SCANNED

SUPPLEMENTAL HYDROGEOLOGIC INVESTIGATION OF THE FORMER COLUMBIA RIBBON AND CARBON COMPANY WASTE DISPOSAL SITE

Prepared For:

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(1269A)

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APPENDICIES

1.0 Introduction

Fred C. Hart Associates, Inc. was retained by Powers Chemco, Inc. to conduct a supplemental hydrogeological investigation at the former Columbia site located in Glen Cove, Long Island, NY. In 1979, Powers Chemco purchased a parcel of land from the Columbia Ribbon and Carbon Manufacturing Company (Columbia) for use as a parking lot, unaware that Columbia had buried drums of industrial and hazardous waste on the property. At no time has Powers Chemco disposed of waste on the site. This supplemental investigation was performed to more fully assess environmental conditions identified during previous work activities at the site. Powers Chemco initiated and planned the supplemental investigation under a voluntary Consent Order, Index #T071585, issued by the New York State Department of Environmental Conservation (NYDEC).

All work conducted was under the approval of the NYDEC. NYDEC had the right to supervise all phases of the project, and provided technical oversight on a periodic basis.

The hydrogeologic investigation was composed of the following three field tasks:

Task 1: The drilling of soil borings and groundwater monitoring wells to more fully assess the geological and hydrogeological characteristics of the site area.

Task 2: The sampling and analysis of groundwater to determine the extent of any contamination migration at the site.

Task 3: The drilling of shallow soil borings to confirm the pinching out of a thin layer of stained soil at the north end of the site.

This report summarizes field activities and presents the findings and conclusions of the investigation.

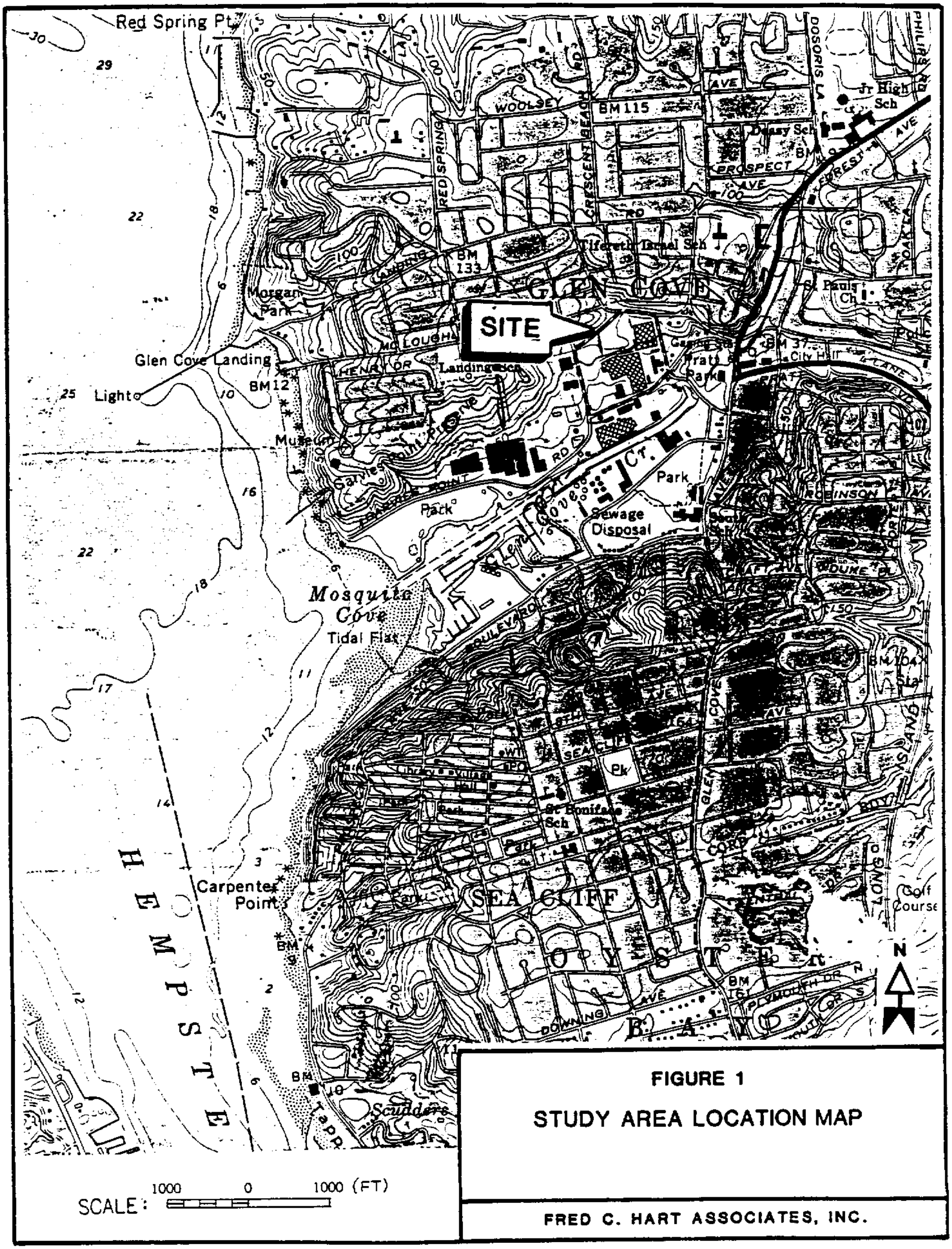

FIGURE 1

STUDY AREA LOCATION MAP

FRED C. HART ASSOCIATES, INC.

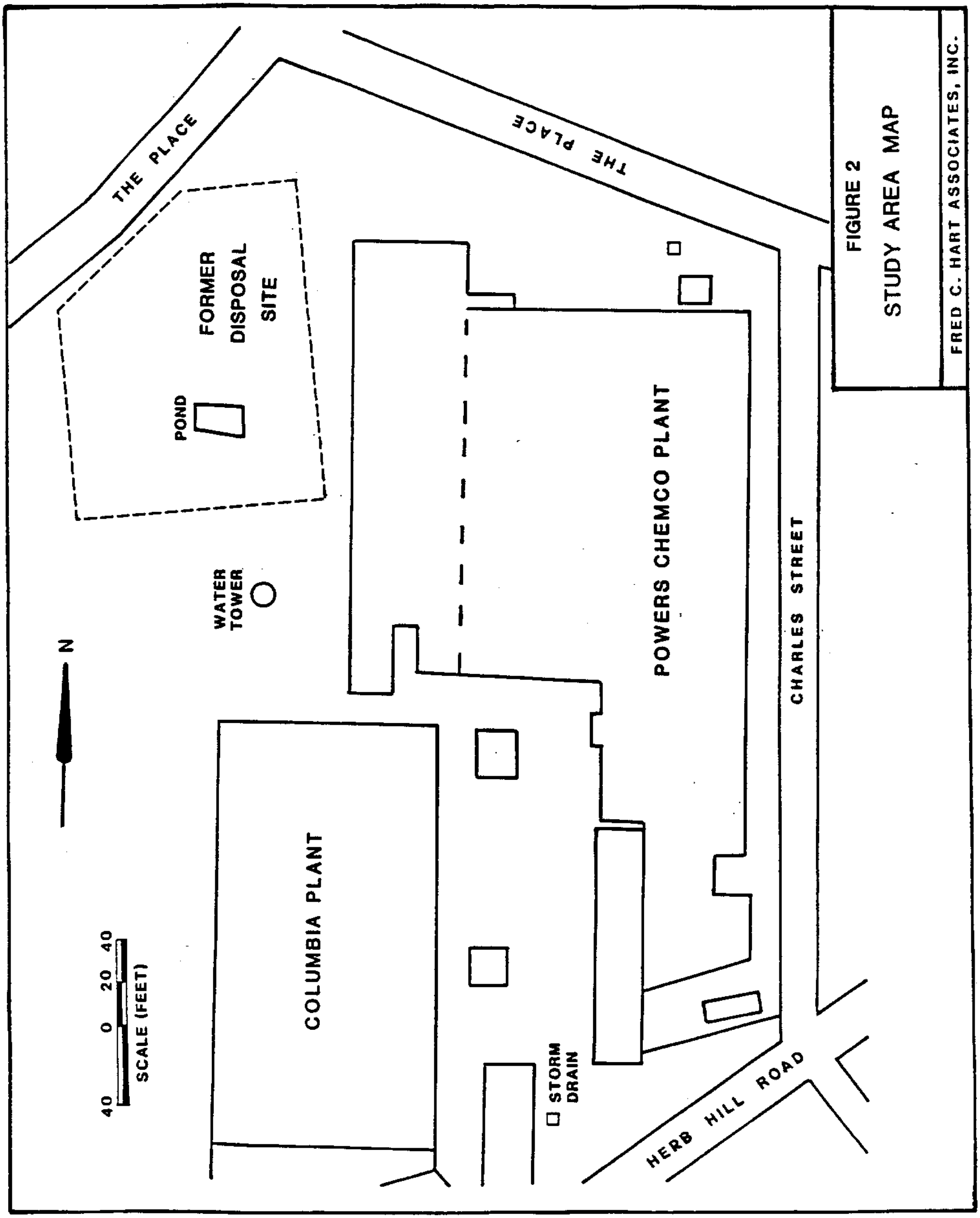
FIGURE 2
STUDY AREA MAP
FRED C. HART ASSOCIATES, INC.
THE PLACE
THE PLACE
FORMER DISPOSAL SITE
POND
WATER TOWER
POWERS CHEMCO PLANT
COLUMBIA PLANT
CHARLES STREET
HERB HILL ROAD
STORM DRAIN
N
SCALE (FEET)
40 0 20 40

2.0 Background

2.1 Study Area Description and History

Powers Chemco, Inc., located in Glen Cove, N.Y., is a privately owned company that manufactures photographic equipment and supplies. Figure 1 provides the location of the study area on the Seacliff, N.Y. 7.5' Quadrangle. Figure 2 provides a study area map and shows the boundaries of the disposal site. The Powers Chemco study area, as a whole, includes the Powers Chemco Property proper and former Columbia property. These areas comprise of a total of 17.3 acres located between Herb Hill Road and The Place. The disposal site comprises less than 2 acres in the northern section of the study area.

2.2 Geologic Setting

The study area is underlain by unconsolidated glacial sediments that were deposited during the late Pleistocene when the ice of the last glacial advance was receding. These glacial deposits consist of lacustrine silts and clays that are intermixed and overlain by coarse sands and gravels which in turn are overlain by ablation till and boulders. Findings of the investigation regarding site-specific geology, as well as regional geology, are provided in Section 6.0.

2.3 Previous Investigations

A previous site investigation and hydrogeologic assessment was completed by Fred C. Hart Associates (HART) from November 1983 - March 1984. The results of the investigation are presented in, "Investigation and Hydrogeologic Assessment of the Former Columbia Ribbon and Carbon Company Waste Disposal Site" April 1984.

Various direct and indirect technologies were employed during the site investigation to delineate the waste disposal area and to assess the degree of contamination in the shallow saturated materials. The indirect techniques consisted of OVA readings, magnetometry, surface resistivity and metal detection which defined the site boundaries, and also revealed the western portion of the parking lot to be relatively free of contamination. The OVA/M-Pacto probe survey showed the western portion of the site to be relatively free of volatile organic concentration. In addition, test pit excavation data showed this area to be clean. Priority pollutant volatile compounds were either not detected or below minimum detection limits in the samples from these pits. Test pits confirmed the northeastern and southern boundaries of contamination, with the eastern limits of the investigation being the edge of the present Powers Chemco building.

This investigation and hydrogeologic assessment determined that the shallow groundwater and soil were contaminated with solvents, principally toluene and residues from the formulation of blue printing inks. The results of that investigation were reported to NYSDEC and served as the basis for the initial remedial program. That program called for the excavation of heavily contaminated soils and the removal of buried drums for proper off-site disposal. The initial remedial program, certified by Fred C. Hart Associates, Inc., was completed in accordance with the approved plan and accepted by NYSDEC.

Based on the analytical data and subsurface information gathered, the need was identified for additional test borings and monitoring wells to be installed. Recommendations based upon this investigation stressed that the area east of the disposal site be further assessed. The western part of the site was excluded from additional investigation. These recommendations were based upon the following criteria:

1. Analytical data, specifically from the electrical resistivity, metal detection and test pit excavation programs, demonstrated contaminants were restricted in the immediate vicinity of the former disposal site and to the east.

2. Sand and gravel units, were found to underly the eastern portion of the disposal area, and information provided in the plant's foundation boring logs suggested they may be laterally continuous to the East. Recommendations excluded the western area of the site from additional investigation based on the analytical data and the fact that thick confining units of clay were found to underlie the western part of the site.

2.4 Work Scope

Based on the need for additional hydrogeological information east of the disposal area, a work scope was developed which consisted of three field tasks. Task 1 involved the drilling of test borings and the installation of monitoring wells at locations east of the disposal area in order to determine the geological and hydrogeological characteristics. Task 2 involved the sampling and analysis of groundwater to more completely determine the extent of contaminant migration, if any. Task 3 involved the drilling of shallow soil borings to confirm the non-continuous nature of a thin layer of stained soil in the disposal area.

3.0 Task 1 - Test Borings and Wells

3.1 Introduction

A supplemental groundwater monitoring system consisting of six wells was installed by HART. This system was installed to provide, along with the previously installed HART wells, the necessary hydrological and chemical data needed to determine the groundwater flow direction and detect contaminant plume migration from the disposal area.

This Task consisted of three subtasks: Drilling and sampling of test borings, screening of soil samples for volatile organic compounds, and installation of monitoring wells. A description of each subtask follows.

3.2 Test Borings

3.2.1 Purpose. Test borings were drilled in order to obtain soil samples from particular locations around the site and to provide for the installation of groundwater monitoring wells in each of the borings. The collection of soil samples enabled an assessment of subsurface lithology and contamination to be made. A total of seven borings were completed at the locations shown in Figure 3. These locations were chosen to characterize subsurface geology at these points and to intercept potential contaminant migration from the disposal area. Specifically, borings TB-7, TB-8 and TB-11 were drilled in the vicinity of the disposal site proper. Borings TB-9, TB-9A, TB-10 and TB-10A were drilled to the east and downgradient of the disposal site.

3.2.2 Procedure. The test borings were drilled by Kendricks Drilling Inc. of Monroe, NY under the close supervision and direction of a HART hydrogeologist. A Mobile B-60 drill rig, using hollow-stem augers and the hydraulic (mud) rotary technique, was used.

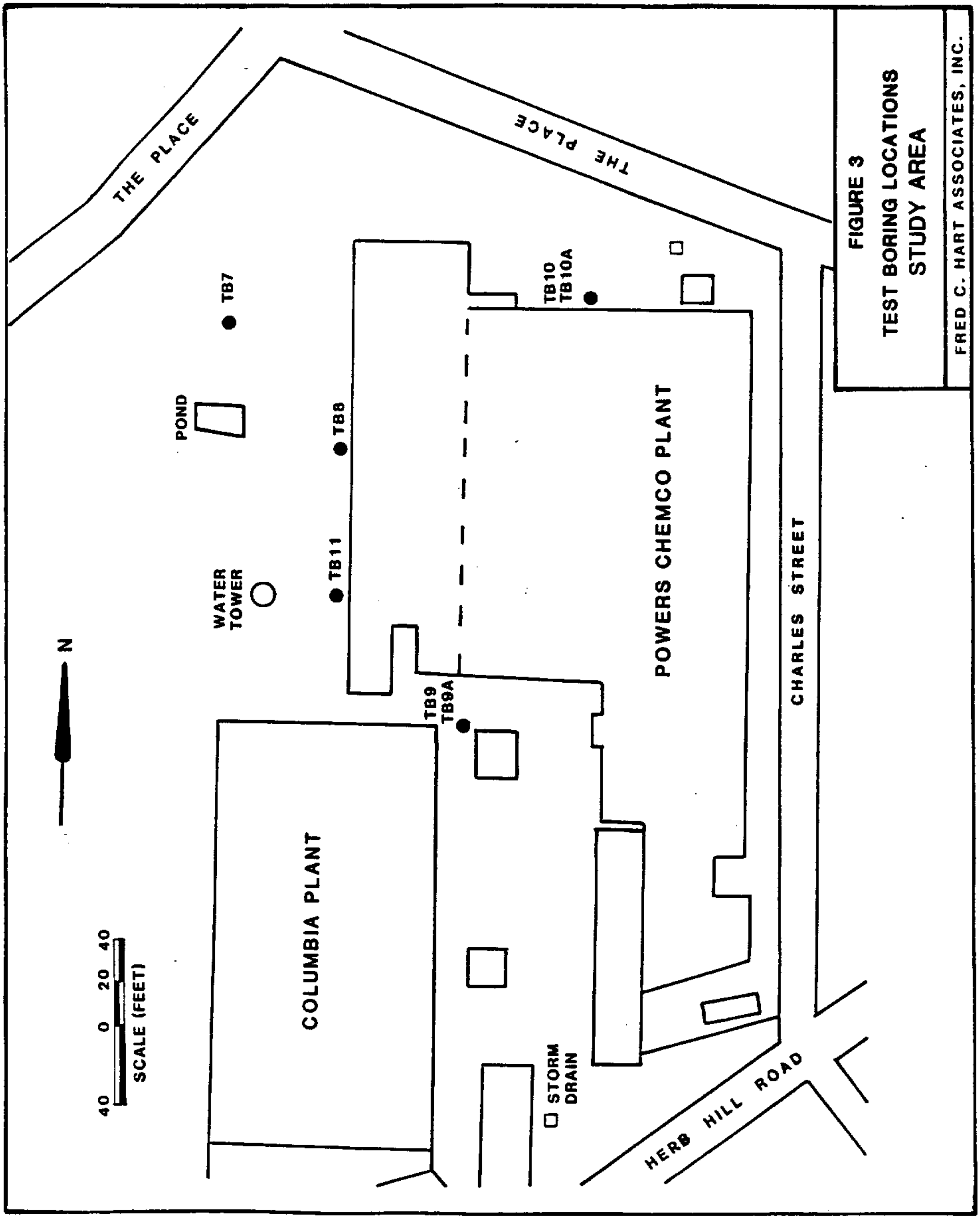

FIGURE 3
TEST BORING LOCATIONS
STUDY AREA

All shallow borings were drilled using five-foot flight hollow-stem augers of 3-3/4 inch inner-diameter (I.D). The shallow borings were advanced within the upper zone until a significant confining layer was encountered. The deep borings were drilled via the mud rotary technique. These borings were designed to penetrate the upper confining layer and be constructed within the deeper zone to a maximum depth of sixty feet. To prevent the movement of potential contaminants from the upper shallow zones to deeper zones, a 5-inch I.D. galvanized steel casing was driven from the surface and seated into the confining layer. Following casing installation, all drilling fluids were flushed from the borehole and new mud was mixed before drilling resumed.

Geologic sampling was conducted utilizing the split-spoon sampling technique. Undisturbed samples were collected continuously in advance of boring with a standard 2-inch outer diameter (O.D) split-spoon sampler driven over a two foot interval with a 140 pound hammer falling 30 inches. The split-spoon samplers used at each boring were decontaminated prior to sampling and between sampling with a mild detergent wash followed by a tap water rinse.

The contents of each split-spoon were carved from the center of the spoon with a clean knife and placed in sample bottles. A portion of the sample was placed in 40 ml volatile organic analysis (VOA) vials which were used for volatile organic screening and the rest in an 8 oz. glass sample bottle.

A detailed log of lithology and groundwater conditions encountered was kept by the site hydrogeologist during drilling. The borehole logs are provided in Appendix 1.

All drilling equipment used (augers, rods, mud pan, rig, etc) was decontaminated between test borings to eliminate the possibility of cross contamination. One specific controlled decontamination area was set up on-site for this purpose. The decontamination process included the removal of bulk solids from all apparatus by steam cleaning. Solid and liquid waste from this process was drummed separately.

3.2.3 Findings. The data obtained from the test borings was used to prepare the description of the site geology provided in Section 6.4 of this report. Data from the volatile organic screens of the soil samples is discussed in the following section. Construction details of the test borings are provided in Table 1.

3.3 OVA HEADSPACE ANALYSIS

3.3.1 Purpose. Soil samples obtained during construction of the test borings underwent Organic Vapor Analyzer (OVA) headspace screening in an effort to: 1. determine the presence and vertical extent of volatile organic compounds in Test Borings 7-11, and, 2. select a screening interval for monitoring well construction to intercept the zone of highest volatile organic concentration.

3.3.2 Procedure. Soil samples were collected by the split-spoon technique during test boring constructions, discussed in the previous section. Soils for OVA analysis were placed in 40 ml VOA Vials and transported directly to the field laboratory.

Upon receipt of the soil samples at the field laboratory, each bottle was placed in a 50°C hot water bath for ten minutes. Afterwards, an aliquot of air from the headspace within the VOA vial was withdrawn by a syringe for direct injection into the OVA. Any presence of volatile organic compounds greater than 1 ppm was indicated by a deflection of the needle on the OVA gauge. Relative quantitative results were indicated by the magnitude of the needle's deflection. By determining the presence of volatile organic compounds in soil samples, zones of potential contamination within the stratigraphic column were delineated.

3.3.3 Findings. The OVA survey of the soil samples showed that test borings 9, 9A and 11 exhibited the lowest readings of total volatile organics. OVA readings ranged from 0-1.6, 0.2-2.6 and 0.1-1.0 ppm respectively. These boreholes are located southeast and down gradient of the former disposal area.

Table 1

CONSTRUCTION DETAILS OF TEST BORINGS

Test Boring	Total Depth Drilled (ft)	Depth to Water in Boring (ft)	Casing Depth (ft)	No. of Soil Samples
7	64	-	46	25
8	20	9	N/A	10
9	30	12	N/A	15
9A	58	12	32'	14
10	26'	8.5	N/A	13
10A	67'	8.5'	29.5	21
11	38'	28'	N/A	19

Test borings 8, 10 and 10A, located due east of the former disposal area, showed relatively greater OVA readings ranging from 0.2-160, 0.4-60 and 0.2-8.8 ppm respectively. Soil samples from the upper ten feet of TB-8, composed predominantly of sands, showed concentrations of total volatile organics ranging from 0.2-0.4 ppm. Soil samples from the lower half (12-20 feet) of this borehole exhibited levels of contamination ranging from 40.0-160.0 ppm. These samples obtained were from below the water table composed mostly of sands with traces of clay and decomposed wood. Soil samples from TB-10, taken from above a clay unit, are composed mostly of sandy and clayey silt. OVA readings in this borehole ranged from 0.4-60.0 ppm. Soils samples from TB-10A are taken through and below this same clay unit and exhibit readings ranging from 0.2-8.8 ppm.

Soil samples from the upper section of TB-7, located in the center of the former disposal area, exhibited relatively greater OVA readings. Samples from this upper unit situated above the clay layer ranged from 100-500 ppm total volatile organics. By contrast soil samples through and below the clay unit contained lower OVA readings ranging from 0.2-4.0 ppm

It should be noted that the results obtained from screening with the organic vapor analyzer are intended for relative comparison of samples, and are not indicative of actual contaminant concentration. Because of the extraction procedure utilized with this technique, apparent concentrations of volatile organics are generally greater than the actual concentration. Resultant data from this exercise were used to select screening intervals for monitoring well installations based on the relative comparisons of samples within a particular borehole.

3.4 Installation of Monitoring Wells

3.4.1 Purpose. The purpose of this program was to investigate potential volatile organic contamination and hydrogeological conditions east of the former disposal area within the shallow and deeper aquifers. The monitoring wells were placed specifically in two zones of interest: 1. the shallowest, most permeable saturated zone underlying the site and 2. in the lower aquifer unit underlying the confining layer.

TABLE 2

WELL CONSTRUCTION DETAILS

Well No.	Depth (Feet)	Screened Interval (Feet)
7	64	54-64
8	18.5	8.5-18.5
9	22	12-22
9A	33	23-33
10	18.9	8.9-18.9
11	38	28-38

(1273A)

3.4.2 Procedure. A total of six groundwater monitoring wells were installed at the study area. Five of these (8, 9, 9A, 10 and 11) are shallow wells installed in the shallow aquifer above a confining unit. One deep well (7A) was installed in the lower aquifer unit directly below the confining unit. All wells were constructed of two-inch I.D. schedule 40 PVC riser pipe (threaded flush joint) and a two-inch I.D. machine slot PVC well screen ten feet in length. Well construction details are provided in Table 2 and Appendix II.

Well screening intervals were dependent on the subsurface geology and stratigraphic contaminant concentration as indicated by OVA headspace analysis.

After the screening interval of each well was determined, the augers were retracted from the bottom of the borehole to the selected interval. The borehole was allowed to collapse below the augers and was then filled with one foot of sand to provide a base on which to set the screen. The well was then installed into the borehole and held in place while the annular space around the screen was backfilled with No. 1 size graded sand to two feet above the top of the screened interval. A two foot bentonite pellet seal was emplaced above the gravel pack, and the remainder of the borehole tremmie-grouted with a cement/bentonite slurry. A 5 ft. long protective steel casing was seated at the surface and grouted in place with cement. A cement pad was constructed around the protective casing to prevent surface water from infiltrating into the well.

Only one of the three originally proposed deep wells was installed at the site. Placement of monitoring well 9A into the lower aquifer was abandoned because the confining unit could not be penetrated after 67 feet of boring. After consulting with the NYDEC, Monitor Well 9A was installed in the lower unit of the overlying shallow aquifer, screened at a depth of 23-33 feet. Well 9, in the same aquifer, is screened at a depth of 12-22 feet.

Following the test boring phase, monitoring well 10D was also abandoned because a suitable interval for placement could not be found despite penetrating through the confining unit to a depth of 68 feet. Sufficient water-bearing material is not present at depth in this location. The decision to abandon placement of this deep well was made with the NYDEC.

Monitoring well 7 was installed into the lower aquifer as originally proposed. The well is screened immediately below the confining unit at a depth of 54-64 feet. Special precautions were taken in the construction of this well to prevent the introduction of contaminants below the confining layer. After boring down to the surface of the confining unit, 5-inch I.D casing was pushed into the confining unit an additional six feet. Following casing emplacement, all drilling fluids were flushed out of the borehole and new drilling mud was mixed before drilling resumed. At a depth of 54 feet the confining unit was breached and found to be underlain with a sand and gravel unit. While drilling continued 10 feet into this unit, temporary inner casing of 4-inch I.D. was emplaced into the borehole to prevent it from collapsing. Following completion of the borehole, the monitoring well was introduced and constructed as the inner-casing was removed. Well construction materials utilized were the same used in construction of the shallow wells.

Following installation, all wells were developed by surging with compressed air to remove formational fines from the well screens and induce the flow of groundwater into the well. Water was removed until visibly free of sediment.

3.5 CASING ELEVATION AND WATER LEVEL MEASUREMENTS

3.5.1 Purpose. In order to contour the potentiometric surface and determine groundwater flow direction, all well casings were surveyed by DBA Engineering of Greenville, NY. Water level measurements were collected by HART Personnel. The water level measurements were used to construct a potentiometric surface map, which is discussed in Section 6.5.

3.5.2 Procedure. Well Elevation Survey. Elevations of inner (PVC) well casings were determined utilizing differential leveling techniques. The elevations were surveyed relative to mean sea level. To insure consistency of measurements, readings were taken on the northern side of the inner well casings, and the location noted on the casing. Data from this survey is provided in Table 3.

Water Level Measurements. Water level measurements were taken of all wells on 5-23-86 by HART Personnel. The instrument probe (Slope Indicator Co., Model S1453) was lowered from the top of the PVC casing down the well. When the electrode came into contact with water, an audio signal was emitted from the instrument. Potentiometric maps were then constructed from the water level measurements.

TABLE 3

Well	Elevation of PVC Riser*	Depth to Water*	Elevation of Water Table
1	64.66	14.13	50.53
3	62.17	12.74	49.43
4	64.02	9.16	54.86
5	61.19	10.41	50.78
6	61.28	13.38	47.90
7	60.28	7.32	53.96
8	59.91	10.48	49.43
9	44.74	13.43	31.31
9A	44.80	13.50	31.30
10	62.25	10.56	51.69
11	60.47	29.63	30.84

* From Top of PVC Riser

ELEVATIONS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL

4.0 TASK II-SAMPLING AND ANALYSIS OF MONITOR WELLS

4.1 Purpose. A total of 10 groundwater monitor wells (6 described in this report and 4 previously installed) and one storm drain were sampled on May 9 and 12, 1986 in order to assess potential contaminant migration from the disposal area (Figure 4). Parameters analyzed for were agreed to in consultation with NYDEC.

4.2 Procedure. Three to five well volumes of water were purged from each well prior to priority pollutant sampling. The purpose of this procedure was to assure that representative samples of the formation waters were obtained. All wells were evacuated with a bottom-loading stainless-steel bailer. Individual well volume data is presented in Table 4. Monitoring well, 3 located in the southern sector of the site, could not be sampled due to structural damage and does not appear on this table.

This purging procedure also enabled observations of the relative recharge capacities of each completed well to be made. In general, it was noted that most of the wells recharged readily and experienced no significant drawdown of static water level. Only well 10 was bailed dry and time had to be allocated to allow the well to recharge several times until the appropriate volume was removed. This can be attributed to the well being screened in a lower permeable unit, with only a few sand lenses within the unit available to recharge the well. Following evacuation of each well, a groundwater sample was collected with a decontaminated bottom-loading, stainless steel bailer, outfitted with a teflon check valve and a new length of polypropylene rope. The sample was poured directly from the bailer into laboratory supplied glassware which had been previously spiked with the appropriate preservatives and packed on ice. The samples were then transferred to the H2M laboratory of Melville, NY, for priority pollutant volatile organic analysis.

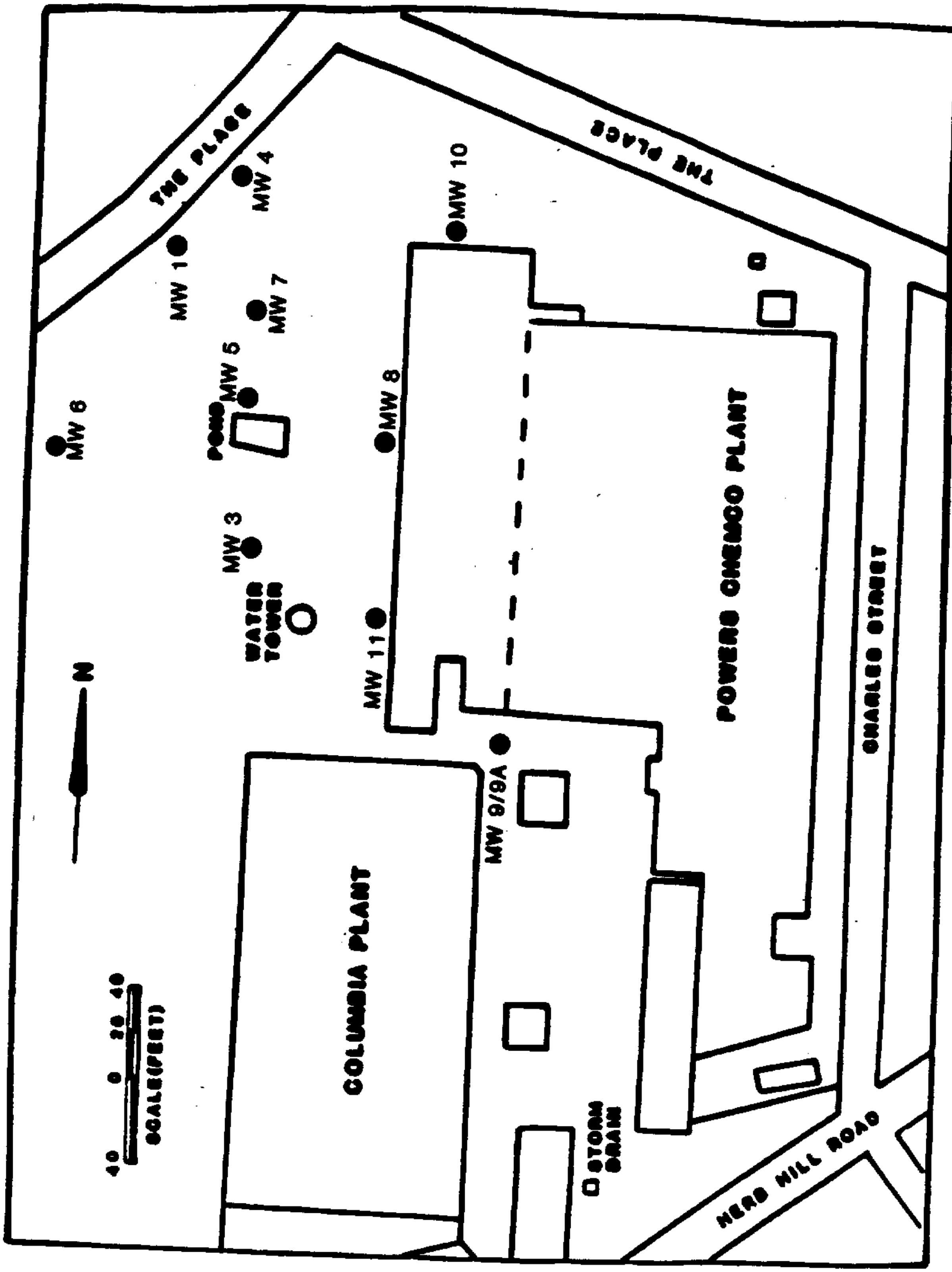

FIGURE 4
SAMPLING WELL LOCATIONS
STUDY AREA

FRED C. HART ASSOCIATES, INC.

TABLE 4

WELL VOLUME DATA AT TIME OF SAMPLING

Well #	Depth to Water (ft)	Height of Water Column (ft)	Volume of Well (gal)	Volume (gal) Removed
1	13.94	10.94	1.75	6.0
4	9.0	10.5	1.72	6.0
5	10.30	5.30	0.8	6.0
6	13.0	1.0	0.16	6.0
7	6.21	57.79	9.2	28.0
8	10.48	8.02	1.3	6.0
9	13.29	8.71	1.3	6..0
9A	13.30	19.7	3.1	12.0
10	10.18	8.32	1.3	6. 0
11	28.50	9.5	1.52	6.0

A total of 15 samples were collected. A list of these samples is provided in Table 5. Ten monitoring wells and one storm drain were sampled. Two blind duplicates were collected from MW-1 and 9A for laboratory QA/QC purposes. One field blank was poured over a decontaminated bailer in order to check on the thoroughness of the decontamination procedures used in the field. Additionally, one trip blank was also provided to check laboratory QA/QC and the integrity of the sample vials.

Sampling equipment was decontaminated between uses to prevent the cross-contamination of samples. The procedure followed consisted of washing the bailer with a mild soap detergent and water, followed by a distilled water rinse and a methanol rinse. The bailers were allowed to dry thoroughly before re-use to assure the complete volatilization of the methanol.

4.3 Findings The findings of this groundwater sampling program are provided in Appendix III and summarized in Table 6. Detected volatile organic compounds are expressed in parts per million (ppm). A total of seven volatile organic constituents were detected. Of these, toluene was the most common contaminant detected, ranging from 0.02-83.0 ppm. No more than three of the detected constituents were ever present in any of the water samples. Total concentrations ranged from 0.01 to 83.0 ppm.

No volatile organics were detected in samples from the storm drain and MW 8. Samples from MW-9, 9A, 10, and 11 contained the presence of some constituents in concentrations (0.01-0.03 ppm) slightly above the level of detection. Toluene, m-xylene, and o/p xylene were present in both MW-9 and 11. Only toluene was present in MW-10 in levels above detection. These wells are located east and downgradient of the former waste disposal site.

MW-9A contained three detected constituents - tetrachloroethene, trichloroethene and cis/trans 1,2 dichloroethene. These compounds have never been previously detected during groundwater monitoring at the facility, both in the disposal area proper, or at any point removed from

TABLE 5

GROUNDWATER SAMPLES COLLECTED

	Sample	Well #	Lab ID #
1.	1	1	655257
2.	4	4	655258
3.	5	5	655259
4.	6	6	655260
5.	7D	7A	655261
6.	8S	8	655251
7.	9S	9	655252
8.	9D	9A	655253
9.	10S	10	655262
10.	11S	11	655254
11.	12	1 (duplicate)	655263
12.	13D	9A (duplicate)	655255
13.	14	Field Blank	655264
14.	15	Trip Blank	655265
15.	Storm Drain	Storm Drain	655256

TABLE 6

Well #	Toluene	M-Xylene	O/P Xylene	Tetra-chloroethene	Trichloro-ethene	Cis/Trans 1,2 dichloroethene	1,1 dichloroethane
1	ND	ND	ND	ND	ND	ND	0.12
4	70.0	ND	ND	ND	ND	ND	ND
5	83.0	ND	ND	ND	ND	ND	ND
6	0.23	ND	ND	ND	ND	ND	ND
7	0.12*	ND	ND	ND	ND	ND	ND
8	ND	ND	ND	ND	ND	ND	ND
9	0.02	0.02	0.01	ND	ND	ND	ND
9A	ND	ND	ND	0.03	0.03	0.03	ND
10	0.02	ND	ND	ND	ND	ND	ND
11	0.03	0.02	0.02	ND	ND	ND	ND

CONCENTRATIONS EXPRESSED IN PPM

ND - Not Detected

* Not Detected During Resampling/Analysis

(1315A)

this. This anamoly may be indicative of regional groundwater quality or of localized trends at depth in the upper glacial aquifer.

Slightly elevated levels of volatile organics were detected in MW-6 and 7. 0.12 ppm of toluene was detected in MW-7, and 0.23 ppm of toluene was detected in MW-6. These wells are located west and in the middle of the former waste disposal site, respectively.

The presence of Toluene in MW-7 was considered anamalous. Due to its low density, toluene generally is found, if present, within the upper part of water-bearing units. It would not be expected to migrate vertically to lower depths. At this location, any migrating contaminant would have to breach a relatively impermeable confining unit as well. Based on this, it was felt that the 0.12 ppm concentration of toluene in this well may be the result of contamination during laboratory analysis. As a result, MW-7 was resampled and analyzed with an additional trip blank. Laboratory analysis showed non-detecable levels of any volatile organics, as shown in Appendix III.

Toluene was the only detected volatile organic in MW-4 and 5, located within the former waste disposal site. The concentration of toluene in these wells was the highest (70 and 83 ppm respectively) in the total study area.

These findings reveal an apparent vertical stratification of contamination. Monitor wells 1 and 9A, which were screened in the lower levels of water-bearing units above confining layers, contained the presence of heavier poly-chlorinated constituents. The remaining monitoring wells, which were screened in the upper sections of the water table, contained the lighter volatile organic constituents toluene and xylene.

5.0 Task III - Shallow Soil Boring Program

5.1 Purpose

Test pit excavations, conducted during the initial site investigation, in the eastern section of the former disposal site, indicated the presence of blue-stained soil eminating from the disposal site eastwards towards the guardhouse. At the vicinity of the guardhouse, the blue-stained soil had decreased in mass and was present as a thin laminae which seemed to be pinching out. As a result, three shallow borings of six foot depth were drilled in the vicinity of the guardhouse to confirm the pinching out of the blue-stained soil. Figure 5 provides a boring location map.

5.2 Procedure

The top asphalt layer was penetrated utilizing the drill rig and a two-inch diameter drill bit. Upon penetrating the asphalt, soil samples were collected continuously ahead of the auger utilizing the split-spoon sampling technique. Test borings were completed to a depth of six feet. Split-spoon samples were visually inspected and logged for lithology and presence of any waste material.

5.3 Findings

Boring logs are provided in Appendix 1. Recoveries from the three borings consisted of dark brown to black sandy silt material possibly roadfill. Occasionally gravel would be present in some samples. None of the recovered samples contained any blue-stained soil confirming that the stained soil faded out to the west of the investigated area.

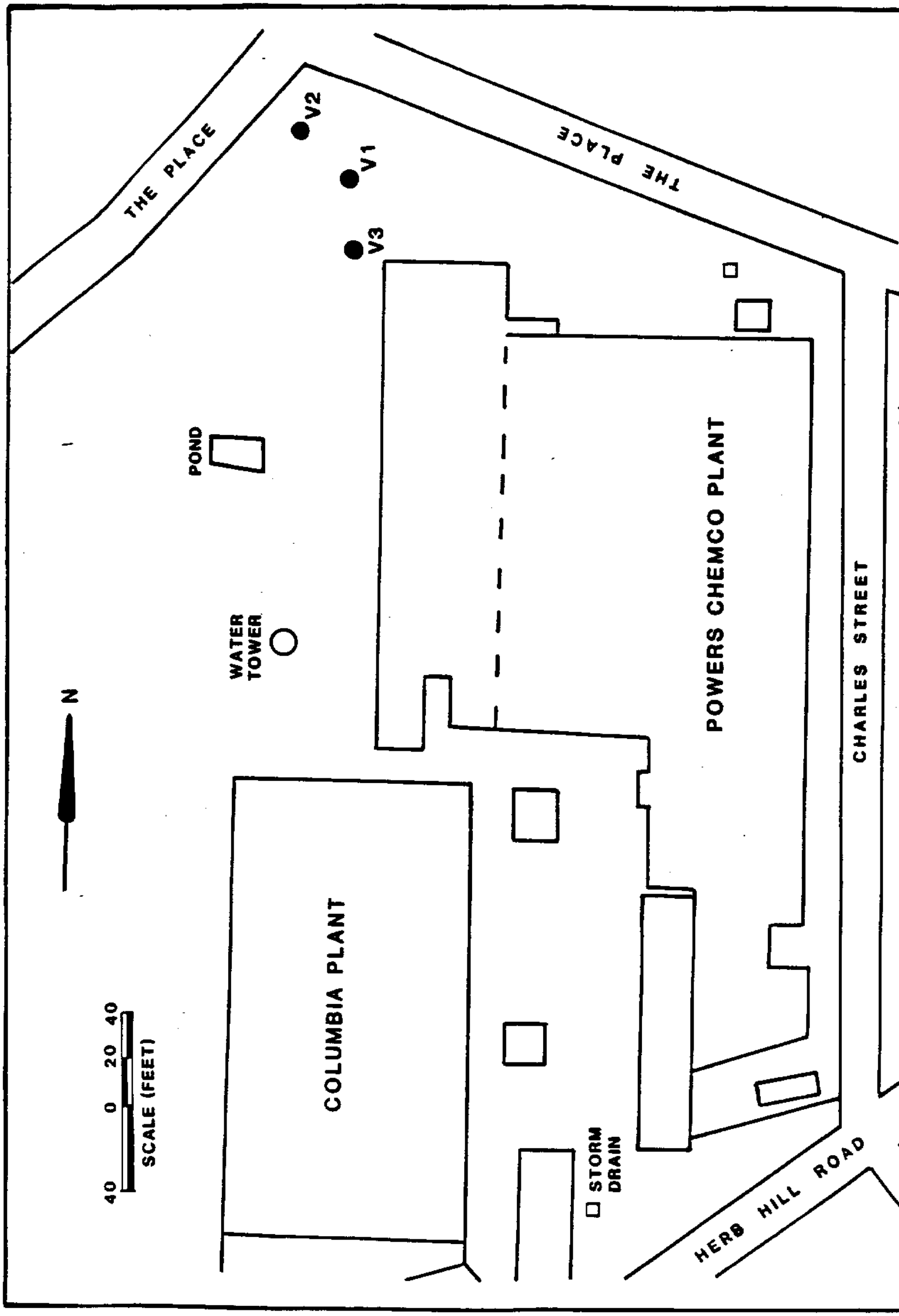

FIGURE 5
SHALLOW BORING LOCATIONS
STUDY AREA

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6.0 ASSESSMENT OF GEOLOGY AND HYDROGEOLOGY

6.1 Introduction

The purpose of this section is to describe the geology and hydrogeology on a regional and a site specific scale, based on published information, and on the results of the investigation at the former Columbia site.

6.2 Regional Geologic Setting

The area of investigation is situated north of the Harbor Hill terminal moraine, a series of coalescing irregular hills which form a pronounced ridge trending north-northeast. This moraine marks the terminal position of the late-Wisconsin ice sheet (glacier). The deposits formed during the glacial recession north of the terminal moraine, in the area of the site, include late-glacial outwash sand and gravel, till or ground moraine (a heterogeneous mixture of clay, silt, sand and boulders) intercalated with gray clay lenses and delta deposits. Additional late-glacial deposits include lacustrine (lake deposited), estuarine, and marine sediments which may occur on the surface of the glacial drift. All these deposits are commonly referred to as upper Pleistocene deposits.

The predominant surface deposit in the vicinity of the site is a veneer of Harbor Hill ground moraine. The deposits below the Harbor Hill ground moraine may be attributable to the recession of the glacial terminus to the northern edge of Long Island resulting in the development of pro-glacial lakes, principally occupying the north shore embayments between the moraine to the south and the ice to the north. These pro-glacial lakes account for the deposition of fine grain (silt and clay) lacustrine materials as well as varved sediments which have been identified throughout the study area. Varved sediments are laminated deposits of finer grain silts and clay and coarser grain materials. This lamination was produced by cold dense glacial melt water plunging beneath lake waters to produce a density current that carried sand, silt and clay over the lake floor. The coarse grained fraction settled quickly during the spring melt while finer grained materials settled more slowly.

After these pro-glacial lakes drained, the remnant deposits were subsequently dissected by streams draining from Long Island Sound basin. These streams deposited a gravelly sand which cut into the laminated deposits. It is these outwash channels of coarse grain materials which occur at the former Columbia site as the shallow sand and gravel deposits.

6.3 Regional Hydrogeology

There are three principal aquifers in the area of the site. These are designated as the shallow unconfined (Upper Glacial), the principal undifferentiated (Magothy), and the deep confined (Lloyd) aquifers. In addition to these aquifers, local bodies of perched groundwater are common throughout the area.

6.3.1 Lloyd Aquifer. The Lloyd sand member of the Raritan formation is the deepest and the only totally confined unconsolidated aquifer in the area. Encountered at a depth of approximately 350 feet below ground, this aquifer is separated from the overlying Magothy by a continuous clay member of the Raritan formation, which typically forms an effective confining layer on the order of 50 to 100 feet thick in the area of the site. Reportedly, the hydrostatic head in this deep confined aquifer is commonly 5 to 50 feet lower than the head in the overlying aquifers.

Locally, this aquifer provides a major source of water for industrial uses, including at the Powers Chemco plant. The regional groundwater flow direction in this aquifer is generally toward the southeast. However, the number of industrial wells in the immediate vicinity of the study area has developed a local cone of depression, resulting in radial groundwater flow toward this area from all directions (USGS, 1960).

6.3.2 Magothy Aquifer. The principal aquifer in the area is that portion of the Magothy formation occurring from about 100 feet below ground surface down to the top of the Raritan Clay member (approximately 200 feet deep). This aquifer is overlain by upper glacial deposits of Pleistocene age. The contact between the Upper Glacial and Magothy is undifferentiated (unknown) and because the hydrostatic heads in the Magothy are one to several feet lower than those in the upper glacial, the upper Magothy receives recharge from these shallow upper glacial deposits. Discontinuous clay and silt lenses within both the upper glacial and the Magothy, where present, serve to inhibit this recharge mechanism. Additionally, in the deeper permeable portions of the Magothy, artesian conditions generally prevail which would also inhibit downward migration. Regionally, the groundwater flow in the Magothy is toward the southeast.

The Magothy is the chief source of drinking water supply in the area of study. The City of Glen Cove municipal water supply wells obtain their water from the 200 to 300 foot zone in the Magothy.

6.3.3 Upper Glacial Aquifer. The upper glacial deposits which constitute the shallow unconfined aquifer consist of those permeable sand and gravel deposits that lie below the main water table and within the upper part of the saturated zone. Based on regional hydrogeologic data, the groundwater flow direction in the shallow unconfined aquifer at the former Columbia site is southerly, toward Glen Cove Creek.

Groundwater from the upper glacial deposits is generally of poor quality because of effects from urbanization. To date, no known users of water from the upper glacial aquifer have been identified in this area.

6.3.4 Bodies of Perched Water. Bodies of perched water that occur close to the land surface in the permeable depressions, which are underlain by less permeable materials, are common in the area of ground moraine north of the Harbor Hill terminal moraine (which includes the area of the site). A sheet of relatively impermeable older ground moraine from an earlier glacial advance may be responsible for these perched zones. Additionally, sand and gravel that was deposited by streams which dissected the finer grain lake deposits may also serve as a zone of perched groundwater in this area.

Usually, these perched groundwater zones are stagnant and exhibit little vertical or horizontal movement. As a result, isolated bogs or swamps develop on the land surface. Such topographic features are common over the study area.

6.4 Site-Specific Geology

The geology in general consists of alternating layers of unconsolidated glacial deposits consisting of sand, gravel, silt and clay Figures 6-9. these deposits vary laterally in thickness along with texture and composition.

Cross-section B-B' (Figure 8) constructed through the middle of the site illustrates the overall geology. Unconsolidated glacial deposits of sand, silt, sand and gravel, sand and silts, clay and silt and clay overlie a thick consolidated clay unit. These upper unconsolidated deposits vary in thickness from 12 feet, in the western portion of the site at TB-2, to 50 feet, in the eastern portion of the study area beneath the Powers Chemco Plant building and decrease in bulk to the south of the study area.

The unconsolidated glacial deposits grade vertically from fill deposits, composed of silty sand, bricks, cement fragments, asphalt and cinders, into a sand and silt layer. Beneath this layer lies a massive sand and gravel unit that acts as the glacial aquifer and comprises the majority of the unconsolidated glacial deposits.

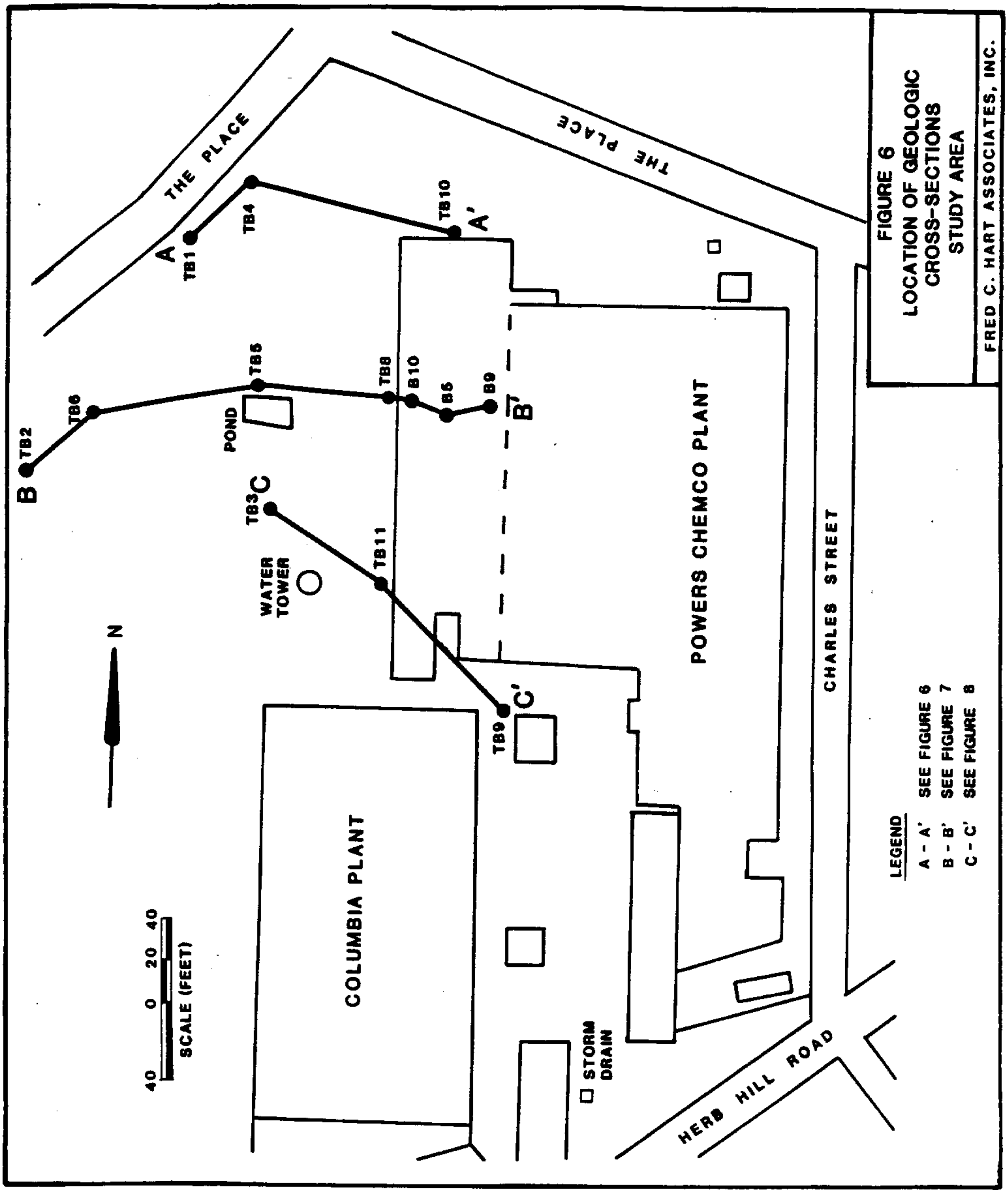

FIGURE 6
LOCATION OF GEOLOGIC CROSS-SECTIONS
STUDY AREA

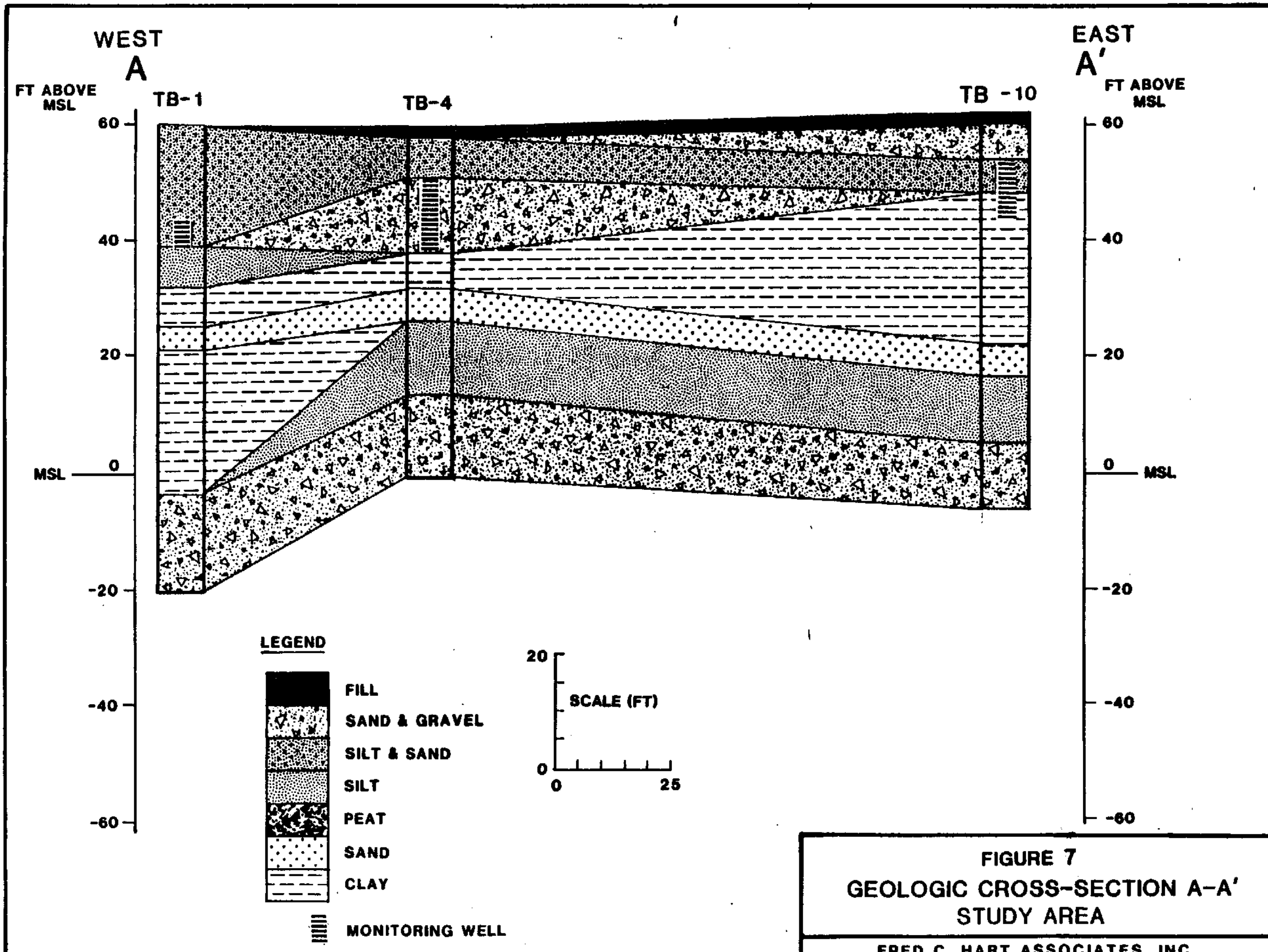

FIGURE 7
GEOLOGIC CROSS-SECTION A-A'
STUDY AREA

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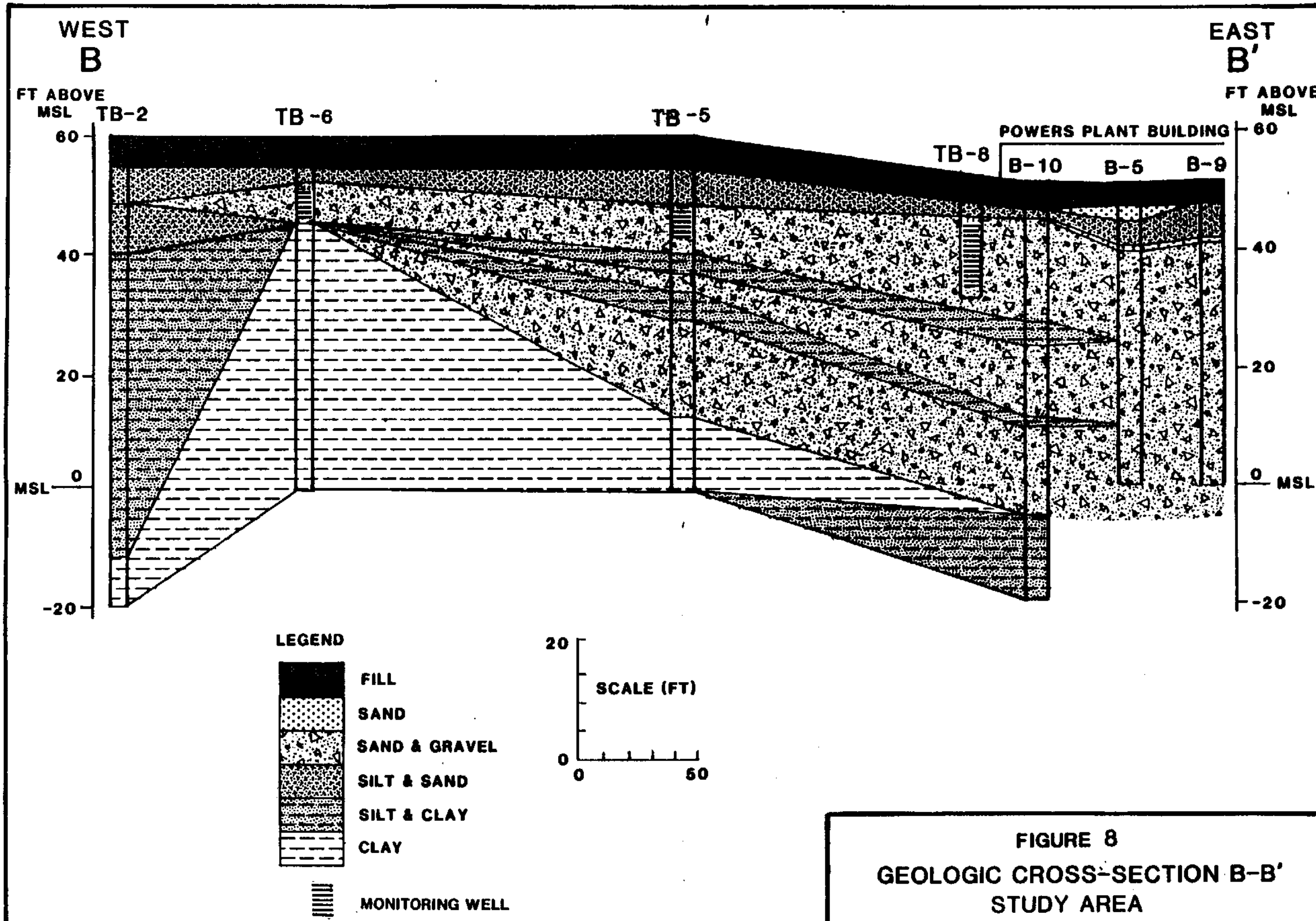

FIGURE 8
GEOLOGIC CROSS-SECTION B-B'
STUDY AREA

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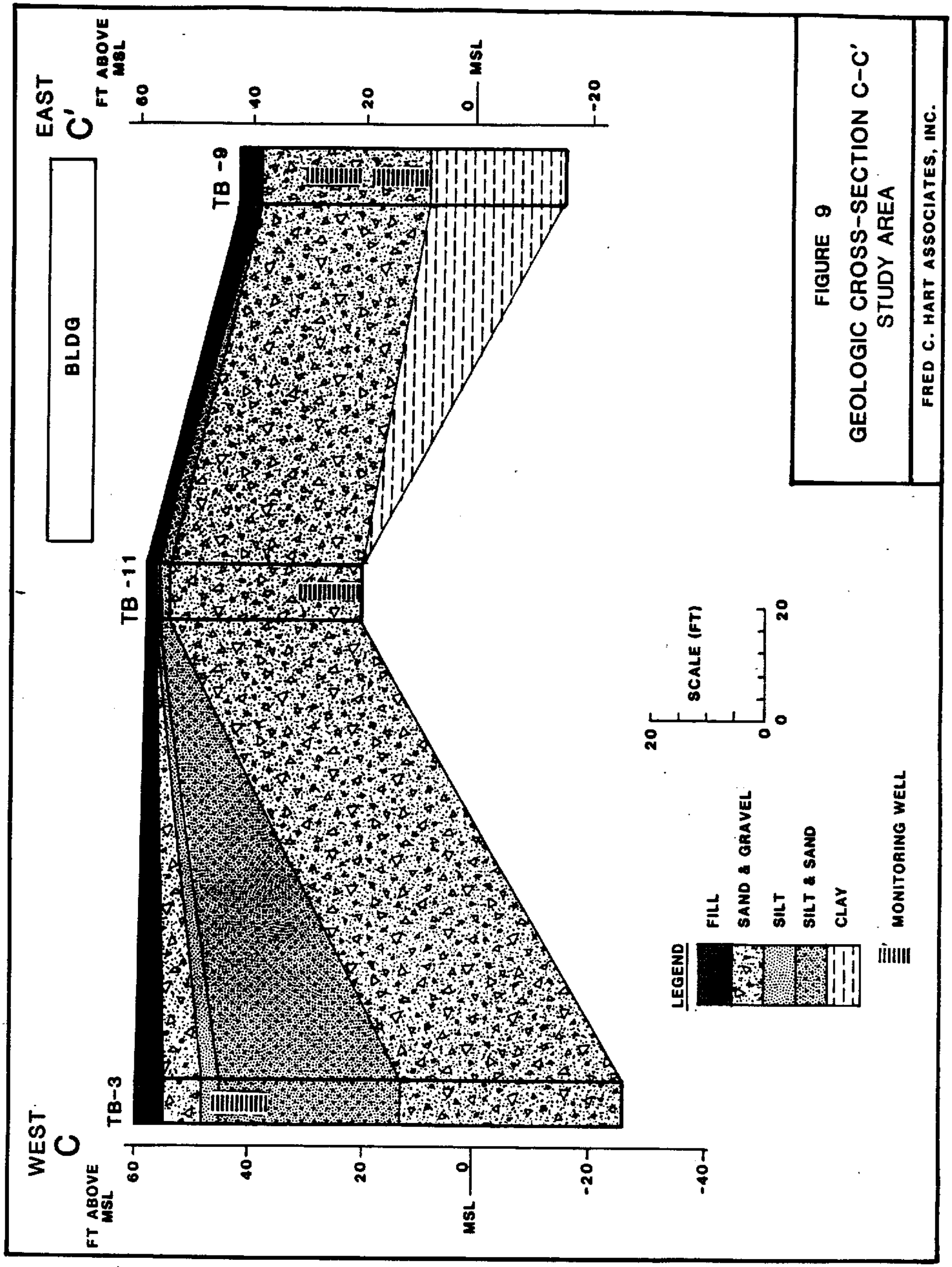

FIGURE 9
GEOLOGIC CROSS-SECTION C-C'
STUDY AREA

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This sand and gravel unit is most pronounced in the eastern portion of the study area beneath the Powers Chemco Plant building where its thickness attains a maximum of 45 feet. To the west, this unit laterally thins out between TB-2 and TB-6 where it shallows above a massive indurated clay unit that underlies the site. Between TB-6 and the middle of the Powers Chemco Plant building, the sand and gravel unit is subdivided into three sub-units by two lenses of silt and clay. These fine-grained deposits pinch out completely to the east underneath the Powers Chemco Plant building and to the south at TB-11.

The underlying lithology is composed of a massive unit of green to gray mottled clay. This clay unit reaches maximum thickness at TB-6 and thins out to the east and west where it becomes more silty in composition.

The northern sector of the site illustrated by cross-section A-A' (Figure 7) is also characterized coarse sand and gravel deposits which are separated by silt and clay layers. The upper sand and gravel unit is most conspicuous at TB-4 and eastward toward the Powers Chemco plant building. It is dissected by a sandy silt layer which is thickest toward the northwest corner of the site at TB-1. This silt layer thins out to the east where its texture becomes much finer grained.

Beneath the upper sand and gravel lies a layer of clay. The clay thins out laterally from TB-1, where it attains a maximum thickness of 35 feet, eastward beneath the Powers Chemco building. This clay layer grades with depth to a silt unit which thickens to the east where it grades into a sandy silt. These finer-grained deposits are underlained by the lower sand and gravel unit.

Cross-section C-C' (Figure 9) was constructed through the southeast sector of the site in an effort to characterized the geology to the south and beneath the Powers Chemco plant building. The overlying fill in the eastern sector give way to a massive unit of sand and gravel whose thickness ranges from 35-45 feet. Underlying the sand and gravel at TB-9 is a dense unit of red and gray clay. In the western sector between MW-3 and 11 the fill is underlain by a small layer of sand and gravel that is underlain by a thick layer of silt. The silt grades with depth into a massive sandy silt which is most extensive at TB-3 (35 feet thick) and pinches out to the east at TB-11.

In summary, the glacial units are composed of massive sand and gravel deposits in the southern and eastern sections and are much finergrained in the western portion where they are composed of large units of silt and clay. The area in between and to the north vary with a greater variety of glacial sediments.

6.5 Site-Specific Hydrogeology

The upper water bearing unit consists of the unconsolidated glacial sands and gravel. This unit overlies finer-grained silts and clays that act as aquitards given their bulk mass and distribution throughout the site. The saturated thickness of the sand and gravel layer varies from 1 to 22 feet and is thickest in the vicinity of MW-9. The average saturated thickness of this shallow aquifer is 11 feet. This water bearing unit is readily recharged by downgradient percolation of precipitation.

The upper water bearing unit is most extensive in the eastern and southeastern portions of the site where the underlying confining units have increased in depth and pinched out all together. Beneath the western portion of the Powers Chemco Plant building the confining units consist of two lenses of silt and clay that range in thickness from 2 to 10 feet. These confining units fade out beneath the middle of the plant building as shown in cross-section B-B' (Figure 8). The water bearing unit decreases in mass beneath the western part of the site, where it shallows above a massive clay unit and disappears completely in the vicinity of TB-2.

Water level measurements obtained in the middle of May were used to evaluate groundwater flow direction in the upper water bearing unit (Figure 10). Groundwater movement was determined to flow in a southerly

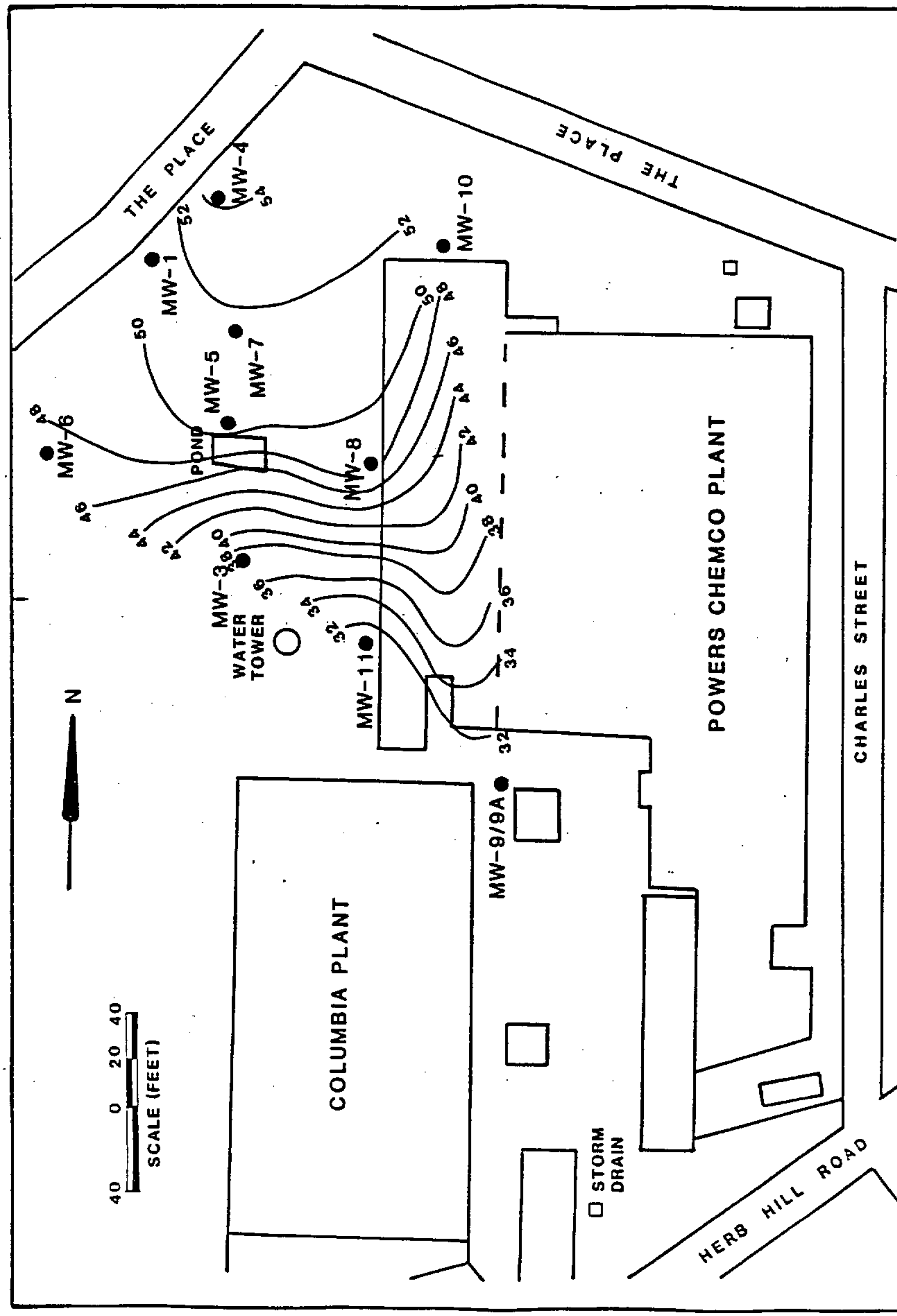

FIGURE 10
POTENTIOMETRIC SURFACE MAP

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direction. Groundwater flow gradient in the northern two-thirds of the site, between MW-3 and MW-4, is very gentle at 0.03 feet. In the southern portion of the site between MW 3 and MW11 the flow gradient is much steeper at 0.29 feet. Groundwater elevations in the study area range from approximately 30.84 to 54.86 feet above mean sea level. The hydraulic gradient decreases towards Glen Cove Creek which is at an elevation of approximately 20 feet above mean sea level. The groundwater in the upper water bearing unit appears to discharge to Glen Cove Creek.

7.0 Distribution of Site Contaminants

The distribution of total volatile organic compounds in groundwater is illustrated in Figure 11. Based on the most recent data, the zone of highest contamination is located between MW-5 and MW-4, in the former disposal area. These two wells (MW-5 and MW-4) are screened at the top of the shallow water table and show total volatile organic concentrations ranging up to 83 ppm. However, MW-7, which is screened below the confining unit, contain no concentrations of volatile organic constituents. The soil samples from above the confining layer produced the highest total volatile organic values of all the screened soil samples as discussed previously in Section 3.3.3. Concentrations of volatile organic compounds in groundwater outside the high contaminant area decrease rapidly by many orders of magnitude. Distribution of the contaminant plume seems to be controlled by the characteristics of the subsurface geology and groundwater flow gradients.

The shallow sand and gravel unit and underlying confining layers of silt and clay act as controlling factors influencing the distribution of contaminants. The contaminants, for the most part, are contained within the sand and gravel unit on-site. The geometry and high permeability of the sand and gravel unit in turn influence the distribution and concentration of the contaminants. The underlying silt and clay appears to act as an effective aquitard, preventing the vertical distribution of the contaminants. This is best illustrated by MW-7, screened beneath the confining unit, which contained no presence of volatile organics.

Lenses of poorly sorted glacial deposits such as the sandy silts and silty sand deposits, due to their relatively low permeabilities, also appear to slow contaminant migration. Where these deposits have interfingered with the sand and gravel unit they appear to have acted as effective barriers to the lateral distribution of the contaminants. Figure 7 best illustrates this scenario. Monitor Well 1, which is screened in a sand and silt zone, contained 0.12 ppm of total volatile organics. Monitor Well 4, however, which is located near by but screened

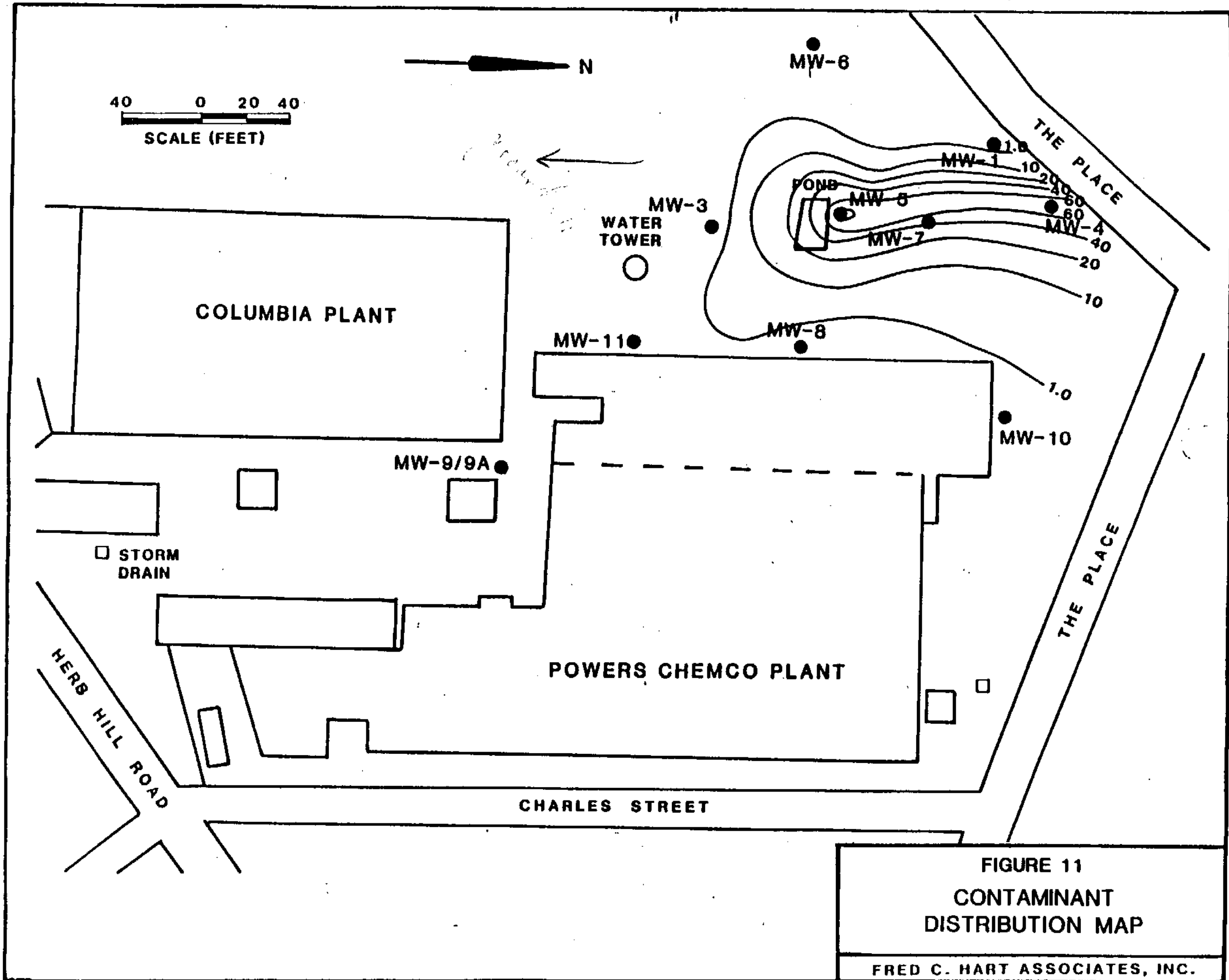

FIGURE 11
CONTAMINANT DISTRIBUTION MAP

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in the sand and gravel unit, contained 70 ppm of total volatile organics. The pinching-out of the sand and clay unit, along with the presence of the sand and silt deposit, acted in concert to limit the distribution of contamination.

The hydraulic gradient appears to play a less important role in the distribution and concentration of contaminants. Groundwater is flowing from north to south across the site (Figure 10). The gradient in the vicinity of the former disposal area has been determined to be relatively mild in comparison to the area immediately south of the disposal area. The highest concentration of contaminants is located in the upgradient portion of the facility. The downgradient values range from 0.07 total volatile organics at MW-11 to 0.14 ppm at MW-9. Based upon the observed concentrations along the hydraulic gradients, it would appear that the majority of the constituents remain confined to the vicinity of the former disposal area.

It appears from the control exerted by the subsurface geology and hydraulic gradient that the contaminants are confined in the shallow sand and gravel unit, and are concentrated in the immediate area of the former disposal site. The exertion of these controls appears to be constricting any potential contaminant plume in the immediate area of the disposal site, and any migrating contaminants are diluted and dispersed.

8.0 CONCLUSIONS

Based on the findings of this investigation, detected volatile organic contaminants are confined to the immediate vicinity of the former disposal area. Significant horizontal or vertical contaminant migration has not occurred in the approximate thirty-year period these contaminants have been in the upper glacial aquifer underlying the disposal area. The site geology, though quite complex, appears to have acted to limit both the horizontal and vertical migration of contaminants.

The U.S. Environmental Protection Agency (EPA) has determined that toluene is a non-carcinogen and has established a reference dose of 10 mg/l (51 Fed. Reg. 21648-21693 (June 13, 1986)) in drinking water. A reference dose is described as "an estimate of the daily dose of a substance which will result in no adverse effect even after a lifetime of such exposure." Concentrations of toluene outside of the immediate disposal area represent values below that of regulatory concern. The reported data shows groundwater quality in all areas outside of the disposal area to satisfy this guideline.

Based on the findings of the investigation at the former Columbia site, the presence of volatile organic groundwater contamination in the vicinity of the facility has been sufficiently delineated. It is recommended that work begin on a feasibility study for remediation of the groundwater contamination and selection of an appropriate and cost-effective remedial action.

APPENDIX I

BORING LOGS

FRED C. HART ASSOCIATES, INC.
530 FIFTH AVENUE
NEW YORK, NEW YORK 10036

JOB NO. AC35 | BORING NO. 7D

PROJECT: Powers Chemco Well Installation | LOCATION: Glen Cove, L I

DRILLING CONTRACTOR: Bedrocks Drilling Inc | DRILLING EQUIPMENT: Rig, Drill Bit, Split spoons

GEOLOGIST: Steve Hambos | DRILLER: John Stevenson

SIZE & TYPE OF BIT | DATE START 4-28-86 | DATE FINISH 5-4-86

CASING — HAMMER WT. — FALL — | SAMPLER | HAMMER WT | FALL

WELL CASING | SCREEN MAKE & TYPE | LENGTH | SLOT

ELEVATION OF: GROUND SURFACE | WELL CASING | SCREEN | WATER | DATE

REMARKS

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
A	5	460	.7'	4-6 6-7	0-.4' = brn, sandy fill } Petroleum .4-.7' = gray sandy fill } odor present		
B	10	500	.9'	38-46 49-21	0-.7' greenish, fine, well-sorted sand Rest = gray very silty f. sand + gravel	odors	
C	15	460	.7'	23 74 100	0-.4 = green silt Rest = brn silty fill Base = hard ... rock frag (siltstone?) Boulder		
1	20	460	1.4	9-20 22-17	0-.4 = Silty clay (gray). .4-1.2' = clayey Rest = silt ...	Silt (brown)	
2		500	1.4	9-12 14-18	Silty ~~sand~~ clayey silt w/ lenses of silty clay		

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BORING No. [illegible]

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
3		460	.8'	7-12 11-16	Soft, gray clayey silt		
4		500	1	5-11 13-22	Soft, gray sandy silt		
5	30	500	1.45	[illegible]	Fine gray silt w/ lenses of silty clay		
6		360	1.3	[illegible]-5 15-18	gray soft silt		
7		220	1.7	6-9 12-15	gray soft sandy silt, clayey at base		
8	35	420	1	17-23 21-22	0-.55' = clayey silt .55-.75' = silty clay (gray) Rest = tan c sand/grvl		
9		100	.6	14-12 14-15	tan c sand + grvl		
10	40	250	.7	16-13 16-17	0-.4 = tan c sand + grvl Rest = gray-grn, hard silty clay		
11		140	1.1	7-10 13-15	gray-green clay		
12		-	2	8-13 14-21	very silty gray clay		
13	45	0.2	2	9-14 20-24	green-gray silty clay - clayey silt		
14		0.6	2	4-12 14-17	gray/green silty clay		
15	50	0.4	2	2-6 [illegible]	same as above		
16		1.3	2	7-10 13-13	same as above but very soft		
17		4.6	1.15	5-15 15-19	0-.55' = gray grn silty clay .55-1.15' = dk brn [illegible] matter. [illegible]		
18	55	0.2	.9	11-14 11-14	tan, c sand + f. grvl [illegible] fine tan sand		
19		4.4	.5	[illegible] 13-6	coarse sand + fine grvl (cream-colored)		
20		3.8	.5	19-24 25-34	med-coarse tan sand w/ some fine grvl		
21		0.4	.3	25-2[illegible] 23-26	same as above		
22		1.2	.3	16, [illegible] 23-34	same as above		

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530 FIFTH AVENUE
NEW YORK, NEW YORK 10036

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JOB NO. 4035	BORING NO. 8S
PROJECT Powers Chemco Well Install.	LOCATION Glen Cove, L. I.
DRILLING CONTRACTOR Kendricks Drilling Inc	DRILLING EQUIPMENT Rig, Augers, split spoons
GEOLOGIST Steve Hambes	DRILLER John Stevenson

SIZE & TYPE OF BIT	DATE START 4-2-86	DATE FINISH 4-2-86

CASING	HAMMER WT.	FALL	SAMPLER	HAMMER WT	FALL
—	—	—			

WELL CASING	SCREEN MAKE & TYPE	LENGTH	SLOT

ELEVATION OF:	GROUND SURFACE	WELL CASING	SCREEN	WATER	DATE

REMARKS

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		0.2	1.0'	14-22 18-22	0-.25' = blk, silty road-fill w/ rock frags Rest = very fine-grained, yellow sand (well-sorted) containing pebbles + [illegible]		
2		0.3	.55'	10-13 12-5	Silty, fine-gr sand (well-sorted) scattered pebbles throughout		
3	5	0.4	.5'	4-5 4-11	lite-brown sandy silt/silty sand		
4		0.9	.6'	3-4 3-1	0-.3' = lt-brn sandy silt/silty sand Rest = Blk, crush-stone like material moist -	organic smell - odor present	
5		0.4	.25'	3	Brn, silty, fine-gr, well-sorted sands		
6	10	—		1-0 1-2	minute amount of m-c sand very wet (DRENCHED)	Sample # 6 not collected	
7		40.0	.65'	2-2 2-2	Silty fine sand - trace of silt [illegible] clay base contains blk charcoal-wood? w/creosote odor.		
8	15	100.0	1.6'	7-13 14-17	0-1' = fine gray sand [illegible] 1.1-1.6' = yellow c. sand w/ gravel		
9		160.0	2'	15-21 21-13	0-.5 = yellow m. sand .5-1.75 = c. yellow sand/some gravel Rest = [illegible] m-c. gray sand (clean)		
10	20	160.0	1.1'	5-7 10-27	olive-colored clay w/ traces of wood		

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NEW YORK, NEW YORK 10036

JOB NO. 2035	BORING NO. 7S
PROJECT Powers Chemco Well Install	LOCATION Glen Cove, LI
DRILLING CONTRACTOR Bouress Drilling, Inc.	DRILLING EQUIPMENT Drill Rig - Augers - Split Spoons
GEOLOGIST Steve Hamikes	DRILLER John Stevenson
SIZE & TYPE OF BIT	DATE START 4-9-86 / DATE FINISH 4-10-86
CASING — HAMMER WT. — FALL —	SAMPLER HAMMER WT FALL
WELL CASING	SCREEN MAKE & TYPE LENGTH SLOT
ELEVATION OF: GROUND SURFACE / WELL CASING	SCREEN / WATER / DATE
REMARKS	

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		0.7	.65'	1-4 / 7-3	0-.15' = blk-brn silty topsoil w/ roots. Rest = rust-colored sandy silt w/ pebbles		
2		0.1	.3'	6-5 / 6-5	0-.2' same as above. .2-.3' = f-c yellow silty sand. Fe blk laminae present at silt/sand contact	- Possibly rust decomp due to organic rich color	
3	5	0	.5'	5-9 / 10-11	f-m sand w/ pebbles (yellow tan color)		
4		0	1'	5-12 / 12-14	m-c grained, yellow tan sand w/ lg pebbles throughout. DAMP	Sands [illegible] very [illegible]	
5		0.1	.75'	12-16 / 15-17	c. sand w/ gravel tan-rust color		
6	10	0.8	1.3'	10-16 / 15-10	brn/rust-colored c sand w/ gravel wet at btm		
7		1.6	.7'	10-7 / 7-7	Same as above. Sample is water-saturated		
8	15	0.2	.4'	7-9 / 10-11	Same as above		
9				5-11 / 9-13	No sample		
10		0.2	.9'	5-12 / 12-13	[illegible] sand w/ [illegible] gravel		
11	20	[illegible]	.9'	16-20 / 12-13	[illegible] sand w/ [illegible]		
12		[illegible]	.7'	6-5 / 9-14	Same as above		
	25						

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BORING No. 5

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
13		0.5	.9'	9-12 15-19	f-c tan sand w/ f. gravel		
14		0.5	.6'	16-25 34-40	Same as above		
15	30	0.3	.5'	7-15 17-21	Same as above		

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NEW YORK, NEW YORK 10036

JOB NO. A035	BORING NO. 9D
PROJECT Powers Chemco Well Install	LOCATION Glen Cove, LI
DRILLING CONTRACTOR Kendricks Drilling Inc	DRILLING EQUIPMENT Auger Rig, [illegible]
GEOLOGIST Steve Hambos	DRILLER John Stevenson
SIZE & TYPE OF BIT	DATE START 4-12-86 / DATE FINISH 4-15-86
CASING — HAMMER WT. — FALL —	SAMPLER / HAMMER WT / FALL
WELL CASING	SCREEN MAKE & TYPE / LENGTH / SLOT
ELEVATION OF: GROUND SURFACE / WELL CASING	SCREEN / WATER / DATE
REMARKS	

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1	30	.5	.9	9-12 15-19	lite tan medium sand w/ few pebbles		
2		.6	1.2	27-21 25-27	0-.4' = gravel .4-.7' = rust colored c. sand (silty) .7-1' = brn silty clay, Rest = gray clay		
3	35	.4	.9	7-7 [illegible]	gray clay		
4		.2	1.4	9-4 8-10	gray clay		
5		.8	1.8	3-[illegible] 12-15	red clay, vertical + horizontal varves in some sections.		
6	40	1.0	1.6	5-7 14-17	Red clay, varved in sections		
7		.4	1.6	5-7 16-17	Same as above		
8	45	.8	1.6	6-8 14-16	0-1.0' = red clay Rest = gray clay rock-frag at base		
9		1.8	2	6-7 [illegible]	Green silt clay		
10		2.6	2	5-7 12-16	Red clay		
11	50	1.7	2	4-7 13-9	Same as above		
12		[illegible]	[illegible]	[illegible]	Red clay with brown organic matter - present	[illegible]	
	55						

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BORING No. [illegible]

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
13			2	10-14 18-21	soft red/green clay		
14			2	13-17 21-25	same as above		

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530 FIFTH AVENUE
NEW YORK, NEW YORK 10036

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JOB NO. AC35	BORING NO. 1C S
PROJECT Powers Chemco Well Install	LOCATION Glen Cove LI
DRILLING CONTRACTOR Hendricks Drilling Inc	DRILLING EQUIPMENT Rig - Augers - Split Spoons
GEOLOGIST Steve Hambos	DRILLER John Stevenson
SIZE & TYPE OF BIT	DATE START 3-31-86 / DATE FINISH 4-1-86
CASING ___ HAMMER WT. ___ FALL ___	SAMPLER HAMMER WT FALL
WELL CASING	SCREEN MAKE & TYPE LENGTH SLOT
ELEVATION OF: GROUND SURFACE	WELL CASING / SCREEN / WATER / DATE
REMARKS	

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		.04	1.4	1-3, 6-8	dk brn silty to sandy topsoil		
2		.08	1.3'	14-14, 18-15	lt tan, f-gr, well-sort sand rock frag throughout		
3	5	1.0	2'	15-9, 8-7	tan/yellow f-gr, well-sort sand w/ pebbles		
4		10.0	1.5'	5-14, 18-18	0-.1' = red-brn sand (well-sort/f-gr), .1-.3' = gray clay; Rest = dk brn-tan sand	From 7-9 = change in rec	
5		20.0	1.5'	4-4, 4-2	0-.3 = gray-grn sandy silt; .3-.4 = brown sand; .4-1.5' = gray/grn sandy silt — moist		
6	10	30.0	1.8'	3-3, 2-3	Green sandy silt		
7		60.0	1.3'	3-3, 5-5	green-dk gray sandy silt more clayey at base		
8	15	14.0	1.6'	5-6, 5-14	lt green-gray clayey silt; 0-.3 = very clayey		
9		10.0	1.1'	15-16, 15-[illegible]	0-.3 = very clayey sandy silt [illegible]; Rest = more [illegible] sandy silt		
10	20	10.0	1.5	10-22, 38-[illegible]	0-.6 = Same as above; Rest = f-m, well-sort sand		
11		2.0	.7	15-[illegible], [illegible]	dull green silt		
12		7.0	1.7	3-[illegible], 15-12	[illegible]	last sample is from 24-26'	
13		3.0	1.7	[illegible], 7-7	[illegible] green silty clay		

Boring Ends at 26'

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JOB NO. 4035	BORING NO. 100
PROJECT Powers Chemco Well Installation	LOCATION Glen Cove, L I
DRILLING CONTRACTOR Kendricks Drilling, Inc	DRILLING EQUIPMENT Drill Rig - Split-Spoons
GEOLOGIST Steve Hawkes	DRILLER John Stevenson
SIZE & TYPE OF BIT	DATE START / DATE FINISH
CASING — HAMMER WT. — FALL —	SAMPLER / HAMMER WT / FALL
WELL CASING	SCREEN MAKE & TYPE / LENGTH / SLOT
ELEVATION OF: GROUND SURFACE / WELL CASING	SCREEN / WATER / DATE
REMARKS	

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		3.2	1.8	2-5 11-11	Green, very soft + silty clay		
2		2.2	1.9	2-2 2-4	Soft gray clay with less silt		
3	30	8.8	.8	2-1 2-4	Soft grn-gray clay with some silt		
4		5.8	1.4	6-9 9-7	Same as above w/ c. Snd brwn .3-.35'		
5	35	4.4	2	1-3 6-6	Soft grn-gray clay		
6		2.8	1.8	1-1 3-4	Same as above		
7		2.2	.9	3-2 8-12	0-.8' = same as above Rest = clay + grvl		
8	40	1.6	.7	4-8 10-9	c Snd w/ f-m, tanish-brn grvl		
9		0.4	.6	[illegible]	f-m grvl		
10	45	2.4	1.2	5-5 5-5	0-.3' = grvl .3-.9 = m-c tanish snd + grvl Rest = soft gray sndy silt (gray-grn)		
11		0.8	.9	3-3 10-7	0-.4' = gray-grn clayey silt Rest = silty gray-grn clay		
12	50	2.3	1.2	10-24 27-28	0-.4' = silty clay .4-.7' = clayey silt Rest = very fine well-sorted silty snd		

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BORING No.

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
13		0.7	1.05	8-14 16-19	0-.3 = Silty snd .3-.6 = clayey silt .6-.7 = clay .7-.9 = silty snd .9-1.0' = clay Rest = sndy silt	Color is gray-green	
14		0.2	1.3	8-12 14-?	0-.7' = sndy silt } Rest = silty clay } gray-grn color		
15	55	0.6	1.9	10-8 4-7	0-.5' = gray-grn silt Rest = silty clay		
16		0.8	1.4	12-15 12-11	0-.4 = gray-grn clay Rest = yellow course snd + fine grvl		
17	60	1.4	.85	16-21 23-21	Coarse snd + fine grvl		
18		1.6	1.3	10-11 14-14	0-.25 = Same as above .25-.65 = clayey silt .65-1.0 = C snd + grvl Rest = Blk organic matter	organic color	
19		2.0	.75	17-20 23-23	0-.15 = organic matter Rest = tan C. snd + grvl		
20	65	2.2	1.3	4-3 6-11	0-.1 = snd + grvl .1-1.3 = gray-grn clay (some silt) laminae of brn organic matter		
21		4.0	1.1	7-15 20-26	0-.2 = clay .2-.4 = brown organic matter Rest = snd + grvl		

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JOB NO. A035	BORING NO. 113
PROJECT Powers Chemco Well Install	LOCATION Glen Cove, L I
DRILLING CONTRACTOR Bendricks Drilling Inc	DRILLING EQUIPMENT Mill Rig - Augers - split spoons
GEOLOGIST Steve Hambos	DRILLER John Stevenson
SIZE & TYPE OF BIT	DATE START 4-4-86 / DATE FINISH 4-7-86
CASING — HAMMER WT. — FALL —	SAMPLER HAMMER WT FALL
WELL CASING	SCREEN MAKE & TYPE LENGTH SLOT
ELEVATION OF: GROUND SURFACE	WELL CASING / SCREEN / WATER / DATE
REMARKS	

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		1.0	.7'	18-19 21-20	Blk-brown sandy-silty topsoil/roadfill with rock frag + fine gravel		
2		0.9	1.5	12-26 25-21	Yellow-brn sandy silt/silty sand pebbles + f grvl throughout		
3	5	0.4	1'	7-7 13-12	Yellow f-m-gr snd w/ scattered fine grvl		
4		0.4	1'	8-9 12-12	fine snd w/ fine gravel		
5		0.5	1'	8-10 7-10	f-c snd w/ f grvl - damp		
6	10	0.6	.75	9-12 14-16	m-c snd w/ f-m grvl slightly damp		
7		0.3	.8	12-15 16-18	Same as above		
8	15	0.4	.7	10-21 31-24	lite-tan coarse snd + grvl dry		
9		0.2	.7	17-20 24-25	Same as above		
10		0.2	.7	19-27 25-24	Same as above but with a black grvl layer from .5-.6' color?		
11	20	0.3	.8	19-24 25-22	[illegible] m-c snd w/ scattered grvl .4-.5' = layer of blk crushstone/grvl		
12		0.1	1	27-29 35-36	tan-rust colored [illegible] snd + grvl		
	25						

FRED C. HART ASSOCIATES, INC.

BORING No.

LOG OF BORING

SAMPLE #	DEPTH	ORGANICS (ppm)	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
13		0.2	1.1'	27-35 32-26	tan-brn c. silty snd + grvl moist/damp		
14		0.2	.75'	16-23 18-17	0-.2' = tan c-gr snd 0.2-.4 = brn, c. snd w/ Pebbles Rest = rust-colored m snd Moist from .45-.75		
15	30	0.2	1.2'	16-20 21-20	[illegible] f-c snd w/ scattered grvl		
16		0.4	.85'	6-16 19-22	rust colored c ~~gravel~~ sand + fine gravel		
17		0.2	.5'	17-23 18-24	Same as above		
18	35	0.4	.7'	14-33 20-21	Same as above		
19			.5'	6-8 18-24	Same as above		
20	40		.8'	12-22 23-55	0-.6' = same as above .6-.8' = fine olive snd		

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PAGE ____ OF ____

JOB NO. A035	BORING NO. V1
PROJECT Powers Chemco Well Installation	LOCATION Glen Cove, NY
DRILLING CONTRACTOR Kendricks Drilling Inc	DRILLING EQUIPMENT Drill Rig - split spoon
GEOLOGIST Steve Hambes	DRILLER J. Stevenson
SIZE & TYPE OF BIT	DATE START 5-5-86 / DATE FINISH 5-5-86
CASING ___ HAMMER WT. ___ FALL ___	SAMPLER HAMMER WT FALL
WELL CASING	SCREEN MAKE & TYPE LENGTH SLOT
ELEVATION OF: GROUND SURFACE / WELL CASING	SCREEN / WATER / DATE
REMARKS	

LOG OF BORING

SAMPLE No.	DEPTH	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		1.2'	—	dark-brown to black road fill of silty/sandy texture. Trace of red and gray laminae. Some small gravel.		
	2'					
2		1.2'	—	Dark-brown, very odorous silty-sandy roadfill. Gravel present throughout.		
	4'					
3		1.25'	—	Dark-brown, odorous sandy silt.		
	6'				Blue-stained soil not encountered	
4						
	8					
	10					

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PAGE ___ OF ___

JOB NO. 4035	BORING NO. V2
PROJECT Powers Chemco Well Installation	LOCATION Glen Cove, N.Y.
DRILLING CONTRACTOR Hendricks Drilling Inc.	DRILLING EQUIPMENT Drill Rig - Augers
GEOLOGIST Steve Hombes	DRILLER J Stevenson
SIZE & TYPE OF BIT	DATE START 5-5-86 / DATE FINISH 5-5-86
CASING — HAMMER WT. — FALL —	SAMPLER HAMMER WT FALL
WELL CASING	SCREEN MAKE & TYPE LENGTH SLOT
ELEVATION OF: GROUND SURFACE	WELL CASING / SCREEN / WATER / DATE
REMARKS	

LOG OF BORING

SAMPLE No.	DEPTH	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		0.75'	–	Black roadfill w/ oily odor.		
	2				Blue-stained soil not encountered	
2		0.6'	–	Dark-brown sandy silt w/ oily odor (Possible road fill)		
	4					
3		0.55'	–	Dark-brown silt w/ gravel		
	6					
4				Tanish-brown sandy silt w/ no odor		
	8					
	10					

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PAGE ____ OF ____

JOB NO. A035.

BORING NO. V3

PROJECT Powers Chemco

LOCATION Glen Cove, NY

DRILLING CONTRACTOR Kendricks Drilling Inc

DRILLING EQUIPMENT Drill Rig - Split Spoon

GEOLOGIST Steve Hombos

DRILLER J. Stevenson

SIZE & TYPE OF BIT | DATE START | DATE FINISH

CASING ___ HAMMER WT. ___ FALL ___ | SAMPLER | HAMMER WT | FALL

WELL CASING | SCREEN MAKE & TYPE | LENGTH | SLOT

ELEVATION OF: GROUND SURFACE | WELL CASING | SCREEN | WATER | DATE

REMARKS

LOG OF BORING

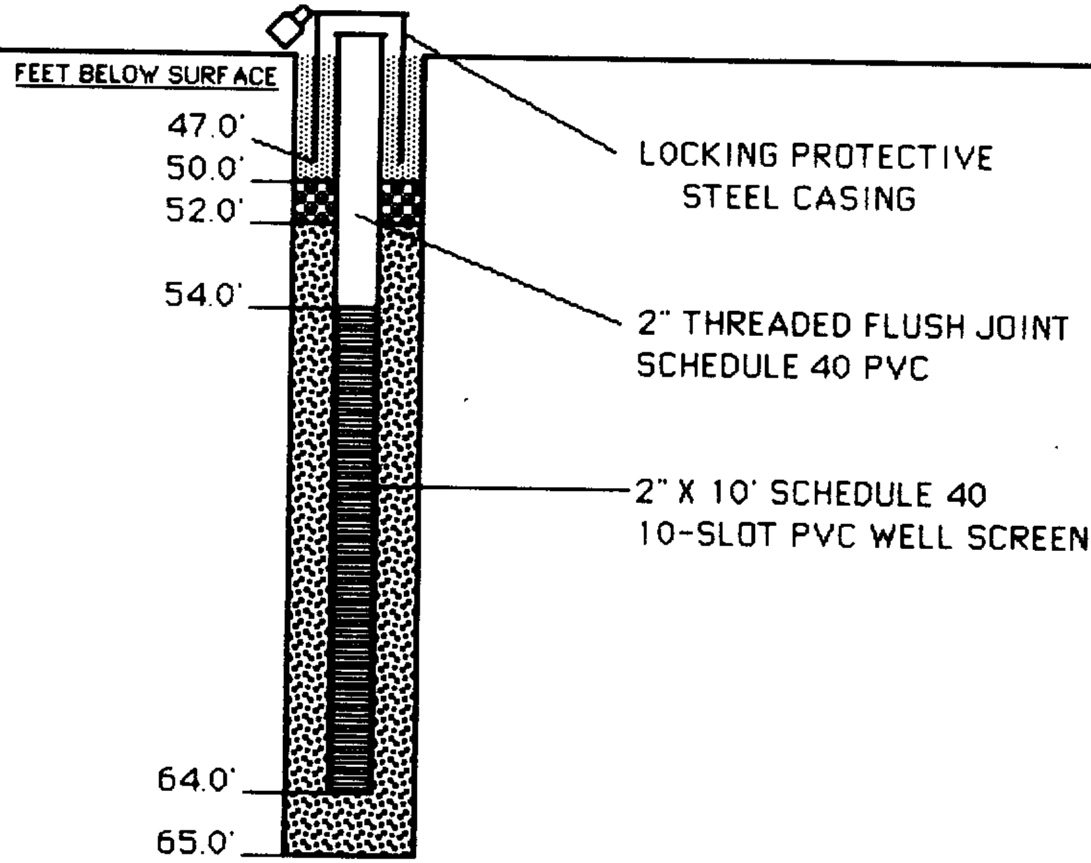
SAMPLE NO.	DEPTH	RECOVERY	BLOWS/6"	DESCRIPTION	REMARKS	GRAPHIC LOG
1		1.6	—	0-1.1' = brown silt 1.1-1.3' = silty sand Rest = dk-brown silt } Poss. be Road Fill	Blue-stained Soil + odors not encountered.	
	2					
2		0.55'	—	Dark-brown sandy silt with gravel		
	4					
3		0.6'	—	~~Dar~~ Same as above w/ medium gravel		
	6					
4		0.3		Same as above		
	8					
	10					

APPENDIX II

AS-BUILT WELL CONSTRUCTION DIAGRAMS

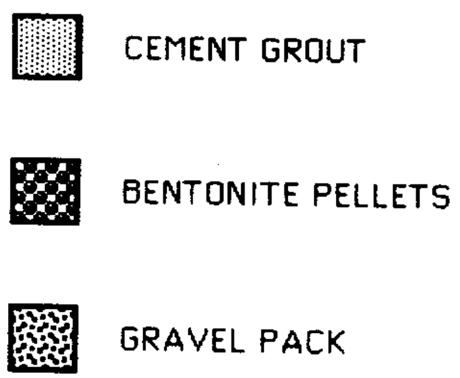
HART WELLS

MW-7A



NOT TO SCALE

LEGEND



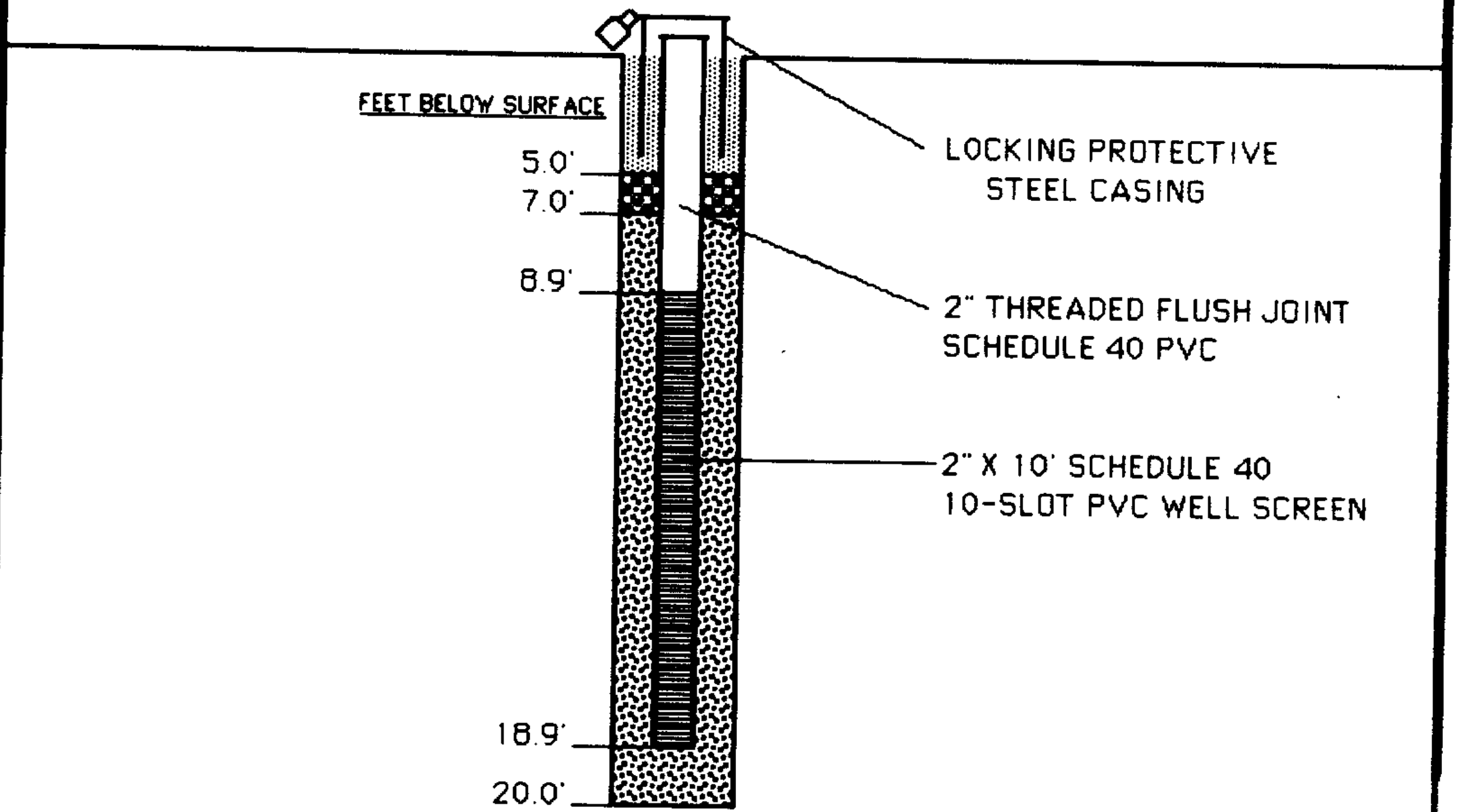
MW-7A

HART MONITOR WELL CONSTRUCTION DIAGRAM POWERS CHEMCO FACILITY GLEN COVE, NEW YORK

Prepared by: Fred C. Hart Associates, Inc.

HART WELLS

MW-8



NOT TO SCALE

LEGEND

- CEMENT GROUT
- BENTONITE PELLETS
- GRAVEL PACK

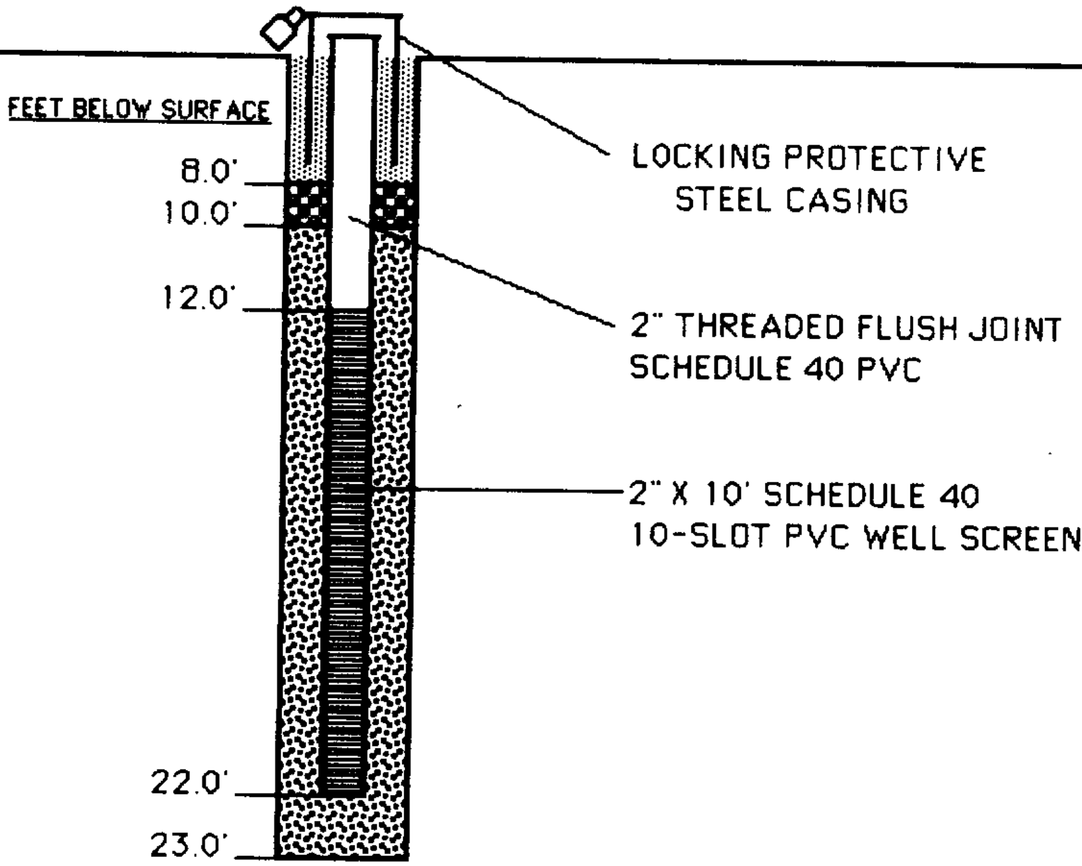
MW-8

HART MONITOR WELL CONSTRUCTION DIAGRAM POWERS CHEMCO FACILITY GLEN COVE, NEW YORK

Prepared by: Fred C. Hart Associates, Inc.

HART WELLS

MW-9



NOT TO SCALE

LEGEND

CEMENT GROUT

BENTONITE PELLETS

GRAVEL PACK

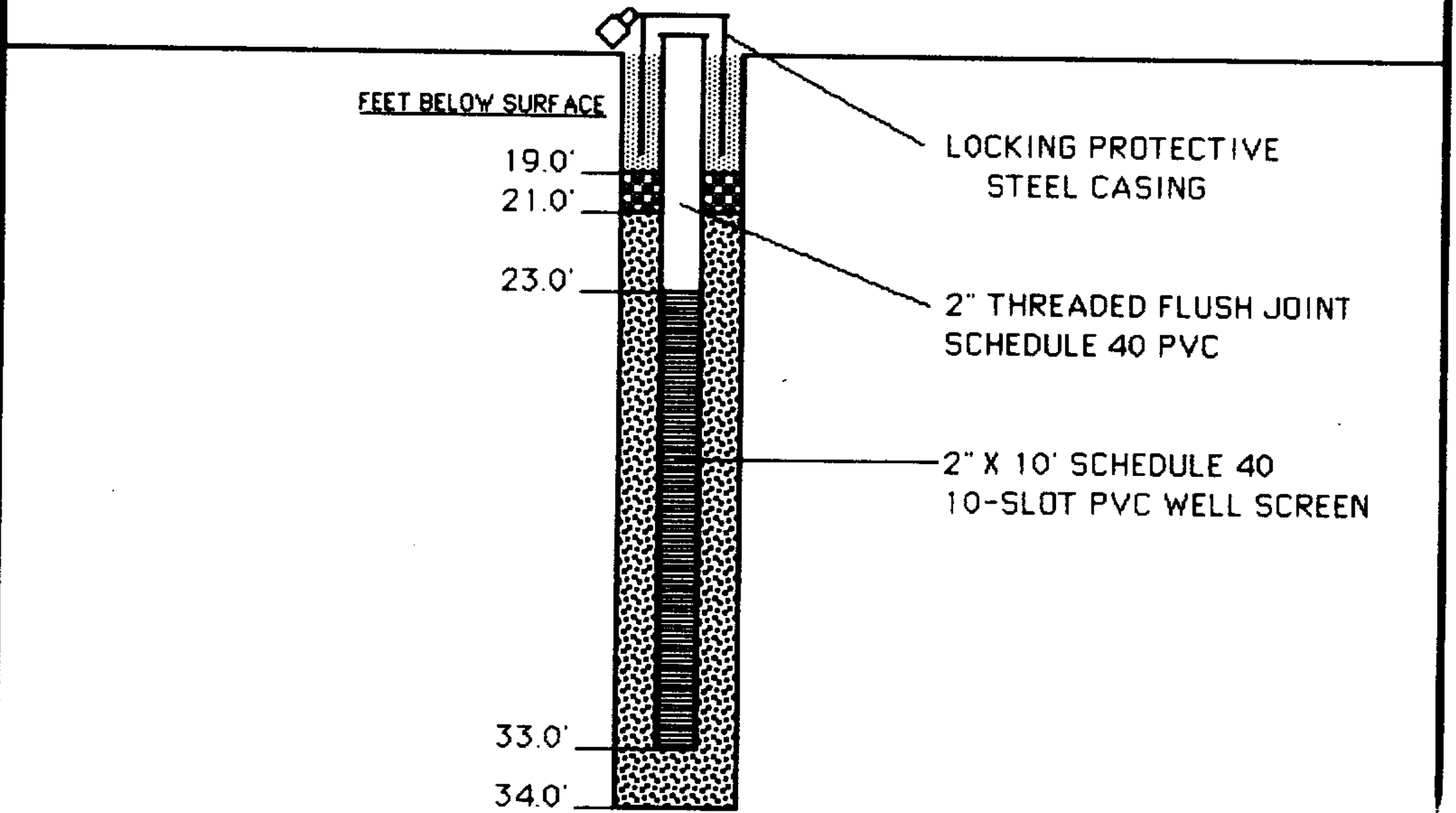
MW-9

HART MONITOR WELL CONSTRUCTION DIAGRAM POWERS CHEMCO FACILITY GLEN COVE, NEW YORK

Prepared by: Fred C. Hart Associates, Inc.

HART WELLS

MW-9A



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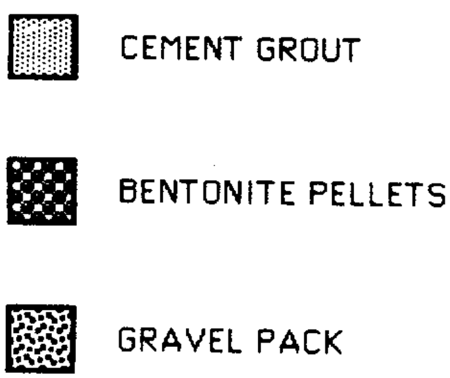


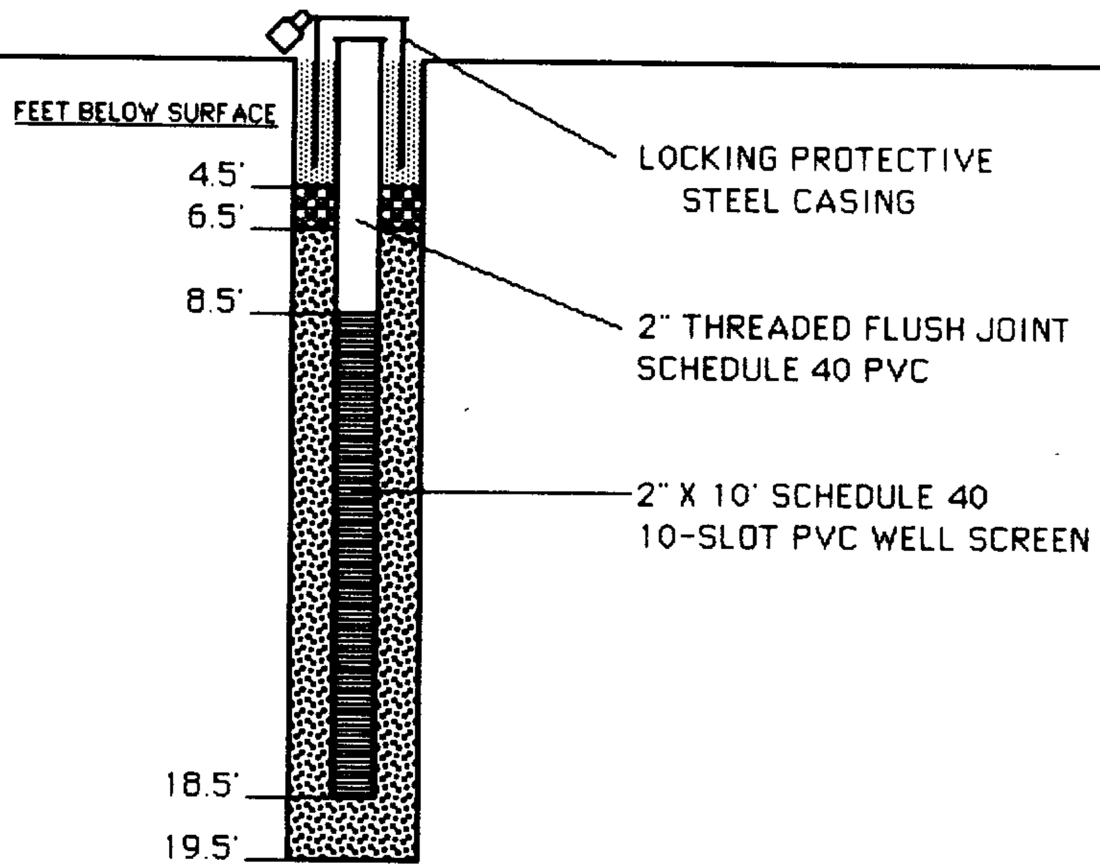
MW-9A

HART MONITOR WELL CONSTRUCTION DIAGRAM POWERS CHEMCO FACILITY GLEN COVE, NEW YORK

Prepared by: Fred C. Hart Associates, Inc.

HART WELLS

MW-10



NOT TO SCALE

LEGEND

CEMENT GROUT

BENTONITE PELLETS

GRAVEL PACK

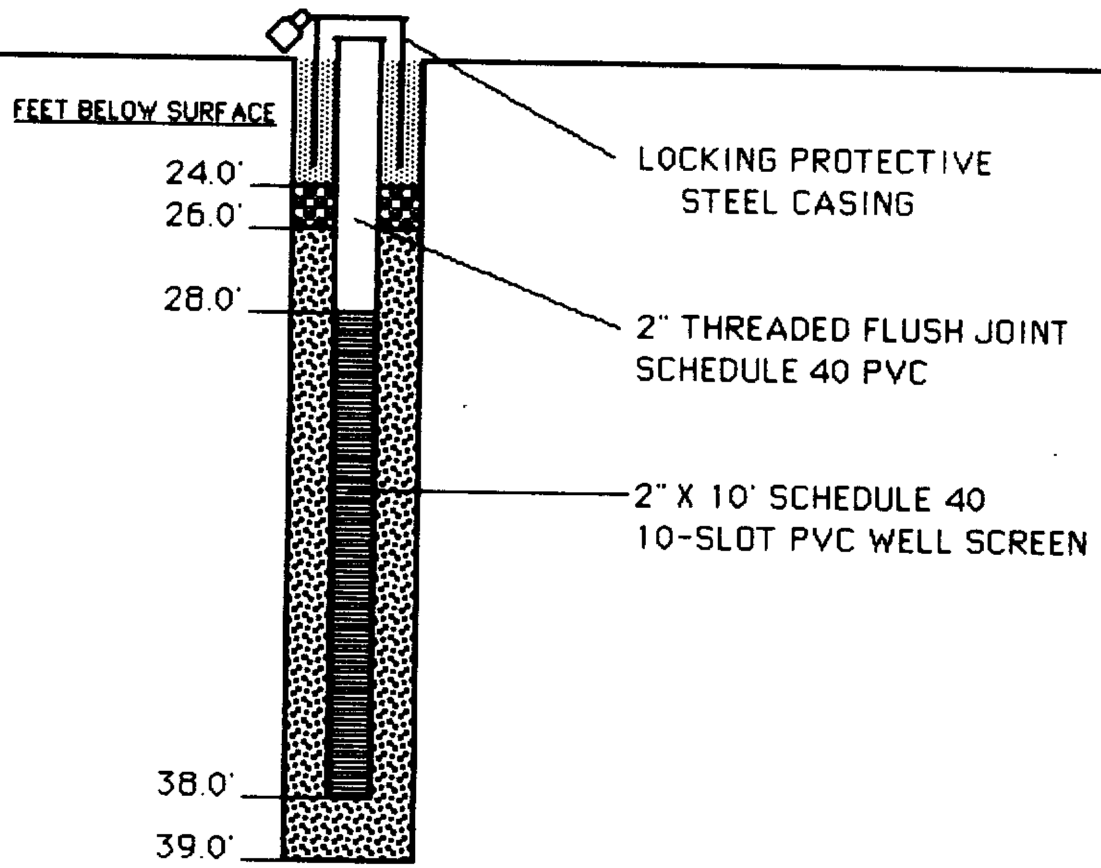
MW-10

HART MONITOR WELL CONSTRUCTION DIAGRAM POWERS CHEMCO FACILITY GLEN COVE, NEW YORK

Prepared by: Fred C. Hart Associates, Inc.

HART WELLS

MW-11



NOT TO SCALE

LEGEND

- CEMENT GROUT
- BENTONITE PELLETS
- GRAVEL PACK

MW-11

HART MONITOR WELL CONSTRUCTION DIAGRAM POWERS CHEMCO FACILITY GLEN COVE, NEW YORK

Prepared by: Fred C. Hart Associates, Inc.

APPENDIX III

GROUNDWATER SAMPLING ANALYTICAL DATA
LABORATORY QA/QC PACKAGE

H2M

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575 BROAD HOLLOW ROAD, MELVILLE, N.Y. 11747 • 516-694-3040

F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655251
Date Collected: 5/9/86
Date Received: 5/9/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Sample I.D. #8S
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

[signature]

S.C. McLendon, P.E.
Laboratory Director

H2M

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655252
Date Collected: 5/9/86
Date Received: 5/9/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Sample I.D. #9S
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	0.02
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	0.02
o/p-xylene	0.01
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

****
* [signature] *
****
S. C. McLendon, P.E.
Laboratory Director

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New York, NY 11036

Sample Lab No. 655253
Date Collected: 5/9/86
Date Received: 5/9/86
Type: Misc. - POwers Chemco Plant, Glen Cove
Point: Sample I.D. #9D
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	0.03
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	0.03
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	0.03
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection:
lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

****
JM Slaum
****

S.C. McLendon, P.E.
Laboratory Director

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F.C. Hart Assoc.
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New York, NY 11036

Sample Lab No. 655254
Date Collected: 5/9/86
Date Received: 5/9/86
Type: Misc. - Powers Chemco, Glen Cove
Point: Sample I.D. #11S
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	0.03
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	0.02
o/p-xylene	0.02
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

S.C. McLendon, P.E.
Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655255
Date Collected: 5/9/86
Date Received: 5/9/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Sample I.D. #13D
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	0.03
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	0.02
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	0.03
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

S.C. McLendon, P.E.
Laboratory Director

H2M

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655256
Date Collected: 5/9/86
Date Received: 5/9/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Storm Drain
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

****
* [signature] *
****
S.C. McLendon, P.E.
Laboratory Director

H2M

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655257
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #1
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	0.12
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

****
[signature]
****
S.C. McLendon, P.E.
Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655258
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #4
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	70
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

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Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655259
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #5
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	83
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

S. C. McLendon, P.E.
Laboratory Director

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F.C. Hart Assoc.
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New York, NY 11036

Sample Lab No. 655260
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #6
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	0.23
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

****
S/C. McLendon, P.E.
Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655261
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #7
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	0.12
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

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* *
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S.C. McLendon, P.E.
Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655262
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #10
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	0.02
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

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Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655263
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #12
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	0.10
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

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Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655264
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #14
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

S.C. McLendon, P.E.
Laboratory Director

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F.C. Hart Assoc.
530 Fifth Ave.
New York, NY 11036

Sample Lab No. 655265
Date Collected: 5/12/86
Date Received: 5/12/86
Type: Misc. - Powers Chemco Plant, Glen Cove
Point: Well #15
Collected By: CL 99

RESULTS FOR PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ppm
Chloromethane	ND
Bromomethane	ND
Vinyl chloride	ND
Chloroethane	ND
Methylene chloride	ND
Trichlorofluoromethane	ND
1,1-dichloroethene	ND
1,1-dichloroethane	ND
Cis/Trans-1,2-dichloroethene	ND
Chloroform	ND
1,2-dichloroethane	ND
1,1,1-trichloroethane	ND
Carbon tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
Trans-1,3-dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
Cis-1,3-dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
m-xylene	ND
o/p-xylene	ND
1,2-dichlorobenzene	ND
1,3-dichlorobenzene	ND
1,4-dichlorobenzene	ND

Method limit of detection: lower than 0.01 ppm.

Quantification limit: 0.01 ppm

ND - Under detection limit.

Date Reported: 5/27/86

S.C. McLendon, P.E.
Laboratory Director

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Fred C. Hart Assoc., Inc.
530 5th Ave.
New York, NY 10036
Attn: Steve Hambos

Lab No. 657192
Type: Misc.
Point: Well #7
Date Collected: 6/27/86
Date Received: 6/27/86
Collected By: CL 99

PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ug/l
Chloromethane	ND
Bromomethane	ND
Vinyl Chloride	ND
Chloroethane	ND
Methylene Chloride	ND
Trichlorofluoromethane	ND
1,1-Dichloroethene	ND
1,1-Dichloroethane	ND
cis/trans-1,2-Dichloroethene	ND
Chloroform	ND
1,2-Dichloroethane	ND
1,1,1-Trichloroethane	ND
Carbon Tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
trans-1,3-Dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
cis-1,3-Dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND

Method limit of detection:
lower than 10 ug/l.

Quantification limit: 10 ug/l.

ND - Under detection limit.

Date Reported: 7/15/86

****
[signature]
****
S.C. McLendon, P.E.
Laboratory Director

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Fred C. Hart Assoc., Inc.
530 5th Ave.
New York, NY 10036
Attn: Steve Hambos

Lab No. 657193
Type: Misc.
Point: Trip Blank
Date Collected: 6/27/86
Date Received: 6/27/86
Collected By: CL 99

PRIORITY POLLUTANTS ANALYSIS - PURGEABLE ORGANICS

Compound	ug/l
Chloromethane	ND
Bromomethane	ND
Vinyl Chloride	ND
Chloroethane	ND
Methylene Chloride	ND
Trichlorofluoromethane	ND
1,1-Dichloroethene	ND
1,1-Dichloroethane	ND
cis/trans-1,2-Dichloroethene	ND
Chloroform	ND
1,2-Dichloroethane	ND
1,1,1-Trichloroethane	ND
Carbon Tetrachloride	ND
Bromodichloromethane	ND
1,2-dichloropropane	ND
trans-1,3-Dichloropropene	ND
Trichloroethene	ND
Dibromochloromethane	ND
1,1,2-trichloroethane	ND
cis-1,3-Dichloropropene	ND
Benzene	ND
2-chloroethylvinyl ether	ND
Bromoform	ND
1,1,2,2-Tetrachloroethane	ND
Tetrachloroethene	ND
Toluene	ND
Chlorobenzene	ND
Ethylbenzene	ND
1,2-Dichlorobenzene	ND
1,3-Dichlorobenzene	ND
1,4-Dichlorobenzene	ND

Method limit of detection: lower than 10 ug/l.

Quantification limit: 10 ug/l.

ND - Under detection limit.

Date Reported: 7/15/86

****
[signature]
****
S.C. McLendon, P.E.
Laboratory Director

F.C. Hart. Assoc.

H2M LABORATORY

Continuing Chain of Custody

Samples Received by Stu Murrell date 5/9/86 time [illegible]30 HRS

Signature Stuart W. Murrell

No. of bottles received	type		H2M lab no.
1	vial	8S	655251
2	vials	9S	655252
2	vials	9D	655253
2	vials	11S	655254
2	vials	13D	655255
2	vials	Storm Drain	655256

Sample Relinquished by	Sample Received by	Date	Time	Bottle Type	Reason
Stuart W. Murrell	[illegible]	5/12/86	60	All	Storage/Analysis

F.C. Hart Assoc.

H2M LABORATORY

Continuing Chain of Custody

Samples Received by Stuart Murrell date 5/12/86 time 1434 HRS

Signature Stuart W. Murrell

No. of bottles received	type	H2M lab no.
2	vials Well #1	655257
2	vials #4	655258
2	vials #5	655259
2	vials #6	655260
2	vials #7	655261
2	vials #10	655262
2	vials #12	655263
1	vial #14	655264
2	vials #15	655265

Sample Relinquished by	Sample Received by	Date	Time	Bottle Type	Reason
Stuart W. Murrell	Caroline Chmouska	5/12/86	16 0	All	Storage/Analysis
Caroline Chmouska	[illegible]	5/20/86	13 0	655258 + 259	Re-Analysis