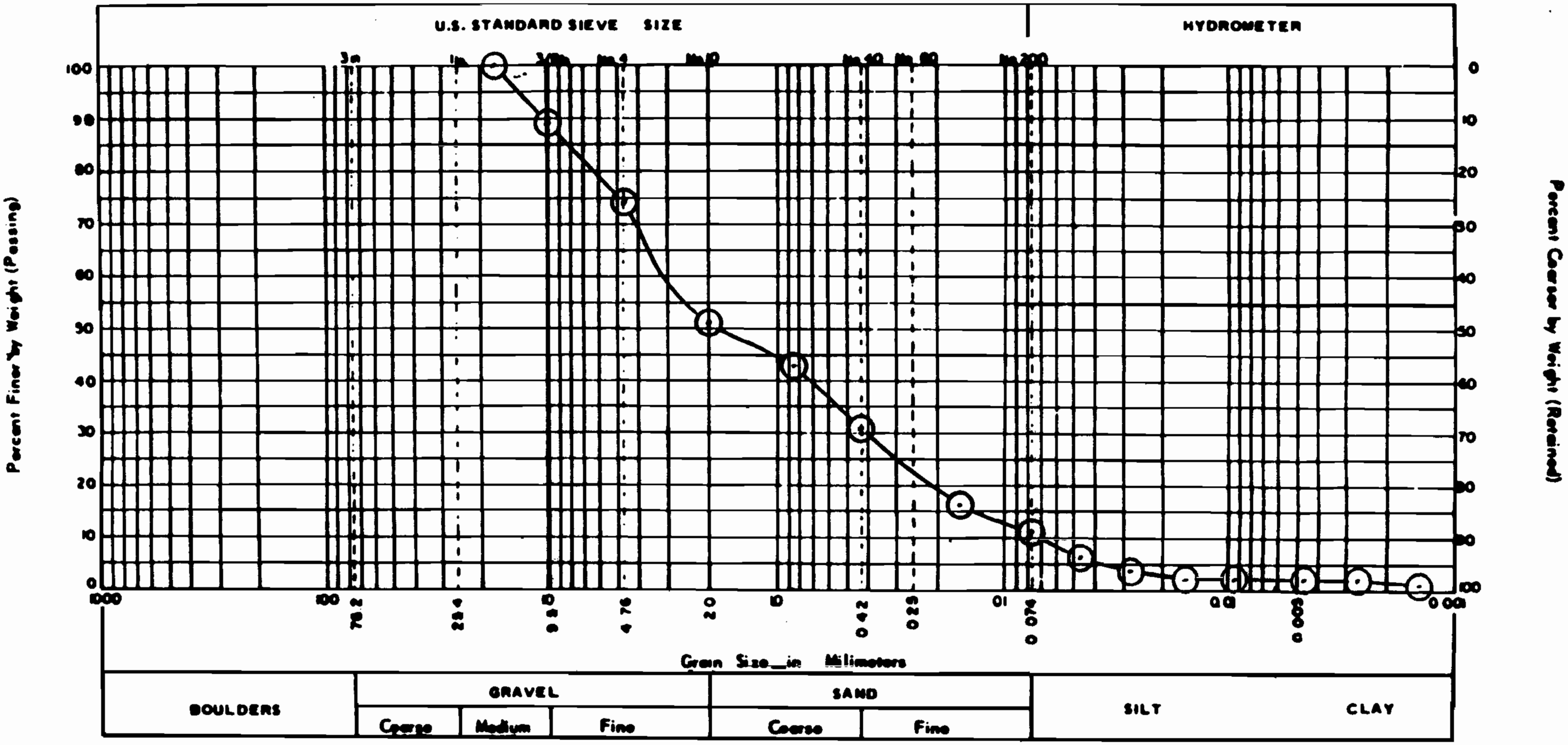
BORING NO. MW-3

SAMPLE NO. B

DEPTH: 176-177.5'

CONTRACT NO. 90240

MECHANICAL ANALYSIS (A.A.S.H.O. DESIGNATIONS M. 146-60 & T.88-57)



SAMPLE NO.	MOISTURE CONTENT	L.L.	P.L.	P.I.	CLASSIFICATION M.S.H.A.	CLASSIFICATION U.S.C.	REMARKS
901178	9.5					(SM)	

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Consulting Engineers

MATERIALS TESTING,
SOILS AND FOUNDATIONS DIVISION

TESTED BY: JGP

DATE: 6/90

CHECKED BY:

SHEET NO. _____ **OF** _____

C.2 FIELD SCREENING RESULTS

Table C-1
FIELD SCREENING RESULTS

Location	Sample	Depth (ft. BGS)	Headspace HNu/OVA (ppm)	Soil Slurry Conductivity (μmhos/cm)
B-1	Background		3.0	
	B1-A	1-3	3.0	30
	B1-B	3-5	3.0	10
	B1-C	5-7	3.3	10
BX-1	Background		2.0	
	BX1-A	1-3	2.5	20
	BX1-B	3-5	4.5	10
	BX1-C	5-7	5.0	35
	BX1-D	8-10	3.5	24
	BX1-E	11-13	2.5	20
	BX1-F	15-17	2.0	42
	BX1-G	17-19	2.5	67
	BX1-H	20-22	3.5	32.5
	BX1-I	22-24	2.5	52
	BX1-J	24-26	2.5	58
B-2	Background		6 to 11' 2 from 11 to 27'	
	B2-A	1-3	6.0	8.6
	B2-B	3-5	6.0	10.0
	B2-C	5-6.5	6.0	13.5
	B2-D	7-9	6.0	10.0
	B2-E	9-11	6.0	13.0
	B2-F	11-13	2.0	9.2
	B2-G	15-17	6.8	7.9
	B2-H	17-19	1.6	7.0
	B2-I	19-21	2.0	5.2
	B2-J	25-27	7.0	4.8

Table C-1 (Continued)

FIELD SCREENING RESULTS

Location	Sample	Depth (ft. BGS)	Headspace HNu/OVA (ppm)	Soil Slurry Conductivity (μmhos/cm)
B-3	Background		1.5	
	B3-A	1-3	3.0	4.2
	B3-B	3-5	3.0	3.0
	B3-C	5-7	3.0	3.0
	B3-D	9-11	3.0	1.3
	B3-E	11-13	3.0	1.5
	B3-F	13-15	3.0	1.3
	B3-G	15-17	3.0	2.8
	B3-H	17-19	4.0	2.8
	B3-I	23-25	3.0	1.7
B-4	Background		2.0	
	B4-A	1-3	2.0	52
	B4-B	5-7	3.0	72
	B4-C	7-9	2.0	10
	B4-D	9-11	2.0	8.0
	B4-E	11-13	2.0	4.4
	B4-F	13-15	2.0	6.2
	B4-G	15-17	2.0	10
	B4-H	17-19	2.0	10
	B4-I	19-21	2.0	17
	B4-J	21-23	2.0	12
	B4-K	23-25	2.0	15

Table C-1 (Continued)

FIELD SCREENING RESULTS

Location	Sample	Depth (ft. BGS)	Headspace HNu/OVA (ppm)	Soil Slurry Conductivity (μmhos/cm)
B-5	Background		15	
	B5-A	1-3	15	50
	B5-B	3-5	15	10
	B5-C	5-7	15	10
	B5-D	7-9	15	16
	B5-E	9-11	15	20
	B5-F	11-13	15	22
	B5-G	13-15	15	22
	B5-H	15-17	15	12
	B5-I	17-19	15	22
	B5-J	19-21	15	12
	B5-K	23-25	15	8
	B5-A	1-3	15	50
	B5-B	3-5	15	10
	B5-C	5-7	15	10
	B5-D	7-9	15	16
	B5-E	9-11	15	20
	B5-F	11-13	15	22
	B5-G	13-15	15	22
	B5-H	15-17	15	12
	B5-I	17-19	15	22
	B5-J	19-21	15	12
	B5-K	23-25	15	8

Table C-1 (Continued)

FIELD SCREENING RESULTS

Location	Sample	Depth (ft. BGS)	Headspace HNu/OVA (ppm)	Soil Slurry Conductivity (μmhos/cm)
B-6	Background		4.0	
	B6-A	1-3	40	47
	B6-B	3-5	4.5	59
	B6-C	5-7	30	26
	B6-D	7-9	100	65
	B6-E	9-11	4.0	29
	B6-F	11-13	4.5	12
	B6-G	13-15	4.0	40
	B6-H	15-17	4.0	24
	B6-I	17-19	4.0	32
	B6-J	19-21	4.0	33
	B6-K	23-25	4.0	53
B-7	Background		2.8	
	B7-A	3-5	2.8	12.5
	B7-B	5-7	2.8	26
	B7-C	11-13	2.8	36
	B7-D	13-15	2.8	35
	B7-E	15-17	2.8	36
	B7-F	17-19	2.8	29.5
	B7-G	19-21	2.8	44
	B7-H	21-23	2.8	41
	B7-I	23-25	2.8	60

Table C-1 (Continued)

FIELD SCREENING RESULTS

Location	Sample	Depth (ft. BGS)	Headspace HNu/OVA (ppm)	Soil Slurry Conductivity (µmhos/cm)
B-8	Background		5.0	
	B8-A	1-3	5.0	7.3
	B8-B	3-5	5.0	130
	B8-C	5-7	5.0	13
	B8-D	7-9	5.0	10
	B8-E	9-11	5.0	7.6
	B8-F	11-13	5.0	10
	B8-G	13-15	5.0	10
	B8-H	15-17	5.0	10
	B8-I	17-19	5.0	16
	B8-J	19-21	5.0	
	B8-K	21-23	5.0	10
	B8-L	23-25	5.0	9
MW-1	Background		0.2	
		5	6.5	170
		15	1.5	180
		56	1.0	200
		65	2.0	100
		75	2.5	70
		85	2.5	150
		95	2.0	110

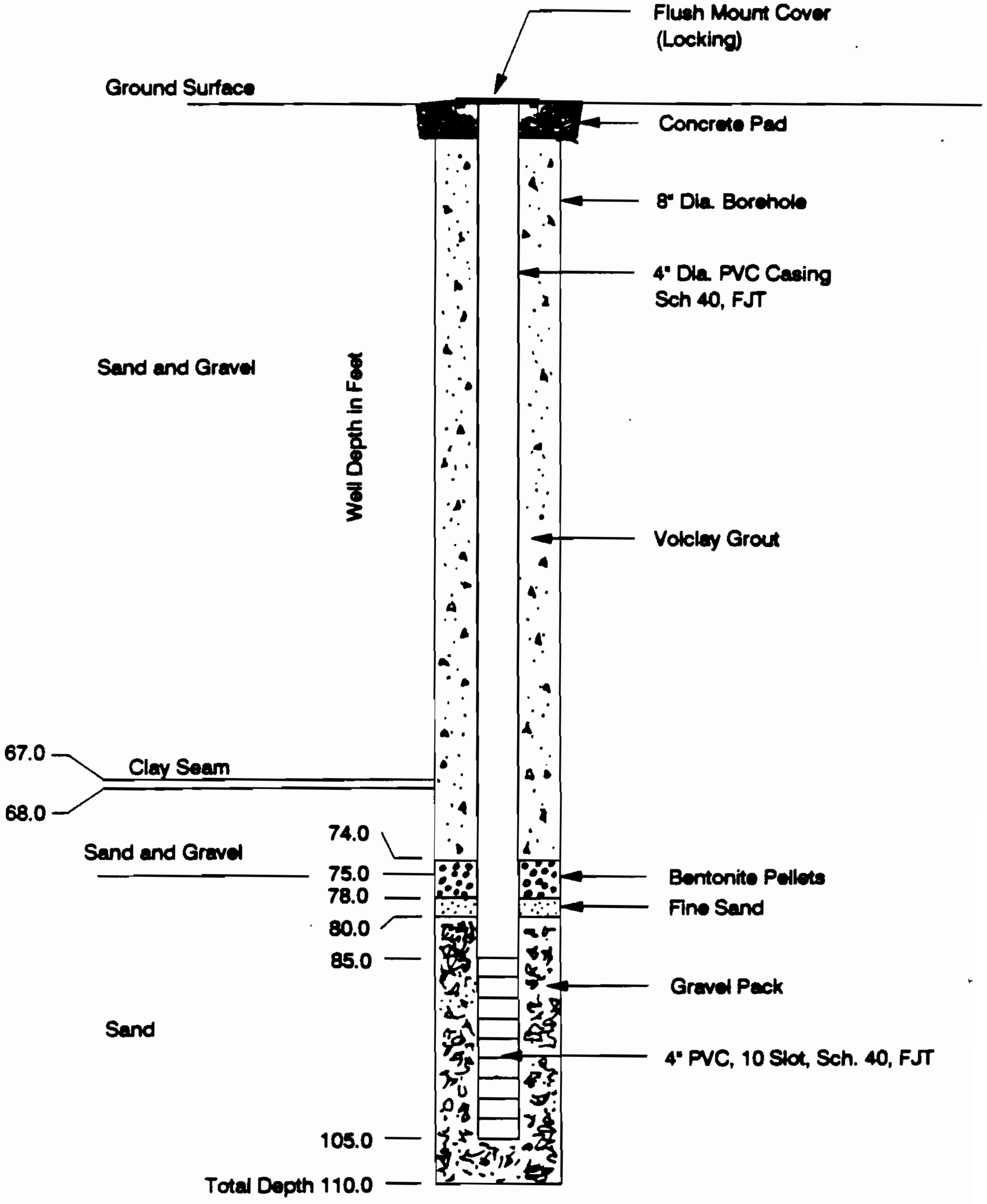
Table C-1 (Continued)

FIELD SCREENING RESULTS

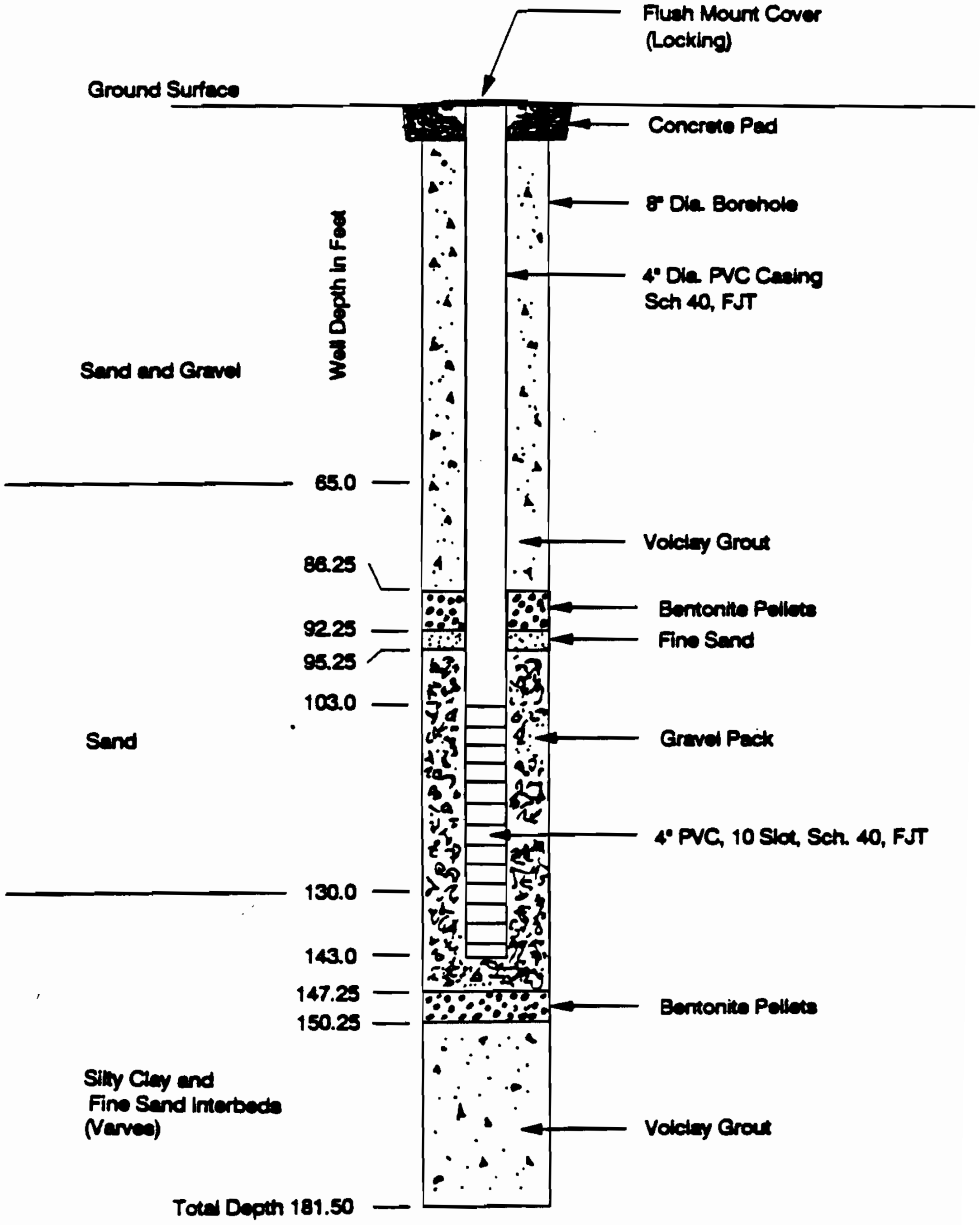
Location	Sample	Depth (ft. BGS)	Headspace HNu/OVA (ppm)	Soil Slurry Conductivity (μmhos/cm)
MW-2	Background		11	
		10	12	110
		20	14	175
		30	16	180
		40	--	--
		50	50	100
		60	48	69
		70	38	115
		80	52	54
		90	24	100
		100	46	40
		110	20	88
		120	14	57
MW-3	Background		1.2	
		25	1.2	19
		35	1.2	24.5
		45	1.2	33.5
		55	1.2	12
		65	1.2	19
		75	1.2	22
		85	1.2	30
		90	1.2	21
		95	1.2	21.5
		100	1.2	22
		105	1.2	--

C.3 MONITORING WELL CONSTRUCTION DIAGRAMS

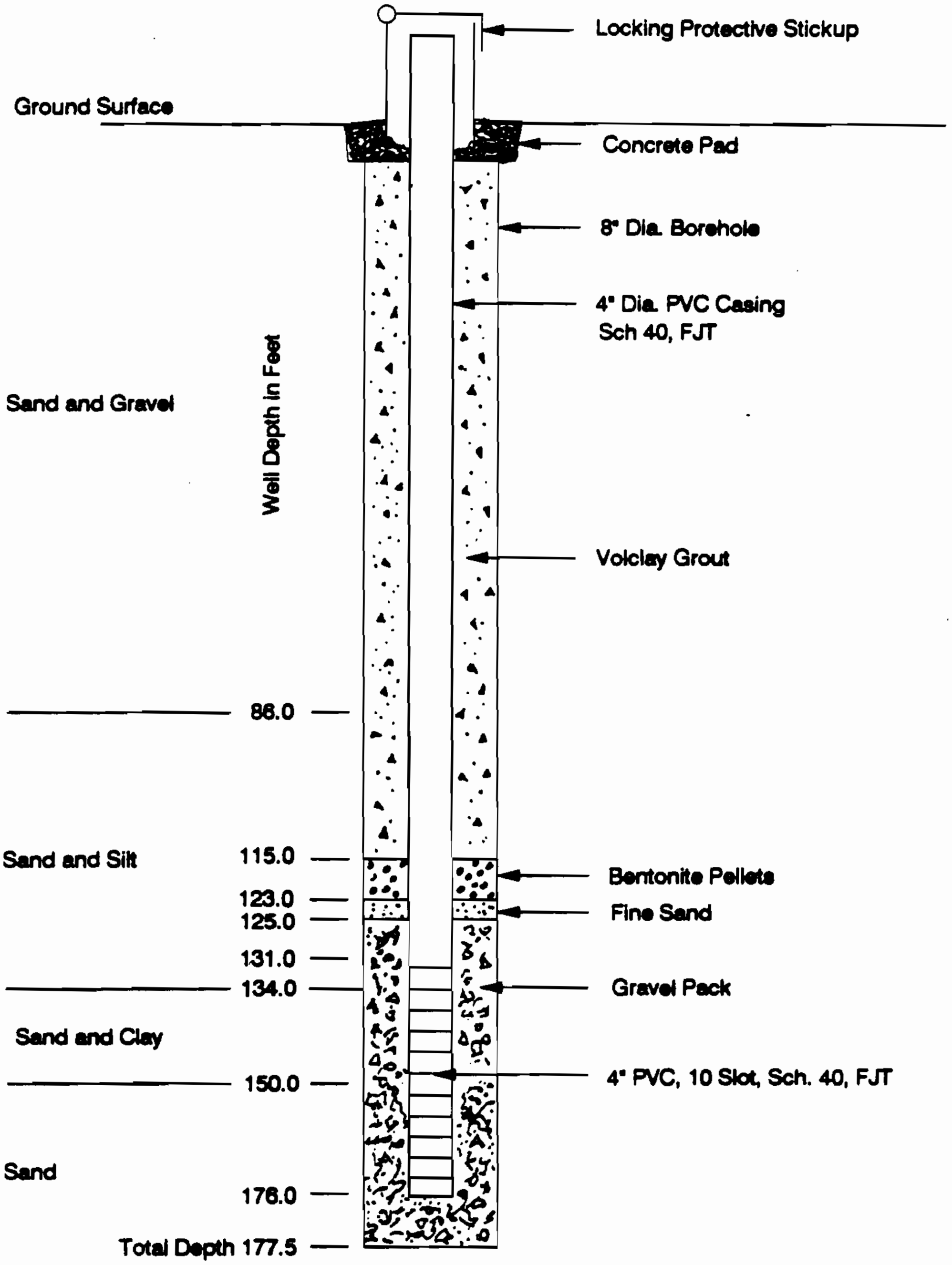
Monitoring Well #1
Hazeltine Greenlawn



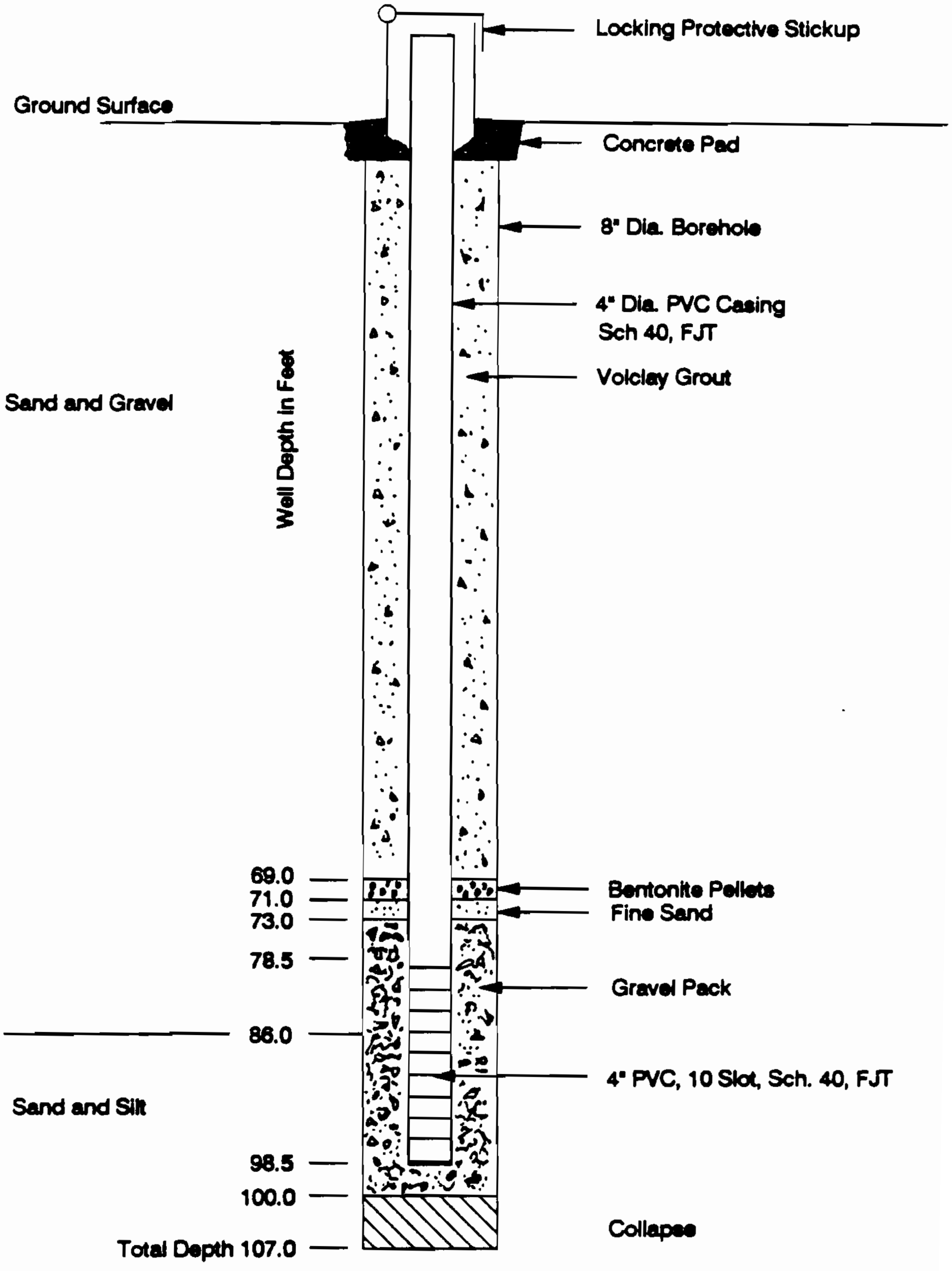
Monitoring Well #2
Hazeltine Greenlawn



Monitoring Well #3X
Hazeltine Greenlawn



Monitoring Well #3
Hazeltine Greenlawn



C.4 WELL DEVELOPMENT RECORDS

WELL DEVELOPMENT RECORD

WELL NO.: MW-1

DATE: 5/15/90

BEGIN: 0945 END: 1130

METHOD: SUBMERSIBLE STAINLESS STEEL PUMP

FLOW RATE: VARIES BETWEEN 0.5-1.0 gpm

INITIAL WL: 87' BGS

Time	pH (S.U.)	Conductivity (umhos/cm)	Observations
0950	7.7	480	Slightly cloudy
1000	8.6	360	Slightly cloudy
1004	8.2	210	Slightly cloudy
1006	8.0	230	Slightly cloudy
1008	8.0	270	Slightly cloudy
1010	7.8	270	Slightly cloudy
1013	7.8	270	Clear
1018	7.6	220	Clear
1024	7.4	240	Clear
1042	7.2	200	Clear Water level (WL) below 92'
1044	7.3	210	Clear
1054	7.2	220	Clear WL @ 97.5'
1100	7.2	205	Clear
1107	7.2	210	Clear WL @ 103.5'
1112	7.2	210	Clear WL @ 104'
1118	7.2	180	Clear
1120	7.1	190	Clear
1130	7.2	180	Clear

WELL DEVELOPMENT RECORD

WELL NO.: MW-2

DATE: 5/2/90

BEGIN: 1610 END: 1915

METHOD: SUBMERSIBLE STAINLESS STEEL PUMP

FLOW RATE: VARIES BETWEEN 2.5-6.5 gpm

INITIAL WL: 102' BGS

Time	pH (S.U.)	Conductivity (umhos/cm)	Observations
1610	8.9	410	Turbid
1630	8.2	390	Slightly cloudy
1645	7.8	390	Clear
1657	7.7	420	Clear
1733	6.9	340	Clear
1745	7.0	310	Clear well drawdown - lower pump 10'
1800	6.6	390	Clear
1815	6.6	390	Clear
1850	6.4	340	Clear
1900	6.3	385	Clear
1915	6.4	360	Clear

WELL DEVELOPMENT RECORD

WELL NO.: MW-3X

DATE: 5/25/90

BEGIN: 0800 END: 1300

METHOD: SUBMERSIBLE STAINLESS STEEL PUMP

FLOW RATE: <1 gal/min

INITIAL WL: 171' BGS

Time	pH (S.U.)	Conductivity (umhos/cm)	Observations
0800			• Pump not down full length in hole (need more wire) • Pump out at least 2 x 55-gal. drums of drilling mud
1135			• Lowered pump to near well bottom, pumped approx. 30 gal. • Pump contained to sputter muddy water (approx. 1 gal/min)
1145	7.6	75	
1150	7.4	110	• Pump slowed; put 30 gal. into casing, pumped back out - outflow slowed to <1 gal/min
1204	7.3	140	
1207	7.4	140	• Pump slowed; added 55 gal to purge; pumped back out; outflow slowed to approx. 1 gal/min
1224	7.8	125	
1229	8.0	140	

WELL DEVELOPMENT RECORD

WELL NO.: MW-3X (Continued)

DATE: 5/25/90

BEGIN: 0800 END: 1300

METHOD: SUBMERSIBLE STAINLESS STEEL PUMP

FLOW RATE: <1 gal/min

INITIAL WL: 171' BGS

Time	pH (S.U.)	Conductivity (umhos/cm)	Observations
1238			• 55 gal. of water added; water surged in and out of well casing using a hose; water pumped out
1300			• Casing filled w/water; let stand approx. 10 min; pumped out • Formation seems tight, little water comes out when pumping too hard (turbid) • Water too turbid to sample; level is measured at about 166' BGS (measured at 1500 hrs)

WELL DEVELOPMENT RECORD

WELL NO.: MW-3X

DATE: 5/30/90

BEGIN: 1000 END: 1700

METHOD: HAND BAILING (STAINLESS STEEL BAILER)

Time	pH (S.U.)	Conductivity (umhos/cm)	Observations
1000			• Water depth at 166' BGS
1010	7.9	130	
1230	7.8	150	• (After approx. 5 gal removed)
1307	7.7	100	
1310	7.7	110	• Total water removed is 10 gal, or 1.5 well volume; water down low to approx 170' BGS • Bottom of well measured at 172' BGS
1620			• Well has sat for 3 hrs.; water level at 170.5' (not much higher than at 1310; water recharge not as good as thought it would be; bottom of well checked again, measured 172' BGS
1630	7.2	120	
1650	7.4	120	
1700			• Well bailed completely dry. This is consistent w/slow recharge and well bottom at 172', not 176'

Appendix D

DATA VALIDATION

D.1 Laboratory Quality Assurance/Quality Control (QA/QC)

D.2 Chain-of-Custody Forms

D.1 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Appendix D

DATA VALIDATION

D.1 Laboratory Quality Assurance/Quality Control (QA/QC)

Sample analysis for this program was conducted under the U.S. EPA Contract Laboratory Program's (CLP) Statements of Work (SOW) for Organic Analysis and Inorganic Analysis. The SOW is a document that provides the procedures to be followed in the preparation and analysis of aqueous and soil samples for the presence and quantitation of specific chemical constituents. Included in the SOW are the minimum quality assurance/quality control (QA/QC) procedures that must be followed when performing analytical work under CLP.

The primary function of the QA/QC program is to define of the procedures for the evaluation and documentation of sampling and analytical methodologies and the reduction and reporting of data. The objective is to provide a uniform basis for sampling collection and handling, instrument and methods maintenance, performance evaluations, and analytical data gathering and reporting.

Table D-1 shows the six sample delivery groups and the associated samples for volatile organic analyses. Table D-2 shows the six sample delivery groups and the associated samples for inorganic analyses. Presented in Table D-3 are the results from the data validation for the organic analyses performed by CompuChem Laboratories.

The data validation results for the inorganic analyses are presented in Table D-4. Adherence to the CLP requirements is indicated in the table by the letter "X". Problems with the analysis and items requiring corrective action under CLP are indicated on the table by a letter code, with an explanatory footnote. Validation for the volatile organic constituents on the NYSDEC's Target Compound List (TCL) was performed on six sets of results, or sample delivery groups (SDG), organized by CompuChem. Validation for the inorganic constituents was performed on six SDG. All of the analyses met the requirements of the Contract Laboratory Program.

Table D-1

SUMMARY OF SAMPLE DELIVERY GROUPS (SDG) FOR VOLATILE ORGANIC ANALYSES

SDG (Number and Type of Samples)	Sample ID #
01 (11 soil)	B2-I, B2-J, B3-G, B3-I, B4-B, B4-I, B8-F, B8-L, B1-C, MW2, MW2SS
06 (4 soil)	B5-F, B5-K, B6-D, B6-K
16 (11 soil)	B7-C, B7-J, B7A-B, B7B-A, BX-1-C, BX-1-J, DC(1-8), MW1-C, MW1-D, MW3-B, MW3-G
48 (3 water)	EB-1, TB1, TB-2
51 (5 water)	FB, MW1, MW2, MW3X (6/12), TB
105 (1 soil)	MW3X (5/26)

Table D-2

SUMMARY OF SAMPLE DELIVERY GROUPS (SDG) FOR INORGANIC ANALYSES

SDG (Number and Types of Samples)	Sample ID #
988558 (16 soil)	B1-C, B2-I, B2-J, B3-G, B3-I, B4-B, B4-I, B5-F, B5-K, B6-D, B6-K, B8-B, B8-I, MW2 (4/46), MW2(4/27), MW2(4/30)
988588 (10 soil	B7 A/B, B7 B/A, B7-C, B7-J, BX-1-B, BX-1-J, DC(1-8), MW1-B/C/D, MW3-B, MW3-G
988577 (4 water)	FB, MW1, MW2, MW3X
88537D (4 water)	FB, MW1, MW2, MW3X
988564 (1 soil)	MW3X
988576 (1 water)	EB-1

Table D-3

DATA VALIDATION - VOLATILE ORGANIC ANALYSES

Volatiles	SDG					
	01	06	16	48	51	105
Surrogate Spike	X	X	X	X	X	X
MS/MSD	X	X	X	--	X	X
Blank (Method)	X	X	X	X	X	X
CRQL	A	X	C	X	X	D
Holding Time (10 Days)	B	X	X	X	X	X

Explanation for SDG 01

A: CRQLs on B4-B were not met for all but one constituent.
CRQLs on MW-2 were not met on 9 constituent.
CRQLs on MW-2SS were not met on all but 3 constituents.
CRQLs on MW2 MW and MW2 MSD were not met on 8 constituents.

B: The holding time of 10 days was exceeded by one day on sample B8-L.

Explanation for SDG 16

C: CRQLs on B7-J were not met on any constituents.
CRQLs on B7A-B were not met on 8 constituents.
CRQLs on DC(1-8) were not met on any constituents.
CRQLs on MW1-C were not met on any constituents.
CRQLs on MW1-D were not met on any constituents.
CRQLS on MW3-B were not met on 8 constituents.
CRQLs on MW-3-G were not on any constituents.

Explanation for SDG 105

D: CRQLS were exceeded for all constituents.

Table D-4

DATA VALIDATION - INORGANIC ANALYSES

	SDG					
QA/QC Requirement	988558	988588	988577	88537D	988564	988576
Calibration Verification						
ICP	X	X	X	X	X	X
GFAA/CVAA	X	X	X	X	X	X
CN	X	X	X	-	X	X
Preparation Blank						
ICP	X	X	X	X	X	X
GFAA/CVAA	X	X	X	X	X	X
CN	X	X	X	-	X	X
ICP Interference Check	X	X	X	X	X	X
Spike Recovery						
ICP	A	E	H	X	O	X
GFAA/CVAA	B	F	I	M	P	X
CN	X	X	X	-	X	X
Duplicate (RPD)						
ICP	X	X	J	N	Q	T
GFAA/CVAA	C	F	K	X	R	X
CN	X	X	X	-	X	X
ICP Serial Dilution	X	X	X	X	X	X
Holding Times						
Metals	X	X	X	X	X	X
HG	X	X	X	X	X	X
CN	X	X	X	-	X	X
CRDL						
Metals	D	G	L	X	S	X
CN	X	X	X	-	X	X

ICP - Indicates those metals analyzed using Inductively Couple Plasma Spectroscopy.

GFAA/CVAA - Indicates those metals analyzed by graphite furnace and cold-vapor atomic absorption.

CN - Cyanide

Table D-4 (Continued)

DATA VALIDATION - INORGANIC ANALYSES

Explanation for SDG 988558:

A: The spike sample recovery for antimony analyzed by ICP was outside of the contract required limits. Corrective action calls for a post-digestion spike and analysis that was performed.

B: The spike sample recovery for mercury analyzed by CVAA was outside of the contract required limits. No corrective action is dictated.

The spike sample recovery for selenium analyzed by GFAA was outside of the contract required limits. No corrective action is dictated.

C: The RPD for lead analyzed by GFAA was outside of the contract required limits. No corrective action is taken under CLP protocol.

D: The CRDL for mercury (0.04 mg/kg) was exceeded in all but one sample (B4-B) in this delivery group. The detection limits ranged from 0.10 to 0.13 mg/kg.

The CRDL for cadmium (1.0 mg/kg) was exceeded in six samples in this delivery group (B3-G, B3-I, B4-B, MW-2 (4/26), MW-2 (4/27), and MW-2 (4/30). The detection limits ranged from 1.1-1.3 mg/kg.

The CRDL for barium (40 mg/kg) was exceeded in one sample, B4-B. The detection limits was 40.8 mg/kg.

The CRDL for selenium (1.0 mg/kg) was exceeded in one sample, B4-B. The detection limit was 2.3 mg/kg.

The CRDL for copper (5.0 mg/kg) was exceeded in MW-2 (4/30). The detection limit was 6.2 mg/kg.

The CRDL for nickel (8.0 mg/kg) was exceeded in MW-2 (4/30). The detection limit was 8.6 mg/kg.

Explanation for SDG 988558 (Continued):

The CRDL for vanadium (10.0 mg/kg) was exceeded in MW-2 (4/30). The detection limit was 10.4 mg/kg.

Explanation for SDG 988588:

E: The spike sample recovery for antimony analyzed by ICP was outside the contract required limits. Corrective action calls for a post-digestion spike and analysis that was performed.

F: The spike sample recovery for selenium analyzed by GFAA was outside the contract required limits. No corrective action is dictated under CLP protocol.

G: The CRDL for mercury (0.04 mg/kg) was exceeded in all ten samples in the sample delivery group. The detection limits ranged from 0.10-0.16 mg/kg.

The CRDL for cadmium (1.0 mg/kg) was exceeded in five samples (B7-C, B7-J, DC(1-8), MW-1-B/C/D and MW3-G) in the delivery group. The detection limits ranged from 1.1-1.6 mg/kg.

The CRDL for nickel (8.0 mg/kg) was exceeded in three samples (DC(1-8), MW1-B/C/D and MW3-G) in the delivery group. The detection limits ranged form 8.2-10.7 mg/kg.

The CRDL for antimony (12.0 mg/kg) was exceeded in DC(1-8). The detection limit was 12.3 mg/kg.

The CRDL for copper (5.0 mg/kg) was exceeded in DC(1-8). The detection limit was 7.2 mg/kg.

The CRDL for potassium (1,000 mg/kg) was exceeded in DC(1-8). The detection limit was 1,250 mg/kg.

The CRDL for lead (0.6 mg/kg) was exceeded in MW3-B. The detection limit was 0.84 mg/kg.

Table D-4 (Continued)

DATA VALIDATION - INORGANIC ANALYSES

Explanation for SDG 988577:

H: The spike sample recovery for aluminum and iron analyzed by ICP was outside of the contract required limits. Corrective action calls for a post-digestion spike and analysis that was performed.

I: The spike sample recovery for selenium and thallium analyzed by GFAA was outside of the contract required limits. No corrective action is dictated under CLP protocol.

J: The RPD for aluminum, cadmium, chromium, and iron analyzed by ICP was outside the contract required limits. The data are flagged with an "*". No corrective action is taken under CLP protocol.

K: The RPD for lead analyzed by GFAA was outside the contract required limits. Corrective action calls for a re-analysis. This re-analysis was performed by the Method of Standard Additions, and the results met all contract required specifications.

L: The CRDL for selenium (5 μg/L) was exceeded in three samples (MW1, MW2, and MW3K) in this delivery group. The detection limit for MW and MW2 was 10 μg/L, while MW3X had a detection limit of 40 μg/L. This value is estimated due to interferences.

The CRDL for arsenic (10 μg/L) was exceeded in one sample (MW3X) in this delivery group. The detection limit was 15.0 μg/L.

Explanation for SDG 88537D:

M: The spike sample recovery for selenium and thallium analyzed by GFAA was outside of the contract required limits. No corrective action is taken under CLP protocol.

N: The RPD for zinc analyzed by ICP was outside the contract required limits. No corrective action is taken under CPL protocol.

Table D-4 (Continued)

DATA VALIDATION - INORGANIC ANALYSES

Explanation for SDG 988564:

O: The spike sample recovery for manganese analyzed by ICP was outside the contract required limits. Corrective action calls for a post-digestion spike and analysis that was performed.

P: The spike sample recovery for lead and selenium analyzed by GFAA was outside the contract required limits. No corrective action is dictated under CLP protocol.

Q: The RPD for iron and manganese analyzed by ICP was outside of the contract required limits. No corrective action is dictated under CLP protocol.

R: The RPD for lead analyzed by GFAA was outside the contract required limits.

S: The CRDL for cadmium (1.0 mg/kg) was exceeded. The detection limit was 1.0 mg/kg.

The CRDL for mercury (0.02 mg/kg) was exceeded. The detection limit was 0.11 mg/kg.

Explanation for SDG 988576:

T: The RPD for cadmium analyzed by ICP was outside the contract required limits. No corrective action is taken under CLP protocol.

D.2 CHAIN-OF-CUSTODY FORMS

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☒ YES ☐ NO

PROJECT NO. 215-018-39

PROJECT NAME Hazeltine Greenlawn

SAMPLERS: *(Name/Signature)* Ross Elliott / Ross Elliott

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	TCL VOA	TAL INORGANIC	CLP CN-				COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
* MW3X	5/31/90	1100	MW3X-water-TCL VOA	2	X						2x40ml (pH<2 (HCl), 4°C)
* MW3X	5/31/90	1120	MW3X-water-TOTAL METALS	1		X					1x1000ml bottle, ~1/2 full, pH<2 (HNO3), 4°C
MW3X	6/1/90	0900	MW3X-water-CLP Cyanides	1			X				1x1000ml Bottle, ~1/2 full (pH>12, NaOH, 4°C
MW3X	6/1/90	0950	MW3X-water-Dissolved metals	1		X					1x1000ml bottle, ~1/2 full, pH<2 (HNO3) .45u filtered

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Ross Elliott / Ross Elliott	6/1/90-1300			

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments: VOAs preserved w/ HCl; INORGANICS (TOTAL & DISSOLVED METALS) preserved w/HNO3; CN preserved w/ NaOH; all samples 4°C; Dissolved metals used .45u filter

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

* STATE (NYSDEC) took splits of these

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☐ YES ☐ NO

PROJECT NO. 215-018

PROJECT NAME Greenlawn Site Investigation

SAMPLERS: *(Name/Signature)* Ross Elliott / Ross Elliott

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	ANALYSES TCL VOA	TAL INORGANICS	CLP CN				COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
MW1	5/25	~~230~~ 1430	MW1 - Water	5	X	X	X				See below
MW2	5/25	~~1000~~ 1300	MW2 - Water	5	X	X	X				see below
~~MW3X~~			~~MW3X water~~	~~5~~	~~X~~	~~X~~	~~X~~				~~See below~~ RE
FB.	5/25	1600	Field Blank - Water	5	X	X	X				Distilled H₂O rinse of bailer; see below
TB	5/23	1600	Trip Blank - water	2	X						see below
MW3X	5/24	1430	Soil - MW3X	2	X	X					2 x 125ml glass (do CN w/ inorganics)

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Ross Elliott / Ross Elliott	5/25/90 1700			
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments: — All samples 4°C

TCL VOA: 2 x 40ml, pH<2 (HCl); TAL INORGANICS: 2 x 1000ml (1 total, 1 dissolved), pH<2 (HNO_3); CLP CN: 1 x 1000ml, pH>12 (NaOH)

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR ☒ YES ☐ NO

PROJECT NO.	PROJECT NAME
215 018 39	Hazeltine - Greenlawn

SAMPLERS: *(Name/Signature)* Sarah L. Stinger

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	NYSDEC VOCs - Soil	NYSDEC Metals/CN		NYSDEC - VOCs WATER			COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
MW3-B	5/16/90	1010	MW3-B (35' - 37')	2	X	X					1×4oz WM + 1×8oz WM 4°C
mw3-G	5/16/90	1418	mw3-G (85' - 87')	2	X	X					1×4oz WM + 1×8 oz WM 4°C
~~MW~~ TB-2	5/17/90	1700	TRIPBLANK 2	2				X			2×40ml vial 4°C

Soil

8.5

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Sarah L. Stinger Sarah L. Stinger	5/17/90 1900			Fed X A/B # 6958203463

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments:

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR ☒ YES ☐ NO

PROJECT NO. [illegible] 34 21

PROJECT NAME [illegible]

SAMPLERS: *(Name/Signature)* [illegible]

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	TCL VOA						COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
MW2(100-101.5)	4/27/90	1600	MON WELL SS (100'-101.5')	1	X						4 oz glass Jar cool

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
SARAH L. SINGER	4/27/90 1730			FEDEX A/B 6958201211
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments:

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☑ YES ☐ NO

PROJECT NO. 215-018-3921

PROJECT NAME [illegible] - Greenlawn

SAMPLERS: *(Name/Signature)* Ross Elliott / Ross Elliott

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	ANALYSES: NYSDEC TCL VOA						COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
MW2	4/30/90	1[illegible]00	MW2-SS (140-141.5)	1	X						4°C / 4oz. WM Glass
B8-L	5/1/90	11:50	B8-L, SOIL, 23-25	1	X						4°C / 4oz. WM Glass
B8-F	5/1/90	9:35	B8-F, SOIL, 11-13	1	X						4°C / 4oz. WM Glass

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Ross Elliott / Ross Elliott	5/1/90 1700 HRS			Fed Ex (#6458204222)

General Comments:
COMPUCHEM ACCT. # 902201

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☒ YES ☐ NO

PROJECT NO. 215-018-39	PROJECT NAME Ncl-Graham

SAMPLERS: *(Name/Signature)* Ross Elliott / Ross Elliott

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	ANALYSES: NYSDEC TCL Volatiles	ANALYSES: TAL Metals (CN)	ANALYSES	ANALYSES	ANALYSES	ANALYSES	COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
B8-B	5/1/90	8:17	B8-B (split spoon 3-5')	1		X					8oz Widemouth, Cool 4°C
B8-I	5/1/90	10:08	B8-I (split spoon 17-19')	1		X					
MW2	4/26/90	1150	MW2 (split spoon 20-22')	1		X					
MW2	4/30/90	1140hr	MW2 (split spoon 130-131.5')	1		X					
B1-C	5/1/90	0835	~~B1-C~~ (split spoon (5'-7')	2	X	X					1×8oz widemouth +1×4oz widem. Cool 4°C
~~B2~~					X	[illegible]					
~~B2~~					X	[illegible]					
			B1-C								
MW2	4/27/90	1600	MW2 (split spoon 100-101.5)	1		X					8oz wm. (4°C)

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Ross Elliott / Ross Elliott	5/3/90 1800 hrs			FEDEX A/B# 0200 1996 8
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments: compuchem acct. # 902201

Distribution: *Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files*

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RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☑ YES ☐ NO

PROJECT NO. 215-018-39	PROJECT NAME Hazeltine Greenlawn
SAMPLERS: *(Name/Signature)* Ross Elliott / Ross Elliott	

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	NYSDEC TCL VOAs	METALS & CN					COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
B2-I	5/3/90	1155	B2-I (split spoon 19-21')	2	X	X					(VOAs) 4oz WM & (METALS & CN) 8oz WM Glass (4°C)
B2-J	5/3/90	1700	B2. J (split spoon 25-27')	1	X	X					8 oz WM (VOAs & Metals/CN) 4°C limited quantity,

Relinquished by: *(Name/Signature)* Sarah L. Stinger Sarah L. Stinger	Date/Time 5/4/90 1600	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, [✓ Fed X], UPS, etc)* Airbill #6458204266
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments:

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR ☒ YES ☐ NO

PROJECT NO. 215 01839

PROJECT NAME Hazeltine Greenlawn

SAMPLERS: *(Name/Signature)* Sarah L. Stinger Sarah L Stinger

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	ANALYSES: NYSDEC TCL VOAs	METALS + CN					COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.) VOAs	Metals + CN	Preserva.	
B3-G	5/4/90	1550	B3-G (split spoon 15'-17')	2	X	X					4oz WM	8 oz WM	4°C	PLEASE RUS
B3-I	5/4/90	1640	B3-I (split spoon 23-25')	2	X	X					4 oz WM	8 oz WM	4°C	" "
B4-B	5/7/90	0950	B4-B (split spoon 5'-7')	2	X	X					4 oz WM	8 oz WM	4°C	
B4-I	5/7/90	1137	B4-I (split spoon 19'-21')	2	X	X					4 oz WM	8 oz WM	4°C	

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, [✓ Fed X] UPS, etc)*
Sarah L. Stinger Sarah L Stinger	5/7/90 1700			FEDEX A/B 6458204281
Relinquished by: *(Name/Signature)*	**Date/Time**	**Received by:** *(Name/Signature)*	**Date/Time**	**Carrier:** *(In person, Fed X, UPS, etc)*
Relinquished by: *(Name/Signature)*	**Date/Time**	**Received by:** *(Name/Signature)*	**Date/Time**	**Carrier:** *(In person, Fed X, UPS, etc)*

General Comments: → Please expedite handling of B3 G+I VOA samples due to holding time limits

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☒ YES ☐ NO

PROJECT NO. 215 018 39

PROJECT NAME Hazeltine - Greenlawn

SAMPLERS: *(Name/Signature)* Sarah L. Stinger Sarah L. Sting

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	ANALYSES NYSDEC TCL VOAs						COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
B5-F	5/8/90	0955	B5-F (split spoon 11-13)	1	X						4 oz WM 4°C
B5-K	5/8/90	1445	B5-K (split spoon 23-25)	1	X						4 oz WM 4°C

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Sarah L Stinger Sarah L Sting	5/8/90 1750			[✓ Fed X] A/B # 6958209292
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments:

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☐ YES ☐ NO

PROJECT NO. 215-018-39

PROJECT NAME Hazeltine Greenlawn

SAMPLERS: *(Name/Signature)* STEVE HALL

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	NYSDEC TCL VOAs	METALS + CN					COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
B6-D	5/4/90	1010	B6-D	2	X	X					SOIL / 4 oz VOA, 8 oz Metals + CN / 4°C
B6-K	5/4/90	1645	B6-K	2	X	X					SOIL / 4 oz VOA, 8 oz Metals + CN / 4°C
EB-1	5/4/90	1720	EB-1	4	X	X					WATER / 2-40 ml VOAs 4°C + 2 1 liter bottles Metals-HNO3 ⊕ CN- Add NaOH
B5-F	5/8/90	0955	B5-F	1		X					SOIL / 8 oz WM-Metals + CN 4°C
B5-K	5/8/90	1445	B5-K	1		X					SOIL / 8 oz WM-Metals + CN 4°C

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
STEVE HALL	5/4/90 1800			[✓ Fed X] Airbill # 6458203485

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments:

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☒ YES ☐ NO

PROJECT NO. 215018 39

PROJECT NAME Hazeltine - Greenlawn

SAMPLERS: *(Name/Signature)* Sarah L. Stinger Sarah L. Stinger

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	NYSDEC VOCs	NYSDEC Metals					COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
MW1-C	5/9/90	1450	MW1-C (75-76.5)	1	X						125 ml WM 4°C
MW1-D	5/9/90	1750	MW1-D (95-96.5)	1	X						125 ml WM 4°C
MW1-BK	5/10/90	1800	MW1 COMPOSITE OF:	1		X					250 ml WM 4°C
			(55-56.5)-B								
	5/9/90		(75-76.5)-C								
			(95-96.5)-D								

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Sarah L. Stinger Sarah L. Stinger	5/10/90 1800			In person, [✓ Fed X], UPS, etc 6458204303

General Comments:

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF COUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR ☐ YES ☐ NO

PROJECT NO. 42
215018 34-02

PROJECT NAME Hazeltine Greenlawn

SAMPLERS: (Name/Signature) Sarah L. Singer
Sarah L. Singer

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	ANALYSES: TOTAL PETROL HC	NYSDEC METALS/CN	NYSDEC TCL VOCS				COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
B11	5/10/90	1130	COMPOSITE OF (9-11) (14-16) (23-25)	2	X						250 ml WM Cool 4°C
B10	5/10/90	1300	COMPOSITE OF (9-11) (14-16) (23-25)	2	X						
B9	5/10/90	1545	COMPOSITE OF (9-11) (14-16) (23-25)	2	X						
B DUP	5/10/90		DUPLICATE OF SOIL COMPOSITE	2	X						↓ ↓
BX1-B	5/11/90	0915	BX-1 B (3-5)	1		X					250 ml WM Cool
BX1-C	5/11/90	0940	BX-1 C (5-7)	1			X				125 ml WM
BX1 J	5/11/90	1405	BX-1J (24-26)	2		X	X				1x750 ml WM + 1x125 ml WM ↓

Relinquished by: (Name/Signature)	Date/Time	Received by: (Name/Signature)	Date/Time	Carrier: (In person, Fed X, UPS, etc)
Sarah L. Singer Sarah L. Singer	5/11/90 1800			In person, [✓ Fed X], UPS, etc AB # 6458204255

General Comments: TPH - NON CLP PROTOCOL
NYSDEC TCLP PROTOCOL FOR METALS/CN + VOCs

Distribution: Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files

RADIAN CORPORATION

CHAIN OF CUSTODY RECORD

RETURN ORIGINAL TO ORIGINATOR
☒ YES ☐ NO

PROJECT NO. 215083

PROJECT NAME [illegible] Greenlawn

SAMPLERS: *(Name/Signature)* Sarah L. Singer / Sarah L. Singer

FIELD NUMBER:	COLLECTION DATE	COLLECTION TIME	SAMPLE NAME	NO. OF BOTTLES	NYSDEC VOCs	NYSDEC Metals/CN				COMMENTS (TYPE OF CONTAINER, SPECIAL PRESERVATION, SPECIAL HANDLING, ETC.)
B7 C	5/14/90	1100	B7 C (11'-13')	2	X	X				1 × 4 oz WM (VOCs) + 1 × 8 oz WM (CN/Metals) 4°C
B7 ~~I~~ J	5/14/90	1210	B7 ~~I~~ J (23-25')	2	X	X				1 × 4 oz WM (VOCs) + 1 × 8 oz WM (CN/Metals) 4°C

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*
Sarah L Singer Sarah L. Singer	5/14/90 1900			[✓ Fed X] FedEx A/B # 645A009133

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

Relinquished by: *(Name/Signature)*	Date/Time	Received by: *(Name/Signature)*	Date/Time	Carrier: *(In person, Fed X, UPS, etc)*

General Comments: Please hold metals/CN samples [illegible] for instructions – process VOCs immediately [illegible] day)

Distribution: *Original: Accompanies Samples (Return to Originator), Yellow Copy: Field Crew, Pink Copy: Laboratory Files*