TABLE OF CONTENTS

Section		Title	Page No.
		Disclaimer	i
		Executive Summary	1
1.0		Introduction	4
	1.1	Purpose	8
2.0		Summary of Sampling	9
	2.1	Soil Sampling - Shallow Borings	9
	2.2	Soil Sampling - Deep Borings	12
	2.3	Soil Gas Sampling	12
	2.4	Monitoring Well Installation and Groundwater Sampling	14
3.0		QA/QC, Data Validation and Data Usability	22
	3.1	QA/QC	22
	3.2	Data Validation	24
	3.3	Data Usability	24
4.0		Sampling Results	26
	4.1	Soil Sampling	26
	4.2	Soil Gas Sampling	29
	4.3	Groundwater Sampling	31
	4.4	Groundwater Flow	37
5.0		Determination of Potential Risk	39
	5.1	Application of Hazard Ranking System	39
		A. Introduction	39
		B. HRS Worksheets	40
		C. Documentation Records for Hazardous Ranking System	48

TABLE OF CONTENTS

Section		Title	Page No.
		Disclaimer	i
		Executive Summary	1
1.0		Introduction	4
	1.1	Purpose	8
2.0		Summary of Sampling	9
	2.1	Soil Sampling - Shallow Borings	9
	2.2	Soil Sampling - Deep Borings	12
	2.3	Soil Gas Sampling	12
	2.4	Monitoring Well Installation and Groundwater Sampling	14
3.0		QA/QC, Data Validation and Data Usability	22
	3.1	QA/QC	22
	3.2	Data Validation	24
	3.3	Data Usability	24
4.0		Sampling Results	26
	4.1	Soil Sampling	26
	4.2	Soil Gas Sampling	29
	4.3	Groundwater Sampling	31
	4.4	Groundwater Flow	37
5.0		Determination of Potential Risk	39
	5.1	Application of Hazard Ranking System	39
		A. Introduction	39
		B. HRS Worksheets	40
		C. Documentation Records for Hazardous Ranking System	48

TABLE OF CONTENTS (CONTINUED)

LIST OF PLATES

2.1 Location of Sampling Points - Soil Borings, Methane Wells and Monitoring Wells

4.4.1 Water Table Elevation - July 18, 1990

APPENDICES

A References Documentation - bound with text

Bound Separately

B Field Reports

C Field Procedures

Section 1 - Soil Samples Analysis and Spilt Spoon Sampling
Section 2 - Soil Gas Sampling for Laboratory Analysis
Section 3 - Monitor Well Sampling

D Drilling Logs

Section 1 - Shallow Borings
Section 2 - Deep Borings
Section 3 - Monitoring Wells

E Letter of Agreement on Soil Gas Sampling

F Q.A.O.'s Field Report

G Data Validation Report by H2M

Section 1 - General
Section 2 - Soil Samples
Section 3 - Water Samples - General
Section 4 - Water Samples - Volatile Organic Analyses
Section 5 - Water Samples - Semi-Volatile Organic Analyses
Section 6 - Water Samples - Pesticides/PCB Analyses
Section 7 - Water Samples - Inorganic Analyses

H NYTEST's Responses to H2M's Data Validation Report

I QAO's Data Usability Analysis

J Chain of Custody Documentation

K Laboratory Analytical Data

Section 1 - Soils - Asbestos
Section 2 - Soils - Total Metals (8 RCRA Metals)
Section 3 - Soil Gas
Section 4 - Groundwater - Full Toxic Compound List

DISCLAIMER

These findings are based upon a detailed sampling procedure that has been formulated in accordance with U.S. E.P.A. procedures both for sampling and for laboratory analysis. Conclusions from this data are limited to those areas focused on in the study and represents our best judgment using analytical techniques and our past experience. Even though our investigation has been scientific and thorough, it is possible that certain areas of this site may pose environmental concerns that as yet are undiscovered. In addition, environmental regulations may change in the future and could have an effect on our conclusions.

EXECUTIVE SUMMARY

Fanning, Phillips and Molnar was retained by Uniondale Realty Associates to conduct a Supplemental Soil and Groundwater Investigation in compliance with the New York State Department of Environmental Conservation (NYSDEC) Order on Consent, Index #W1-0418-90-01 and Nassau County Department of Health (NCDH). A work plan for this work was prepared by Fanning, Phillips and Molnar, approved by NYSDEC and NCDH and appended to the Order on Consent. This report presents the results of the investigation.

The Uniondale Shopping Center site, located in the Village of Uniondale, Town of Hempstead, Nassau County, New York is currently owned by Uniondale Realty Associates and consists of 10.7 acres of vacant lot with one large and one small abandoned building and some paved parking areas. A large portion of the unpaved area is underlain by an unlined landfill. The landfill closed filling operations in 1975.

The following summarizes the work conducted under Order on Consent #W1-0418-90-01.

Two (2) additional monitoring wells were installed downgradient on the property boundaries in the shallow aquifer. All wells were surveyed to vertical and horizontal control datum to determine groundwater flow direction and gradient in the aquifer. The groundwater from the two new wells and the existing five (5) wells was analyzed for full target compound list (TCL) parameters following NYSDEC protocol. The groundwater from the two (2) downgradient wells and the two (2) upgradient wells was analyzed for total and fecal coliform and fecal streptococcus.

A total of sixteen (16) shallow soil borings were conducted at the site. Composite samples from each shallow soil boring covering the soil profile from 0 to 5 feet were collected. These samples were tested for metals and asbestos.

In addition, a total of three (3) deep soil borings to a depth of approximately 35 feet in the fill area were attempted. The samples obtained from the three (3) deep (35') soil borings were to be tested for the full target compound list parameters and extraction procedure toxicity (EP Tox) test for metals, herbicides and pesticides. However, these deep borings were unable to be conducted past eight feet below land surface due to high levels of methane (greater than 25 percent of the lower explosive limit) in the fill area.

Soil gas samples were collected and analyzed to determine levels of volatile organic compounds present in the soil gases of the unsaturated zone. Collection of all groundwater and soil samples was done in accordance with the Quality Assurance/Quality Control procedures from Fanning, Phillips and Molnar's work plan for the soil and groundwater investigation. All sample analysis was performed in accordance with NYSDEC contract laboratory protocol (CLP). In addition to following Fanning, Phillips and Molnar's protocol, all drilling and sampling was performed in accordance with all applicable NYSDEC protocols and was performed under NYSDEC oversight at all times.

The landfill is known to have accepted construction and demolition debris. There was no evidence of hazardous waste disposal at the site in the record searches conducted. There have been allegations of hazardous substances dumping as evidenced by signed

affidavits presented during public hearings concerning the site. The results of the present investigation show that low concentrations of two volatile organic compounds were detected in the fill area, but there were no detections indicating that a release of hazardous substances had migrated to the downgradient wells. All other soil, soil gas and groundwater analytical results indicated that site activities did not impact the environment.

The HRS scores for the site based upon all investigations conducted have been calculated as follows (see Section 5.1):

S_M = 23.1

S_{gw} = 40

S_{sw} = 0

S_a = 0

S_{FE} = Not Applicable

S_{DC} = 0

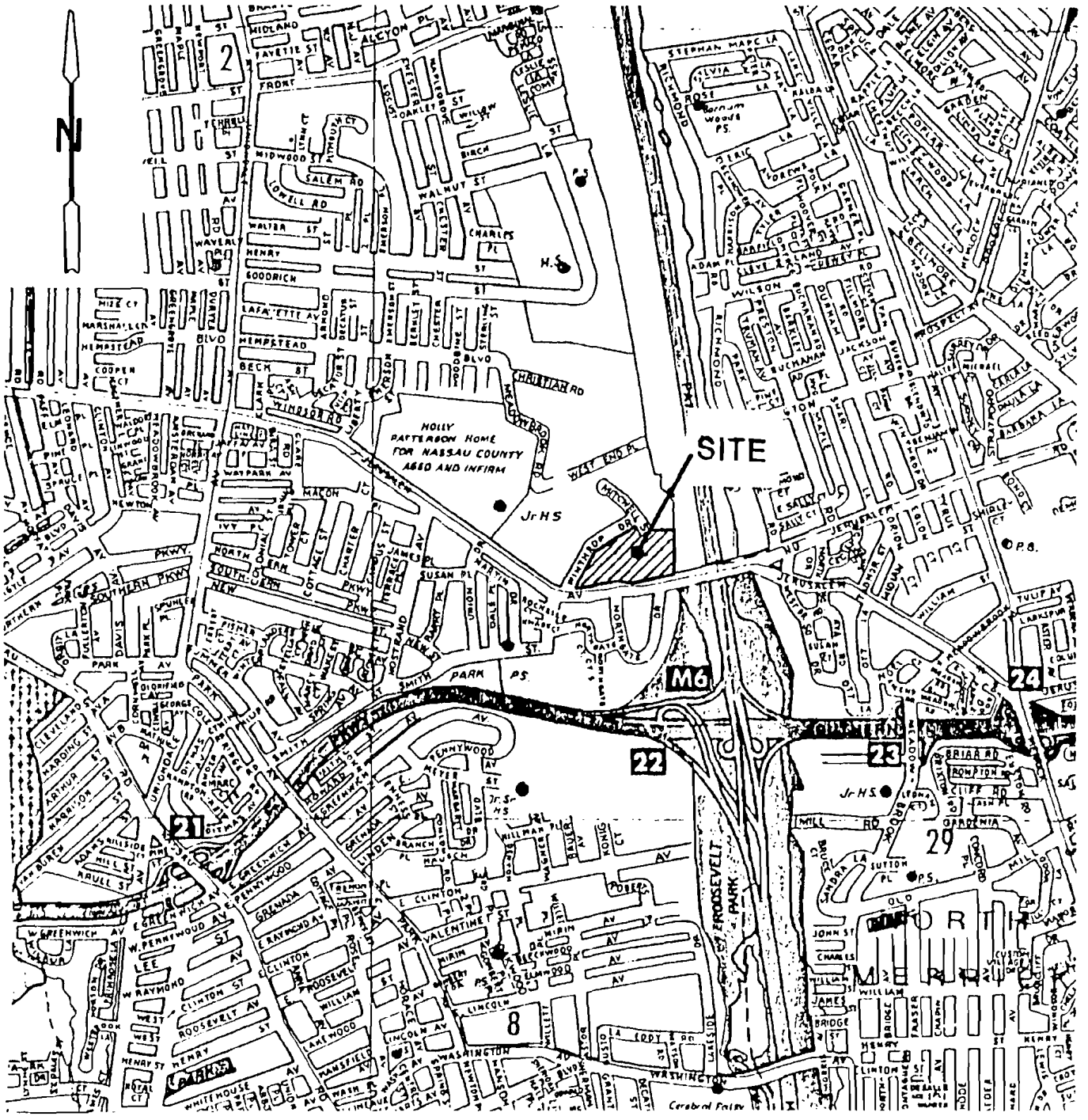
The S_M score reflects the potential for impacts due to the migration of hazardous substances away from the site. This score is the composite of scores for groundwater (S_{gw}), surface water (S_{sw}), and air (S_a) transport routes. The S_{FE} score reflects the potential for harm from substances which can explode or cause fires, and the S_{DC} reflects the potential harm from direct contact with hazardous substances.

SECTION 1.0
INTRODUCTION

On April 25, 1989, a public hearing was held at Hempstead Town Hall as part of the State Environmental Quality Review Act (SEQRA) and preparation of a final environmental impact statement (References 1 and 2 in Appendix A) for the proposed development of a 10.7 acre shopping center (site) located on Jerusalem Avenue in Uniondale, Town of Hempstead, Nassau County, New York (see Figure 1.1 for site location). The site is currently owned and operated by Uniondale Realty Associates. Fanning, Phillips and Molnar was retained to provide consulting engineering services for the investigation of the site and preparation of environmental impact statements. During the public hearing conducted by the Hempstead Town Board (lead agency), people signed affidavits attesting to material that was landfilled at the site which included paint [redacted] **ical waste.**

Prior to this public hearing, a site investigation study (Reference 3 in Appendix A) was conducted for the site in 1986. A thorough review of files at the Nassau County Department of Health (NCDH), New York State Department of Environmental Conservation (NYSDEC), and the Nassau County Fire Marshal showed no evidence of hazardous waste activity. Tests on site showed little, if any contamination and laboratory tests directly in the fill, showed undetected levels of priority pollutant VOCs.

In May 1989, after the public hearing, a further study was undertaken to investigate this new evidence and to further study the soils of the fill in an attempt to ascertain whether contaminants were leaving the site and impacting any human population or the



F,P&M

FIGURE 1.1-SITE LOCATION

environment. A total of five (5) wells were installed to investigate the groundwater quality upgradient, within, and downgradient of the fill. Each well was surveyed to vertical and horizontal control datum to determine the groundwater flow direction and gradient in the aquifer. To further categorize the hydrodynamics of the fill, a paired piezometer was installed in the fill (two (2) wells were installed, 1 shallow and 1 deep in the fill).

In addition, four (4) soil samples were obtained within the fill, 2 in the unsaturated and 2 in the saturated zones. All groundwater and soil samples were tested by a U.S. Environmental Protection Agency (USEPA), NYSDEC Contract Laboratory for full target compound list (TCL) parameters.

The results of the groundwater sampling (Reference 4 in Appendix A) indicated that there were substances present in the groundwater within the fill in both the shallow and deeper zones. However, groundwater quality directly downgradient of the fill was acceptable (within the standards). Thus, based upon the results of the investigation, it was concluded that the site does not pose a threat to drinking water suppliers of Nassau County and a final impact statement (FEIS) was prepared (Reference 2 in Appendix A).

In June of 1989, the completed soil and groundwater investigation report dated June, 1989 was submitted to the New York State Department of Environmental Conservation. The cover letter requested the agency to review and comment on the report and its recommendations. A completed soil and groundwater investigation report dated June, 1989 was also submitted to Nassau County Department of Health Services.

In July, 1989, the Nassau County Department of Health submitted a

letter to the Commissioner of the Town of Hempstead Conservation and Water Waste. The letter stated that based upon the laboratory results, there was no evidence to classify this area as a hazardous waste site. Also, the Department agreed with the recommendation of the installation of two additional monitoring wells downgradient within the property boarders into the shallow aquifer.

In September 1989, the Nassau County Department of Health stated that the department agrees with the recommendations for the installation of two additional monitoring wells.

In November 1989, an additional copy of the Supplemental Soil and Groundwater Investigation at the Uniondale Shopping Center Site, June 1989, was submitted to the NYSDEC.

In December 1989, a letter from the Nassau County Department of Health to the New York State Department of Environmental Conservation stated that although the County has approved the report and the recommendations for additional work, that further evaluation and approval would be dependant upon their (NYSDEC's) office. The New York State Department of Environmental Conservation forwarded a letter to the Town of Hempstead, stating that the NYSDEC has reviewed the reports and determined additional site testing will be required. Based upon additional test results, a decision will be made whether the site is a hazardous waste site.

A supplemental soil and groundwater investigation of the site was requested by the NCDH and the NYSDEC. The NYSDEC has also required that this additional work be performed and attached to the FEIS before it will review the FEIS, as documented in the Order on Consent (Index # W1-0418-90-01) for the site (Reference 5 in Appendix A). This

resulted in the generation of the NYSDEC approved work plan (Reference 6 in Appendix A) that was used to conduct the investigation described in this report. This work plan was attached to the Order on Consent Index # W1-0418-90-01 as Appendix B of the Order.

1.1 Purpose

The purpose of this investigation was to determine whether hazardous wastes were disposed of at the site and if such hazardous wastes were disposed of at the site, whether they constitute a significant threat to the public health or environment, necessitating remedial work. A secondary purpose was to assess the shallow soils at the site to determine if there would be any impact to the surrounding community during construction from dust generation. The NYSDEC will then review and comment upon this report. The FEIS, will then incorporate their comments from this investigation so that the Hempstead Town Board can complete the SEQRA and site plan approval process for the site.

This investigation was carried out by the collection of soil, soil gas, and groundwater data to supplement data that had already been obtained through previous investigations (References 1, 2, 3 and 4 in Appendix A) and to develop a Hazardous Ranking System (HRS) score for the site. All data obtained was used in conjunction with data from previous investigations to determine if any imminent and/or significant environmental hazard exists. This was accomplished through the installation of additional monitoring wells and the analysis of soil, soil gas and groundwater samples.

SECTION 2.0
SUMMARY OF SAMPLING

Fanning, Phillips and Molnar personnel, under NYSDEC and NCDH oversight as detailed by the Order on Consent (Reference 6 in Appendix A), collected samples of the subsurface materials penetrated during sixteen (16) shallow soil borings completed on May 10 and May 11, 1990. Three (3) deep soil borings were started in the period from June 27 to July 3, 1990 to obtain soil samples at depths greater than five (5) feet. Completion and sampling of these borings was not possible due to methane readings greater than 25 percent of the lower explosive limit for methane. This resulted in the NYSDEC being unable to provide oversight guidance during this phase of the investigation due to safety concerns, and the task was, therefore, not executed. Soil gas samples were obtained from existing methane monitoring wells on July 11, 1990 under NYSDEC and NCDH oversight. Groundwater samples from six monitoring wells were collected on July 18 and 19, 1990. All samples were collected in a manner consistent with the Phase II work plan following Fanning, Phillips and Molnar's Quality Assurance/Quality Control procedures. Select samples were split with representatives for NYSDEC and NCDH. All sampling activities are documented in the field reports in Appendix B.

2.1 Soil Sampling - Shallow Borings

A total of sixteen (16) shallow soil borings were performed at the site (see Plate 2.1 for sampling locations). The 16 shallow soil borings were spatially distributed throughout the site in order to provide coverage to categorize the upper surface of the fill. The purpose of this sampling was to determine the potential risk that may

exist for construction workers during the construction phase of the development. Thus, it is expected, based upon the plans for construction, that only the upper 5 feet of the fill will be disturbed and regraded.

Each shallow sampling location was investigated by soil borings and continuous split-spoon sampling throughout the 5 foot soil profile (see Table 2.1 for a summary of the soil sampling in this zone). The sample used was an oversized split spoon to ensure that adequate amounts of soil were retrieved for analytical analysis. The samplers penetrated 2.5 feet of unsaturated zone per sample. The 0.0 to 2.5 foot sample and the 2.5 to 5.0 foot sample were composited to produce one sample for analysis.

The soils in the 0-5 foot zone were analyzed for total metals (for the 8 RCRA characteristic metals) and asbestos. The total metals analyses were performed by NYTEST Environmental, Inc., (NEI) located in Port Washington, New York. The asbestos analyses were performed by North Atlantic Laboratories, Inc., located in Ronkonkoma, New York. The field procedure for this sampling is detailed in Appendix C, Section 1. The drilling logs from the shallow boring work are presented in Appendix D.

The samples for asbestos analyses were collected in the field by North Atlantic Laboratories' personnel. These samples were composited and subjected to asbestos analysis utilizing Polarized Light Microscopy with dispersion staining. The analysis was intended to determine presence or absence and type of asbestos. Contamination of sampling equipment was averted by subjecting the split spoon samplers to a rigorous amended water cleaning procedure between sample pulls.

TABLE 2.1
SUMMARY OF SOIL SAMPLING
UNIONDALE SHOPPING CENTER
UNIONDALE REALTY ASSOCIATES

Sample ID#	Number of Samples	Type of Sample	Depth of Sample	Analytical(1) Parameters
Shallow Borings (soils)				
SB-1	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-2	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-3	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-4	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-5	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-6	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-7	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-8	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-9	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-10	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-11	2	1 composite	0'5'	Total metals (8 RCRA metals)and Asbestos
SB-12	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-13	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-14	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-15	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
SB-16	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos
Field Blank	1	NA	NA	Total metals (8 RCRA metals)and Asbestos

NA indicates not applicable

(1) Analytical parameters listed as: Metals (8 RCRA) include- Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver.

To afford maximum sampler protection, the worker was outfitted in a half mask respirator and eye protection and wetted all samples with amended water to minimize fiber release. Sampling techniques were consistent with normal EPA and OSHA sampling techniques for asbestos.

The sampler was certified as an EPA asbestos handler and duly trained in use of this particular field sampling equipment. The laboratory and its personnel performing analysis of each sample was certified under the New York State Environmental Laboratory Approval Program (ELAP) administered under the Department of Health.

2.2 **Soil Sampling - Deep Borings**

A total of three (3) deep soil borings to a depth of 35' were attempted at the locations indicated in Plate 2.1. The purpose of these three (3) deep soil borings was to obtain discrete soil samples at various depths within each of the borings. However, due to high levels of methane in the fill exceeding Fanning, Phillips and Molnar's Health and Safety Plan of 25% LEL, it was determined by the NYSDEC that it was unsafe to drill in the fill.

2.3 **Soil Gas Sampling**

Fanning, Phillips and Molnar agreed with a NYSDEC suggestion to test the soil by soil gas analysis in the fill (see Appendix E for letter of agreement). The soil gas sampling locations chosen were existing methane wells, M-21, M-13 and M-15, and M-21, with M-23 and M-20 proposed as alternates. M-13 and M-21 sampling points could not be located in the field when the sampling was performed on July 11, 1990. Methane wells M-18 and M-23 were substituted for M-13 and M-21 after discussions between NYSDEC personnel and Fanning, Phillips and Molnar personnel.

The sampling procedure is described in detail in Appendix C, Section 2, which is a modification of the procedure briefly detailed in the letter of agreement in Appendix E. Specifically, the Tenax Tubes that were proposed in the letter of agreement were not used. Four component trap systems were recommended over the Tenax Tubes by the analytical laboratory for increased accuracy of results. The analyses of the samples were performed by H2M Laboratories of Melville, New York. All sampling and analytical methods were approved by NYSDEC.

Two samples were taken per well. One sample had 1000 milliliters (ml) of soil gas collected and one sample had 250 ml of soil gas collected. This was done for the following reasons:

1. To provide the laboratory with a backup tube in the event that the sample had less volatile organics adsorbed onto the adsorbent material than the Gas Chromatograph-Mass Spectrometer (GC-MS) was initially calibrated for. The second tube was run, if necessary, after the proper range had been selected on the GC-MS.
2. To provide a back up tube on each well in the event of breakage of a trap in the field or in the laboratory. If a sample trap was broken and only one sample trap was available for the well, the other well air samples were analyzed first to select the proper settings on the GC-MS in advance of the run on the well that had only one sample tube available. The M-23 well had a duplicate set of tubes collected for analysis. This sample was designated as M-300 to serve as a blind duplicate. One sample tube was not

opened at the site, serving as a trip blank.

All site activities were monitored using a photoionization detector and a combustible gas indicator. In addition, hydrogen sulfide was monitored for using Dräeger tubes but was not present.

2.4 Monitoring Well Installation and Groundwater Sampling

A total of two (2) downgradient monitoring wells (MW-6 and MW-7) were installed between June 28 and July 2, 1990. All drilling was done by Soil Mechanics of Seaford, New York, under Fanning, Phillips and Molnar's supervision and NYSDEC and NCDH oversight. A full description of all field activities concerning this phase of site work is documented in the field reports in Appendix B.

A decontamination pad, constructed of wood and plastic sheeting, was assembled in a designated on-site cleaning area. The augers, rods, appurtenant equipment, well pipe and screens were steam cleaned on the pad before monitoring wells were installed. However, the steam cleaner provided up to 174°F of heat and did not provide sufficient heat (212°F). This resulted in the NYSDEC's disapproval of the cleaning method. An alternate cleaning method was recommended by the NYSDEC, which included chemical cleaning as per Fanning, Phillips and Molnar's decontamination protocol. The augers were then chemically washed with 10% nitric acid rinse, tap water rinse, methanol rinse (pesticide grade), and distilled water rinse. This was approved by the NYSDEC.

A hollow stem auger drill rig was used to a depth of 20 feet at both locations. An organic vapor analyzer (OVA) and Photovac MicroTIP (photoionization detector - PID) were used during the drilling to monitor the breathing zone, gases exiting the borehole, and auger

cuttings. There were no recordings above background levels on the OVA or PID during drilling the monitoring wells.

Installation and design of each monitoring well was based on previous data gathered from existing monitoring wells. Relevant data used to construct the new wells included depth to water table and subsurface material descriptions. Detailed monitoring well completion logs are provided in Appendix D. Table 2.4.1 provides the monitoring well construction details.

The monitoring wells were constructed of 10 feet lengths of 4 inch I.D., flush thread schedule 40 PVC riser casing and 0.010 inch slotted screen. Prior to installation, the casing and screen was steam cleaned and sterilized by rinsing with isopropyl alcohol and then a second steam cleaning (decontamination for the bacteriological testing). The screens were positioned to extend 5 feet above and below the water table. A 2 inch layer of sand was placed at the bottom of the borehole prior to installing the well screen. The gravel pack to be placed in the borehole annulus in the screened interval was rinsed thoroughly with distilled water and stored in a clean 55 gallon drum. A sample of water from the gravel pack rinseate was taken for bacteriological sampling. A sample of tank water during well construction was also taken for analysis of full TCL parameters.

The gravel pack was placed in the borehole annulus by use of a tremie pipe until it extended 2 feet above the top of the well screen. Two feet of bentonite pellets (¼ inch diameter) were then placed into the annular space of the hole above the sand pack. Approximately 2½ gallons of potable water was used to saturate the bentonite pellets and the seal was allowed to swell. Approximately 5 feet of a

TABLE 2.4.1
MONITORING WELL CONSTRUCTION DETAILS
UNIONDALE REALTY ASSOCIATES
UNIONDALE, NEW YORK

Well Number	Bottom of[1] Boring (feet)	Screened[1] Zone (feet)	Elevation of[2, 3] Measuring Point (feet)	Height of[4] Measuring Point (feet)	Land Surface[3] Elevation (feet)	Well Diameter (inches)
MW-6	20.5	9-19	48.88	1.05	47.83	4
MW-7	20.5	9-19	48.76	1.26	47.5	4

Note 1 - Boring depths and screen zones were measured in feet below land surface.
2 - Measuring point of all monitoring wells is the top of the PVC casing.
3 - Elevations are relative to a common datum.
4 - Measurement from land surface to measuring point.

cement/bentonite/water grout mixture in the ratio of 94 pounds/3-5 pounds/6.5 gallons, respectively, was tremie piped into the annular space to fill the space from the top of the bentonite seal to the ground surface. A five foot long section of 6 inch I.D. steel casing with locking cap was placed on both wells (MW-6 and MW-7). A protective cement mound was added to the outside of the casing.

On July 12, 1990, wells MW-6 and MW-7 were developed by Soil Mechanics using polyethylene suction line and a centrifugal pump. The tube was used to surge the well at regular intervals to remove fine grained materials from the vicinity of the screened interval. This would ensure the free flow of groundwater into the well. Each well was developed for approximately one hour, and the turbidity of the recovered well water was 50 Nephelometric Turbidity Units (NTU) or less. All the well fluids were pumped into 55 gallon drums and stored on a concrete platform located at the southeast section of the site.

The newly installed wells (MW-6 and MW-7) had vertical control established on the casings by a surveyor licensed to perform work in New York State (Tyson Surveyors - NYS Licensed Land Surveyor). The vertical control of existing wells MW-3, 4, and 5 was run for confirmation. Horizontal control was performed on all monitoring wells at the site (MW-1 through MW-7) and many of the methane monitoring wells and soil borings by the same surveyor.

The wells were allowed one week to equilibrate to natural groundwater flow conditions before the groundwater sampling event, which was conducted by Fanning, Phillips and Molnar personnel on July 18 and 19, 1990 under NYSDEC and NCDH oversight. All groundwater sampling activities were performed following the field procedures

detailed in Appendix C, Section 3.

A total of one sample per well or six (6) groundwater samples were collected during this investigation (2 upgradient wells, 2 wells within the fill, and 2 downgradient wells). Table 2.4.2 provides a summary of sample collection. Tables 2.4.3 and 2.4.4 provide summaries of the purging data and groundwater sampling stabilization parameters, respectively. During purging operations, it was noted that MW-4 had high turbidity/low yield. As a result, MW-4 was not sampled due to concerns that the high turbidity might invalidate some of the analyses. This was confirmed by NYSDEC and NCDH at the site.

All groundwater samples were tested for full TCL parameters. Unfiltered groundwater samples were obtained and analyzed for all parameters by NEI. The groundwater in the two (2) downgradient wells and two (2) upgradient wells were also tested for total and fecal coliform and streptococcus by NEI.

TABLE 2.4.2
SUMMARY OF GROUNDWATER SAMPLING
UNIONDALE REALTY ASSOCIATES
UNIONDALE, NEW YORK

Sample ID#	Number of Samples	Type of Sample	Depth of Sample	Analytical(1) Parameters
Monitoring Wells (aqueous)				
MW-1	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptococcus
MW-2	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptococcus
MW-3	1	Grab	Groundwater	Full TCL analysis and unfiltered metals
MW-4	1	Grab	Groundwater	Full TCL analysis and unfiltered metals
MW-5	1	Grab	Groundwater	Full TCL analysis and unfiltered metals
MW-6	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptococcus
MW-7	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptococcus
Field Blank	1	NA	NA	Full TCL analysis, unfiltered metals, total and fecal coliform and streptococcus
Trip Blank	1	NA	NA	TCL VOCs only
Matrix Spike	1	Grab (split)	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptococcus
Matrix Spike Duplicate	1	Grab (split)	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptococcus

NA indicates not applicable
(1) Analytical parameters listed as: full TCL include- VOCs, BNA/E, PCBs, Pesticides, cyanide and metals.

TABLE 2.4.3
SUMMARY OF PURGING DATA - JULY 18 AND 19, 1990
UNIONDALE REALTY ASSOCIATES
UNIONDALE, N.Y

Well #	Date	Depth of Well/(ft)	Depth to Water (ft)	Water Column (ft)	4 Vol. (gallons)	10 Vol. (gallons)	Pump Time on	Pump Time off	Amount Pumped
1	7/18/90	21.40	17.98	3.42	9.05	22.6	1107	1122	18
2	7/18/90	20.40	16.38	4.02	10.63	26.5	1238	1252	20
3	7/18/90	24.40	16.41	7.99	21.14	52.8	1600	1613	53
4	7/19/90	22.93	16.22	6.71	*	*	1236	1257	8
5	7/19/90	50.70	16.53	34.17	90.4	226	1420	1440	130
6	7/19/90	20.50	15.35	5.15	12.65	31.62	1110	1113	70
7	7/18/90	20.50	14.85	5.65	14.94	37.40	1421	1434	50

* Volumes of sample could not be obtained due to low hydraulic yield within the well, and high turbidity.

TABLE 2.4.4
SUMMARY OF GROUNDWATER SAMPLING
STABILIZATION PARAMETERS
JULY 18 AND 19, 1990
UNIONDALE REALTY ASSOCIATES
UNIONDALE, N.Y

Well#	Date	Ph	Specific Conductance (umhos/cc)	Temp (°C)	Turbidity (NTUs)
1	7/18/90	6.12	193	14.5	75
		6.08	178	14.5	20
		6.24	185	14.5	10
		6.28	192	14.5	5
2	7/18/90	6.25	450	14.5	100
		6.29	428	14.5	21
		6.37	429	14.5	8
				14.5	12
3	7/18/90	6.26	523	14	45
		6.30	450	14	15
		6.22	432	14	15
4*	7/19/90	6.80	1380	18	100+
5	7/19/90	6.25	1475	16	49
		6.26	1295	16.5	32
		6.37	1188	16.0	16
		6.16	1220	15.5	23
6	7/19/90	6.85	433	15	100
		6.86	434	15	24
		6.74	444	16	10
					9
7	7/18/90	6.35	1012	13	100
		6.57	998	13	60
		6.60	1000	13	12
		6.67	995	13	5

* Volumes of sample could not be obtained due to low hydraulic yield within well and high turbidity.

SECTION 3.0
QA/QC, DATA VALIDATION AND DATA USABILITY

3.1 QA/QC

The field and laboratory methodologies and results were analyzed by the Quality Assurance Officer (QAO) at Fanning, Phillips and Molnar for applicability, efficiency, and usability. The QA/QC procedures for field sampling and laboratory validation were developed in the Fanning, Phillips and Molnar work plan for the project. This work plan was approved by the State (NYSDEC) and the Nassau County Department of Health (NCDH) authorities prior to our field sampling. Thus, the field and lab methodologies may be deemed to satisfy the applicability criterion for the project.

A field inspection was conducted by the QAO on 5/10/90, who found the field sampling and decontamination procedures that were being followed on that day to be in general compliance of the work plan and to his satisfaction (see the QAO's field report, Appendix F, for details). The work plan's sampling and decontamination procedures were adhered to on other sampling days as well (see field reports in Appendix B).

Field blanks were prepared for each analytical parameter for each delivery to the laboratory. A trip blank was also taken during the sampling and was included in the cooler delivery to the laboratory. The trip blank was tested for TCL VOCs. In addition, a matrix spike and matrix spike duplicate were prepared and analyzed by the laboratory from groundwater samples of MW-7. All results of field blanks, trip blanks, MS and MSDs are summarized in Section 4.0 where the sampling results are presented.

The field and trip blanks were found (through lab analyses) to be relatively clean and free of gross contamination. The blanks for pesticides/PCBs were totally clean (see Table 4.3.4 of Section 4.0).

The blanks for volatile organics in groundwater were found to have very low levels of methylene chloride, a common lab contaminant. However, methylene chloride was also found in NYTEST's method blank and, based on the QAO's data usability analysis (see Appendix I), methylene chloride contamination was flagged as undetected (see Table 4.3.1). The field blank taken on 7/19/90 for volatiles in groundwater (which is associated with samples MW-5 and MW-6) was found to have 88 ug/l of 1,1,1-trichloroethane. This, however, does not compromise our sampling results because 1,1,1-trichloroethane was undetected in the associated samples (see Table 4.3.1). Thus, for practical purposes, the blanks for (the sampling of) volatile organics in groundwater were clean.

The blanks for TCL semi-volatile compounds in groundwater were found to be clean except for the presence of di-n-butylphthalate and bis(2-ethylhexyl)phthalate (see Table 4.3.2), which are common field and laboratory contaminants with origins in the plastic materials. The QAO has taken the blank contamination by these two chemicals into consideration during his data usability analysis (see Appendix I).

The blanks for metals in groundwater and in soil were found to have some contaminants (see Tables 4.3.3 and 4.1.2). However, as also observed by the QAO (see Appendix I), no gross contamination was found. The presence of the contaminants in the blanks was taken into consideration by the QAO during his data usability analysis (see Appendix I), resulting in the rejection of a few sampling results for

metals in groundwater (see Table 4.3.3) and in soil (see Table 4.1.2).

In summary, all blanks were found to be free of gross contamination and only a few data for metals in groundwater had to be rejected due to blank contamination. Thus, our field and lab methodologies are found to be efficient since no resampling was necessary. (Also, as can be verified from Appendix I, the QAO has found all sampling results, except for those few results rejected in Tables 4.1.2 and 4.3.3, to be usable.) Thus, as per the analysis of the QAO, our field and lab methodologies generally satisfy the criteria of applicability, efficiency, and usability.

3.2 **Data Validation**

The laboratory analyses were conducted by NYTEST Environmental, Inc., Port Washington, NY, which is a NYSDEC approved laboratory. A data validation of 50% of the NYTEST results (as per NYSDEC) was done by H2M Labs, Inc., Melville, NY, which has experience in such projects. H2M was suggested as the data validator for this project in the Fanning, Phillips and Molnar's work plan that was approved by NYSDEC and NCDH. The results of H2M's data validation are attached in Appendix G. The NYTEST clarifications and/or corrections, made in response to H2M's data validation reports, are attached in Appendix H.

3.3 **Data Usability**

The QAO has reviewed the NYTEST lab results for the soil and groundwater samples pertaining to the site from a data usability standpoint. EPA's "Laboratory Data Validation, Functional Guidelines for Evaluating Organics Analyses" and EPA's "SOP No. HW-2, Evaluation of Metals Data for the Contract Laboratory Program (CLP), based on SOW 7/87 SOP Revision VIII" were used to determine data usability. Based

upon the evaluation, the QAO has found that all data for volatile and semi-volatile organics in groundwater, pesticides/PCBs in groundwater, and inorganics in soil and groundwater (except those data rejected, with flag R_D, in Tables 4.1.2 and 4.3.3), are usable. The QAO has concluded that some of the data for the above compounds should be considered as estimated and flagged with J_D (see Table 4.3.1, 4.3.2, 4.3.4, 4.1.2, and 4.3.3, of Section 4.0). See Appendix I for details of the QAO's data usability analysis.

SECTION 4.0
SAMPLING RESULTS

This section presents the analytical results of the soil, soil gas and groundwater sampling conducted at the site from May 10 to July 19, 1990. All sampling was conducted under the direct oversight of NYSDEC personnel. Chain of custody forms were maintained and are presented in Appendix J.

4.1 Soil Sampling

Soil samples from sixteen (16) shallow borings were analyzed for total metals (8 RCRA metals) and asbestos as described in Section 2.1 and Appendix C, Section 1. The metals analyses were performed by NEI located in Port Washington, New York, and the asbestos analyses were performed by North Atlantic Laboratories located in Bohemia, New York. The complete analytical results are presented in Appendix K, Section 1 (asbestos) and Section 2 (metals). Data validation was performed on 50 percent of the soil analyses by H2M Laboratories, Inc. (H2M) of Melville, New York (Appendix G) as stated in the approved work plan (Reference 6 in Appendix A).

Table 4.1.1 is a summary of the asbestos sampling. Asbestos was not detected in soil borings SB-2, 3, 4, 5, 8, 10, 13, 15 and 16. Chrysotile type asbestos was found at trace levels in SB-1, 6, 7, 9, 11, 12 and 14. According to the laboratory, trace levels mean only one or two fibers that cannot be quantified into a concentration.

Table 4.1.2 is a summary of the metals analyzed for total metals (8 RCRA metals). Arsenic ranged from undetected to 8.1 micrograms per kilogram (ug/kg). Barium ranged from 8.6 to 243 ug/kg. Chromium ranged from undetected to 15.1 ug/kg. Mercury was undetected at all

TABLE 4.1.1
SUMMARY OF ASBESTOS SAMPLING IN SOILS[1]
MAY 10 AND 11, 1990
UNIONDALE REALTY ASSOCIATES
UNIONDALE, NEW YORK

(All Results Expressed as Percentages)

Analyte	SB1	SB2	SB3	SB4	SB5	SB6	SB7	SB8	SB9	SB10	SB11	SB12	SB13	SB14	SB15	SB16
Asbestos - Total (%)	Trace	ND	ND	ND	ND	Trace	Trace	ND	ND	ND	Trace	Trace	ND	Trace	ND	ND
Asbestos Type (%)																
Chrysotile	Trace	NI	NI	NI	NI	Trace	Trace	NI	Trace	NI	Trace	Trace	NI	Trace	NI	NI
Non-Asbestos Fibers:																
Cellulose %	5	5	10	10	10	15	5	15	5	15	10	15	10	10	10	15
Fiberglass %	NI	NI	NI	NI	5	5	NI	NI	5	NI	5	5	NI	5	10	NI
Other %	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Non-Fiberous Material:																
Vermiculite %	NI	NI	NI	NI	NI	5	NI	NI	NI	NI	5	NI	NI	5	NI	NI
Perlite %	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Binder %	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Other % (Detritus)	95	95	90	90	85	75	95	85	90	85	80	80	90	80	80	85

(1) Samples were subjected to Polarized Light Microscopy with dispersion staining (EPA Method 600/M4 82-020).

ND Not Detected

NI None Identified

SOIL (METALS)

FPM - NOV 90 REPORT

TABLE 4.1.2
DETECTED TOTAL METALS (8 RCRA METALS) IN SOIL SAMPLES
MAY 10 AND 11, 1990
FOR UNIONDALE REALTY ASSOCIATES - UNIONDALE, NEW YORK
[ALL VALUES IN MILLIGRAMS/KILOGRAM (mg/kg)]

	[A] 6 NYCRR Part 360 4.4(a) MC[1]	[B] Proposed RCRA Action Levels	[C] Common Range in Soils	CRDL	IDL	FB-1	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-15	SB-16	TW-1
Arsenic	--	30	1-50	2.2	1.1	U	3.4N	2.4N	3.6N	3.1N	1.58N	2.9N	8.1NS	3.8NS	6.8NS	3.3NS	3.6NS	4.1NS	4.7NS	7.1NS	3.4N	3.9N	UW
Barium	--	--	100-3000	44.9	0.8	9.48	R_D(1)	R_D(2)	R_D(3)	R_D(4)	R_D(5)	R_D(6)	R_D(7)	R_D(8)	R_D(9)	R_D(10)	R_D(11)	49.2EJ_D	62.7EJ_D	243EJ_D	49.8EJ_D	64.2EJ_D	8.68
Cadmium	25	40	0.01-0.7	1.1	0.9	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Chromium	1000	400	1-1000	2.2	1.4	U	13.4*J_D	13.0*J_D	7.6*J_D	8.8*J_D	9.3*J_D	8.7*J_D	8.3*J_D	14.0*J_D	7.4*J_D	8.2*J_D	5.3*J_D	14.2*J_D	10.2*J_D	11.4*J_D	8.4*J_D	15.1*J_D	U*J_D
Lead	1000	--	2-200	0.7	0.6	19.7N	R_D(12)	R_D(13)	R_D(13)	R_D(14)	R_D(15)	R_D(16)	R_D(17)	R_D(18)	R_D(19)	R_D(20)	R_D(21)	R_D(22)	R_D(23)	520*	144*	R_D(24)	UNW*
Mercury	10	--	0.01-0.3	0.04	0.04	U	U	U	U	U	U	U	0.26	U	U	U	0.28	U	U	0.16	U	U	U
Selenium	--	--	0.1-2	1.1	1.1	UWN	UN	UNW	UN	UN	UN	UN	UN	UNW	UN	UN	UNW	UNW	UNW	UNW	UNW	UNW	UWN
Silver	--	200	0.01-5	2.2	0.9	U	U	U	U	U	U	U	U	U	U	U	U	U	1.08	U	U	U	U

[A] Chapter 360 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, Solid Waste Management Facilities, Section 360-4.4(a), "Sewage sludge and septage destined for land application" (as of 12/31/88) (Reference 8 in Appendix A).
[B] Federal Register, Volume 55, Number 145, Friday, July 27, 1990, Proposed Rules, p. 30865-30867. Applied to results of soil sample analyses (Reference 7 in Appendix A).
[C] Source: "Review of In-Place Treatment Techniques for Contaminated Surface Soils," Volume 2, EPA-540/2-84-0036, November 1984, except as noted (Reference 9 in Appendix A). Applied to results of soil and sediment sample analyses.
1 "Maximum Concentration, ppm, dry weight basis."

Qualifiers

U - Analyzed for but not detected.
B - Reported value is less than the Contract Required Detection Limit (CRDL) but is greater than the Instrument Detection Limit (IDL).
E - The reported value is estimated because of the presence of interference.
N - Spiked sample recovery not within control limits.
W - Post-digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.
* - Duplicate analysis not within control limits.
S - The reported bale was determined by Method of Standard Addition (MSA).
J_D - Estimated, as per data usability analysis in Appendix I.
R_D - Rejected based on data usability analysis.

(1) The value was 40.48E mg/kg prior to data usability analysis, which then became 40.48EJ_D and, finally, R_D.
(2) The value was 32.58E mg/kg prior to data usability analysis, which then became 32.58EJ_D and, finally, R_D.
(3) The value was 26.38E mg/kg prior to data usability analysis, which then became 26.38EJ_D and, finally, R_D.
(4) The value was 33.78E mg/kg prior to data usability analysis, which then became 33.78EJ_D and, finally, R_D.
(5) The value was 15.38E mg/kg prior to data usability analysis, which then became 15.38EJ_D and, finally, R_D.
(6) The value was 31.78E mg/kg prior to data usability analysis, which then became 31.78EJ_D and, finally, R_D.
(7) The value was 45.38E mg/kg prior to data usability analysis, which then became 45.38EJ_D and, finally, R_D.
(8) The value was 25.38E mg/kg prior to data usability analysis, which then became 25.38EJ_D and, finally, R_D.
(9) The value was 35.18E mg/kg prior to data usability analysis, which then became 35.18EJ_D and, finally, R_D.
(10) The value was 18.08E mg/kg prior to data usability analysis, which then became 18.08EJ_D and, finally, R_D.
(11) The value was 21.18E mg/kg prior to data usability analysis, which then became 21.18EJ_D and, finally, R_D.
(12) The value was 64.1S* mg/kg prior to data usability analysis.
(13) The value was 7.9* mg/kg prior to data usability analysis.
(14) The value was 71.4* mg/kg prior to data usability analysis.
(15) The value was 15.1S* mg/kg prior to data usability analysis.
(16) The value was 37.2* mg/kg prior to data usability analysis.
(17) The value was 58.7S* mg/kg prior to data usability analysis.
(18) The value was 14.1S* mg/kg prior to data usability analysis.
(19) The value was 66.0* mg/kg prior to data usability analysis.
(20) The value was 25.7S* mg/kg prior to data usability analysis.
(21) The value was 29.4S* mg/kg prior to data usability analysis.
(22) The value was 73.4* mg/kg prior to data usability analysis.
(23) The value was 76.3* mg/kg prior to data usability analysis.
(24) The value was 52.5* mg/kg prior to data usability analysis.

Notes to Reading the Table

1. If a subscripted flag appears adjacent to an unsubscripted flag(s) and/or number, then the unsubscripted flag and/or number represents the situation prior to the data usability analysis. For example, "13*J_D" means that the contaminants's value was "13*" prior to data usability analysis.

2. Subscripted flags have exclusive priority during data analysis. For example, "13*J_D" mg/kg must be thought and used during analysis as 13J (estimated).

locations except SB-7, 11, and 14 where it ranged from 0.16 to 0.28 ug/kg. Silver was detected at only one location, SB-13, at an estimated concentration of 1 ug/kg. Cadmium and selenium was not detected in any of the samples.

Table 4.1.2 lists the proposed federal action levels (Reference 7 in Appendix A) for metals in soils and the New York State Code of Rules and Regulations' permissible levels for sludge destined for land application (Reference 8 in Appendix A). New York State does not have action levels for metals in soils, generally using the federal action levels if levels have been established for that analyte. The table also includes the common range of these metals in soil under natural or native conditions (Reference 9 in Appendix A).

4.2 Soil Gas Sampling

Soil gas samples were collected from existing methane wells M-18, M-15 and M-23 with M-300 as blind duplicate of M-23. The procedure is described in Section 2.3 and Appendix C, Section 2. The analytical work was conducted by H2M Laboratories, Inc., located in Melville, New York. The analytical results are in Appendix K, Section 3.

Table 4.2.1 is a summary of the soil gas analytical results. Methane well M-18 had chlorobenzene at 12,000 micrograms per cubic meter (ug/m^3) and acetone at 5700 ug/m^3. Methane well M-23 had chloroethane, chlorobenzene, acetone and xylenes present at 780, 6800, 4800 and 440 ug/m^3, respectively. The blind duplicate of this well had similar though lower levels of chloroethane, chlorobenzene and acetone but did not have a detection of xylenes. Methane well M-15 had chloromethane at 400 ug/m^3 and chloroethane at 3600 ug/m^3. All methane well samples had estimated concentrations of various

TABLE 4.2.1
SUMMARY OF SOIL GAS ANALYSES
JULY 11, 1990
UNIONDALE, NEW YORK

SOIL GAS
FPM - NOV. 90 REPORT

Parameters	M-18	M-23	M-300 Duplicate (M-23)	M-15	Trip Blank	Field Blank
Volatile Organics (ug/m^3)						
Acetone	5700	4800	2600	ND	ND	320
Chlorobenzene	12000	6800	4300	ND	ND	ND
Chloroethane	ND	780	440	3600	ND	ND
Total Xylenes	ND	440	ND	ND	ND	ND
Chloromethane	ND	ND	ND	400	ND	ND
Unknown Alkane	9100	31000	19000	12000	ND	ND
Unknown	7900	ND	ND	ND	ND	ND
2,2,3,4-tetramethyl pentane	6500	18000	ND	6100	ND	ND
1,1-dimethyl cyclohexane	14000	ND	ND	ND	ND	ND
cis/trans-dimethyl cyolohexcane	24000	ND	ND	15000	ND	ND
Unknown	14000	ND	ND	ND	ND	ND
Alkyl Cyclohexane	11000	ND	ND	ND	ND	ND
Unknown	7500	ND	9500	ND	ND	ND
Alkyl Hexane	11000	23000	ND	ND	ND	ND
Unknown	5000	ND	ND	ND	ND	ND
Methyl Cyclopentane	ND	24000	15000	7700	ND	ND
Unknown	ND	32000	20000	14000	ND	ND
Unknown	ND	23000	18000	11000	ND	ND
2,2,3,4-tetramethyl pentane	ND	18000	ND	ND	ND	ND
Unknown	ND	28000	18000	ND	ND	ND
Dimethyl Cyclohexane	ND	43000	28000	ND	ND	ND
Unknown	ND	24000	16000	6800	ND	ND
Alkane Cyclohexane	ND	25000	ND	ND	ND	ND
Alkyl Alkane	ND	ND	14000	ND	ND	ND
Cyclohexane	ND	ND	ND	6300	ND	ND
Unknown	ND	ND	ND	12000	ND	ND
Methyl Cyclohexane	ND	ND	ND	9900	ND	ND

ND - Not Detected

identifiable and nonidentifiable volatile organic compounds not on the Target Compound List (TCL).

4.3 Groundwater Sampling

Groundwater from four (4) existing and two (2) newly installed wells was sampled for full TCL parameters on July 18 and 19, 1990 as described in Section 2.4 and Appendix C, Section 3. The sample analyses were conducted by NEI of Port Washington, New York. The analytical results are in Appendix K, Section 4. Data validation was performed on 50 percent of this data by H2M Laboratories, Inc., of Melville, New York, as agreed upon in the approved work plan (Reference 6 in Appendix A).

Table 4.3.1 is a summary of detected TCL volatile organic compounds (VOCs) for 1989 and 1990 sampling events. Wells MW-1 and MW-2 are upgradient wells, MW-3 and MW-5 are wells in the landfill area and MW-6 and MW-7 are wells located downgradient of the landfill area and are at the southern boundary of the site.

Acetone was detected at upgradient well MW-2 at 56 micrograms per liter (ug/l). Methylene chloride was detected at upgradient well MW-1 at an estimated concentration of 4 ug/l and at downgradient well MW-7 at an estimated concentration of 2 ug/l. Benzene was detected at landfill well MW-3 at 11 ug/l and MW-5 at 26 ug/l. Chlorobenzene was detected at landfill well MW-3 at 24 ug/l and MW-5 at 18 ug/l. There was a reduction in benzene and chlorobenzene levels from 1989 to 1990, as indicated in Table 4.3.1.

A total of 37 ug/l of tentatively identified VOCs were detected at MW-3 and 10 ug/l of tentatively identified VOCs were detected at MW-5. All other wells had no detection of tentatively identified

TABLE 4.3.1
DETECTED TCL VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
JULY 18 AND 19, 1990 AND JUNE 7 AND 8, 1989
UNIONDALE REALTY ASSOCIATES - UNIONDALE, NEW YORK
[All values in micrograms/liter (ug/l)]

	Standards			Samples											QA/QC					
Chemical Detected Identified	Federal 40 CFR 141 MCL*/SMCL** [ug/l]	State 6NYCRR 703 Standards [ug/l]	CRDL	MW-1 1989	MW-1 1990	MW-2 1989	MW-2 1990	MW-3 1989	MW-3 1990	MW-5 1989	MW-5 1990	MW-6 1990	MW-7 1990	MW-6 Tank Water	Field Blank 7/18/90	Field Blank 7/19/90	Trip Blank 7/18/90	Trip Blank 7/19/90	MB1	MB2
Acetone	* **	50	10	U	U	U	$56U_D$(3)	6.08J	U	398	U	U	U	U	U	U	U	U	U	33
Benzene	5 /0**	ND	5	U	U	U	U_D	30.0	11	31.0	26	U	U	U	U	U	U	U	U	U
Carbon Disulfide		50	5	U	U	U	U	U	U	U	6	U	U	U	U	U	U	U	U	U
Chlorobenzene	*	5	5	U	U	U	U	33.0	24	35.0	18	U	U	U	U	U	U	U	U	U
1,1-Dichloroethene	7	5	5	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Methylene Chloride	*	5	5	U	$5U_D$(1)	U	U	U	U	U	U	U	$5U_D$(2)	$5U_D$(1)	76(4)	$5U_D$(1)	$5U_D$(5)	$5U_D$(5)	3J	U
1,1,1-Trichloroethane	200 **	5	5	U	U	U	U	U	U	U	U	U	U_D	U	U	88	U	U	U	U
Trichloroethene	5 /0	5	5	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Ethylbenzene		5	5	U	U	U	U	U	U	2J	U	U	U	U	U	U	U	U	U	U
Toluene	5	U	5	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Vinyl Acetate			10	U	U	U	$10UJ_D$(6)	U	$10UJ_D$(6)	U	$10UJ_D$(6)	$10UJ_D$(6)	U	U	U	U	U	U	U	U
Xylene (total)		15	5	U	U	U	U_D	9.0	U_D	16.0	U_D	U_D	U	U	U	U	U	U	U	U
Subtotal				U	U	U	10	78	45	123	60	10	U	U	76	88	U	U		
Tentatively Identified																				
Subtotal				7	U	U	U	224	37J	116	10J	U	U	U	5.0J	U	U	U		
VOC Total				7	U	U	10	302	82	239	70	10	U	U	81	88	U	U		

MB1 - Method Blank for MW-1, MW-7, Field Blank (7/18/90), Field Blank (7/19/90), Trip Blank (7/18/90), and Trip Blank (7/19/90).
MB2 - Method Blank for MW-2, MW-3, MW-5, and MW-6.

Qualifiers

U - Analyzed for, but not detected.
J - Estimated value.
B - Analyte found in the method blank as well as the sample.
J_D - Estimated, as per data usability analysis in Appendix I.
U_D - Undetected based on data usability analysis.

(1) The value was 48J ug/l prior to data usability analysis.
(2) The value was 28J ug/l prior to data usability analysis.
(3) The value was 56B ug/l prior to data usability analysis.
(4) The value was 76B ug/l prior to data usability analysis.
(5) The value was 38J ug/l prior to data usability analysis.
(6) The value was 10U ug/l prior to data usability analysis.

* Maximum Contaminant Level- "maximum permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system."
** Maximum Contaminant Level Goal- "nonenforceable health goal."

NOTES TO REGULATIONS

Federal Standards

Environmental Protection Agency National Primary Drinking Water Regulations (as of 7/17/89) (Reference 10 in Appendix A). Applied to results of all water sample analyses.

State Standards

Chapter 10 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, Division of Water Resources, Article 2, Part 703.5(a) (2) and (3), Classes and quality standards for groundwaters- "The purpose of these classes, quality standards, and effluent standards and/or limitations is to prevent pollution of groundwaters and to protect the groundwaters for use as a potable water." (as of 7/5/85) (Reference 11 in Appendix A). Applied to results of all groundwater sample analyses regardless of groundwater use.

Notes to Reading the Table

1. If a subscripted flag appears adjacent to an unsubscripted flag, then the unsubscripted flag represents the situation prior to the data usability analysis. For example, "UJ_D" means that the contaminant was originally undetected but should be considered estimated (J_D).
2. Subscripted flags (J_D and U_D) have exclusive priority during data analysis. For example, $10UJ_D$ must be thought of and used during analysis and totaling as 10J (estimated).
3. Data usability analysis was done only for the 1990 results and, hence, caution must be exercized when comparing them with the 1989 results.

VOCs. The total VOCs at each well were as follows:

Well #	Total VOCs	Location
MW-1	56 ug/l	Upgradient
MW-2	56 ug/l	Upgradient
MW-3	72 ug/l	Landfill area
MW-5	60 ug/l	Landfill area
MW-6	None ug/l	Downgradient
MW-7	2 ug/l	Downgradient

Table 4.3.1 lists federal and New York State standards for VOCs in groundwater.

Table 4.3.2 is a summary of detected semi-volatile organic compounds for 1989 and 1990 sampling events. Bis(2-ethylhexyl) phthalate and di-n-butylphthalate were detected in all wells and the field blanks at similar concentrations.

There were no detections of any other identified or tentatively identified semi-volatile organic compounds in downgradient wells MW-6 and MW-7 or upgradient wells MW-1 and MW-2 with the exception of 13 ug/l of tentatively identified semi-volatile organic compounds in upgradient well MW-2. Wells MW-3 and MW-5 in the landfill area of the site had minor amounts of semi-volatile organic compounds. Table 4.3.2 lists federal and New York State standards for semi-volatile organic compounds in groundwater.

Table 4.3.3 is a summary of detected TCL metals for 1989 and 1990 sampling events. Various levels of analytes were found in the groundwater samples, many of them naturally occurring at these levels as discussed in Section 5.2 of this report. Table 4.3.3 lists federal and New York State standards for metals in groundwater.

Table 4.3.4 summarizes the TCL pesticides and polychlorinated biphenyls analyses of groundwater in 1990. There were no detections

TABLE 4.3.2
DETECTED TCL SEMIVOLATILE COMPOUNDS IN GROUNDWATER
JULY 18 AND 19, 1990 AND JUNE 7 AND 8, 1989
UNIONDALE REALTY ASSOCIATES- UNIONDALE, NEW YORK
[All values in micrograms/liter (ug/l)]

Chemical Detected	Standards		Samples													QA/QC	
			MW-1		MW-2		MW-3		MW-5		MW-6	MW-7	Field Blank	Field Blank	MW-6 Tank		
Identified	State 6NYCRR 703 Standards	CRDL	1989	1990	1989	1990	1989	1990	1989	1990	1990	1990	7/18/90	7/19/90	Water	MB1	MB2
Di-n-butylphthalate	50	10	U	89U (7)	U	31U (8)	4J	36U (9)	2J	69U (10)	72U (11)	62U (12)	82	35	U	U	U
bis (2-Ethylhexyl) Phthalate	4.2	10	0.78BJ	$22U_D$(2)	1BJ	$25U_D$(3)	19BJ	$13U_D$(4)	7J	23U(5)	$20U_D$(6)	23U(5)	24	$18U_D$(1)	U	U	5J
Napthalene	50	10	U	U_D	U	U_D	7J	$8J_D$	9J	13	U_D	U_D	U	U	U	U	U
N-Nitroso-diphenylamine	50	10	U	U	U	U	U	13	6J	U	U	U	U	U	U	U	U
2-Methylphenol	50	10	U	U	U	U	2J	U	2J	2J	U	U	U	U	U	U	U
4-Methylphenol	50	10	U	U	U	U	U	U	2J	U	U	U	U	U	U	U	U
Isophorone	50	10	U	U	U	U	U	U	1.3JB	U	U	U	U	U	U	U	U
Benzoic Acid	50	50	U	U	U	U	7J	U	5J	U	U	U	U	U	U	U	U
Acenaphthylene	50	10	U	U	U	U	0.6J	U	U	U	U	U	U	U	U	U	U
Acenaphthene	50	10	U	U	U	U	2J	U	U	U	U	U	U	U	U	U	U
Dibenzofuran	50	10	U	U	U	U	U	U	0.7J	U	U	U	U	U	U	U	U
Diethylphthalate	50	10	1BJ	U	1BJ	U	2BJ	U	4J	U	U	U	U	U	U	U	U
Fluorene	50	10	U	U	U	U	3J	U	1J	U	U	U	U	U	U	U	U
Phenanthrene	50	10	U	U	U	U	17	U	3J	U	U	U	U	U	U	U	U
Anthracene	50	10	U	U	U	U	3J	U	0.7J	U	U	U	U	U	U	U	U
Butylbenzylphthalate	50	10	U	U	U	U	0.7J	U	0.06J	U	U	U	U	U	U	U	U
Benzo(a)anthracene	50	10	U	U	U	U	11	U	U	U	U	U	U	U	U	U	U
Chrysene	50	10	U	U	U	U	12	U	U	U	U	U	U	U	U	U	U
Benzo(b)fluoranthene	50	10	U	U	U	U	6J	U	U	U	U	U	U	U	U	U	U
Benzo(a)pyrene	50	10	U	U	U	U	9J	U	U	U	U	U	U	U	U	U	U
Indeo(1,2,3-cd)pyrene	50	10	U	U	U	U	3J	U	U	U	U	U	U	U	U	U	U
Dibenzo(ah)anthrancene	50	10	U	U	U	U	0.7J	U	U	U	U	U	U	U	U	U	U
Pentachlorophenol	21	50	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Fluoranthene	50	10	U	U	U	U	19	U	2J	U	U	U	U	U	U	U	U
Pyrene	50	10	U	U	U	U	20	U	2J	U	U	U	U	U	U	U	U
2,4-Dinitrophenol	50	50	U	$50UJ_D$	U	$50UJ_D$	U	$50UJ_D$	U	$50UJ_D$	$50UJ_D$	$50UJ_D$	U	U	U	U	U
Subtotal			1.8	50	2	50	148	71	47.8	65	50	50	106	35	U		
Tentatively Identified																	
Subtotal			19	U	40	13J	727	90J	340	35J	U	U	11J	120J	U		
Semivolatile Organic Compound Total			20.8	50	42	63	875	161	387.8	100	50	50	117	155	U		

MB1 - Method Blank for MW-1, MW-2, MW-3, MW-7, and Field Blank (7/18/90).
MB2 - Method Blank for MW-5, MW-6, and Field Blank (7/19/90).

Qualifiers

U - Analyzed for, but not detected.
J - Estimated Value.
B - Analyte found in the method blank as well as the sample.
* Maximum Contaminant Level- "maximum permissible level of contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system."
** Maximum Contaminant Level Goal- "nonenforceable health goal."
J_D - Estimated as per data usability analyses in Appendix I.
U_D - Undetected based on data usability analysis.

(1) The value was 18B ug/l prior to data usability analysis.
(2) The value was 22 ug/l prior to data usability analysis.
(3) The value was 25 ug/l prior to data usability analysis.
(4) The value was 13 ug/l prior to data usability analysis.
(5) The value was 23 ug/l prior to data usability analysis.
(6) The value was 20B ug/l prior to data usability analysis.
(7) The value was 89 ug/l prior to data usability analysis.
(8) The value was 31 ug/l prior to data usability analysis.
(9) The value was 36 ug/l prior to data usability analysis.
(10) The value was 69 ug/l prior to data usability analysis.
(11) The value was 72 ug/l prior to data usability analysis.
(12) The value was 62 ug/l prior to data usability analysis.

NOTES TO REGULATIONS
Federal Standards- Environmental Protection Agency National Primary Drinking Water Regulations (as of 7/17/89) (Reference 10 in Appendix A). Applied to results of all water sample analyses. NO STANDARDS HAVE BEEN SET FOR THE IDENTIFIED SEMI-VOLATILE CHEMICALS DETECTED.
State Standards- Chapter 10 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, Division of Water Resources, Article 2, Part 703.5(a)(2) and (3), Clases and quality standards for groundwaters- "The purpose of these classes, quality standards, and effluent standards and/or limitations is to prevent pollution of groundwaters and to protect the groundwaters for use as a potable water." (as of 7/5/85) (Reference 11 in Appendix A). Applied to results of all groundwater sample analyses regardless of groundwater use.

NOTES TO READING THE TABLE
1. If a subscripted flag appears adjacent to an unsubscripted flag, then the unsubscripted flag represents the situation prior to the data usability analysis. For example, "UJ_D" means that the contaminant was originally undetected but should be considered estimated (J_D).
2. Subscripted D flags (J_D and U_D) have exclusive priority during data analysis. For example, $50UJ_D$ must be thought and used during analysis and totaling as 50J (estimated).
3. Data usability analysis was done only for the 1990 results and, hence, caution must be exercized when comparing them with the 1989 results.

TABLE 4.3.3
DETECTED TCL METALS IN GROUNDWATER
JULY 18 AND 19, 1990 AND JUNE 7 AND 8, 1989
UNIONDALE REALTY ASSOCIATES - UNIONDALE, NEW YORK
[All values in micrograms/liter (ug/l)]

			Standards		Samples										QA/QC			
			Federal 40 CFR 141	State 6NYCRR 703	MW-1		MW-2		MW-3		MW-5		MW-6	MW-7	Field Blank	Field Blank	MW-6 Tank	
Analytes	CRDL	IDL	MCL*/SMCL**	Standards	1989	1990	1989	1990	1989	1990	1989	1990	1990	1990	7/18/90	7/19/90	Water	Remarks
Aluminum	200.0	25.0			1109	1620J_D	671	616J_D	218	253J_D	155B	425J_D	447J_D	849J_D	25UJ_D	25UJ_D	1518J_D	*
Antimony	60.0	30.0			U	30UJ_D	U	63.2J_D	19.0B	57J_D	U	30UJ_D	35BJ_D	30UJ_D	30UJ_D	30UJ_D	30UJ_D	N
Arsenic	10.0	44.1	50***	25	U	44UJ_D	U	44UJ_D	1.8B	44UJ_D	U	44UJ_D	44UJ_D	44UJ_D	44UJ_D	44UJ_D	44UJ_D	N
Barium	200.0	3.4	1000***	1000	9.01B	B	37.0B	B	442	244	497	689	B	226	U	U	U	
Beryllium	5.0	0.5			U	B	U	U	U	U	U	U	U	U	0.74	U	B	
Cadmium	5.0	3.8	10***	10	U	3.8UJ_D	U	3.8UJ_D	U	3.8UJ_D	U	3.8UJ_D	3.8UJ_D	3.8UJ_D	3.8UJ_D	3.8UJ_D	3.8UJ_D	N
Calcium	5000.0	264.0			17345	R_D(1)	36739	171000J_D	99674	454000J_D	124000	121000J_D	671000J_D	133000J_D	3020J_D	577J_D	144000J_D	E
Chromium	10.0	6.1	50***	50	U	6.1UJ_D	U	6.1UJ_D	U	6.1UJ_D	U	6.1UJ_D	6.1UJ_D	6.1UJ_D	6.1UJ_D	6.1UJ_D	BJ$_D$	*
Cobalt	50.0	8.1			U	U	U	U	U	U	U	U	U	B	U	U	U	*
Copper	25.0	4.1	1000**	1000	1.46B	R_D(2)	U	R_D(2)	U	R_D(2)	U	B	B	R_D(2)	36.3	U	B	
Iron	100.0	11.1	300**	300****	438	2830J_D	911	974J_D	29481	18900J_D	31800	38600J_D	R_D(8)	15600J_D	46.9J_D	253J_D	4030J_D	E
Lead	3.0	40.0	50***	25	~~1.5~~B	U	3.6B	U	10.4	31.6	5.8	9.5	U	U	U	U	U	
Magnesium	5000.0	179.0			3831	R_D(3)	7412	R_D(3)	11949	R_D(3)	12700	10900J_D	3980BJ_D	13700J_D	1610J_D	277J_D	BJ$_D$	E
Manganese	15.0	0.9	50**	300****	12.2	271J_D	89	68.2J_D	710	325J_D	735	571J_D	59.6J_D	1890J_D	2.1J_D	3.0J_D	22.7J_D	EN
Mercury	0.2	0.2	2***	2	U	U	U	U	U	U	U	U	U	U	U	U	U	
Nickel	40.0	16.4			676.0B	U	U	U	9.38	U	U	U	U	U	U	U	U	
Potassium	5000.0	1528.0			2628	B	7550	U	17518	B	8450	5010	7020	9080	U	U	U	
Selenium	5.0	59.8	10***	10	0.6B	60UJ_D	1.0B	60UWJ_D	U	5.0WJ_D	U	60UWJ_D	60UJ_D	60UJ_D	60UJ_D	60UWJ_D	60UJ_D	N
Silver	10.0	3.8	50***	50	2.89B	U	U	U	U	U	U	U	U	U	U	U	U	
Sodium	5000.0	222.0			30908	R_D(4)	30756	R_D(5)	19876	R_D(6)	20500	12100J_D	2860BJ_D	R_D(10)	8070J_D	251J_D	5420J_D	E
Thallium	10.0	56.6			U	U	U	U	0.3B	U	U	U	U	U	U	U	U	
Vanadium	50.0	5.9			U	U	U	U	U	U	U	U	U	U	U	U	U	
Zinc	20.0	3.6	5000**	5000	9.90B	58	10.9B	B	26.7	285	173	R_D(7)	R_D(9)	33	U	14.8	62.7	
Cyanide					U	U	17.5	U	U	U	U	U	U	U	U	U	U	

Qualifiers:
U - Analyzed for but not detected.
J - Estimated value.
B - Reported value is less than the Contract Required Detection Limit (CRDL) but is greater than the Instrument Detection Limit (IDL).
E - The reported value is estimated because of the presence of interference.
N - Spiked sample recovery not within control limits.
W - Post-digestion spike for furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.
* - Duplicate analysis not within control limits.
S - The reported value was determined by Method of Standard Addition (MSA).
**** -If both analytes are present, the total of both concentrations may not exceed 500 ug/l.
*** - Maximum Contaminant Level - "maximum permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system."
** - Secondary Maximum Contaminant Level - same definition as MCL except "not federally enforceable but intended as guidelines for the States."
J_D - Estimated, as per data useability analysis in Appendix I.
R_D - Rejected, based on data usability analysis.

(1) The value was 14,500 ug/l prior to date usability analysis, which then became 14,500J_D and, finally, R_D.
(2) The value was B prior to data usability analysis.
(3) The value wast B prior to data usability analysis; which then became BJ_D; and, finally, R_D.
(4) The value was 8,860 ug/l prior to data usability analysis, which then became 8,860J_D and, finally, R_D.
(5) The value was 29,000 ug/l prior to data usability analysis, which then became 29,000J_D and, finally, R_D.
(6) The value was 9,020 ug/l prior to data usability analysis, which then became 9,020J_D and, finally, R_D.
(7) The value was 41.5 ug/l prior to data usability analysis.
(8) The value was 853 ug/l prior to data usability analysis, which then became 853J_D, and, finally, R_D.
(9) The value was 27.1 ug/l prior to data usability analysis.
(10) The value was 12,900 ug/l prior to data usability analysis, which then became 12,900J_D, and, finally, R_D.

NOTES TO REGULATIONS

Federal Standards - Environmental Protection Agency National Primary Drinking Water Regulations (as of 7/17/89) (Reference 10 in Appendix A). Applied to results of all water samples analyses.
State Standards - Chapter 10 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, Division of Water Resources, Article 2, Part 703.5(a)(2) and (3), Classes and quality standards for groundwaters - "The purpose of these classes, quality standards, and effluent standards and/or limitations is to prevent pollution of groundwaters and to protect the groundwaters for use as a potable water." (as of 7/5/85) (Reference 11 in Appendix A). Applied to results of all groundwater sample analyses regardless of groundwater use.
Federal Standards - Environmental Protection Agency National Secondary Drinking Water Regulations (as of 9/26/88) (Reference 10 in Appendix A). Applied to results of all water sample analyses.

NOTES TO READING THE TABLE

1. If a subscripted flag appears adjacent to an unsubscripted flag and/or a number, then the unsubscripted flag and/or number represents the situation prior to the data usability analysis. For example, "UJ$_D$" means that the contaminant was originally undetected, but should be considered estimated (J_D); similarly, "1620 J_D" means that the lab reported result of 1620 ug/l should be considered estimated (J_D) because of data usability considerations.

2. Subscripted flags have exclusive priority during data analysis. For example, 10UJ$_D$ must be thought and used during analysis as 10U (estimated).

TABLE 4.3.4
DETECTED TCL PESTICIDES/POLYCHLORINATED BIPHENYLS IN GROUNDWATER
JULY 18 AND 19, 1990
UNIONDALE REALTY ASSOCIATES
UNIONDALE, NEW YORK

[All Results in micrograms/liter (ug/l)]

	Samples						Quality Assurance/Quality Control		
Analyte	MW-1 7/18/90	MW-2 7/18/90	MW-3 7/18/90	MW-5 7/19/90	MW-6 7/19/90	MW-7 7/18/90	Field Blank 7/18/90	Field Blank 7/19/90	MW-6 Tank Water
Polychlorinated Biphenyls	U	U	U	U	U	U	U	U	U
Pesticides	U	U	U	U	U	U	U	U	U

Qualifiers

U - Analyzed for but not detected.

of these analytes.

Table 4.3.5 summarizes the bacteriological analyses of groundwater in 1990. The analyses were performed on samples taken from MW-1 and MW-2, upgradient wells and MW-6 and MW-7, downgradient wells. Fecal coliform were present in one upgradient well (MW-2) at 4 most probable number per 100 milliliters (MPN) and one downgradient well (MW-7) at 9 MPN. Total coliform counts were 12 and 70 MPN for upgradient wells MW-1 and MW-2, respectively, and 50 and 900 MPN for downgradient wells MW-6 and MW-7, respectively. Fecal streptococci were present at one upgradient well, MW-2, at 4 MPN and both downgradient wells, MW-6 and MW-7 at 4 and 23 MPN, respectively.

4.4 **Groundwater Flow**

Groundwater flow at the site has been documented, in various Fanning, Phillips and Molnar's reports, to flow in a south-southeasterly direction (Reference 4 in Appendix A). This is consistent with the regional groundwater flow direction as discussed in Section 5.2.

Water level data was collected on July 18, 1990 from five (5) existing wells and the two (2) wells installed during this investigation. The two new wells were installed on the downgradient side of the site and provide further definition of the water table in this area. Plate 4.4.1 depicts the water table elevation on July 18, 1990 showing that the flow direction and gradient is similar to that of previous site reports.

TABLE 4.3.5
BACTERIOLOGICAL ANALYSES IN GROUNDWATER
JULY 18 AND 19, 1990
UNIONDALE REALTY ASSOCIATES
UNIONDALE, NEW YORK

All Results in Most Probable Number/100 milliliters

	Samples					Quality Assurance/Quality Control				
Analyte	MW-1 7/18/90	MW-2 7/18/90	MW-6 7/19/90	MW-7 7/18/90	MW-7 DUP 7/18/90	Field Blank 7/18/90	Field Blank 7/19/90	Method Blank 7/18-19/90	Gravel Pack 6/29/90	Method Blank 6/29/90
Fecal Coliforms	<2	4	<2	9	13	8	<2	<2	<2	<2
Total Coliforms	12	70	50	900	1600	50	<2	<2	<2	<2
Fecal Streptoccus	<2	4	4	23	50	<2	<2	<2	<2	<2

SECTION 5.0
DETERMINATION OF POTENTIAL RISK

This section uses the USEPA Hazard Ranking System and a discussion of the results of the investigation authorized by the NYSDEC Order on Consent Index #W1-0418-90-01 to formulate conclusions about the potential risk of the site to the environment.

5.1 Application of Hazard Ranking System

A. Introduction

The Hazard Ranking System has been applied using the new data obtained during the recent Follow-up Soil and Groundwater Investigation. The final scores calculated are:

S_M = 23.1

S_{gw} = 40

S_{sw} = 0

S_a = 0

S_{FE} = Not Applicable

S_{DC} = 0

The HRS scoring was requested by the NYSDEC Order on Consent Index #W1-0418-90-01.

B. HRS WORKSHEETS

Facility name: Uniondale Shopping Center

Location: Jerusalem Avenue and Meadowbrook Parkway, Uniondale, New York

EPA Region: II

Person(s) in charge of the facility: Uniondale Realty Associates

Name of Reviewer: Thomas P. Doriski-FP & M Date: 9/1990

General description of the facility:
(For example: landfill; surface impoundment; pile; container; types of hazardous substances; location of the facility; contamination route of major concern; types of information needed for rating; agency action, etc.)

Site is 10.7 acres of which approximately 5.5 acres is a landfilled area. Site operated from 1930 to 1962 as a concrete mixing facility and sand mining operation. Site operated as a concrete mixing/sand mining facility and a bowling alley facility complex from 1962 to 1973. Site started filling operations around 1960 to 1975. Site accepted construction and demolition debris; alleged acceptance of gasoline, hospital wastes, paint thinners and miscellaneous domestic wastes. *

Scores: S_M = 23.1 (S_{gw} = 40 S_{sw} = 0 S_a = 0)

S_{FE} = Not Applicable

S_{DC} = 0

* Site operated as a bowling alley and golf driving range complex from 1975 to 1986. Site vacant from 1986 to present.

FIGURE 1

HRS COVER SHEET

Ground Water Route Work Sheet						
	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	(0) 45	1	0	45	3.1
	If observed release is given a score of 45, proceed to line 4 . If observed release is given a score of 0, proceed to line 2 .					
2	Route Characteristics					3.2
	Depth to Aquifer Concern	0 1 2 (3)	2	6	6	
	Net Precipitation	0 1 (2) 3	1	2	3	
	Permeability of the Unsaturated Zone	0 1 2 (3)	1	3	3	
	Physical State	0 (1) 2 3	1	1	3	
		Total Route Characteristics Score		12	15	
3	Containment	0 1 2 (3)	1	3	3	3.3
4	Waste Characteristics					3.4
	Toxicity/Persistence	0 3 6 9 (12) 15 18	1	12	18	
	Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
		Total Waste Characteristics Score		13	26	
5	Targets					3.5
	Ground Water Use	0 1 2 (3)	3	9	9	
	Distance to Nearest Well/Population Served	0 4 6 8 10 12 16 18 20 24 30 32 35 (40)	1	40	40	
		Total Targets Score		49	49	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			22,932	57,330	
7	Divide line 6 by 57,330 and multiply by 100		S_{gw} =	40		

FIGURE 2

GROUNDWATER ROUTE WORKSHEET

Surface Water Route Work Sheet						
	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	(0) 45	1	0	45	4.1
	If observed release is given a score of 45, proceed to line 4 . If observed release is given a score of 0, proceed to line 2 .					
2	Route Characteristics					4.2
	Facility Slope and Intervening Terrain	(0) 1 2 3	1	0	3	
	1-yr. 24-hr. Rainfall	0 1 (2) 3	1	2	3	
	Distance to Nearest Surface Water	0 1 2 (3)	2	6	6	
	Physical State	0 (1) 2 3	1	1	3	
		Total Route Characteristics Score		9	15	
3	Containment	(0) 1 2 3	1	0	3	4.3
4	Waste Characteristics					4.4
	Toxicity/Persistence	0 3 6 9 (12) 15 18	1	12	18	
	Hazardous Waste Quantity	0 (1) 2 3 4 5 6 7 8	1	1	8	
		Total Waste Characteristics Score		13	26	
5	Targets					4.5
	Surface Water Use	0 1 (2) 3	3	6	9	
	Distance to a Sensitive Environment	0 1 2 (3)	2	6	6	
	Population Served/ Distance To Water Intake Downstream	(0) 4 6 8 10 12 16 18 20 24 30 32 35 40	1	0	40	
		Total Targets Score		12	55	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	64,350	
7	Divide line 6 by 64,350 and multiply by 100		S_{sw} =	0		

FIGURE 7

SURFACE WATER ROUTE WORKSHEET

Air Route Work Sheet						
	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	(0) 45	1	0	45	5.1
	Date and Location:					
	Sampling Protocol:					
	If line 1 is 0, the S_a = 0. Enter on line 5 . If line 1 is 45, then proceed to line 2 .					
2	Waste Characteristics					5.2
	Reactivity and Incompatibility	0 1 2 3	1		3	
	Toxicity	0 1 2 3	3		9	
	Hazardous Waste Quantity	0 1 2 3 4 5 6 7 8	1		8	
		Total Waste Characteristics Score			20	
3	Targets					5.3
	Population Within 4-Mle Radius	0 9 12 15 18 21 24 27 30	1		30	
	Distance to Sensitive Environment	0 1 2 3	2		6	
	Land Use	0 1 2 3	1		3	
		Total Targets Score			39	
4	Multiply 1 x 2 x 3				35,100	
5	Divide line 4 by 35,100 and multiply by 100		S_a = 0			

FIGURE 9

AIR ROUTE WORKSHEET

	S	S^2
Groundwater Route Score (S_{gw})	40	1600
Surface Water Route Score (S_{sw})	0	0
Air Route Score (S_a)	0	0
$S^2gw + S^2sw + S^2a$		1600
$\sqrt{S^2gw+S^2sw+S^2a}$		40
$\sqrt{S^2gw+S^2sw+S^2a}$ / 1.73 = S_M		23.1

FIGURE 10

WORKSHEET FOR COMPUTING S_M

S_{FE} is scored only if a Fire Marshall has certified that the site is a fire and explosion threat or field observation has documented a fire and explosion threat. Since neither of these is true, S_{Fe} is not scored.

Fire and Explosion Work Sheet						
	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Containment	1 3	1		3	7.1
2	Waste Characteristics					7.2
	Direct Evidence	0 3	1		3	
	Ignitability	0 1 2 3	1		3	
	Reactivity	0 1 2 3	1		3	
	Incompatibility	0 1 2 3	1		3	
	Hazardous Waste	0 1 2 3 4 5 6 7 8	1		8	
		Total Waste Characteristics Score			20	
3	Targets					7.3
	Distance to Nearest Population	0 1 2 3 4 5	1		5	
	Distance to Nearest Building	0 1 2 3	1		3	
	Distance to Sensitive Environment	0 1 2 3	1		3	
	Land Use	0 1 2 3	1		3	
	Population Within 2-Mile Radius	0 1 2 3 4 5	1		5	
	Buildings Within	0 1 2 3 4 5	1		5	
		Total Targets Score			24	
4	Multiply 1 x 2 x 3				1,440	
5	Divide line 4 by 1,440 and multiply by 100		S_{FE}=			

FIGURE 11

FIRE AND EXPLOSION WORKSHEET

Direct Contact Work Sheet						
	Rating Factor	Assigned Value (Circle One)	Multi-plier	Score	Max. Score	Ref. (Section)
1	Observed Release	(0) 45	1	0	45	8.1
	If line 1 is 45, proceed to line 4 . If line 1 is 0, proceed to line 2 .					
2	Accessibility	(0) 1 2 3	1	0	3	8.2
3	Containment	(0) 15	1	0	15	8.3
4	Waste Characteristics Toxicity	0 1 (2) 3	5	10	15	8.4
5	Targets Population Within a 1-Mile Radius	0 1 2 3 4 (5)	4	20	20	8.5
	Distance to a Critical Habitat	(0) 1 2 3	4	0	12	
		Total Targets Score		20	32	
6	If line 1 is 45, multiply 1 x 4 x 5 If line 1 is 0, multiply 2 x 3 x 4 x 5			0	21,600	
7	Divide line 6 by 21,600 and multiply by 100		S_{DC} =	0		

FIGURE 12

DIRECT CONTACT WORKSHEET

C. Documentation Records for Hazard Ranking System

INSTRUCTIONS: The purpose of these records is to provide a convenient way to prepare an auditable record of the data and documentation used to apply the Hazard Ranking System to a given facility. As briefly as possible, summarize the information you used to assign the score for each factor (e.g., "Waste quantity = 4,230 drums plus 800 cubic yards of sludges"). The source of information should be provided for each entry and should be a bibliographic-type reference that will make the document used for a given data point easier to find. Include the location of the document and consider appending a copy of the relevant page(s) for ease in review.

FACILITY NAME: Uniondale Shopping Center

LOCATION: Jerusalem Avenue and Meadowbrook Parkway, Uniondale, New York.

DATE SCORED: September, 1990

PERSON SCORING: Thomas P. Doriski - Fanning, Phillips and Molnar

PRIMARY SOURCE(S) OF INFORMATION:

Fanning, Phillips and Molnar Draft Environmental Impact Statement for Uniondale Shopping Center.

FACTORS NOT SCORED DUE TO INSUFFICIENT DATA:

COMMENTS OR QUALIFICATIONS:

GROUNDWATER ROUTE

1. OBSERVED RELEASE

Contaminants detected (5 maximum):

None. No contaminants were detected in the upgradient wells indicating an upgradient source. No contaminants were detected in the downgradient wells indicating a release from the site. Therefore, there were no detections of contaminants significantly above background levels outside of the fill area that would indicate a release from the fill. The only contaminants detected in the fill were benzene and chlorobenzene at approximately 25 micrograms per liter.

Reference: Table 3.3.1, this report

Assigned value = 0

Rationale for attributing the contaminants to the facility:

Not Applicable (N/A)

2. ROUTE CHARACTERISTICS

Depth to Aquifer of Concern

Name/description of aquifer(s) of concern:

Upper glacial aquifer/Pleistocene Age glacial deposits of sand and gravel. Magothy aquifer/Cretaceous Age deltaic deposits of sand silt and clay. The upper glacial and Magothy aquifers are hydraulically connected.

References: 1 and 2

Depth(s) from the ground surface to the highest seasonal level of the saturated zone (water table(s)) of the aquifer of concern:

The depth to water beneath the fill areas was 16 feet below land surface during July, 1990.

References: Table 2.4.3. this report, 3 and 4

Depth from the ground surface to the lowest point of waste disposal/storage:

The fill extends to a depth of 50 feet at MW-5 as determined during 1989 drilling operations.

Reference: 5 (drilling logs for MW-5)

Assigned value: = 3

Net Precipitation

Mean annual or seasonal precipitation is approximately 42.5 inches average annual.

Reference: 6

Mean annual evaporation is approximately 28 inches average annual.

Reference: 14

Net precipitation (subtract the above figures):

14.5 inches

Assigned value = 2

Permeability of Unsaturated Zone

Soil type in unsaturated zone:

Sand, brown fine to coarse grained with small gravel in natural deposits. Rags, wood, paper, metal, black organics, ceramics, brick, plastics, concrete and asphalt in fill deposits.

Reference: 5

Permeability associated with soil type:

Greater than 10^{-3} cm/sec (HRS Users Manual - Table 2) or more specifically 0.03 to 0.04 cm/sec for typical outwash deposits on Long Island.

References: 7 and 8

Assigned value = 3

Physical State of Waste

Physical state of substances at time of disposal (or at present time for generated gases):

Solid, unconsolidated and unstabilized based on records search.

Reference: 5a

Assigned value = 1

3. CONTAINMENT

Containment

Method of waste or leachate containment evaluated:

No method of containment utilized. Landfill, no liner.

Reference: 5, drilling logs for MW-5

Method with highest score:

No liner or incompatible liner; moderately permeable. Compatible liner; landfill surface encourages ponding; no run-on control (HRS Users Manual - Table 3).

Assigned value = 3

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Benzene, Chlorobenzene

Reference: Table 3.3.1, this report

Compound with highest score:

Benzene and chlorobenzene have the same score.

Assigned value = 12

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum):

Unknown. There is no documentation of hazardous waste disposal at the site, only alleged hazardous waste disposal.

Basis of estimating and/or computing waste quantity:

Based on groundwater analytical data, records concerning the site, and the public hearing affidavits, it is estimated that a quantity much less than 40 drums or 10 tons or cubic yards may or may not be present. The value one (1) was chosen as the smallest, non-zero number available from the table in the HRS User's Manual.

References: Tables 3.3.1, 3.3.2, 3.3.3, 3.3.4, this report and 5.

Assigned value = 1

5. TARGETS

Groundwater Use

Use(s) of aquifer(s) of concern within a 3-mile radius of the facility:

The upper glacial and Magothy aquifers are designated sole sources aquifers (Reference 9). The water withdrawn from this aquifer system in the site area is used for domestic and commercial/industrial uses.

Assigned value = 3

Distance to Nearest Well

Location of nearest well drawing from aquifer of concern or occupied building not served by a public water supply:

Town of Hempstead, Uniondale Water District well field: 2000 feet north-northwest of the site. Located on Meadowbrook Road.

Town of Hempstead, East Meadow Water District well field: 1100 feet north-northwest of the site. Located on Meadowbrook Road and West End Place.

Distance to above well or buildings:

1100 feet

References: 5a, 10 and 11

Assigned value = 4

Population served by Groundwater Wells within a 3-mile Radius

Identified water-supply well drawing from aquifer(s) of concern within a 3-mile radius and populations served by each:

The population density for this area of concern (3-mile radius around the site) is 12 people per gross acre (Reference 5, page 70). The entire area bounded by a 3-mile radius circle (18,086 acres) is served by groundwater from within the 3-mile radius. This equals to a population of 217,000 people served by groundwater withdrawn from within 3 miles of the site. Slightly more than this will be served with groundwater from within the area of concern due to water district boundaries. However, the highest value that can be assigned to this factor is 5, for populations greater than 10,000 people. Therefore, the 217,000 people estimate is sufficient for this ranking.

References: 5a and 11

Computation of land area irrigated by supply well(s) drawing from aquifer(s) of concern within a 3-mile radius, and conversion to population (1.5 people per acre):

Greenfield Cemetary, 1.4 miles west-southwest, approximately 140 acres. Eisenhower Park, 2.8 miles, north-northeast, approximately 750 acres. 1335 people.

References: 5a, 10 and 11

Total population served by groundwater within a 3-mile radius:

Approximately 218,000

Assigned value = 5

Total assigned value = 40

SURFACE WATER ROUTE

1. OBSERVED RELEASE

Contaminants detected in surface water at the facility or downhill from it (5 maximum):

None. There have been no observed releases to surface water. Fill area is covered by 4 to 5 feet of sand and gravel. Downgradient monitoring wells between the fill area and surface water have no detection of hazardous contaminants. Stream is a groundwater effluent stream.

References: Tables 3.3.1, 3.3.2, 3.3.3 and 3.3.4, this report.

Assigned value = 0

Rationale for attributing the contaminants to the facility:

Not applicable (N/A)

2. ROUTE CHARACTERISTICS

Facility Slope and Intervening Terrain

Average slope of facility, in percent:

0 to 10 percent

Reference: 5a

Name/description of nearest downslope surface water:

East Meadow Brook/stream that has an average discharge of 14.8 cubic feet per second (cfs).

Reference: 12

Average slope of terrain between facility and above-cited surface water body in percent:

1.7 percent (47 feet Mean Sea Level (MSL), southeast corner of site to 35 feet MSL at East Meadow Brook at a horizontal distance of 700 feet).

References: 5a and 10

Is the facility located either totally or partially in surface water?

No

References: 5a and 10

Is the facility completely surrounded by areas of higher elevation?

No

References: 5a and 10

Assigned value = 0

1 Year, 24 Hour Rainfall in Inches

2.7 inches (HRS User's Manual - Figure 8)

Reference: 7

Assigned value = 2

Distance to Nearest Downslope Surface Water

700 feet east-southeast of the site

References: 5a and 10

Assigned value = 3

Physical State of Waste

Solid, unconsolidated and unstabilized based on records search.

Reference: 5a

Assigned value = 1

3. CONTAINMENT

Containment

Method(s) of waste or leachate containment evaluated:

No method of containment utilized. Fill area is covered with five feet of sand and gravel. The high permeability of this cover in conjunction with the slope within the fill area precludes surface water runoff.

References: 5 and 10

Method with highest score:

Landfill slope precludes runoff, landfill surrounded by sound diversion system or landfill has adequate cover material.

Assigned value = 0

4. WASTE CHARACTERISTICS

Toxicity and Persistence

Compound(s) evaluated:

Benzene and chlorobenzene

Reference: Table 3.3.1, this report

Compound with highest score:

Benzene and chlorobenzene have the same score.

Assigned value = 12

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility, excluding those with a containment score of 0 (Give a reasonable estimate even if quantity is above maximum:

Unknown. There is no documentation of hazardous waste disposal at the site, only alleged hazardous waste disposal.

Basis of estimating and/or computing waste quantity:

Based on groundwater analytical data, records concerning the site and the public hearing affidavits, it is estimated that a quantity much less than 40 drums or less than 10 tons or 10 cubic yards may or may not be present. The value one (1) was chosen as the smallest, non-zero number available from the table in the HRS User's Manual.

References: Tables 3.3.1, 3.3.2, 3.3.3, 3.3.4, this report and 5a.

Assigned value = 1

5. TARGETS

Surface Water Use

Use(s) of surface water within 3 miles downstream of the hazardous substance:

East Meadow Brook, from Jerusalem Avenue (at site) south to Merrick Road in the downstream direction is 3 miles. The NYSDEC has classified East Meadow Brook as a class D fresh surface water. Class D is defined as:

The waters are suitable for fishing. The water quality shall be suitable for primary and secondary contact recreation even though other factors may limit the use for that purpose. Due to such

natural conditions, such as intermittency of flow, water conditions not conducive to propagation of game fishery or stream bed conditions, the water will not support fish propagation.

References: 5a and 13

Assigned value = 2

Is there tidal influence?

No

Reference: 10

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

No coastal wetlands within 2 miles

References: 5a and 10

Distance to 5-acre (minimum) freshwater wetland, if 1 mile or less:

Less than 100 feet

References: 5a and 10

Distance to critical habitat of an endangered species or national wildlife refuge, if 1 mile or less:

N/A

Reference: 5a

Assigned value = 3

Population Served by Surface Water

Location(s) of water supply intake(s) within 3 miles (free-flowing bodies) or 1 mile (static waterbodies) downstream of the hazardous substance and population served by each intake:

N/A

Reference: 5a

Assigned value = 0

Computation of land area irrigated by above-cited intake(s) and conversion to population (1.5 people per acre).

N/A

Total population served:

N/A

Name/description of nearest of above waterbodies:

N/A

Distance to surface water intakes:

N/A

AIR ROUTE

1. OBSERVED RELEASE

Contaminants detected:

None. No releases of gases to air. No detection of any gases in the absence of drilling or excavating work below the five foot below land surface level.

Reference: Field reports - Appendix B of this report

Assigned value = 0

Date and location of detection of contaminants:

N/A

Methods used to detect the contaminants:

N/A

Rationale for attributing the contaminants to the site:

N/A

2. WASTE CHARACTERISTICS

Reactivity and Incompatibility

Most reactive compound:

N/A

Most incompatible pair of compounds:

N/A

Toxicity

Most toxic compound:

N/A

Hazardous Waste Quantity

Total quantity of hazardous waste:

N/A

Basis of estimating and/or computing waste quantity:

N/A

3. TARGETS

Population Within 4-Mile Radius

Give radius used, give population, and indicate how determined:

N/A

Distance to a Sensitive Environment

Distance to 5-acre (minimum) coastal wetland, if 2 miles or less:

N/A

Distance to a 5-acre (minimum) freshwater wetland, if 1 mile or less:

N/A

Distance to critical habitat of an endangered species, if 1 mile or less:

N/A

Land Use

Distance to commercial/industrial area, if 1 mile or less:

N/A

Distance to national or state park, forest, or wildlife reserve if 2 miles or less:

N/A

Distance to residential area, if 2 miles or less:

N/A

Distance to agricultural land in production within past 5 years, if 1 mile or less:

N/A

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

N/A

Is a historic or landmark site (National Register of Historic Places and National Natural Landmarks) within the view of the site?

N/A

FIRE AND EXPLOSION

S_{FE} is scored only if a Fire Marshall has certified that the site is a fire and explosion threat or field observation documented a fire or explosion threat. Since neither of these is true, S_{FE} is not scored.

1. CONTAINMENT

Hazardous substances present:

N/A

Type of containment, if applicable:

N/A

2. WASTE CHARACTERISTICS

N/A

Direct Evidence

Type of instrument and measurements:

N/A

Ignitability

Compound used:

N/A

Reactivity

Most reactive compound

N/A

Incompatibility

Most incompatible pair of compounds:

N/A

Hazardous Waste Quantity

Total quantity of hazardous substances at the facility:

N/A

Basis of estimating and/or computing waste quantity:

N/A

3. TARGETS

Distance to Nearest Population

N/A

Distance to Nearest Building

N/A

Distance to Sensitive Environment

Distance to wetlands:

N/A

Distance to critical habitat:

N/A

Land Use

Distance to commercial/industrial area, if 1 mile or less:

N/A

Distance to national or state park, forest, or wildlife reserve, if 2 miles or less:

N/A

Distance to residential area, if 2 miles or less:

N/A

Distance to agricultural land in production within past 5 years, if 1 mile or less:

N/A

Distance to prime agricultural land in production within past 5 years, if 2 miles or less:

N/A

Is a historic or landmark site (National Register or Historic Places and National Natural Landmarks) within the view of the site?

N/A

Population Within 2-Mile Radius

N/A

Buildings Within 2-Mile Radius

N/A

Population Within 2-Mile Radius

N/A

Buildings Within 2-Mile Radius

N/A

DIRECT CONTACT

1. OBSERVED INCIDENT

Date, location, and pertinent details of incident:

N/A

Assigned value = 0

2. ACCESSIBILITY

Describe type(s) of barrier(s):

Chain-link fence (10 foot) surrounds property. All access through fence such as gates are locked at all times.

References: 5 and field reports - Appendix B of this report

Assigned value = 0

3. CONTAINMENT

Type of Containment, if applicable:

N/A

Reference: 5a

Assigned value = 0

4. WASTE CHARACTERISTICS

Toxicity

Compounds evaluated:

Benzene and chlorobenzene

Assigned value = 2

Compound with highest score:

Benzene and chlorobenzene have the same score.

5. TARGETS

Population Within 1-Mile Radius

24,115 people

Reference: 5a

Assigned value = 5

Distance to Critical Habitat (of Endangered Species)

N/A (no endangered species in area)

Reference: 5a

Assigned value = 0

D. HRS Documentation References

1. Doriski, T.P and F. Wilde-Katz, 1983. Geology of the "20 Foot" Clay and Gardiners Clay in Southern Nassau and Southwestern Suffolk Counties, Long Island, New York. U.S.G.S. Water Resources Investigation Report 82--4056.
(Location: Fanning, Phillips and Molnar's files)

2. Perlmutter, N. Mand J.J. Geraghty, 1963. Geology and Ground-Water Conditions in Southern Nassau and Southeastern Queens Counties, Long Island, New York. U.S.G.S. Water Supply Paper 1613-A.
(Location: Fanning, Phillips and Molnar's files)

3. Doriski, T.P., 1986. Potentiometric - Surface Altitude of Major Aquifers on Long Island, New York, in 1983. U.S.G.S. Water Resources Investigation Report 85-4321.
(Location: Fanning, Phillips and Molnar's files)

4. Donaldson, C.D. and E.J. Koszalka, 1983. Water Table on Long Island, New York, March 1979. U.S.G.S. Open File Report 82-163.
(Location: Fanning, Phillips and Molnar's files)

5. Fanning, Phillips and Molnar, 1989. Supplemental Soil and Groundwater Investigation.
(Location: Fanning, Phillips and Molnar's files)

5a. Fanning, Phillips and Molnar, 1988. Draft Environmental Impact Statement for Uniondale Shopping Center.
(Location: Fanning, Phillips and Molnar's files)

6. Miller, J.F. and R.H. Frederick, 1969. The Precipitation Regime of Long Island, New York. U.S.G.S. Professional Paper 627-A.
(Location: Fanning, Phillips and Molnar's files)

7. Barrett, K.W., S.S. Chang, S.A. Haus and A.M. Platt, 1982. Uncontrolled Hazardous Waste Site Ranking System. MITRE Report MTR-82W111.
(Location: Fanning, Phillips and Molnar's files)

8. U.S.G.S., 1984. Unpublished report on a recharge project in the unsaturated zone at Medford, New York by Robert C. Prill and Thomas P. Doriski.
(Location: Secondary Authors files, (516) 737-6200)

9. USEPA, 1990. Fact Sheet Sole Source Aquifers in Region II (attached).

10. U.S.G.S., 1969. Freeport, New York, 1:24,000 Topographic Quadrangle (attached).
(Location: Fanning, Phillips and Molnar's files)

11. Kilburn, C., 1982. Ground-Water Pumpage in Nassau County, Long Island, New York, 1920-77. U.S.G.S. Open File Report 81-499. (Location: Fanning, Phillips and Molnar's files)

12. U.S.G.S., 1981. Water Resources Data - New York - Water Year 1981. U.S.G.S. Water Data Report NY-81-2. (Location: Fanning, Phillips and Molnar's files)

13. New York State Department of Environmental Conservation, 1988. 6 NYCRR, Chapter X. (Location: Fanning, Phillips and Molnar's files)

14. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, 1984. Climatological Data, Annual Summary, New York - 1984. Volume 96, Number 13. (Location: Fanning, Phillips and Molnar's files)

FACT SHEET

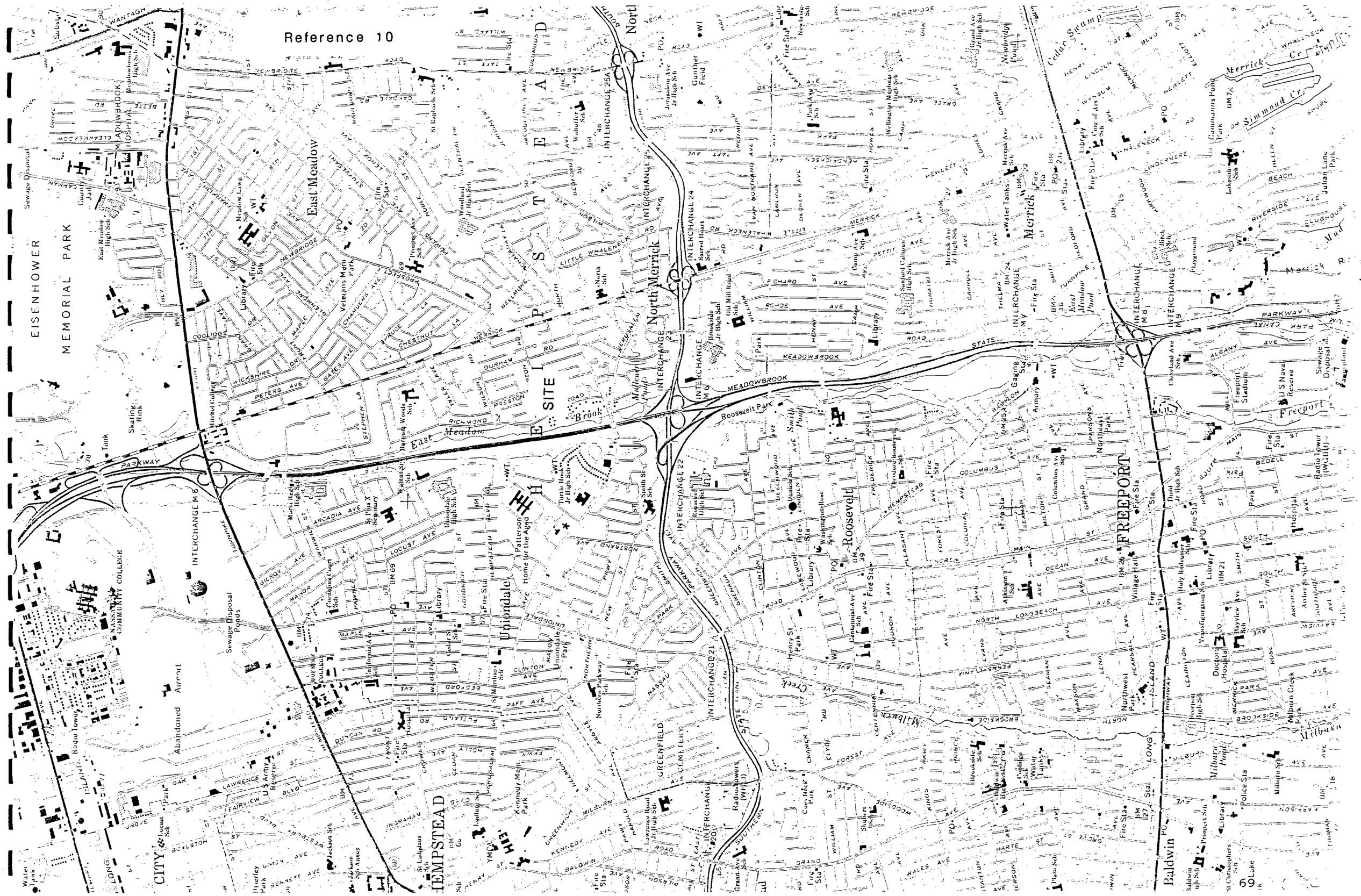
SOLE SOURCE AQUIFERS IN REGION II

Sole Source Aquifer Name	State	Citation	Publication Date
Brooklyn/Queens Aquifer System	NY	49 FR 2950	January 24, 1984
Buried Valley Aquifer System	NJ	45 FR 30537	May 8, 1980
Cattaraugus Creek Aquifer System	NY	52 FR 36100	September 25, 1987
Clinton Street-Ballpark Aquifer System	NY	50 FR 2025	January 14, 1985
Cortland-Homer-Preble Aquifer System	NY	53 FR 22045	June 13, 1988
Highlands Aquifer System	NJ/NY	52 FR 37213	October 5, 1987
Nassau/Suffolk Aquifer System	NY	43 FR 26611	June 21, 1978
New Jersey Coastal Plain Aquifer System	NJ	53 FR 23791	June 24, 1988
Northwest New Jersey Fifteen Basin Aquifer System	NJ/NY	53 FR 23685	June 23, 1988
Ridgewood Area Aquifer System	NJ/NY	49 FR 2943	January 24, 1984
Schenectady/Niskayuna Aquifer System	NY	50 FR 2022	January 14, 1985
Upper Rockaway River Basin Aquifer System	NJ	49 FR 2946	January 24, 1984

FOR MORE INFORMATION CONTACT

U.S. ENVIRONMENTAL PROTECTION AGENCY
JOHN MALLECK, CHIEF
OFFICE OF GROUND WATER MANAGEMENT
ROOM 842 - 26 FEDERAL PLAZA
NEW YORK, N.Y. 10278
212-264-5635

Reference 10



5.2 **Discussion**

The site has been assessed in detail by previous Fanning, Phillips and Molnar reports such as the Environmental Impact Statements (References 1 and 2 in Appendix A) and the soil and groundwater investigation reports (References 3 and 4 in Appendix A). This discussion will be limited to the findings of the work conducted under NYSDEC Consent on Order W1-0418-90-01 (Reference 5 in Appendix A). Significant findings and conclusions from previous work will be incorporated into this discussion where appropriate.

Shallow Soils

The shallow soil sampling portion of the investigation was conducted to determine shallow soil quality with respect to construction activities related to the proposed shopping center. The analytical results indicate that the shallow soil at the site is relatively free of contamination.

Asbestos is non-existent or at trace levels at the site. The total metals analysis, defined by the eight (8) RCRA metals, indicates that all metals are within the common range of these metals found in soils with the exception of lead at SB-14. The lead level in the soil at SB-14 is 520 mg/kg, which is slightly above the common range of 2 to 200 mg/kg found in soils (Reference 7 in Appendix A). This level does not exceed the level of lead for wastes destined for land application as defined by Chapter 360 of 6NYCRR (Reference 8 in Appendix A). The federal government has not set or proposed an action level for lead in soil (Reference 9 in Appendix A). Therefore, although lead in the shallow soil at SB-14 is slightly higher than the common range, it does not exceed any standards or guidance values.

Moreover, out of 16 borings, only 1 had this level. This implies that this condition is localized. All other metals are within the common range found in soils and do not exceed any standards or guidance values.

Soil Gas

The soil gas survey conducted pursuant to the letter of agreement between Fanning, Phillips and Molnar and NYSDEC (Appendix E), amending the work plan, has indicated that several TCL volatile organic compounds are present as soil gas in the unsaturated zone at the site. The compounds present are acetone, chlorobenzene, chloroethane, chloromethane and xylene. The concentrations vary from location to location at the site as indicated in Section 4.2 of this report. Due to the absence of soil gas standards, the soil gas results were evaluated based upon the most applicable guidelines. Available standards and guidelines for air exist, including the Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) (based on 8 hour time weighted average (TWA) concentrations) and the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limits (REL's).

Acceptable ambient levels (AALs) for different volatile compounds in air are given in the New York State Department of Environmental Conservation (NYSDEC) Air Quality Guidelines. An AAL is the contaminant concentration which is considered to be an acceptable average concentration at a receptor on an annual basis. However, due to the lack of exposure route for soil gases (as shown by the ambient air quality analysis) and the proposed site use (commercial), the AALs are not directly applicable for comparison to detected

concentrations in the soil gas, and therefore, will not be used.

For evaluation of the soil gas results, this study will exercise the applicability of OSHA exposure limits due to the proposed construction on site.

Chlorobenzene was detected in two of the three methane wells sampled at Uniondale (M-18 and M-23) with concentrations ranging from less than 100 to 12000 ug/m^3. Chlorobenzene soil gas values are far below the OSHA exposure limits. This implies that if the same concentrations were to be breathed in the construction work place for an 8 hour day, it would be safe.

Acetone was detected in two of the three methane wells tested (M-18 and M-23). Acetone concentrations in the gas samples at the Uniondale site range from less than 200 to 5700 ug/m^3; furthermore, acetone was the only chemical detected in the background sample (320 ug/m^3) that represents the above ground air quality. The values detected at the site are well within OSHA limits.

Chloroethane (ethylchloride) was detected in two of the three methane wells tested (M-15 and M-23) with concentrations ranging from less than 200 to 3600 ug/m^3. The concentration of chloroethane observed at the site are well within OSHA guidelines.

Chloromethane (methyl chloride) was detected at one of the methane wells (M-15) at the site at a concentration of 400 ug/m^3. The levels at the site are well within OSHA guidelines.

Xylene (dimethylbenzene) was detected in one of the two analyses for M-23 at 440 ug/m^3. Xylene does not exceed the OSHA guideline.

The results of the soil gas analyses indicate that the levels of volatile organic compounds gases are low and immediately drop to non-

detectable levels at land surface due to dilution. The results represent the same compounds that were detected at low ug/kg levels from soil samples during the installation of MW-5 during 1989 (Reference 4 in Appendix A). The levels of gas in the soil are below the OSHA exposure limits.

Based on these results, the soil gas levels will not be a health and safety concern for construction work or future occupants on the site. They will not be a concern after construction is completed due to the development plan, which includes paving (encapsulating) the entire landfill area thereby eliminating water percolation through the vadose zone and isolating the gases from exposure. It should be noted, however, that if gases are released, these will dissipate to levels below or well within the acceptable limits. Furthermore, a methane venting system has been designed and approved (conceptually) by the Town of Hempstead Building Department and will be installed for remediation of methane upon permitting construction completion (References 1 and 2 in Appendix A). This system will capture and remediate the low levels of volatile organic compounds.

The analytical data from the soil sampling conducted from 1986 to 1989 (References 1 and 3 in Appendix A) and the soil sampling conducted for this study indicate that the soils at the site are relatively free of contamination. The HRS evaluation and analytical data indicate that hazardous wastes are not present in the soils at levels that constitute a significant threat to public health or the environment. Methane appears to present the only significant concern at the site. It is present in the soil primarily below five feet. This was recognized and addressed in the DEIS (Reference 1 in Appendix

A) for both development and post-development stages of the proposed shopping center.

Groundwater

Groundwater analytical results indicate that very minor groundwater contamination exists within the landfill area of the site and is non-existent directly downgradient of the site. The area upgradient of the site has minor groundwater contamination typical of a well-developed suburban area such as Nassau County.

Volatile organic compounds (VOCs) in the groundwater at the site is primarily limited to the landfill area with minor concentrations of benzene and chlorobenzene (11 to 26 and 18 to 24 ug/l, respectively). These analytes were not detected in any other wells at the site in either the upgradient or downgradient direction. The wells in the downgradient direction are free of all VOCs and tentatively identified VOCs with the exception of methylene chloride at 2 ug/l at MW-7. This detection may be questionable due to the lab qualifiers indicating that the detection is an estimated value and the presence of the analyte in the method blank during analysis at the contract laboratory. The upgradient wells (MW-1 and MW-2), monitoring the quality of groundwater moving onto the site, had detections of acetone (56 ug/l) and methylene chloride (4 ug/l, estimated).

Semi-volatile organic compounds were detected in the groundwater. Among the semi-volatiles detected, bis(2-ethylhexyl)phthalate and di-n-butylphthalate were detected at higher concentrations. These chemicals are commonly found in analyses for semi-volatile organic compounds all over Nassau County in the shallow aquifer and were detected in the field blanks at similar levels.

The presence of phthalate compounds at these concentrations is not likely attributable entirely to groundwater quality conditions at the site. Phthalate compounds are plasticizers found in plastic containers (such as bottles used for deionized water) used during field sampling and laboratory analyses. Phthalates are also used in the manufacture of PVC products, such as well casings and may leach from the PVC over time. Therefore, either material (PVC casing or deionized water bottles) may be a source of the phthalates since the phthalates were also detected in the field blanks. There were other identified and tentatively identified semi-volatile organic compounds detected in the fill area at concentrations well below groundwater standards but were not detected in the downgradient wells. Bis(2-ethylhexyl) phthalate and di-n-butylphthalate were the only semi-volatile organic compounds detected downgradient of the fill area.

The TCL metals analysis indicate that iron and manganese were detected at relatively higher concentrations. Groundwater analyses performed on groundwater in the water table aquifer in various areas of Long Island indicate that manganese and iron commonly occur at relatively higher concentrations in the groundwater. The levels detected in these studies are similar to the levels detected in the upgradient and downgradient wells at the site. Four observation wells near the site sampled by the US Geological Survey are N-1163, N-1165, N-1615 and N-1185. The concentrations of various analytes in groundwater from the wells can be considered to be indicative of background or natural conditions for the area of Nassau County in which the site is located. The groundwater in the four wells had the following concentrations of iron and manganese:

	Manganese [ug/l]	Iron [ug/l]
N-1163	1600	1400
N-1165	3600	7500
N-1185	590	370
N-1615	900	2800

(Source: References 12 and 13 in Appendix A)

These concentrations are similar to the concentrations for iron and manganese detected in upgradient wells, MW-1 and MW-2 and downgradient wells, MW-6 and MW-7. The two wells constructed in the fill area, MW-3 and MW-5, have concentrations of iron above these concentrations. These iron concentrations appear to be local to these wells. Iron concentrations in groundwater from downgradient wells MW-6 and 7 are at background concentrations for southern Nassau County. This indicates that although iron and manganese concentrations exceed groundwater standards at the site, the concentrations are near background concentrations for groundwater of the water table aquifer for the area surrounding the site and downgradient (References 12 through 17 in Appendix A). Iron concentrations, higher due to landfill activities, are localized to the fill area only. Moreover, both iron and manganese are considered as aesthetic based parameters as opposed to health based.

There were no detections of pesticides or PCBs in groundwater at the site.

Bacteriological analyses were performed on groundwater samples upgradient and downgradient of the site. The samples were analyzed for coliform, fecal coliform and fecal streptococci bacteria. These indicator bacteria are commonly used to indicate the presence of human sewage and, under ideal conditions, are correlated with the number of

pathogens in a water sample. The purpose of the sampling was to determine if pathogens might be present in the groundwater at the site as a result of the alleged dumping of hospital wastes during the landfilling activities around 1962 to 1975.

Total coliform bacteria are native soil organisms, whereas fecal coliform and fecal streptococci originate from the feces of wild and domestic animals (Reference 18 in Appendix A). It has been found through various investigations that the ratio of fecal coliform to fecal streptococci (FC:FS) in water contaminated with human waste is always greater than 4.0 and that the ratio in water contaminated by farm animals, dogs, cats and rodents is less than 0.7. These ratios should be used with caution as relationships change with time and distance from the source (Reference 18 in Appendix A). The FC:FS ratio at MW-1, MW-2, MW-6 and MW-7 are 1, 0.5, 0.39 and 0.26, respectively. This implies a non-human waste source for the bacteria upgradient and downgradient of the landfill area of the site.

The bacteria levels found at the site are similar to bacteria levels found in the groundwater in East Meadow, New York, approximately 3.0 miles north-northeast of the site (Reference 19 in Appendix A). Fecal coliform in East Meadow ranged from 0 to 23 maximum count per 100 milliliters (MC/100 ML) and fecal streptococci ranged from 0 to 27 MC/100 ML. Fecal coliform at the Uniondale site ranged from <2 most probable number per 100 milliliters (MPN) to 13 MPN and fecal streptococci ranged from 4 to 50 MPN. The highest levels of bacteria were detected in the groundwater at MW-7. This well also had the highest specific conductivity of the downgradient wells indicating it is directly downgradient of groundwater flowing

beneath the fill area. The high total coliform count in MW-7 and the MW-7 duplicate appears to be the result of native soil bacteria that are probably active in the fill area. This is also supported by the presence of methane within the fill area.

The bacteria in the groundwater upgradient and downgradient of the site appear to be from non-human sources. Moreover, given the long time frame from the last landfilling operations, it is doubtful that any pathogens (if ever present) are still alive. The longest documented survival of a virus outside of its host in the soils of Long Island is 154 days (Reference 18 Appendix A). The last landfilling activity that took place on this site was in 1975.

Groundwater flow at the site is depicted in Plate 4.4.1. It is in agreement with previous water table maps of the site (Reference 4 in Appendix A) and regional groundwater flow direction (References 20, 21, 22 and 23 in Appendix A).

The horizontal groundwater flow velocity at the site can be calculated by using the following equation.

$$V = \frac{Ki}{n_e C}$$

Where,

V = groundwater velocity in feet per day (ft/d)

K = hydraulic conductivity in gallons per day per square foot (gpd/ft^2)

i = hydraulic gradient in feet per foot (ft/ft)

n_e = effective porosity (percent)

C = 7.48 gallons per cubic foot (gal/ft^3)

The average gradient at the site is 0.002 ft/ft and the hydraulic conductivity is approximately 2,000 gpd/ft2 (Reference 24 in Appendix

A). Based on these values and an effective porosity of 30 percent, the horizontal groundwater velocity is 1.8 feet/day.

Franke and Cohen (Reference 23 in Appendix A) constructed a flow net depicting the water level contours and flow lines associated with the shallow groundwater flow subsystem of East Meadow Brook (see inset on Plate 4.4.1). The site is located within the portion of the subsystem in which groundwater recharging the water table remains in the shallow subsystem (shallow water table) and ultimately discharges to East Meadow Brook as upward flow to the stream bed or Merrick Bay as horizontal flow within the shallow subsystem. Groundwater in the shallow subsystem moves within the shallow subsystem and does not migrate deeper in the upper glacial aquifer or to the Magothy aquifer. The average depth of the shallow subsystem in 1961 was 50 to 75 feet below the water table (Reference 23 in Appendix A) which would be approximately 65 to 90 feet below land surface at the site. The fill area at the site extends only 50 feet below land surface, indicating that the fill area is entirely within the shallow subsystem of groundwater flow.

5.3 **Conclusions**

The following conclusions are made concerning the site and associated site activities from 1930 to present with respect to the site's impact on groundwater and the environment. The conclusions are based upon the findings of Fanning, Phillips and Molnar investigations from 1986 to present and the Hazardous Ranking System evaluation contained in this report.

1. The HRS evaluation indicates that the site is in an area sensitive with respect to the groundwater migration route.

This is related to the shallow depth to groundwater, depth of fill area, permeability of the unsaturated zone, population size served by groundwater and degree of hydraulic connection between the shallow and deeper aquifers. NYSDEC personnel that have evaluated HRS rankings from sites on Long Island have indicated that the above factors usually result in any location on Long Island ranking high on the migration route.

2. The groundwater beneath the site is in the shallow subsystem of groundwater flow associated with East Meadow Brook. All groundwater recharging through the site's unsaturated materials and all groundwater in the fill area migrates horizontally or upwards to slowly discharge into Merrick Bay or East Meadow Brook. Therefore, even though the HRS indicates a sensitivity towards the groundwater migration route, the shallow subsystem of flow mitigates the sensitivity. The direction of groundwater flow is not factored into the HRS evaluation.

3. The site is not in a sensitive environment with respect to air or surface water except as related to groundwater.

4. Fire and explosion is not a hazard at the site under present site conditions. Explosion from methane could be a problem and was identified early on in the DEIS. The DEIS and FEIS present the design of a methane collection system to ensure the safety of the workers at the shopping center.

5. The shallow soils at the site are relatively free of contamination. Asbestos is either non-existent or present

at trace levels, dependent upon location. The metals (8 RCRA metals) do not exceed any action or guidance levels (state or federal) and are within the common range for metals in soils with the exception of lead at only one location, SB-14 at 520 ug/kg (action level is 1000 ug/kg).

6. Soil gas in the unsaturated zone was detected with the following volatile organic compounds: acetone, chlorobenzene, chloroethane, chloromethane and xylenes. All compounds are below OSHA exposure limits.
7. Monitoring well MW-7 is directly downgradient of water flowing beneath the fill area. The specific conductivity of this well is similar to fill area wells MW-3 and 5 which are distinctly different from upgradient wells MW-1 and 2.
8. The groundwater below the fill area of the site has been minimally impacted by low concentrations of two volatile organic compounds (benzene and chlorobenzene) and above background levels of two metals (iron and manganese). This impact has occurred in the fill area only. Downgradient wells indicate that there is no volatile organic compound contamination in groundwater at the downgradient property boundary. Iron and manganese concentrations in the downgradient wells are at background concentrations for this area of Nassau County.
9. Several semi-volatile organic compounds bis(2-ethylhexyl) phthalate and di-N-butylphthalate were detected in all wells and the field blanks at similar levels. Therefore, its presence cannot be attributed to the fill area. All other

semi-volatile organic compound detections in groundwater were at low (ug/l) concentrations in the fill area only.

10. There are no pesticides or polychlorinated biphenyls in groundwater at the site.
11. Bacteriological analyses show no indication that human waste that might contain pathogens exists at the site.
12. Site related activities have had no significant impact on the environment beyond the fill area of the site. Site related activities have had minimal impact in the area directly underlying the fill area. Methane is present in the unsaturated zone starting at five feet below land surface and deeper, and is slowly being released by diffusion in undetectable levels at land surface.

SECTION 6.0
RECOMMENDATIONS

The following recommendations are forwarded regarding future site related activities:

1. The final design of facilities on the site should incorporate a methane collection system to address the one active problem the site investigations have identified. (NOTE: This has already been addressed in the Environmental Impact Statements prepared for the site.)
2. Monitoring wells MW-6 and 7 should be preserved and incorporated into the final design of the facility. Access to MW-1 and 2 should be given to the Nassau County Department of Health or the USGS. Monitoring wells MW-3, 4 and 5 should be properly abandoned.
3. Water level and water quality of groundwater should be monitored at sampling points MW-2, 6 and 7. This will provide one upgradient and two downgradient sampling points. Analytes should be: temperature, pH, specific conductivity, and VOCs as measured by a water quality laboratory. The schedule should be semi-annual during construction and yearly following construction completion for three years after completion of the facility construction or until groundwater has been determined to be of acceptable quality for two consecutive years. All analytical data obtained should be tabulated with analytical data from all previous investigations. All data should also be presented in graphical form for visual confirmation of water quality

trends and submitted to NYSDEC annually.

4. Water level data from the monitoring wells left on and upgradient of the site should be contoured onto a site map to ascertain water level contour changes resulting from a change in recharge patterns.

For additional oversized figure(s), see Project Manager.

APPENDIX A
REFERENCES DOCUMENTATION

REFERENCES

1. Fanning, Phillips and Molnar, 1988. Draft Environmental Impact Statement for Uniondale Shopping Center. (Location: Fanning, Phillips and Molnar's files)

2. Fanning, Phillips and Molnar, 1989. Final Environmental Impact Statement for Uniondale Shopping Center. (Location: Fanning, Phillips and Molnar's files)

3. Fanning, Phillips and Molnar, 1986. Site Contamination Study (with Supplement Sampling Program; Amendment #1 and Amendment #2) (Location: Fanning, Phillips and Molnar's files)

4. Fanning, Phillips and Molnar, 1989. Supplemental Soil and Groundwater Investigation at Uniondale Shopping Center Site. (Location: Fanning, Phillips and Molnar's files)

5. New York State Department of Environmental Conservation, 1990. Order on Consent Index #W1-0418-90-01. (Attached)

6. Fanning, Phillips and Molnar, 1990. Work Plan for Follow-up Soil and Groundwater Investigation at Uniondale Shopping Center Site. (Attached)

7. U.S. Government Printing Office, 1990. Federal Register/Volume 55, No. 145/Friday, July 27, 1990/Proposed Rules, p. 30865-30867. (Location: Fanning, Phillips and Molnar's files) (Copy attached)

8. New York State Department of Environmental Conservation, 1988. 6NYCRR Part 360 Solid Waste Management Facilities. (Location: Fanning, Phillips and Molnar's files)

9. USEPA, 1984. Review of In-Place Treatment Techniques for Contaminated Surface Soils. Volume 2, EPA-540/2-84-0036. (Location: Fanning, Phillips and Molnar's files)

10. U.S. Government. 40 CFR-Part 141. (Location: Fanning, Phillips and Molnar's files)

11. New York State Government, 1985. 6NYCRR, Article 2, Part 703.5(a)(2) and (3). (Location: Fanning, Phillips and Molnar's files)

12. Ku, H.F.H. and D.J. Sulam, 1974. Hydrologic and Water Quality Appraisal of Southeast Nassau County, Long Island, New York. Long Island Water Resources Bulletin LIWR-13. (Location: Fanning, Phillips and Molnar's files)

13. Perlmutter, N.M. and E. Koch, 1975. Hydrogeochemical Data from Investigation of Water Quality in Sewered and Unsewered Areas,

Southern Nassau County, Long Island, New York. Nassau County Department of Public Works, Long Island Water Resources Bulletin LIWR-4.
(Location: Fanning, Phillips and Molnar's files)

14. Soren, J., 1977. Ground-Water Quality Near the Water Table in Suffolk County, Long Island, New York. Suffolk County Department of Environmental Control, Long Island Water Resources Bulletin LIWR-8.
(Location: Fanning, Phillips and Molnar's files)

15. U.S. Geological Survey, 1986. Water Resources Data, New York, Water Year 1986. USGS Water Data Report NY-86-2.
(Location: Fanning, Phillips and Molnar's files)

16. Koszalka, E.J., 1980. Hydrogeologic Data from the Northern Part of the Town of Brookhaven, Suffolk County, New York. Suffolk County Water Authority, Long Island Water Resources Bulletin LIWR-5.
(Location: Fanning, Phillips and Molnar's files)

17. Harr, C.A., 1973. Chemical Constituents in Water from Selected Sources in Nassau and Suffolk Counties, Long Island, New York. U.S.G.S. Open File Report.
(Location: Fanning, Phillips and Molnar's files)

18. Mallard, G.E., 1980. Microorganisms in Stormwater -- A Summary of Recent Investigations. U.S.G.S. Open File Report 80-1198.
(Location: Fanning, Phillips and Molnar's files)

19. Katz, B.G. and G.E. Mallard, 1980. Chemical and Microbiological Monitoring of a Sole Source Aquifer Intended for Artificial Recharge. U.S.G.S. Open File Report 80-567.
(Location: Fanning, Phillips and Molnar's files)

20. Doriski, T.P., 1987. Potentiometric Surface Altitudes of the Water Table, Magothy and Lloyd Aquifers on Long Island, New York in 1984. U.S.G.S. Water Resources Investigation Report 86-4189.

21. Doriski, T.P., 1986. Potentiometric Surface Altitudes of the Water Table, Magothy and Lloyd Aquifers on Long Island, New York in 1983. U.S.G.S. Water Resources Investigation Report 85-4321.
(Location: Fanning, Phillips and Molnar's files)

22. Donaldson, C.D. and E.J. Koszalka, 1983. Water Table on Long Island, New York, March 1979. U.S.G.S. Open File Report 82-163.
(Location: Fanning, Phillips and Molnar's files)

23. Franke, O.L. and P. Cohen, 1972. Regional Rates of Ground-Water Movement on Long Island, New York. U.S.G.S. Professional Paper 800-C, p. C271-277.
(Location: Fanning, Phillips and Molnar's files)

24. McClymonds, N.E. and O.L. Franke, 1972. Water Transmitting Properties of Aquifers on Long Island, New York. U.S.G.S. Professional Paper 627-E.
(Location: Fanning, Phillips and Molnar's files)

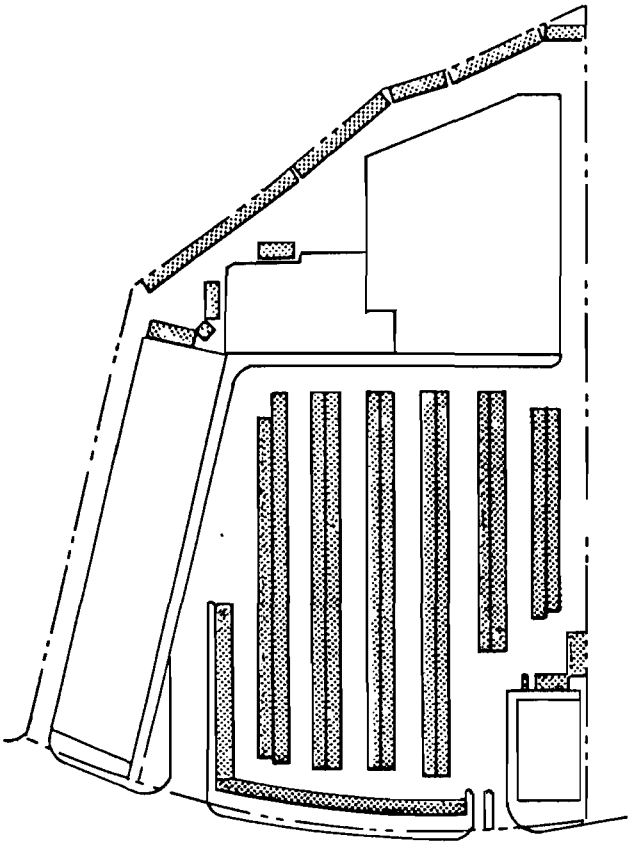
REFERENCE 1

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

FOR

UNIONDALE SHOPPING CENTER



DECEMBER 1988

fanning, phillips & molnar
ENGINEERS
HONKONKOMA NEW YORK

TABLE OF CONTENTS

		Page No.
Section 1	Executive Summary	1
	1.1 Proposed Action	1
	1.2 Environmental Impact	1
Section 2	Description of the Proposed Action	2
	2.1 Project Purpose and Need	2
	2.2 Site Location	3
	2.3 Design and Layout	3
	2.4 Construction and Operation	6
Section 3	Environmental Setting	10
	3.1 Geology	10
	3.1.1 Subsurface Geology	10
	3.1.2 Soils/Surface Geology	14
	3.1.3 Soil Quality and Soil Gas	16
	3.1.4 Topography	21
	3.2 Water Resources	26
	3.2.1 Groundwater	26
	3.2.2 Surface Water	34
	3.3 Air Resources	40
	3.3.1 Climate	42
	3.3.2 Air Quality	47
	3.4 Terrestrial and Aquatic Ecology	50
	3.4.1 Existing Environmental Conditions	50
	3.4.2 Ecology	51
	3.4.3 Floral Inventory	53
	3.4.4 Fish and Wildlife	54

TABLE OF CONTENTS (continued)

		Page No.
	3.4.5 Wetlands	58
	3.5 Human Resources	58
	3.5.1 Transportation	58
	3.5.2 Land Use and Zoning	63
	3.5.3 Community Services	66
	3.5.4 Cultural Resources	70
	3.5.5 Demography	70
Section 4	Significant Environmental Impacts	76
	4.1 Geology Impacts	76
	4.1.1 Subsurface Geology	76
	4.1.2 Soil Quality and Soil Gas	76
	4.1.3 Topography/Drainage	76
	4.2 Water Resources	77
	4.2.1 Groundwater	77
	4.2.2 Surface Water	79
	4.3 Air Resources	81
	4.3.1 Climate	81
	4.3.2 Air Quality	81
	4.4 Terrestrial and Aquatic Ecology	82
	4.4.1 Vegetation	82
	4.4.2 Fish and Wildlife	82
	4.4.3 Wetlands	82
	4.5 Human Resources	84
	4.5.1 Transportation	84
	4.5.2 Land Use and Zoning	89
	4.5.3 Community Services	89

TABLE OF CONTENTS (Continued)

		Page No.
	4.5.4 Cultural Resources	89
	4.5.5 Demography	89
Section 5	Mitigation Measures to Minimize Environmental Impact	91
	5.1 Geology	91
	5.2 Water Resources	92
	5.3 Air Resources	92
	5.4 Terrestrial and Aquatic Ecology	92
	5.5 Human Resources	95
Section 6	Adverse Environmental Effects That Cannot be Avoided if the Project is Implemented	96
Section 7	Alternatives	98
Section 8	Irreversible and Irretrievable Commitment of Resources	104
Section 9	Growth Inducing Aspects	105
Section 10	Effects on the Use and Conservation of Energy Resources	106
Section 11	References	
Section 12	Appendices	

APPENDIX 1 - Site Contamination Study Supplement - Sampling Program
APPENDIX 2 - Traffic Impact Study
APPENDIX 3 - Carbon Monoxide Hot Spot Screening Analysis
APPENDIX 4 - Engineering Report Methane Sampling Analysis and Remediation

REFERENCE 2

4/139

FINAL ENVIRONMENTAL IMPACT STATEMENT

FOR THE

UNIONDALE SHOPPING CENTER

JULY 1989

fanning, phillips & molnar
ENGINEERS

TABLE OF CONTENTS

		Page No.
	Foreword	i
Section 1	Executive Summary	1
	1.1 Proposed Action	1
	1.2 Environmental Impacts	1
Section 2	Description of the Proposed Action	2
	2.1 Project Purpose and Need	2
	2.2 Site Location	2
	2.3 Design and Layout	3
	2.4 Construction and Operation	5
	2.5 Lead Agency Jurisdiction	7
Section 3	Environmental Setting	10
	3.1 Geology	10
	3.1.1 Subsurface Geology	10
	3.1.2 Soils/Surface Geology	10
	3.1.3 Soil Quality and Soil Gas	10
	3.1.4 Topography	13
	3.2 Water Resources	13
	3.2.1 Groundwater	13
	3.2.2 Surface Waters	15
	3.3 Air Resources	16
	3.3.1 Climate	16
	3.3.2 Air Quality	16

TABLE OF CONTENTS (continued)

		Page No.
	3.4 Terrestrial and Aquatic Ecology	16
	3.4.1 Existing Environmental Conditions	16
	3.4.2 Ecology	16
	3.4.3 Floral Inventory	18
	3.4.4 Fish and Wildlife	18
	3.4.5 Wetlands	20
	3.5 Human Resources	20
	3.5.1 Transportation	20
	3.5.2 Land Use and Zoning	21
	3.5.3 Community Services	24
	3.5.4 Cultural Resources	24
	3.5.5 Demography	24
Section 4	Significant Environmental Impacts	25
	4.1 Geology Impacts	25
	4.1.1 Surface Geology	25
	4.1.2 Soil Quality and Soil Gas	26
	4.1.3 Topography/Drainage	26
	4.2 Water Resources Impacts	26
	4.2.1 Groundwater	27
	4.2.2 Surface Water	27
	4.3 Air Resources	27
	4.3.1 Climate	27
	4.3.2 Air Quality	27

TABLE OF CONTENTS (continued)

		Page No.
	4.4 Terrestrial and Aquatic Ecological Impacts	27
	4.4.1 Vegetation	27
	4.4.2 Fish and Wildlife	28
	4.4.3 Wetlands	28
	4.5 Human Resources	30
	4.5.1 Transportation Services	30
	4.5.2 Land Use and Zoning	33
	4.5.3 Community Services	34
	4.5.4 Cultural Resources Impacts	34
	4.5.5 Demography Impacts	34
Section 5	Mitigation Measures to Minimize Environmental Impact	35
	5.1 Geology	35
	5.2 Water Resources	40
	5.3 Air Resources	44
	5.4 Terrestrial and Aquatic Ecology	44
	5.5 Human Resources	46
Section 6	Adverse Environmental Effects That Cannot be Avoided if the Project is Implemented	49
Section 7	Alternatives	51
Section 8	Irreversible and Irretrievable Commitment of Resources	53
Section 9	Growth Inducing Aspects	54
Section 10	Effects on the Use and Conservation of Energy Resources	55
Section 11	References	56

TABLE OF CONTENTS (continued)

		Page No.
Section 12	Appendices	57
	APPENDIX A - Town of Hempstead Town Board Meeting Transcript	
	APPENDIX B - Town of Hempstead Positive Declaration	
	APPENDIX C - Soil and Groundwater Investigation	
	APPENDIX D - Estimation of Water Usage	

REFERENCE 3

SITE CONTAMINATION STUDY

UNIONDALE

PREPARED FOR

REALCO

OCTOBER 14,1986

fanning, phillips & molnar
ENGINEERS
PLAINVIEW NEW YORK

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE #
1	Site Visits	1
2	Photo Log	5
3	Past Spill Activity & History of Land Use	24
4	Organic Vapor and Petroleum Hydrocarbon Survey	27
5	Results, Conclusions and Recommendations	36
Appendix A	Lab Results	A-1

AMMENDMENT #1
UNKNOWN SUBSTANCE LABORATORY ANALYSIS

AMMENDMENT #2
SITE CONTAMINATION STUDY
UNIONDALE

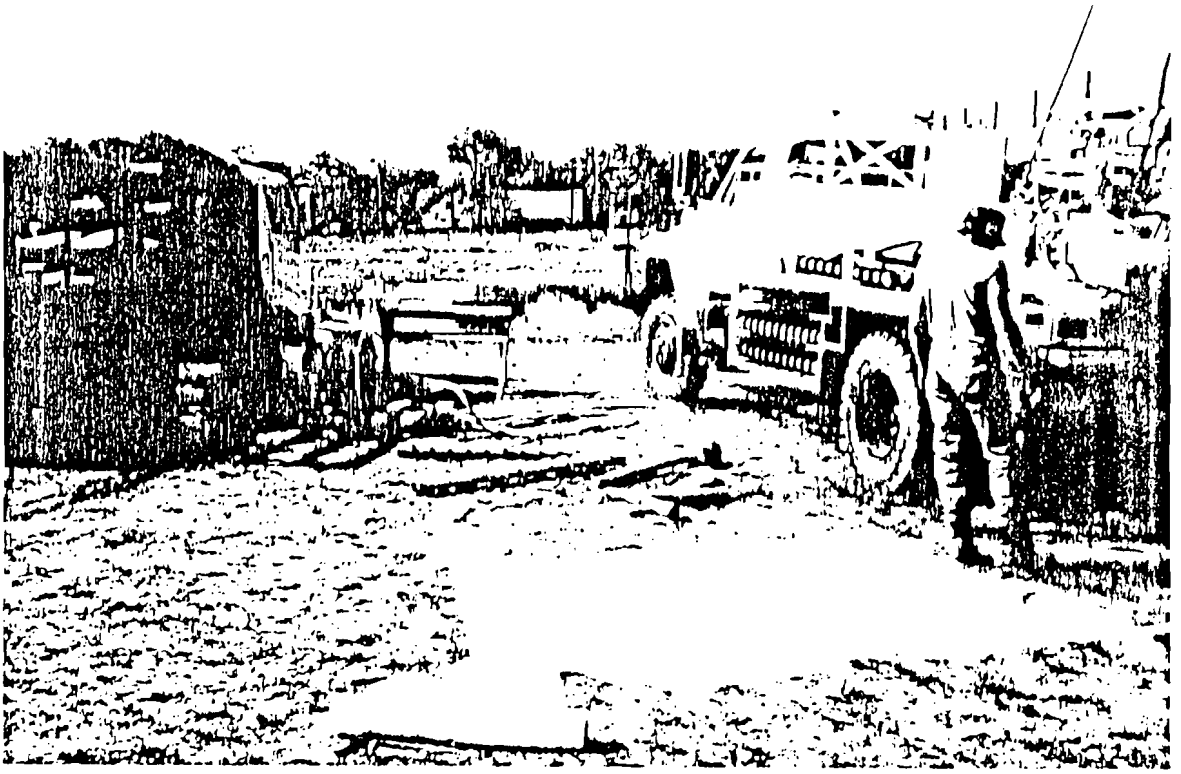
REFERENCE 4

SUPPLEMENTAL

SOIL & GROUNDWATER INVESTIGATION

AT

UNIONDALE SHOPPING CENTER SITE



JUNE , 1989

fanning, phillips & molnar
ENGINEERS
ROCKVILLE CENTRE NEW YORK

TABLE OF CONTENTS

		Page No.
	Executive Summary	i
	Disclaimer	1
Section 1	Introduction	2
Section 2	Summary of Past Site Contamination Study	4
Section 3	Regional Groundwater Quality in the Vicinity of the Site	7
	3.1 Public Supply Wells	7
	3.2 Monitoring Wells	13
Section 4	Monitoring Well Installation and Sampling Procedures	15
	4.1 Monitoring Well Installation	15
	4.2 Soil Sampling Procedures	17
	4.3 Groundwater Sampling Procedures	22
Section 5	Soil and Groundwater Sampling Results	24
	5.1 Soil Sampling Results	24
	5.2 Groundwater Sampling Results	24
	5.3 Quality Assurance/Quality Control (QA/QC)	24
Section 6	Discussion	32
	6.1 Discussion of Guidelines and Standards Used For the Assessment of the Contamination in the Soils and Groundwater at the Site	32
	6.2 Discussion of the Soil Sample Results	36
	6.3 Discussion of the Groundwater Sample Results	38
Section 7	Conclusions and Recommendations	40
	7.1 Conclusions	40
	7.2 Recommendations	41

TABLE OF CONTENTS (continued)

APPENDIX A - Lead Agency Determination

APPENDIX B - Field Reports

APPENDIX C - NYSDEC Well Construction Specifications

APPENDIX D - Chain of Custody and Laboratory Reports

Reference 5

New York State Department Of Environmental Conservation
Division of Environmental Enforcement
202 Mamaroneck Avenue - Room 304
White Plains, N.Y. 10601-5381
Telephone: (914) 761-3575

Thomas C. Jorling
Commissioner

July 23, 1990

Thomas V. Pantelis, Esq.
D'Amato, Forchelli, Libert, Schwartz
Mineo & Joseph F. Carlino
120 Mineola Boulevard
P.O. Box 31
Mineola, N.Y. 11501

CERTIFIED MAIL/RRR

RE: ORDER ON CONSENT
PLANDER LANES
UNIONDALE REALTY ASSOCIATION
Index # W1-0418-90-01

Dear Mr. Pantelis:

Enclosed please find a fully executed copy of the above Order on Consent. The Order was signed by Deputy Commissioner Sullivan on July 13, 1990.

Thank you for your continuing courtesy and cooperation in this matter.

Very truly yours,

/s/

Hedy Voigt
Senior Attorney

HV-I-PANTEIS.1/jg

Enclosure

cc: A. Candela
H. Berger
R. Tramontano
K. Phillips

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
----------X

In the Matter of the Development and Implementation of an Investigation Program for an Inactive Hazardous Waste Disposal Site, Under Article 27, Title 13, of the Environmental Conservation Law of the State of New York by

ORDER
ON
CONSENT

Index #W1-0418-90-01

UNIONDALE REALTY ASSOCIATES

Respondent.

----------X

1. The New York State Department of Environmental Conservation ("the Department") is responsible for enforcement of Article 27, Title 13 of the Environmental Conservation Law of the State of New York ("ECL"), entitled "Inactive Hazardous Waste Disposal Sites.

2. Uniondale Realty Associates ("Respondent") a general partnership organized and existing under laws of the State of New York, doing business in the State of New York. Respondent owns property at Jerusalem Avenue, Uniondale, Town of Hempstead, County of Nassau, State of New York (the "Site"), a map of which is appended hereto as "Appendix A".

3. Respondent has applied to the Town of Hempstead Town Board ("Town Board') for site plan approval to develop the site with a shopping center. In accordance with the State Environmental Quality Review Act ("SEQR") the Town Board, as lead agency, issued a positive declaration and required Respondent to prepare an environmental impact statement ("EIS").

4. The Town Board, however, will not consider the SEQR process to be completed until the Department, as an involved agency, reviews and comments upon the EIS.

5. Based upon available information and data, the Department suspects that hazardous wastes as defined at ECL section 27-130(1) may have been disposed of at the site.

6. Before the Department will review and comment upon the EIS it has required Respondent to perform additional testing and study of the site pursuant to the Work Plan attached to this Order as "Appendix B".

7. The goal of this Order is the development and implementation of an investigation at the site by Respondent. The data will be used to determine whether hazardous wastes were disposed of at the site and if such hazardous wastes were disposed of at the site whether they constitute a significant threat to the public health or environment necessitating remedial work. Another purpose of this Order is for the Department to review and comment upon the EIS, which will incorporate the data gathered from the Work Plan, so that the Town Board will complete the SEQR and site plan approval process for the site.

8. Respondent having consented to the issuance and entry of this Order, agrees to be bound by its terms.

9. The site has not now nor has it ever been listed by the Department on the State's Registry of Inactive Hazardous Disposal Sites.

NOW, having considered this matter and being duly advised, IT IS ORDERED THAT:

I. All activities and submittals required by this Order shall be in accordance with Requisite Technology. As used in this Order, Requisite Technology means engineering and scientific principles and practices, subject to the Department's approval, which (a) are technologically feasible, and (b) will identify any present or potential significant threat to the public health or environment posed by the presence of hazardous waste at the Site.

II. Within 30 days after the effective date of this Order, Respondent shall submit to the Department all data within its possession or control regarding environmental conditions on-Site and off-Site, and other information described below, to the extent that such data have not previously been provided to the Department. The data shall include:

a. A brief history and description of the Site, including the types, quantities, physical state, location and dates of disposal of hazardous waste, as well as the names of the following:

(1) the current owner and operator of the site;

(2) the owner and operator of the site at the time or subsequent to the time by any hazardous waste disposal occurred;

(3) any person who generated any hazardous waste that was disposed of at the site;

(4) any person who transported any hazardous waste to the site;

(5) any person who disposed of any hazardous waste at the site;

(6) any person who by contract, agreement or otherwise arranged for the transportation of any hazardous waste to the site or the disposal of any hazardous waste at the site;

b. A description of the results of all previous investigations of the Site and areas in the vicinity of the Site, including copies of all available topographic and property surveys, engineering studies and aerial photographs.

III. The Respondent has submitted a Work Plan outlining the nature and extent of the work to be undertaken in conducting the investigation.

IV. The Work Plan has been approved by the Department and is attached as "Appendix B", and is

incorporated into this Order. The Approved Work Plan meets the requirements of the Department's current Phase II generic work plan.

V. During the Investigation, Respondent shall have on-site full time, a representative qualified to inspect the work. In accordance with the time schedule contained in the Approved Work Plan, Respondent shall conduct the investigation and submit to the Department an Investigation Report (the "Report"). The Report shall include all data generated and all other information obtained during the Investigation. The Report shall include a certification by Respondent's consultant that all activities that comprised the Investigation were performed in accordance with the Approved Work Plan as well as fully completed Hazard Ranking System score sheets.

VI. The Department reserves the right to require a modification and/or an amplification and expansion of the Investigation and Report by Respondent if the Department determines that further work is necessary, as a result of reviewing data generated by the Investigation or as a result of reviewing any other data or facts.

VII. After receipt of the Report, the Department shall determine if the Investigation was conducted and the Report prepared in accordance with the Approved Work Plan

and this Order. The Department shall notify Respondent in writing of its approval or disapproval of the Report within 45 days.

If the Department disapproves the Report, the Department shall notify Respondent in writing of the Department's objections. Respondent shall revise the Report and/or reperform or supplement the Investigation in accordance with the Department's specific comments and shall submit a revised Report. The period of time within which the Report must be revised or the Investigation reperformed or supplemented shall be specified by the Department in its notice of disapproval.

After receipt of the revised Report, the Department shall notify the Respondent in writing of its approval or disapproval of the revised Report within 45 days.

If the Department disapproves the revised Report, the Department may revise the Report and/or reperform or supplement the Investigation as deemed necessary by the Department. The Report as modified by the Department shall be deemed the Approved Report.

The Approved Report shall be attached as "Appendix C" and incorporated into this Order.

After the Department's approval of the Report it shall promptly advise the Town Board of its findings and conclusions in a form and manner sufficient for the Town

Board to deem the Department's role as an involved agency complete pursuant to SEQR.

VIII. The Department shall have the right to obtain split samples, duplicate samples, or both, of all substances and materials sampled by Respondent as provided in the Approved Work Plan.

IX. Respondent shall provide notice to the Department at least 10 working days in advance of any field activities to be conducted pursuant to this Order.

X. Respondent shall obtain whatever permits, easements, rights-of-way, rights-of-entry, approvals or authorizations that are necessary to perform Respondent's obligations under this Order as provided in the Work Plan.

XI. Respondent shall permit any duly designated officer, employee, consultant, contractor or agent of the Department or any State agency to enter upon the Site or areas in the vicinity of the Site which may be under the control of Respondent for purposes of inspection, sampling and testing and to assure Respondent's compliance with this Order.

XII. Respondent shall retain professional consultants, contractors and laboratories acceptable to the Department to perform the technical, engineering and analytical obligations required by this Order. The experience, capabilities and qualifications of the firms or

individuals selected by Respondent shall be submitted to the Department for approval prior to the initiation of any activities for which they will be responsible.

XIII. Respondent shall not suffer any penalty under this Order, or be subject to any action or proceeding if it cannot comply with any requirements hereof because of an act of God, war or riot. Respondent shall immediately notify the Department in writing when it obtains knowledge of any such conditions and request an appropriate extension or modification of this Order.

XIV. The failure of Respondent to comply with any term of this Order shall constitute a violation of this Order.

XV. Nothing contained in this Order shall be construed as barring, diminishing, adjudicating or in any way affecting:

a. the Department's right to bring any action or proceeding against anyone other than Respondent, its directors, officers, employees, servants, agents, successors and assigns;

b. the Department's right to enforce the Order against Respondent, its directors, officers, employees, servants, agents, successors and assigns in the event that Respondent shall fail to satisfy any of the terms hereby. Respondent reserves its rights and defenses to contest such action.

c. the Department's right to bring any action or proceeding against Respondent, its directors, officers, employees, servants, agents, successors and assigns with respect to areas or resources that may have been affected or contaminated as a result of the release or threatened release of hazardous wastes or constituents at or from the Site, including, but not limited to, claims for natural resources damages; and nothing contained herein shall limit Respondent right against third parties. Respondent reserves its rights and defenses to contest such action.

d. the Department's right to bring any action or proceeding against any responsible party to compel the development and implementation of an inactive hazardous waste disposal site remedial program for the Site, including but not limited to a remedial investigation/feasibility study and to obtain recovery of its cost in connection with the site as provided for by statute. Respondent reserves its rights and defenses to contest such action.

XVI. This Order shall not be construed to prohibit the Commissioner or his duly authorized representative from exercising any summary abatement powers.

XVII. In the event that the site is placed on the Registry of Inactive Hazardous Waste Disposal Sites, then the Department reserves its right to seek reimbursement for administrative costs and expenses as provided for by statute. Respondent does not waive its rights to contest the imposition of such costs.

XVIII. Respondent shall indemnify and hold the Department, the State of New York and their representatives and employees harmless for all claims, suits, actions, damages and costs of every name and description arising out of or resulting from the fulfillment or attempted fulfillment of the terms of this Order by Respondent, its directors, officers, employees, servants, agents, successors or assigns.

XIX. This Order shall not be construed as an admission by Respondent that hazardous wastes are buried at the site or that the site is an inactive hazardous waste site.

XX. The effective date of this Order shall be the date it is signed by the Commissioner or Deputy Commissioner.

XXI. By executing this Order Respondent shall not be deemed to have waived any of its rights to contest any proceeding commenced by the Department or the exercise of any power by the Department by any and all legal means.

XXII. Within 30 days after the effective date of this Order, Respondent shall file a Declaration of Covenants and Restrictions with the Nassau County Clerk to give all parties who may acquire any interest in the Site notice of this Order. The Covenants and Restrictions may be

rescinded upon a determination that the Site does not qualify to be listed on the Registry of Inactive Hazardous Waste Sites or upon completion of any remediation program which may be required as a result of the findings from testing conducted under the approved Work Plan.

XXIII. In the event that Respondent proposes to convey the whole or any part of its ownership interest in the Site, Respondent shall, not fewer than 60 days prior to the proposed conveyance, notify the Department, in writing, of the identity of the transferee and the nature and date of the proposed conveyance and shall notify the transferee, in writing, with a copy of the Department of the applicability of this Order. This obligation shall cease upon a finding that the Site does not qualify to be listed on the Registry of Inactive Hazardous Waste Sites or upon completion of any remediation program which may be required as a result of the findings from testing conducted under the approved Work Plan.

XXIV. If Respondent desires that any provision of this Order be changed, it shall make timely written application to the Department for Commissioner's consideration, setting forth reasonable grounds for the relief sought. Such written application shall be delivered or mailed pursuant to paragraph XXVI with a copy to the Project Manager as designated by the Department.

XXV. All written communications required by this Order shall be transmitted by United States Postal Service, by private courier service, or hand delivered as follows:

XXVI. All communications, correspondence and documents submitted pursuant to this Order from Respondent to the Department shall be addressed to the Department's attorney:

Louis A. Evans, Esq.
NYS Department of Environmental Conservation
Division of Environmental Enforcement
202 Mamaroneck Avenue - Room 304
White Plains, NY 10601-5381

XXVII. All Work Plans, Reports and other technical documents required to be submitted under this Order shall be sent to the following:

1. One copy to: David L. Markell, Esq.
Director, Div. of Environmental Enforcement
NYS Department of Environmental Conservation
50 Wolf Road - Room 609
Albany, NY 12233-5500

2. Six copies to: Michael J. O'Toole, Jr., P.E.
Director, Div. of Hazardous Waste Remediation
NYS Department of Environmental Conservation
50 Wolf Road - Room 212
Albany, NY 12233-7010

3. Two copies to: Ronald Tramontano, P.E.
Director, Bur. of Env. Exposure Investigation
NYS Department of Health
2 University Place
Albany, NY 12203

4. One copy to: Louis A. Evans
NYS Department of Environmental Conservation
Division of Environmental Enforcement
202 Mamaroneck Avenue - Room 304
White Plains, NY 10601-5381

5. One copy to: Anthony Candela, P.E.
NYSDEC Regional Headquarters
Building 40, SUNY
Stony Brook, NY 11794

XXVIII. Communication from the Department to Respondent shall be made as follows:

a) Peter R. Mineo, Esq.
D'Amato, Forchelli, Libert, Schwartz,
Mineo & Joseph F. Carlino, Esqs.
120 Mineola Blvd.
P.O. Box 31
Mineola, NY 11501

b) Kevin Phillips
Fanning, Phillips & Molnar
909 Marconi Avenue
Ronkonkoma, NY 11779

XXIX. Respondent, its officers, directors, agents, servants, employees, successors and assigns shall be bound by this Order.

XXX. The terms hereof shall constitute the complete and entire Order between Respondent and the Department concerning the Site. 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 party to be bound. No informal advice, guidance, suggestions or comments by the Department regarding reports, proposals, plans, specifications, schedules or any other

submittals shall be construed as relieving Respondent of its obligations to obtain such formal approvals as may be required by this Order.

Dated: JUL 13 1990, New York

EDWARD O. SULLIVAN
Deputy Commissioner
New York State Department
of Environmental Conservation

Edward O. Sullivan

TO: Peter R. Mineo, Esq.
D'Amato, Forchelli, Libert, Schwartz,
Mineo & Joseph F. Carlino, Esqs.
120 Mineola Boulevard
P.O. Box 31
Mineola, NY 11501

CONSENT BY RESPONDENT

UNIONDALE REALTY ASSOCIATES

Respondent hereby consents to the issuing and entering of this Order, waives its right to a hearing herein as provided by law, and agrees to be bound by this Order.

By: _____
(Printed name)

Title: General Partner
(Printed title)

Date: 6/22/90

STATE OF NEW YORK)
) ss.:
COUNTY OF)

On this ____ day of _____, 1990, before me personally came _____, to me known, who being duly sworn, did depose and says that he resides in _____; that he is the _____ of _____, the partnership described herein and which executed the foregoing instrument on behalf of said partnership.

_____
Notary Public

FRANCES CANO
NOTARY PUBLIC, State of New York
No. 31-4814035
Qualified in New York County
Commission Expires October 31, 1991

Reference 6

WORK PLAN
FOR
FOLLOW-UP
SOIL AND GROUNDWATER INVESTIGATION
AT
UNIONDALE SHOPPING CENTER SITE

PREPARED FOR

PHILIPS INTERNATIONAL

MAY 1990

fanning, phillips & molnar
ENGINEERS
RONKONKOMA NEW YORK

TABLE OF CONTENTS

Section	Title	Page #
1.0	Background	1
2.0	Summary of Work Plan	4
3.0	Soil Sampling	11
	3.1 Soil Sampling Locations and Procedures	11
	3.2 Soil Sampling Analysis	16
4.0	Monitoring Well Installation Procedures and Construction	17
	4.1 Monitoring Well Installation Procedures	17
	4.2 Monitoring Well Construction	17
5.0	Groundwater Sampling	20
	5.1 Groundwater Sampling Procedures	20
6.0	Quality Assurance/Quality Control (QA/QC)	24
	6.1 Sampling Methods	24
	6.2 Sampling Equipment Decontamination Procedures	25
	6.3 Bacteriological Testing	25
	6.4 Quality Assurance Officer's Resume, and Signature Page	26
	6.5 Data Validator and Criteria	29
7.0	Health and Safety Plan	33
8.0	Follow-up Soil and Groundwater Investigation Report Outline	43
Appendix A	NYSDEC and NCDH Requirements	
Appendix B	NYTEST Environmental, Inc., Sample Preservation and Holding Time Requirements and Detection Limits	

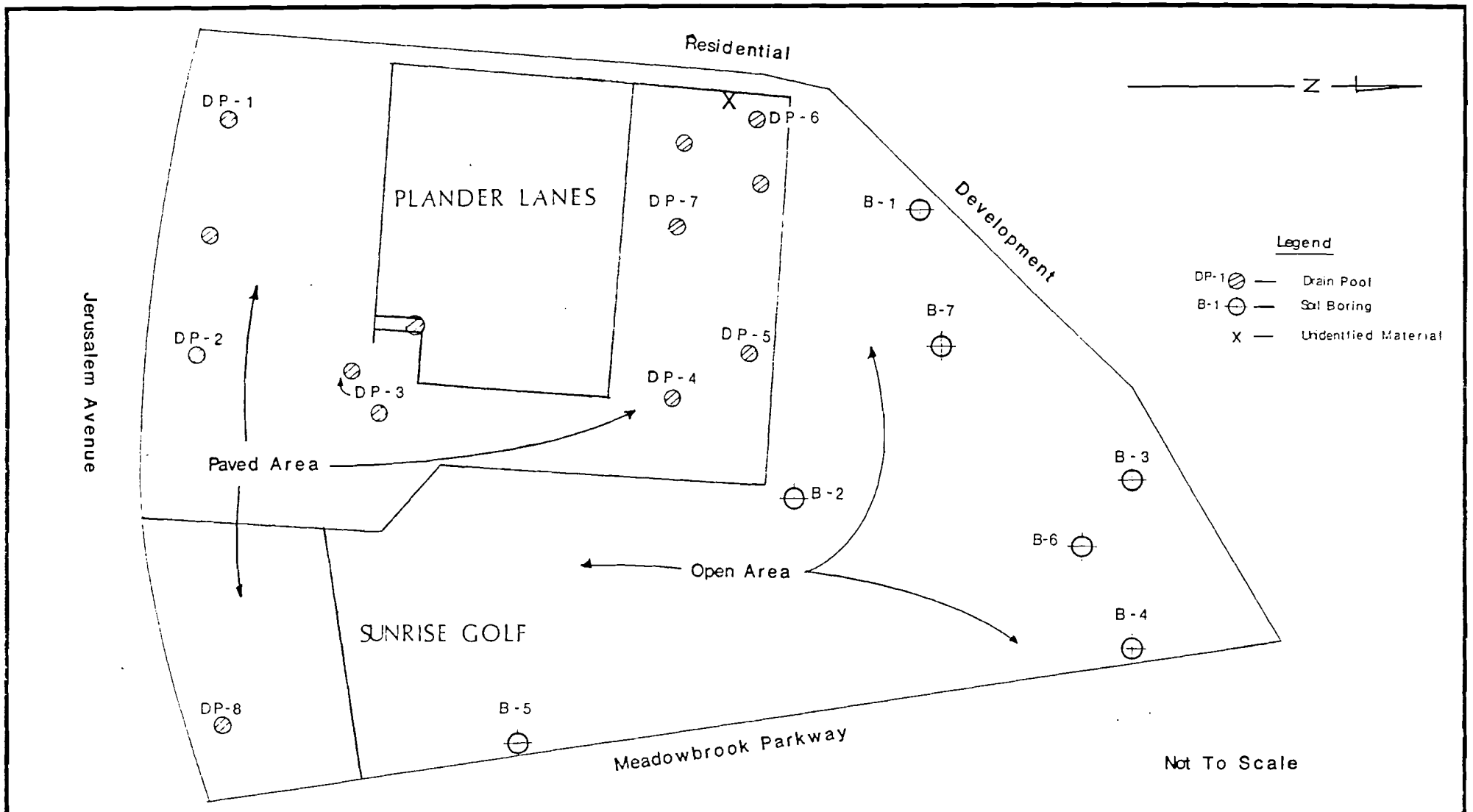
SECTION 1.0

BACKGROUND

A site investigation study was conducted for the site in 1986 (see Appendix A). A thorough review of Nassau County Health Department, New York State Department of Environmental Conservation, and the Nassau County Fire Marshal showed no evidence of hazardous waste activity. Tests on site showed little, if any, contamination and laboratory tests, directly in the fill, showed undetected levels of priority pollutant VOCs (see Figure 1.1). On April 26, 1989, a public hearing was held at Hempstead Town Hall, as part of the State Environmental Quality Review Act (SEQRA) and preparation of a Final Environmental Impact Statement (FEIS) for the proposed development of a 10.7 acre shopping center, located on Jerusalem Avenue, Uniondale, Town of Hempstead, Nassau County, New York. During the public hearing, people signed Affidavits attesting to material that was landfilled at the site which included paint cans and medical wastes.

In May 1989, a further study was undertaken to investigate this new evidence and to further study the soils of the fill in an attempt to ascertain whether contaminants were leaving the site and impacting any human population or the environment. A total of five (5) wells were installed to investigate the groundwater quality upgradient, within, and downgradient of the fill. Each well was surveyed to determine the groundwater flow direction and gradient in the aquifer. To further categorize the hydrodynamics of the fill, a paired piezometer was installed in the fill (two (2) wells were installed, 1 shallow and 1 deep in the fill).

In addition, four (4) soil samples were obtained within the fill,



F,P&M

FIGURE 1.1-BORING LOCATIONS OF OVA/GC ANALYSIS AND SAMPLING

2 in the unsaturated and 2 in the saturated zones. All groundwater and soil samples were tested by a USEPA, NYSDEC Contract Laboratory for full target compound list (TCL) parameters.

The results of the groundwater sampling indicated that there are substances present in the groundwater within the fill in both the shallow and deeper zones. Groundwater quality within the fill was categorized to be slightly tainted and exceeded the NYSDEC Class "GA" groundwater standards. However, groundwater quality directly downgradient of the fill was acceptable (within the standards).

Thus, based upon the results of the investigation, it was concluded that the site does not pose a threat to drinking water suppliers of Nassau County. We will further confirm this with two additional downgradient wells in this study. Soil samples were obtained in the middle of the fill at four (4) different depths. Low levels of PCBs, lead, pesticides and VOCs were detected at different depths within the soil borings. The concentration of the compounds in the fill were not high enough to cause a threat to human health and are below action levels of the New Jersey (ECRA) or EPA records of decision.

SECTION 2.0

SUMMARY OF WORK PLAN

Additional requests from NYSDEC and Nassau County Department of Health have precipitated this work plan. This work plan has been derived from the recommendations of the Fanning, Phillips and Molnar report entitled "Supplemental Soil and Groundwater Investigation at Uniondale Shopping Center Site, June 1989" and requirements of the NYSDEC and the NCDH (see Appendix A for NCDH and NYSDEC requirements for the work plan).

This section of the work plan will present a summary of the work plan.

Shallow Soils

A total of sixteen (16) shallow soil borings will be located on the site (as shown in Figure 2.1). The sixteen (16) shallow soil borings will be completed from a 0 to 5 foot depth. Each shallow soil boring will be composited within the entire soil profile (0 to 5 feet) and tested for metals and asbestos.

Laboratory analysis for all shallow soil borings will be performed by a USEPA contract, NYSDEC certified laboratory (NYTEST) and tested for Total Metals (the eight (8) RCRA Metals) (see Table 2.1 for summary of sampling). Asbestos samples will be obtained and tested by a NYS Certified Laboratory (North Atlantic Labs, Inc.). Appendix B presents the NYSDEC 1990 protocol for sample preservative, holding time requirements, and detection limits. The purpose of the metals and asbestos testing, within the upper 5 foot zone of the soil profile, is to determine the health effects of dust inhalation and exposure to construction workers at the site during the construction

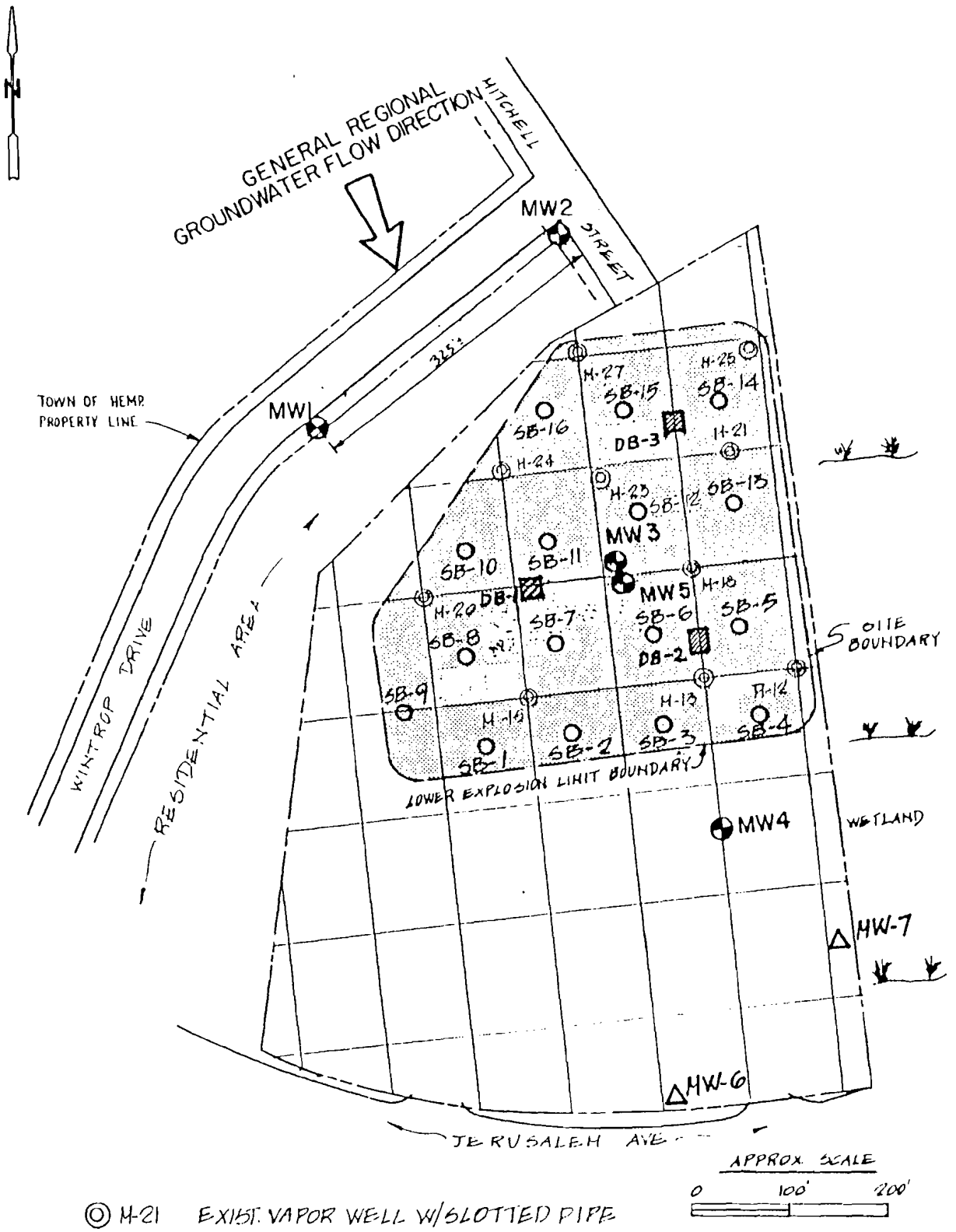


FIGURE 2.1–MONITORING WELL AND BORING LOCATIONS

F,P&M

Table 2.1
Summary of Sampling
Uniondale Shopping Center
Philips International

Sample ID#	Number of Samples	Type of Sample	Depth of Sample	Analytical(1) Parameters	PID Analysis
Shallow Borings (soils)					
SB-1	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No(2)
SB-2	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-3	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-4	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-5	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-6	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-7	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-8	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-9	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-10	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-11	2	1 composite	0'5'	Total metals (8 RCRA metals)and Asbestos	No
SB-12	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-13	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-14	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-15	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
SB-16	2	1 composite	0'-5'	Total metals (8 RCRA metals)and Asbestos	No
Field Blank	1	NA	NA	Total metals (8 RCRA metals)and Asbestos	No
Deep Borings (soils)					
DB-1	1-3	discrete	0'-35'	Full TCL analysis and EP Tox	Yes
DB-2	1-3	discrete	0'-35'	Full TCL analysis and EP Tox	Yes
DB-3	1-3	discrete	0'-35'	Full TCL analysis and EP Tox	Yes
Field Blank	2	NA	NA	Full TCL analysis and EP Tox	No
Trip Blank	1	NA	NA	TCL VOCs only	No
Matrix Spike	1	discrete (split)	0'-35'	Full TCL analysis and EP Tox	Yes
Matrix Spike Duplicate	1	discrete (split)	0'-35'	Full TCL analysis and EP Tox	Yes
Monitoring Wells (aqueous)					
MW-1	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptacoccus	No
MW-2	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptacoccus	No
MW-3	1	Grab	Groundwater	Full TCL analysis and unfiltered metals	No
MW-4	1	Grab	Groundwater	Full TCL analysis and unfiltered metals	No
MW-5	1	Grab	Groundwater	Full TCL analysis and unfiltered metals	No
MW-6	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptacoccus	No
MW-7	1	Grab	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptacoccus	No
Field Blank	1	NA	NA	Full TCL analysis, unfiltered metals, total and fecal coliform and streptacoccus	No
Trip Blank	1	NA	NA	TCL VOCs only	No
Matrix Spike	1	Grab (split)	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptacoccus	No
Matrix Spike Duplicate	1	Grab (split)	Groundwater	Full TCL analysis, unfiltered metals, total and fecal coliform and streptacoccus	No

* See Figure 2.1 for Sampling Locations and Appendix B for sample preservation and holding times and detection limits.
NA indicates not applicable
(1) Analytical parameters listed as: Metals (8 RCRA) include- Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver. Full TCL include- VOCs, BNA/E, PCBs, Pesticides, cyanide and metals.
EP Tox include - Characteristic of Extraction Procedure Toxicity for Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium, Silver, Endrin, Lindane, Methoxychlor, Toxaphene, 2,4-D, and 2,4,5-TP Silvex.
(2) Although "No" PID is indicated for samples, the borehole will be monitored with a PID during drilling.

phase of the project and the surrounding population.

Deep Soils

In addition, a total of three (3) soil borings to a depth of approximately 35 feet in the fill area (as shown on Figure 2.1) will be completed. The locations of these borings has been determined by the NYSDEC and the NCDH. Discrete soil samples, at various depths within each of the 3 borings, will be retained for laboratory analysis as specified by the NYSDEC personnel. The samples that will be retained for analysis will be determined in the field by use of a photoionization detector (PID) and field observation. Table 2.1 was constructed to provide a summary of the soil sampling for this project, both shallow and deep soil borings.

The soil samples obtained from the three (3) deep (35') soil borings will be tested for the full target compound list parameters and extraction procedure toxicity (EP TOX) test for metals, herbicides and pesticides. Discrete soil samples will be selected for laboratory analysis by the use of a PID (MicroTIP) from each split spoon at the location of readings in excess of 5 ppm. Less than 5 ppm, no sample will be taken. Each soil sample detected with >5 ppm total organic vapors will be sent to the laboratory for TCL and EP Toxicity analysis as per NYSDEC CLP protocol. Head space analysis will be performed on each sample above 5 ppm total organic vapors. This will be done by containing a portion of each sample in a 40 ml vial. Following a 30 minute rest period, a 2 ml sample of head space vapor from each vial will be withdrawn using a dedicated air-tight syringe and injected into a portable Gas Chromatograph (OVA/GC) in the field. The results will be recorded on strip charts and in field notebooks. The NYSDEC

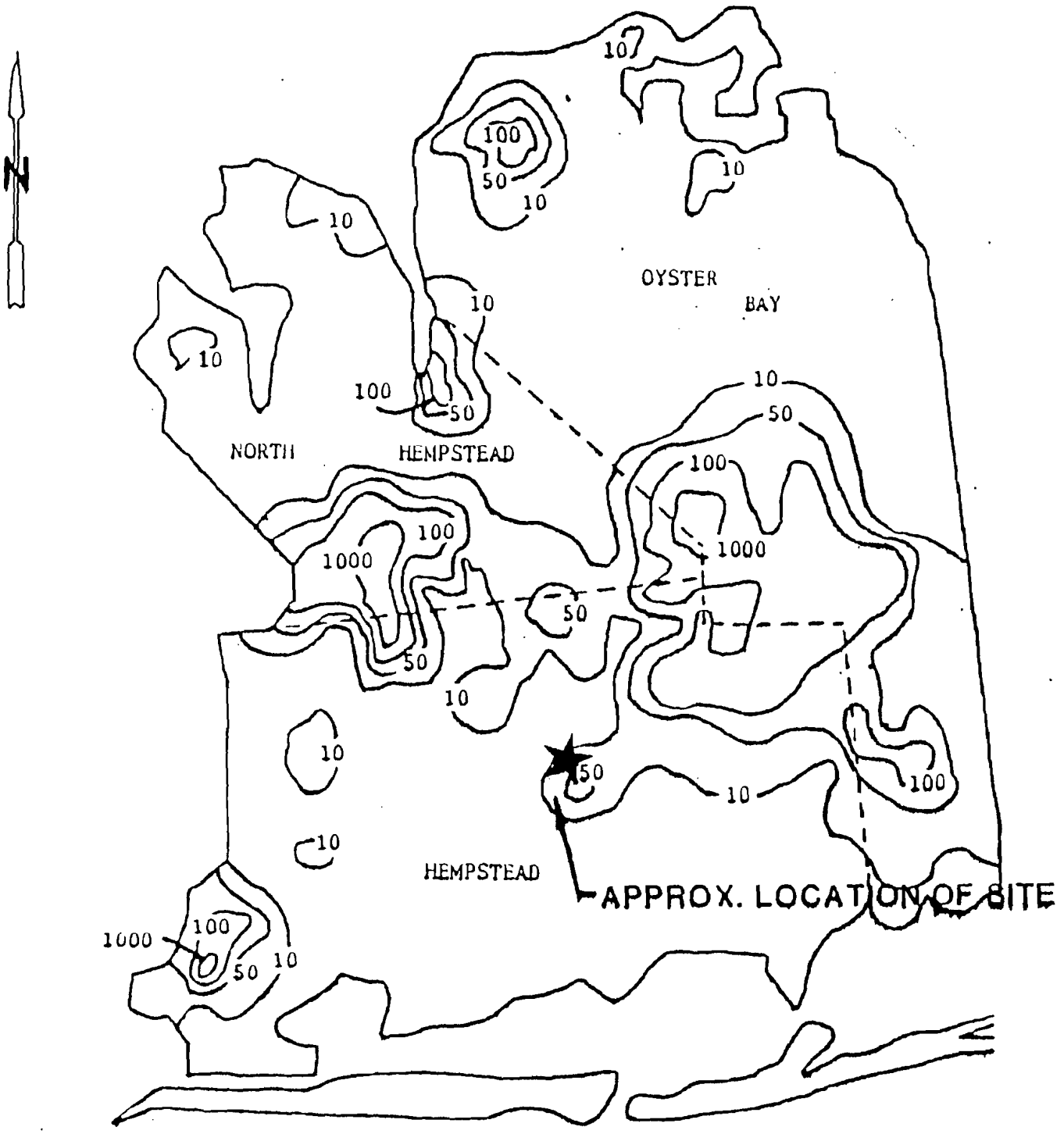
contract laboratory that will perform the sample analysis will be NYTEST Environmental, Inc.

Groundwater

The results of the groundwater testing in previous studies has indicated minor contamination of petroleum based compounds present in the fill. Note, that these levels of organics are below levels measured in 30% of the glacial aquifer in Nassau County (see Figure 2.2). The concentrations of benzene detected in the groundwater in the fill are above the NYSDEC standards for class "GA" groundwater. The direction of groundwater flow beneath the site is south to southeast, toward Meadow Brook. There are no public water supply wells downgradient of the site, thus, eliminating the path of this contamination to a receptor (public water supply). The concentration of benzene detected in the groundwater downgradient of the fill showed a significant decrease to below "GA" standards. This may be due to biodegradation, dispersion, and adsorption or chemical reaction.

Finally, the vertical gradient in the paired piezometers in the fill shows an upward movement, indicating a discharge area. This is consistent with what would be expected due to its proximity to Meadow Brook. This shows that, hydrodynamically, the water within the fill is not moving downward but rather laterally and slightly upward into Meadow Brook away from any public water supply wells.

Therefore, based upon the previous studies of the site, Fanning, Phillips and Molnar recommended that two (2) additional wells be installed on-site in a downgradient direction (as shown in Figure 2.1). These wells, and the existing wells on site and upgradient should be tested for full target compound list parameters following



N.T.S.

LEGEND:

— 10 — LEVELS ARE IN UG/L

SOURCE: NASSAU COUNTY DEPT. OF HEALTH (WATER SUPPLY BRIEFING REPORT, NOV. 1981)

FIGURE 2.2 -TOTAL VOLATILE ORGANIC CHEMICALS IN THE UPPER GLACIAL AQUIFER IN NASSAU COUNTY-1979

NYSDEC protocol. Groundwater samples tested for all parameters will be unfiltered. The groundwater from the two (2) downgradient wells and two (2) upgradient wells will also be tested for total and fecal coliform and streptacoccus by NYTEST Environmental, Inc.

All sampling will be in accordance with the Quality Assurance/Quality Control procedures, as outlined in Section 6.0 of this work plan. All sample analysis will be performed in accordance with NYSDEC contract laboratory protocol (CLP). Laboratory sample preservatives and holding time requirements, and detection limits are presented in Appendix B. Also all drilling and sampling will be performed in accordance with all NYSDEC protocol. The wells installed downgradient on the site will be developed and then sampled one week after development.

In order to maintain Quality Assurance/Quality Control (QA/QC), all sampling equipment will be steam cleaned and sampling equipment will be cleaned in accordance with USEPA and NYSDEC protocol. One field blank per activity day will be prepared and submitted to the laboratory for each day of sampling for the indicated analysis (as shown on Table 2.1). A trip blank will also be submitted for VOC analysis only for each delivery to the laboratory. A Chain of Custody will be maintained throughout the sample transportation. All daily work performed at the subject site will be documented in a field note book and daily field reports will be prepared and recorded by Fanning, Phillips and Molnar.

Based upon the results of this investigation, recommendations will be made in order to determine whether steps for remediation or further investigation is necessary.

SECTION 3.0

SOIL SAMPLING

This section of the work plan will present the soil sampling locations, procedures and soil analysis.

3.1 Soil Sampling Locations and Procedures

Shallow Soils

A total of sixteen (16) shallow soil borings will be performed at the Uniondale site (see Figure 2.1 for sampling locations). As Figure 2.1 shows (boring locations), the 16 shallow soil borings are spatially distributed throughout the site in order to provide coverage that will categorize the upper surface of the fill. The purpose of this sampling is to determine the potential risk that may exist for construction workers during the construction phase of the development. Thus, it is expected, based upon the plans for construction, that only the upper 5 feet of the fill will be disturbed and regraded.

Each shallow sampling location will be investigated by soil borings and continuous split-spoon sampling throughout the 5 foot soil profile (see Table 2.1 for a summary of the soil sampling in this zone).

The soils in the 0-5 foot zone will be composited and tested for total metals (for the 8 RCRA characteristic metals) and asbestos. Generally, the soil samples will be collected as follows:

1. The laboratory cooler will be opened and sample bottles will be inspected to ensure that all of the required bottles are present and properly labeled.

2. Collection of all 16 soil samples in the shallow borings will be performed using a clean oversized split-spoon. The split spoons will be cleaned in accordance with Section 6.0. When retrieved, the sampler will be opened and the soil will be placed into the laboratory-prepared sample vials or jars using a clean stainless steel scoop or trowel. To the extent possible, soil that has come in contact with the walls of the sampler will be discarded.
3. For each sampling event, samples will be handled with a new pair of disposable plastic surgical gloves.
4. Each sample bottle will be labeled with the following information. This information will also be recorded in a bound sampling log book or field book.
   a. Owner/client
   b. Sample number or designation, and location if possible.
   c. The date
   d. Time
   e. Type of laboratory analysis
   f. Name or initials of person collecting the sample
5. The sample bottles will be custody sealed, placed in the laboratory cooler and packed with ice or chemical ice packs to maintain the temperature 4°C.
6. The chain-of-custody forms for the analytical laboratory will be completed and signed.
7. All field blanks will be collected in accordance with the procedures described in section 6.0.
8. The coolers containing the samples will be transported to

the laboratory within 48 hours after the samples have been collected. The laboratory will be notified by the project manager in a timely manner of the impending arrival of the samples. The laboratory will be prepared to receive the samples and perform preliminary extraction analysis within regulatory agency recommended holding times.

The samples for asbestos testing will be collected in the field by North Atlantic Labs, Inc., personnel. Split spoon samples will be taken to a depth of 5 feet at 2.5 foot intervals. These samples will be composited and subjected to asbestos analysis utilizing Polarized Light Microscopy with dispersion staining. Analysis will be qualitative in nature to determine presence or absence and type of asbestos and will not yield quantitative results. Contamination of sampling equipment will be averted by subjecting the split spoon samplers to a rigorous amended water cleaning procedure between sample pulls.

To afford maximum sampler protection, the worker will be outfitted in a half mask respirator and eye protection and will wet all samples with amended water to minimize fiber release. Sampling techniques will be consistent with normal EPA sampling techniques.

The sampling personnel is to be certified as an EPA asbestos handler and duly trained in use of this particular field sampling equipment. The laboratory and its personnel performing analysis of the sample are to be certified under the New York State Environmental Laboratory Approval Program administered under the Department of Health.

Deep Soil Sampling

A total of three (3) deep soil borings to a depth of 35' will be performed at the locations as indicated in Figure 2.1. The purpose of these three (3) deep soil borings is to obtain discrete soil samples at various depths within each of the borings. The samples will be collected for laboratory analysis based upon visual inspection and results of the PID analysis as follows:

A photoionization detector will be utilized to screen continuous split spoon soil samples for total organic vapors (excluding methane). This will be done on each split spoon sample throughout each 35' boring. The purpose of utilizing the PID instead of a flame ionization detector is due to the presence of methane in the fill. As each split spoon sample is obtained, a PID analysis will be performed and the results recorded. PID results >5 ppm will be retained in laboratory prepared sample bottles. Soil head space will also be analyzed in the field by retaining a portion of each sample. Head space analysis will be performed by use of an OVA/GC in the field. These samples will also be submitted to the laboratory for analysis.

The soil sampling procedures that will be followed during this project are as follows:

1. The laboratory cooler will be opened and sample bottles will be inspected to ensure that all of the required bottles are present and properly labeled.
2. Collection of all soil samples in deep borings will be performed using a clean, over-sized split spoon. The split spoons will be cleaned in accordance with Section 6.0. When retrieved, the sampler will be opened and the soil will be

placed into the laboratory-prepared sample vials or jars using a dedicated stainless steel scoop or trowel. A field blank will be prepared on one dedicated trowel prior to sampling. To the extent possible, soil that has come in contact with the walls of the sampler, and the top portion of the sample will be discarded. A portion of each sample will be contained in one (1) 40 ml vial for head space analysis using an OVA/GC.

3. For each sampling event, samples will be handled with a new pair of disposable plastic surgical gloves.
4. Each sample bottle will be labeled with the following information. This information will also be recorded in a bound sampling log book or field book.
   a. Owner/client
   b. Sample number or designation, and location if possible.
   c. The date
   d. Time
   e. Type of laboratory analysis
   f. Name or initials of person collecting the sample
5. The sample bottles will be custody sealed, placed in the laboratory cooler and packed with ice or chemical ice packs to maintain the temperature 4°C.
6. The chain-of-custody forms for the analytical laboratory will be completed and signed.
7. All field blanks will be collected in accordance with the procedures described in section 6.0.
8. The coolers containing the samples will be transported to

the laboratory within 48 hours after the samples have been collected. The laboratory will be notified by the project manager in a timely manner of the impending arrival of the samples. The laboratory will be prepared to receive the samples and perform preliminary extraction analysis within regulatory agency recommended holding times.

3.2 Soil Sampling Analysis

Shallow Soil Samples

All sixteen (16) shallow soil borings (0-5 feet) will be composited and samples will be tested for the 8 RCRA characteristic metals (EP Toxicity metals for total metal analysis) and asbestos. All soil samples tested for metals will be collected in accordance with the QA/QC protocol outlined in Section 6.0 of this work plan and analyzed in accordance with the required qualification and quantification limits as per the New York State DEC contract laboratory requirements (see Appendix B for laboratory requirements). All soil samples tested for asbestos will be collected and analyzed in accordance with all New York State Certification requirements.

Deep Soil Borings

Discrete soil samples will be obtained from the three (3) deep soil borings based upon the PID screening. Each soil sample retained for laboratory analysis will be tested for full TCL parameters and the EP Toxicity test will be performed for metals, herbicides and pesticides. All soil samples from the deep borings will be collected in accordance with the QA/QC protocol, outlined in Section 6.0 of this work plan, and analyzed in accordance with the required qualification and quantification limits as per the NYSDEC contract laboratory requirements (see Appendix B).

SECTION 4.0

MONITORING WELL INSTALLATION PROCEDURES AND CONSTRUCTION

A total of two (2) downgradient groundwater monitoring wells will be installed at the Uniondale Site (see Figure 2.1 for locations). The monitoring well installation procedures and construction details are presented in this section of the report.

4.1 Monitoring Well Installation Procedures

The borings for the monitoring wells will be drilled with a hollow-stem auger drill rig. The augers and all drilling equipment will be steam cleaned between each well location to minimize the possibility of contaminants entering the bore hole.

4.2 Monitoring Well Construction

Each monitoring well will be constructed using a 10 foot length screen. The screens will be positioned so that they extend above and below the water table. An appropriate length of riser pipe will be attached to the screen and will extend approximately 2 feet above grade. All wells installed during this investigation will be completed and developed as described below.

Casing and Well Screen:	Four-inch I.D. threaded Schedule 40, National Sanitation Foundation (NSF) approved, PVC screens and riser pipe will be used. No solvent or glue will be used to assemble the well screen and riser casing.
Screen Slot Size:	0.10-inch machine slotted.
Storage of Casing and Screen:	The NSF PVC casing and screen lengths will not be stored on the ground. The well string will be assembled on racks or pallets in a specially designated staging area (to be determined in field).

Cleaning and Sterilization of Casing and Screen:	Prior to installation, the casing and screen will be steam-cleaned and sterilized by rinsing with isopropyl alcohol. The casing screen will then be steam cleaned again.
Bottom Cap:	A bottom cap will be installed below the well screen in all monitoring wells.
Decontamination:	All downhole equipment will be steam cleaned. This procedure will be repeated between drilling each well. The circulating system and water tank of the rig will be flushed with clean water before drilling is begun. The rinse water will be collected and disposed of properly.
Sand Pack and Sterilization:	By weight, 90 percent of the sand pack material will be larger than the screen slot size. The pack will have a uniformity coefficient $\leq$ 2.0. The sand pack will be rinsed thoroughly with distilled water prior to use. A field blank will be prepared for each sand pack by running distilled water through it. The distilled water will be tested for total and fecal coliform and streptacoccus.
Placement of the Sand Pack:	A 2" layer of sand will be placed in each bore hole prior to installing the well screen. The sand pack will extend to a minimum of 2 feet above the top of the well screen by use of a tremie. This extension will be confirmed by measuring down the annular space with a weighted tape.
Bentonite Seal:	At a minimum, a 2-foot bentonite seal will be placed in the annular space above the sand pack in each well by placing 1/4-inch-diameter bentonite pellets into the annular space by use of a tremie.
Grouting Annular Space:	A cement/bentonite/water grout mixture shall be 94 lbs./3-5 lbs./6.5 gallons, respectively. The cement-bentonite grout will be pumped into the annular space to fill the space from the top of the bentonite seal to the ground surface (grade). The grout will be tremie-piped into the annular space. Care will be taken not to disrupt the bentonite seal.
Well Development:	Each well will be developed to the point that the turbidity of the recovered well water is 50 Nephelometric Turbity Units (NTU) or less. In the event that this is not achievable, the development time will be determined in the field.
Protective Casing:	A 5-foot-long section of 6-inch I.D. steel casing

will be placed over the 4-inch well for protection. The casing will extend two feet above grade and set into the bentonite-cement grout at a minimum of 3½ feet in the annular space. A lockable cap will be affixed to the protective casing.

Well Labeling: The complete identification number of each monitoring well will be painted on the inside or cover of the protective steel casing.

Abandonment of Wells: All soil borings that are not completed as monitoring wells or wells that will be abandoned will be fully sealed in a manner appropriate for the geologic conditions to prevent contaminant migration through the bore hole. The sealing will include pressure injection with bentonite grout using a tremie-pipe and this mixture will extend the entire length of the boring to 5 feet below the ground surface. The upper 5 feet will be backfilled with appropriate native materials compacted to avoid settlement.

Well Survey: The two (2) downgradient wells will be surveyed for elevation by a New York State licensed surveyor. The well elevations will be tied into the monitoring well network existing on the site.

Groundwater Elevation Mapping: The depth to groundwater in each monitoring well will be measured using an electric-audio water level indicator with an accuracy to .01 foot. All wells in the network will be measured and a groundwater contour map calculated in order to determine the groundwater flow direction and gradient at the site.

SECTION 5.0

GROUNDWATER SAMPLING

This section of the work plan will present the groundwater sampling procedures and the groundwater analysis.

5.1 Groundwater Sampling Procedures

The groundwater sampling procedures for this project are presented below:

1. Prior to groundwater sampling, the depth to the static water level in each well will be measured with an electric water-level indicator equipped with calibrated tape to the nearest 0.01 foot and recorded. The depth to the bottom of the well from the top of the PVC casing will also be measured and recorded. To avoid cross-contamination between wells, the indicator probe will be decontaminated in accordance with the procedures described in Section 6.0.
2. The laboratory-provided sample bottle cooler will be inspected to ensure that all the required bottles are present and labeled.
3. Using a dedicated teflon bailer, the wells will be purged by removing at least 4 to 10 volumes of water. During well purging, portable meters will be used in the field to measure pH, temperature, specific conductance, and turbidity. Sample development will occur after the pH, temperature and specific conductance have stabilized, and the turbidity of the well water is 50 NTUs or less (stability will be achieved when each parameter is within plus or minus 10 percent of the previous value). Should any well not stabilize, the volume of water to be

removed from the well will be determined in the field. Sampling of the groundwater will commence following well recovery. A calibrated bucket will be used to estimate the volume of water removed from each well. Any water withdrawn from the well will be drummed and disposed of in accordance with the NYSDEC requirements.

4. A dedicated Teflon bailer equipped with a teflon check valve will be used to obtain a water sample from each well. Prior to initial use, each bailer will be cleaned in accordance with the procedures described in Section 6.0. All groundwater samples will be taken from the dedicated teflon bailers after they have been acclimated to the observation well be gently removing three bail volumes of water. The bailer will then be lowered into the well very carefully so as not to disturb the water surface, in an attempt to obtain the most representative sample of the shallow groundwater. A dedicated polypropylene line will be used to slowly lower the bailer by hand with the slack portion of the line left to lie on a tarp, or in a clean container, placed next to the well. The bailer will be lowered until it is approximately opposite the central portion of the well screen. The first three bailers of groundwater will be discarded before the samples are collected. At the completion of the sampling of a well, the bailer will be cleaned in accordance with the procedures described in Section 6.0.

5. For each well sampled, the bailer will be handled with a new pair of disposable plastic surgical gloves. Water samples will be carefully transferred from the bailer to the sample bottles to

minimize the potential for aeration of the sample.

6. Each bottle will be labeled with the following information:

   a. Owner/client
   b. Well number or
   c. Sample identification number or designation
   d. Date
   e. Time
   f. Type of laboratory analysis (i.e., Total Metals, etc.)
   g. Name of person collecting the sample

7. A separate flask or jar will be filled with well water from the bailer used to perform the field tests. The field tests include temperature, pH, and specific conductivity. The tests will be performed using portable meters. Prior to the tests, the instruments will be calibrated according to the manufacturers' specifications. The probes will then be inserted into the container while the sample is gently agitated. The readings will be recorded when the meter display stabilizes. After each use, the probes will be cleaned and prepared for further use according to Section 6.0.

8. Full and labeled sample bottles will be placed in the cooler packed with ice or chemical ice packs to maintain temperature at 4°C.

9. The chain-of-custody and recording procedures will be recorded.

A total of one sample per well or seven (7) groundwater samples will be collected during this investigation (2 upgradient, 2 within the fill, and 3 downgradient). These groundwater samples will be collected in accordance with the procedures outlined in subsection 5.1. In addition, all groundwater samples will be tested for full TCL parameters. Unfiltered groundwater samples will be obtained and analyzed for all parameters by NYTEST. The groundwater in the two (2)

downgradient wells and two (2) upgradient wells will also be tested for total and fecal coliform and streptacoccus by NYTEST.

Field blanks will be prepared for each analytical parameter for each delivery to the laboratory. A trip blank will also be present during the sampling and will be included in the cooler delivery to the laboratory. The trip blank will be tested for VOCs. In addition, a matrix spike and matrix spike duplicate will also be tested by the laboratory for one of the groundwater samples.

SECTION 6.0

QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This section of the plan will discuss the quality assurance/quality control (QA/QC) procedures to be used during field activities described in this work plan. Subsection 6.1 describes the guidelines that the sampling methods generally follow. Subsection 6.2 describes the decontamination procedure for all sampling equipment. Subsection 6.3 presents the total and fecal coliform and streptacoccus testing. Subsection 6.4 presents the name and qualifications of the quality assurance officer and signature page. Subsection 6.5 presents the project and data validator, as well as the criteria by which the data shall be validated.

6.1 Sampling Methods

Sampling Methods and techniques will be in accordance with NYSDEC September 1989 Analytical Services Protocol (ASP). In situations not covered by these guidelines or regulations, the methods will be designed to be appropriate for the sample type, location and analysis to be performed.

Field blanks will be obtained during all phases of sampling. Field blanks will be prepared by pouring distilled water over a cleaned split spoon, scoop or trowel, and dedicated bailer and captured in laboratory prepared sample bottles. In addition, a field blank will also be prepared on the sand pack for the downgradient wells. Field blanks will be analyzed by the laboratory for the same parameters tested for as the samples. Trip blanks will also be submitted to the laboratory with each delivery for TCL VOC analysis

only.

Two (2) sets of matrix spikes and matrix spike duplicates will be prepared for full laboratory analysis (one for each media).

6.2 Sampling Equipment Decontamination Procedures

All sampling equipment (i.e., split spoons, bailers, augers, scoops, and trowels) will be decontaminated prior to use in the field. The sampling equipment will be decontaminated between samples and all augers will be steam-cleaned prior to use at new sampling locations. All sampling devices will be cleaned and prepared for field use through the following procedures:

1. Non-phosphate detergent and tap water wash;
2. Tap water rinse;
3. 10% nitric acid rinse;
4. Tap water rinse;
5. Methanol rinse (pesticide grade);
6. Distilled/deionized water rinse;
7. Air dry; and
8. All cleaned sampling equipment will be placed on and covered with plastic sheeting or wrapped in clean aluminum foil.

6.3 Bacteriological Testing

1. Laboratory grade distilled/deionized water will be passed through a sample of the gravel pack, collected and tested for total and fecal coliform and streptacoccus.
2. The casing and screen for each of the wells will be steam cleaned, disinfected by an isopropyl alcohol wash and steam cleaned again prior to installation.

3. NYTEST will perform the total and fecal coliform and streptacoccus testing on two (2) samples of groundwater from downgradient wells, two (2) from upgradient wells and one (1) field blank.

6.4 Quality Assurance Officer's Resume and Signature Page

(See next two pages.)

QUALITY ASSURANCE OFFICER

RAVI K. KORLIPARA
ENGINEER

EDUCATION

B.Tech (5 year degree)	Chemical Engineering	Regional Engineering College Warangal, India	1980
M.S.	Materials Science and Engineering	SUNY at Stony Brook	1983
Ph.D.	Mechanical Engineering	SUNY at Stony Brook	Thesis work completed 7/88

RELEVANT KNOWLEDGE AND EXPERIENCE

- Considerable experience in theoretical and mathematical modeling of dynamical systems. Experience includes theorizing and solving problems in porous media, hydrology and groundwater.
- Working knowledge of geology at the level of site auditing and groundwater studies.
- Over 20 hours of formal training in general, analytical, physical, inorganic, and organic chemistry, chemical and material balances, and chemical thermodynamics and phase equilibria.
- Theoretical and experimental experience in electrochemistry (Masters' thesis) and in corrosion.
- Chemical laboratory training in quantitative and qualitative techniques. Theoretical and experimental experience in X-ray diffractometry, scanning electron microscopy, electron microprobe and energy dispersive analysis. Theoretical knowledge in small-angle X-ray, light, and neutron scattering. Familiar with using OVA GC/MS.
- Experience in projects requiring extensive data analysis (quality, validation, and interpretation) including a Class 2 Federal and State Inactive Hazardous Waste Site on Long Island.
- Knowledge in sampling plan development methods.
- Knowledge in QA/QC and auditing procedures. Instituted a Statistical Quality Control Program in a manufacturing firm on Long Island.
- Experience in interacting with analytical laboratories and government agencies.

EMPLOYMENT HISTORY

August 5, 1988 - Present - Fanning, Phillips and Molnar

ASSOCIATIONS

American Society of Mechanical Engineers, Associate Member
National Water Well Association

QUALITY ASSURANCE OFFICER (QAO)
SIGNATURE PAGE

I, Ravi K. Korlipara, hereby certify that I am an employee of Fanning, Phillips and Molnar and that I have acted in conjunction with the project manager to develop this site specific quality assurance plan.

I understand that I shall derive my responsibility and authority from a source other than the project manager and have the authority to override the project manager's decision in areas where QA/QC elements may be compromised.

I certify that my education and experience fulfill the minimum requirements of the New York State Department of Environmental Conservation as indicated on my resume.

I agree to assist the project manager in the development of the sampling and analytical portion of the Quality Assurance Plan, interface with the data validator and develop a project specific data usability report.

Ravi K. Korlipara
Signature of QAO

RAVI K. KORLIPARA
Print Name

MAY 1, 1990
Date

6.5 Data Validator and Criteria

The Data Validator for this project will be H2M Labs, Inc. H2M Labs, Inc., has been involved in CLP analysis since 1985. The laboratory has proven its proficiency in all the CLP methodologies:

Target Compound List Purgeable Organics

Target Compound List Base/Neutral Acid Extractable

Target Compound List Pesticide/PCB's

Target Compound List Metals

Over the years our staff has gained expertise in the analytical methods, the reporting requirements and validation of the data generated. The Data Validation staff all have a technical background and have supervised or performed CLP analyses in the methodologies required. Therefore, our staff has the in-depth knowledge of the quality control requirements and the CLP deliverables.

When choosing a lab to perform data validation, it is important that the following key criteria are met:

1. The laboratory must be thoroughly familiar with CLP methods and reporting requirements.
2. Have an awareness of the practical usability of the data.
3. That the lab be a participant in the NYSDEC Contract Laboratory Program.
4. The validating laboratory should be independent of the analyzing laboratory.
5. The validating laboratory should meet with the regulatory agency prior to initiating the project to review the site specific concerns.
6. In order to facilitate the validation process, the project workplan and Q.A. Project Plan should be reviewed by the validating laboratory.
7. The validating laboratory must be willing to maintain communication with the analyzing laboratory. Telephone logs should be maintained for all communication involving the

project.

8. Provide a timely report on the reviewed data.

H2M Labs, Inc., will follow these eight guidelines when validating you data packages.

H2M Labs, Inc., is currently under contract with Engineering Science, Inc., for Data Validation Services. The purpose of this project is to provide data validation services in support of contamination assessments at selected landfill sites in New York. This project is for submission to the New York State Department of Environmental Conservation. This contract is from October 1989 through March 1990. Prime Contract Number D00230.

OUTLINE OF DATA VALIDATION PROCEDURE

Three main areas of Data Validation are included in H2M Labs, Inc., review procedure:

1. Completeness of the Data Package
2. Correctness of Data
3. Usability of Data

1. The Completeness of the Data Package includes the following:
   - Review of the chain of custody information
   - Case Narrative
   - Q.C. Summary Forms
   - Inclusion of standard and sample chromatograms and spectra
   - Raw Q.C. information (instrument and method information)
   - Reports
   - Calibration Forms
   - Method Detection Limit

2. Correctness

- Holding Times
- Reported in the correct formation in accordance with the protocol
- QC/QA criteria met
- Calculations done correctly
- Forms completed properly including qualifiers in accordance with protocol
- Calibration criteria met specifications
- Case Narrative includes all problems or deviations from protocol
- Final values compared with raw data for correctness in reported value

3. Usability

The data report submitted will include any and all deviations in the above mentioned. An assessment of the data will be made and included.

A report will be submitted to the client within two weeks of the receipt of the data package for review. This report will include the following information:

- A general assessment of the data package for completeness and correctness. This review is divided into each section of the data package.

  A detailed description of all deviations from the protocols. The reference in the protocol citing the requirement and a quote from the document will be given.
- A listing of the validator's attempts, if unable to reconstruct the reported data from the raw data.
- Telephone logs are included.

- A detailed assessment of the degree to which the data has been compromised by deviations in protocol.
- An overall appraisal of the data package.

Additional information may be included depending on the nature of the document.

The following documents are used as references for the data validation procedure:

- "Functional Guidelines for Evaluation of Inorganic Data"
- "Functional Guidelines for Evaluation of Organic Analysis" Technical Directive Document No. HQ-8410-01
- "Functional Guidelines for Evaluating Pesticide/PCB's Analyses" Technical Directive Document No. HQ-8410-01

For this project, data validation will be performed for half of all samples obtained.

SECTION 7.0

HEALTH AND SAFETY PLAN

The subject site is presently known as the site of the Uniondale Shopping Center, located in Uniondale, New York. It is presently vacant but in the past, had been utilized as a bowling alley and golf driving range. Prior to that time, the site was utilized as a cement manufacturing plant (from 1930 up to 1962). Due to the excavation of sand in the northern portion of the site a large pit was created and subsequently filled with groundwater. In 1962 a bowling alley was constructed in the southwest portion of the property while the cement plant was still in operation. By 1973, the pit had already begun to be filled in by construction and demolition debris and by 1975, a golf driving range was constructed to utilize the area of the former pit. From 1975 to 1986 the site was functioning as a bowling alley and golf driving range.

INVESTIGATIVE HISTORY

A site contamination study was conducted for the site in 1986. A thorough review of the Nassau County Health Department, NYSDEC and Nassau County Fire Marshal file showed no evidence of hazardous waste activity. Tests on site showed little, if any contamination and laboratory tests directly in the fill showed undetectable levels of priority pollutant volatile organic compounds.

On April 25, 1989, a public hearing was held at Hempstead Town Hall as part of the SEQRA process and preparation of a FEIS for the proposed development of a 10.7 acre shopping center. During a public hearing, people signed affidavits that questionable materials were landfilled including paint cans and medical wastes. In May, 1989 a

further study was undertaken to investigate this new evidence supplied to the developer and to further study the soils of the fill. A total of five (5) wells were installed to investigate the groundwater quality upgradient within and downgradient of the fill.

In addition, five soil samples were obtained within the fill, 2 in the unsaturated and 3 in the saturated zones. The results of the groundwater sampling indicated that there are substances present in the groundwater within the fill in both the shallow and deeper zones. Groundwater quality within the fill was characterized to be slightly tainted and exceeded the NYSDEC Class "GA" groundwater standards for benzene.

In summary, the results of the groundwater testing indicated minor contamination of petroleum based compounds that are present in the fill. The groundwater flow beneath the site is south to southeast towards Meadow Brook. The concentration of benzene detected in the groundwater, downgradient of the fill, showed a significant decrease to below the "GA" standards.

The results of the sampling of the soils in the fill indicated detected levels of PCBs, pesticides and metals. In addition, low concentrations of base neutral/acid extractables and VOCs were detected. Among the VOCs detected, benzene and other gasoline-type constituents were detected at low concentrations. Furthermore, methane has also been detected at relatively high concentrations in the fill zone.

PURPOSE

The purpose of this plan is to assign responsibilities, establish personnel protection standards, mandatory safety practices and

procedures, and provide for contingencies that may arise while conducting sampling and other on-site activities.

APPLICABILITY

The provisions of the Plan are mandatory for all on-site Fanning, Phillips and Molnar employees and Fanning, Phillips and Molnar subcontractors engaged on-site operations who will be exposed or have the potential to be exposed to on-site hazardous substances.

Fanning, Phillips and Molnar policy states that Fanning, Phillips and Molnar subcontractors shall provide a health and safety plan for their employees covering any exposure to hazardous materials and shall complete all work in accordance with that plan. The subcontractor may choose to use Fanning, Phillips and Molnar's Health and Safety Plan as a guide in developing its own plan or may choose to adopt in full the plan. In either case, the subcontractor shall hold Fanning, Phillips and Molnar harmless from, and indemnify, against all liability in the case of any injury. Fanning, Phillips and Molnar reserves the right to review and approve the subcontractor's plan at any time. All subcontractors will, at a minimum, follow all provisions of the Health and Safety Plan.

Inadequate health and safety precautions on the part of the subcontractor, or the belief that the subcontractor's personnel are or may be exposed to an immediate health hazard, can be the cause for Fanning, Phillips and Molnar to suspend the subcontractor's site work and ask the subcontractor's personnel to evacuate the hazard area.

Subcontractor will be responsible for operating in accordance with the most current Occupational Safety and Health Administration (OSHA) regulations 29 CFR part 1910.120 - Hazardous waste operations

and emergency response.

HEALTH AND SAFETY PLAN STANDARD OPERATING PROCEDURES (SOP)

All workers involved in site activity, including all subcontractors on site such as drillers and surveyors, will receive and review the Health and Safety Plan Standard Operating Procedures (SOP). Non-essential persons will be kept off the site unless necessary. Visiting personnel will be required to review the Health and Safety Plan SOP prior to entering the site and will utilize the necessary personnel protective equipment. Daily activities will include a review of the Health and Safety Plan between the work crew and how the plan related to the days work. Implementation of the Health and Safety Plan will be the field responsibility of the on-site hydrogeologist. A daily log of all field activities will be recorded.

SOP AIR MONITORING

A Photovac MicroTIP (PID) and Combustible Gas Indicator (CGI) will be utilized to monitor the ambient air at the site and at the specific work area daily, prior to beginning work. At each borehole and monitoring well, the location will be screened with the PID and CGI and will be continually monitored at grade level during drilling. The PID will also be utilized to monitor the air at the worker's breathing level. PID steady state readings above 5 parts per million will require upgrading safety equipment to Level C. The CGI will be utilized to determine explosive potential in the work zone. A log of events and observations will be recorded daily.

SOP PERSONAL PROTECTIVE EQUIPMENT

Level D personal protective equipment will be utilized by the drilling crew and site hydrogeologist during monitoring well

installation, soil boring, and decontamination (see Table 7.1). This will include protective clothing, eye protection, hard hats and work boots. However, sampling personnel (from North Atlantic Labs, Inc.) will be required to wear a half mask respirator and eye protection during sampling. This protective gear is for protection from possible asbestos exposure. Sampling techniques will be consistent with EPA sampling techniques. If steady state above 5 parts per million (ppm) readings are encountered with the PID during drilling, sampling, or at any other time, personnel will leave immediate area until protective equipment can be upgraded to level C to include half-face air purifying respirators with cartridges designed for organic vapor compounds along with Level C equipment. If steady state readings above 5 parts per million are recorded with the PID, additional dermal protection will be provided to all workers by utilizing disposal coveralls and gloves in conjunction with the respirators. If at any time site conditions require level A or B personal protective equipment as determined by the on-site hydrogeologist, work will cease and the Health and Safety Plan SOP will be modified for incorporation of this equipment.

Soil and aqueous sampling and decontamination procedures will be conducted with level D personal protection equipment and will utilize disposable vinyl gloves in between sampling efforts and during decontamination. If above 5 ppm steady state levels of organic vapors are detected or dusty conditions exist during sampling, personal protection equipment will be upgraded to level C with half-face air purifying respirators with cartridges designed for organic vapor compounds and, if necessary, disposable coveralls.

TABLE 7.1
SAMPLE PROTECTIVE ENSEMBLES*

LEVEL OF PROTECTION	EQUIPMENT	PROTECTION PROVIDED	SHOULD BE USED WHEN	LIMITING CRITERIA
C	Recommended: • Full facepiece, air purifying canister equipped respirator. • Chemical resistant clothing (overalls and long-sleeved jacket; hooded, one or two piece chemical splash suit; disposable chemical resistant one piece suit). • Inner and outer chemical resistant gloves. • Chemical resistant safety boots/shoes. • Hard hat. • Two way radio communications. Optional: • Coveralls • Disposable boot covers • Face shield • Escape mask • Long cotton underwear	The same level of skin protection as Level B, but a lower level of respiratory protection.	• The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin. • The types of air contaminants have been identified, concentrations measured, and a canister is available that can remove the contaminant. • All criteria for the use of air purifying respirators are met.	• Atmospheric concentration of chemicals must not exceed IDLH levels. • The atmosphere must contain at least 19.5 percent oxygen.
D	Recommended: • Coveralls. • Safety boots/shoes. • Safety glasses or chemicals splash goggles. • Hard hat. Optional: • Gloves. • Escape mask. • Face shield.	No respiratory protection. Minimal skin protection.	• The atmosphere contains no known hazard. • Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.	• This level should not be worn in the Exclusion Zone. • The atmosphere must contain at least 19.5 percent oxygen.

*Based on EPA protective ensembles.

In the event that the conditions on-site become unsafe for drilling activity, as determined by the field hydrogeologist (such as % LEL > 25), drilling will cease until the problem is remedied.

DECONTAMINATION PROCEDURE

The daily contamination procedure is as follows:

1) Establish a decontamination area
2) At this station establish a basin with detergent (Alconox or equivalent), a rinse basin with tap water and a garbage can lined with a plastic bag.
3) Wash and rinse boots
4) Remove outside gloves and discard in plastic bag
5) Remove disposable coveralls and discard in plastic bag (if applicable)
6) Spent organic vapor cartridges are to be discarded in the plastic bag.

The final closure of the decontamination area will involve double bagging all disposable clothing to be removed to an approved disposal facility. Decontamination and rinse solutions will be contained in 55 gallon drums and will be removed to an approved disposal facility. All rinse basins, etc. will be thoroughly washed, rinsed and dried prior to removal from the site.

SOP EMERGENCY EQUIPMENT AND PLAN

Emergency equipment on-site will include a first-aid kit and disposable eye wash equipment. Emergency telephone numbers for the local police, fire department, ambulance and hospital will be kept in the field book of the hydrogeologist/engineer and are listed herein.

The nearest hospital with emergency room facilities is listed, with directions, on the last page of this plan. In the event of a medical emergency, an ambulance will provide transportation to the hospital.

ON SITE AIR MONITORING

Background Readings

Before any field activities commence, the background levels of organic vapors on the site will be read and noted. Daily background readings shall take place in the vicinity of the work to commence on that day.

Air Monitoring Frequency

The following schedule should be followed for air monitoring activities as specified for each activity.

Activity: Soil Boring

Air Monitoring Equipment	Monitoring Frequency* (in the Breathing Zone)
PID	Monitor every 10 min.
CGI	Monitor every 10 min.

RESPIRATORY PROTECTION

Type of Cartridges/Limits of Cartridges

If air purifying respirators are authorized, organic vapor and high efficiency dust and mist cartridges will be used. Organic vapor and high efficiency dust and mist cartridges will provide protection up to 50 ppm. However, if steady air concentrations in the work zone exceed 50 ppm evacuate the site.

During asbestos sampling, laboratory personnel will be outfitted in a half mask respirator (MSHA and NIOSH approved).

* Air monitoring will be conducted in the breathing zone and the monitoring schedule can be modified based upon the discretion of the hydrogeologist and/or upon site field conditions.

WORK LIMITATIONS

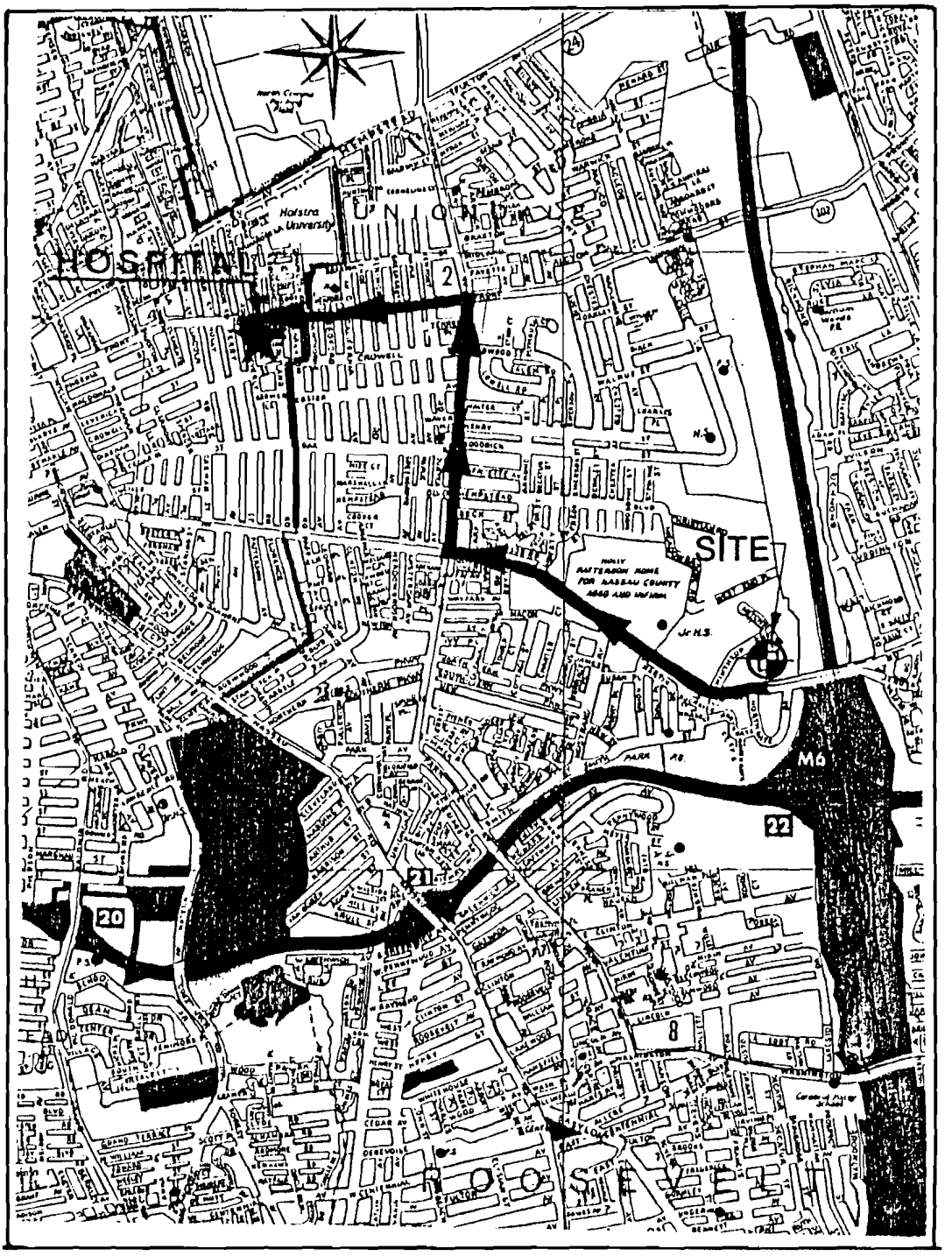
In general, field work will be conducted during daylight hours only. At least two personnel will be in the field at all times. The Project Manager must grant special permission for any field activities conducted beyond daylight hours. All personnel working in the field must have completed the Hazardous Material Sites Training Course (or its equivalent).

EMERGENCY PHONE NUMBERS
(Area code in Nassau County is 516)

Fire Department	911
Police Department	911
Ambulance	911
Poison Control Center	542-2323
Hempstead General Hospital	560-1200
Directions to Hospital:	Take Jerusalem Ave. West, make a right onto Uniondale Ave, head north and make a left onto Front Street. It is approximately 6 to 8 blocks on the left (see Figure 7.1 for map showing route to hospital).
Fanning, Phillips and Molnar	737-6200

CONTACT PERSONNEL AT FANNING, PHILLIPS AND MOLNAR

Kevin Phillips - Project Manager
Martin O. Klein - Project Hydrogeologist/Health and Safety Officer
Andrew P. Ritchie - Project Engineer



Scale in Miles (approx.)

0 1 2

F,P&M

FIGURE 7.1 – ROUTE TO HOSPITAL FROM SITE

SECTION 8.0

FOLLOW-UP SOIL AND GROUNDWATER INVESTIGATION REPORT OUTLINE

Section		Title
1.0		Introduction
2.0		Summary of Sampling (QA/QC)
3.0		Sampling Results
	3.1	Soils
	3.2	Groundwater
4.0		Discussion and Conclusions (Determination of Potential Risk)
	4.1	Discussion
	4.2	Conclusions
5.0		Recommendations

APPENDIX A
NYSDEC AND NCDH REQUIREMENTS

FANNING, PHILLIPS & MOLNAR
Consulting Engineers
909 MARCONI AVENUE
RONKONKOMA, NEW YORK 11779

RICHARD FANNING, P.E. (1931-1968)
KEVIN J. PHILLIPS, P.E., Ph.D.
GARY A. MOLNAR, P.E.

516/737-6200
718/767-3337
TELECOPIER 516/737-2410

February 16, 1990

Mr. Anthony Candela
Senior Engineer
Regional Hazardous Waste Division
NYS Department of Conservation
SUNY Bldg. 40
Stony Brook, NY 11794-3070

Dear Mr. Candela:

In a meeting today with Ms. Angela Peteneili, of the Nassau County Health Department, we discussed the Supplemental Geohydrology Work Plan for the Uniondale Shopping Center site sent to you on Monday, February 12.

At this meeting, the following was tentatively agreed upon:

1. The main concern of the Nassau County Health Department was airborne contaminants (asbestos, and heavy metals) during the site preparation phase.

2. Because the fill is not anticipated to be excavated i.e. the foundation will be fricition piles, the area of concern is 0-5'.

3. Sixteen borings in the top 5' of fill was tentatively agreed upon.

4. Fanning, Phillips and Molnar will prepare a health and safety plan including air sampling for asbestos during the construction period if asbestos shows up in the 16 borings.

In addition, virus testing will be included in the 2 down gradient wells.

As the February 26 conference with Judge Joseph Goldstein of the New York State Supreme Court is only 6 days away, we would appreciate at your earliest convenience to review this new material in conjunction with the previous plan of study and comment as quickly as possible.

Very truly yours,

Kevin J. Phillips

Kevin J. Phillips, P.E., Ph.D.
Principal, Fanning, Phillips
and Molnar

KJP:ds

cc: Mr. Gus Fotos
Peter Mineo, Esq.

New York State Department of Environmental Conservation
Region 1 Headquarters
SUNY, Building 40, Stony Brook, NY 11794-2356
(516) 751-4078

Thomas C. Jorling
Commissioner

February 27, 1990

Mr. Kevin J. Phillips, P.E., Ph.D
Fanning, Phillips and Molnar
909 Marconi Avenue
Ronkonkoma, NY 11779

RE: Uniondale Shopping Center Site

Dear Mr. Phillips:

We have reviewed the supplemental geohydrology workplan (February 1990) for the above referenced site.

DEC recommends the following field work to be performed in addition to the work tentatively agreed upon by you and Ms. Angela Petenelli of the Nassau County Health Department.

1. 3 soil borings ≈ 35' deep in fill area as shown on the attached figure. Discrete soil sampling at various depths within each of 3 borings (i.e. no compositing allowable). Samples to be collected for analysis will be determined in the field with the help of OVA/HNu meter and by field observation.

2. Soil samples should be analyzed for the target compound list (including PCB's) and EP Toxicity.

3. 2 additional downgradient wells as you agreed upon. Locations are shown on the figure.

4. Sampling of all on site wells for TCL including total metals' analysis (i.e. no filteration of samples).

5. A Quality Assurance Project Plan in accordance with New York State CLP (Contract Laboratory Protocols).

6. For all sample analysis, use laboratories acceptable to Division of Hazardous Waste Remediation, NYSDEC. Workplan should include drilling and sampling protocols which are in accordance with those of NYSDEC including those mentioned above.

7. All soil borings should be grouted with cement/bentonite grout from bottom of the soil boring upwards to ground level.

If you have any questions, please feel free to contact me at (516) 751-4078, Ext. 386.

Very truly yours,

Girish Desai
Assistant Sanitary Engineer
Div. of Hazardous Waste Remediation

GD:pl

cc: A. Candela
L. Evans
G. Aiello
A. Petenelli
J. Swartout

APPENDIX B
NYTEST ENVIRONMENTAL, INC.
NYSDEC 1990 PROTOCOL SAMPLE PRESERVATION AND HOLDING TIME REQUIREMENTS AND DETECTION LIMITS

SECTION II

SAMPLE PRESERVATION AND HOLDING TIME REQUIREMENTS

NYDEC
1990 protocol

Table 1 - Required Containers, Preservatives, and Holding Times (Continued)

Parameter Name	Container[1]	Preservative[2,3]	Maximum Holding Time[4]
Aqueous Samples (Continued)			
$CBOD_5$	P,G	Cool, 4° C	24 hours
COD	P,G	Cool, 4° C, H_2SO_4 to pH < 2	26 days
Chloride	P,G	Cool, 4° C	26 days
Color	P,G	Cool, 4° C	24 hours
Cyanide, Total	P,G	Cool, 4° C, NaOH to pH > 12	12 days
Cyanide, Amenable to Chlorination	P,G	Cool, 4° C, NaOH to pH > 12, 0.6 g ascorbic acid[5]	12 days[6]
Fluoride	P only	Cool, 4° C	26 days
Hardness	P,G	HNO_3 to pH < 2	6 months
Kjeldahl Nitrogen	P,G	Cool, 4° C, H_2SO_4 to pH < 2	26 days
Organic Nitrogen	P,G	Cool, 4° C, H_2SO_4 to pH < 2	26 days
Metals[7], except Chromium^{+6} and Mercury	P,G	HNO_3 to pH < 2	6 months
Chromium^{+6}	P,G	Cool, 4° C	24 hours
Mercury	P,G	HNO_3 to pH < 2	26 days

Table I - Required Containers, Preservatives, and Holding Times (Continued)

Parameter Name	Container[1]	Preservative[2,3]	Maximum Holding Time[4]
Aqueous Samples (Continued)			
Silica	P only	Cool, 4° C	26 days
Specific Conductance	P,G	Cool, 4° C	26 days
Sulfate	P,G	Cool, 4° C	26 days
Sulfide	P,G	Cool, 4° C,add zinc acetate plus NaOH to pH > 9	5 days
Surfactants (MBAS)	P,G	Cool, 4° C	24 hours
Turbidity	P,G	Cool, 4° C	24 hours
Organic Tests[8]:			
Purgeable Halocarbons	G, Teflon lined septa	Cool, 4° C	7 days
Purgeable Aromatics	G, Teflon lined septa	Cool, 4° C	7 days
Acrolein and Acrylonitrile	G, Teflon lined septa	Cool, 4° C, 0.008% $Na_2S_2O_3$[5], Adjust to pH 4 - 5[9]	7 days
Phenolics[10]	G, Teflon lined cap	Cool, 4° C, 0.008% $Na_2S_2O_3$[5]	5 days after VTSR until extraction; 40 days for analysis[12]

Table I - Required Containers, Preservatives, and Holding Times (Continued)

Parameter Name	Container[1]	Preservative[2,3]	Maximum Holding Time[4]
Aqueous Samples (Continued)			
Haloethers[10]	G, Teflon lined cap	Cool, 4° C, 0.008% $Na_2S_2O_3$[5]	5 days after VTSR until extraction; 40 days for analysis[12]
Chlorinated Hydrocarbons[10]	G, Teflon lined cap	Cool, 4° C, 0.008% $Na_2S_2O_3$[5],	5 days after VTSR until extraction; 40 days for analysis[12]
Chlorinated Dioxins and Furans[10]	G, Teflon lined cap	Cool, 4° C, 0.008% $Na_2S_2O_3$[5],	5 days after VTSR until extraction; 40 days for analysis[12]
Pesticides[10]	G, Teflon lined cap	Cool, 4° C, Adjust pH to 5 - 9[14]	5 days after VTSR until extraction; 40 days for analysis[12]
Radiological Tests:			
Alpha, beta and Radium	P,G	HNO_3 to pH < 2	6 months

Soil/Sediment/Solid Samples

The same containers and holding times as listed for aqueous samples are to be used for soil/sediment/solid samples. Preservation for all analyses is limited to cooling to 4° C.

7. Samples should be filtered immediately on-site before adding preservative for dissolved metals.

8. Guidance applies to samples to be analyzed by GC, LC or GC/MS for specific compounds.

9. The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

10. When the extractable analytes of concern fall within a single chemical catagory, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical catagories, the sample may be preserved by cooling to 4° C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6 - 9; samples preserved in this manner may be held for five days before extraction and for forty days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re the requirement for thiosulfate reduction of residual chlorine), and footnotes 12, 13 (re the analysis of benzidine).

11. If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement of benzidine.

12. This does not supercede the contract requirement of a 30 day reporting time.

13. Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.

14. For the analysis of diphenylnitrosamine, add 0.008% sodium thiosulfate and adjust the pH to 7 - 10 with NaOH within 24 hours of sampling.

15. The pH adjustment may be performed upon receipt in the laboratory and may be omitted if the samples are extracted with 72 hours of collection. For the analysis of aldrin, add 0.008% sodium thiosulfate.

SUPERFUND-CLP ORGANICS
Superfund Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

Volatiles	CAS Number	Quantitation Limits** Low Water µg/L	Low Soil/Sediment[a] µg/Kg
1. Chloromethane	74-87-3	10	10
2. Bromomethane	74-83-9	10	10
3. Vinyl chloride	75-01-4	10	10
4. Chloroethane	75-00-3	10	10
5. Methylene chloride	75-09-2	5	5
6. Acetone	67-64-1	10	10
7. Carbon Disulfide	75-15-0	5	5
8. 1,1-Dichloroethylene	75-35-4	5	5
9. 1,1-Dichloroethane	75-35-3	5	5
10. 1,2-Dichloroethylene(total)	540-59-0	5	5
11. Chloroform	67-66-3	5	5
12. 1,2-Dichloroethane	107-06-2	5	5
13. 2-Butanone	78-93-3	10	10
14. 1,1,1-Trichloroethane	71-55-6	5	5
15. Carbon tetrachloride	56-23-5	5	5
16. Vinyl acetate	108-05-4	10	10
17. Bromodichloromethane	75-27-4	5	5
18. 1,2-Dichloropropane	78-87-5	5	5
19. cis-1,3-Dichloropropene	10061-01-5	5	5
20. Trichloroethene	79-01-6	5	5
21. Dibromochloromethane	124-48-1	5	5
22. 1,1,2-Trichloroethane	79-00-5	5	5
23. Benzene	71-43-2	5	5
24. trans-1,3-Dichloropropene	10061-02-6	5	5
25. Bromoform	75-25-2	5	5
26. 4-Methyl-2-pentanone	108-10-1	10	10
27. 2-Hexanone	591-78-6	10	10
28. Tetrachloroethene	127-18-4	5	5
29. Toluene	108-88-3	5	5
30. 1,1,2,2-Tetrachloroethane	79-34-5	5	5

Superfund Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*

Volatiles (continued)	CAS Number	Quantitation Limits** Low Water µg/L	Low Soil/Sediment[a] µg/Kg
31. Chlorobenzene	108-90-7	5	5
32. Ethyl Benzene	100-41-4	5	5
33. Styrene	100-42-5	5	5
34. Total Xylenes	1330-20-7	5	5

[a] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 125 times the individual Low Soil/Sediment CRQL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation Limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

Superfund Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

Semivolatiles	CAS Number	Quantitation Limits** Low Water µg/L	Low Soil/Sediment[b] µg/Kg
35. Phenol	108-95-2	10	330
36. bis(2-Chloroethyl) ether	111-44-4	10	330
37. 2-Chlorophenol	95-57-8	10	330
38. 1,3-Dichlorobenzene	541-73-1	10	330
39. 1,4-Dichlorobenzene	106-46-7	10	330
40. Benzyl alcohol	100-51-6	10	330
41. 1,2-Dichlorobenzene	95-50-1	10	330
42. 2-Methylphenol	95-48-7	10	330
43. 2,2'-oxybis(1-Chloro-priopane	108-60-1	10	330
44. 4-Methylphenol	106-44-5	10	330
45. N-Nitroso-di-n-propylamine	621-64-7	10	330
46. Hexachloroethane	67-72-1	10	330
47. Nitrobenzene	98-95-3	10	330
48. Isophorone	78-59-1	10	330
49. 2-Nitrophenol	88-75-5	10	330
50. 2,4-Dimethylphenol	105-67-9	10	330
51. Benzoic acid	65-85-0	50	1600
52. bis(2-Chloroethoxy) methane	111-91-1	10	330
53. 2,4-Dichlorophenol	120-83-2	10	330
54. 1,2,4-Trichlorobenzene	120-82-1	10	330
55. Naphthalene	91-20-3	10	330
56. 4-Chloroaniline	106-47-8	10	330
57. Hexachlorobutadiene	87-68-3	10	330
58. 4-Chloro-3-methylphenol (p-chloro-m-cresol)	59-50-7	10	330
59. 2-Methylnaphthalene	91-57-6	10	330
60. Hexachlorocyclopentadiene	77-47-4	10	330
61. 2,4,6-Trichlorophenol	88-06-2	10	330
62. 2,4,5-Trichlorophenol	95-95-4	50	1600
63. 2-Chloronaphthalene	91-58-7	10	330

Superfund Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*

Semivolatiles (continued)	CAS Number	Quantitation Limits** Low Water µg/L	Low Soil/Sediment[b] µg/Kg
64. 2-Nitroaniline	88-74-4	50	1600
65. Dimethyl phthalate	131-11-3	10	330
66. Acenaphthylene	208-96-8	10	330
67. 2,6-Dinitrotoluene	606-20-2	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. Diethylphthalate	84-66-2	10	330
75. 4-Chlorophenyl phenyl ether	7005-72-3	10	330
76. Fluorene	86-73-7	10	330
77. 4-Nitroaniline	100-01-6	50	1600
78. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79. N-nitrosodiphenylamine	86-30-6	10	330
80. 4-Bromophenyl phenyl ether	101-55-3	10	330
81. Hexachlorobenzene	118-74-1	10	330
82. Pentachlorophenol	87-86-5	50	1600
83. Phenanthrene	85-01-8	10	330
84. Anthracene	120-12-7	10	330
85. Di-n-butyl phthalate	84-74-2	10	330
86. Fluoranthene	206-44-0	10	330
87. Pyrene	129-00-0	10	330
88. Butyl benzyl phthalate	85-68-7	10	330
89. 3,3'-Dichlorobenzidine	91-94-1	20	660
90. Benz(a)anthracene	56-55-3	10	330
91. Chrysene	218-01-9	10	330
92. bis(2-Ethylhexyl)phthalate	117-81-7	10	330
93. Di-n-octyl phthalate	117-84-0	10	330
94. Benzo(b)fluoranthene	205-99-2	10	330

Superfund Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*

Semivolatiles (continued)	CAS Number	Quantitation Limits** Low Water µg/L	Quantitation Limits** 'Low Soil/Sediment[b] µg/Kg
95. Benzo(k)fluoranthene	207-08-9	10	330
96. Benzo(a)pyrene	50-32-8	10	330
97. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
98. Dibenz(a,h)anthracene	53-70-3	10	330
99. Benzo(g,h,i)perylene	191-24-2	10	330

[b] Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Semi-Volatile TCL Compounds are 60 times the individual Low Soil/Sediment CRDL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Superfund Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*

Pesticides/PCBs	CAS Number	Quantitation Limits** Low Water µg/L	Low Soil/Sediment[c] µg/Kg
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptachlor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor epoxide	1024-57-3	0.05	8.0
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.
109. 4,4'-DDE	72-55-9	0.10	16.
110. Endrin	72-20-8	0.10	16.
111. Endosulfan II	33213-65-9	0.10	16.
112. 4,4'-DDD	72-54-8	0.10	16.
113. Endosulfan sulfate	1031-07-8	0.10	16.
114. 4,4'-DDT	50-29-3	0.10	16.
115. Endrin ketone	53494-70-5	0.10	16.
116. Methoxychlor	72-43-5	0.5	80.
117. alpha-Chlordane	5103-71-9	0.5	80.
118. gamma-Chlordane	5103-74-2	0.5	80.
119. Toxaphene	8001-35-2	1.0	160.
120. AROCLOR-1016	12674-11-2	0.5	80.
121. AROCLOR-1221	11104-28-2	0.5	80.
122. AROCLOR-1232	11141-16-5	0.5	80.
123. AROCLOR-1242	53469-21-9	0.5	80.
124. AROCLOR-1248	12672-29-6	0.5	80.
125. AROCLOR-1254	11097-69-1	1.0	160.
126. AROCLOR-1260	11096-82-5	1.0	160.

[c] Medium Soil/Sediment Contract Required Detection Limits (CRDL) for Pesticide TCL compounds are 15 times the individual Low Soil/Sediment CRDL.

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

** Quantitation Limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculate on dry weight basis, as required by the protocol, will be higher.

SUPERFUND-CLP INORGANICS

Superfund Target Compound List (TCL) and Contract Required Quantitation Limit

Parameter	Contract Required Quantitation Level (µg/L)
1. Aluminum	200
2. Antimony	60
3. Arsenic	10
4. Barium	200
5. Beryllium	5
6. Cadmium	5
7. Calcium	5000
8. Chromium	10
9. Cobalt	50
10. Copper	25
11. Iron	100
12. Lead	5
13. Magnesium	5000
14. Manganese	15
15. Mercury	0.2
16. Nickel	40
17. Potassium	5000
18. Selenium	5
19. Silver	10
20. Sodium	5000
21. Thallium	10
22. Vanadium	50
23. Zinc	20
24. Cyanide	10

1: Any analytical method specified in Exhibit D, CLP-Inorganics may be utilized as long as the documented instrument or method detection limits meet the Contract Required Quantitation Level (CRQL) requirements. Higher quantitation levels may only be used in the following circumstance:

If the sample concentration exceeds two times the quantitation limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the contract required quantitation level. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 85
Contract Required Quantitation Level (CRQL) = 5

The value of 85 may be reported even though instrument detection limit is greater than Contract Required Quantitation Limit. The instrument or method detection limit must be documented as described in Exhibit E.

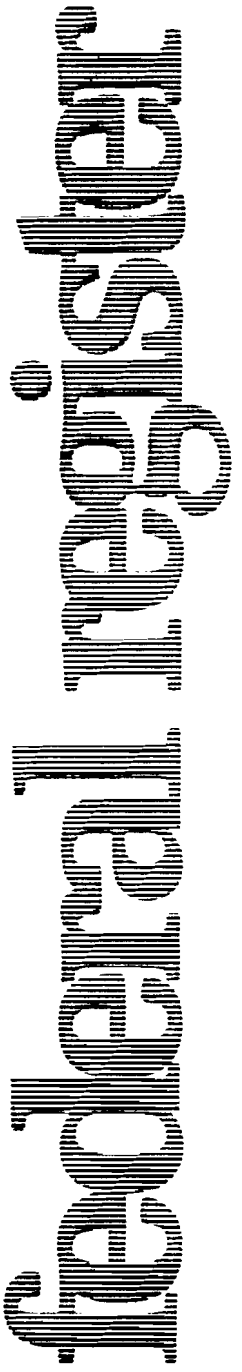
2: These CRQL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The quantitation limits for samples may be considerably higher depending on the sample matrix.

SECTION IV
RCRA Target Compound List (TCL) and
Contract Required Quantitation Limit

Parameter	CAS Number	Contract Required Quantitation Level (µg/L)
A. Ignitability (° C or ° F)	NA	NA
B. Corrosivity (pH units)	NA	NA
C. Reactivity		
1. Total Releasable Cyanide as HCN		100,000
2. Total Releasable Sufide as H_2S		100,000
D. Extraction Procedure Toxicity; (EP Tox) (concentrations in extract)		
1. Arsenic		1,000
2. Barium		10,000
3. Cadmium		100
4. Total Chromium		1,000
5. Lead		1,000
6. Mercury		50
7. Selenium		100
8. Silver		1,000
9. gamma-BHC (Lindane)	58-89-9	100
10. 2,4-Dichlorophenoxyacetic acid; (2,4-D)	94-75-2	1,000
11. Endrin	72-20-8	5
12. Methoxychlor	72-43-5	1,000
13. 2,4,5-Trichlorophenoxy-propionic acid; (2,4,5-TP; Silvex)	93-72-1	100
14. Toxaphene	8001-35-2	100

Parameter	CAS Number	Contract Required Quantitation Level (µg/L)
E. Toxcity Characteristic Leaching Procedure (TCLP) (concentrations in extract)		
Metals		
1. Arsenic		1,000
2. Barium		10,000
3. Cadmium		100
4. Total Chromium		1,000
5. Lead		1,000
6. Mercury		50
7. Selenium		100
8. Silver		1,000
Volatiles		
1. Acetone	67-64-1	10
2. Acrylonitrile	107-13-1	1,000
3. Benzene	71-43-2	10
4. 2-Butanone (Methylethylketone)	78-93-3	10
5. n-Butyl alcohol	71-36-6	1,000
6. Carbon disulfide	75-15-0	100
7. Carbon tetrachloride	56-23-5	10
8. Chlorobenzene	108-90-7	10
9. Chloroform	67-66-3	10
10. 1,2-Dichloroethane	107-06-2	10
11. 1,1-Dichloroethylene	75-35-4	10
12. Ethyl acetate	141-78-6	10
13. Ethyl benzene	100-41-4	10
14. Ethyl ether	60-29-7	10
15. Methanol	67-56-1	10
16. Methylene chloride	75-09-2	10
17. 4-Methyl-2-pentanone (Methyl iso-butyl ketone)	108-10-1	10

7-27-90
Vol. 55 No. 145



Friday
July 27, 1990

United States
Government
Printing Office
SUPERINTENDENT
OF DOCUMENTS
Washington, DC 20402

OFFICIAL BUSINESS
Penalty for private use, $300

SECOND CLASS NEWSPAPER

Postage and Fees Paid
U.S. Government Printing Office
(ISSN 0097-6326)

Appendix A—Examples of Concentrations Meeting Criteria for Action Levels—Continued

Constituent name	Class	Air (ug/m3)	Water (mg/L)	Soils (mg/kg)
Methylene chloride	B	3E−01	5E−03	9E+01
n-Nitroso-di-n-butylamine	B2	6E−04	6E−06	1E−01
n-Nitroso-n-ethylurea	B			
n-Nitroso-n-methylethylamine	B2		2E−06	3E−02
n-Nitrosodi-n-propylamine	B2		5E−06	1E−01
n-Nitrosodiethanolamine	B2		1E−05	3E−01
n-Nitrosodiphenylamine	B2		7E−03	1E+02
n-Nitrosopyrrolidine	B2	2E−03	2E−05	3E−01
Nickel	D		7E−01	2E+03
Nickel refinery dust	A	4E−03		
Nitric oxide	D		4E−00	8E+03
Nitrobenzene	D	2E−00	2E−02	4E+01
Nitrogen dioxide	D		4E+01	8E+04
Osmium tetroxide	D		4E−04	8E−01
Parathion	C		2E−01	5E+02
Pentachlorobenzene	D		3E−02	6E+01
Pentachloronitrobenzene	C	1E−01	1E−01	2E+02
Pentachlorophenol	D		1E−00	2E+03
Phenol	D		2E+01	5E+04
Phenyl mercuric acetate	D		3E−03	8E−00
Phosphine	D		1E−02	2E+01
Phthalic anhydride	D		7E+01	2E+05
Polychlorinated biphenyls	B2		5E−06	9E−02
Potassium cyanide	D		2E−00	4E+03
Potassium silver cyanide	D		7E−00	2E+04
Pronamide	D		3E−00	6E+03
Pyridine	D		4E−02	8E+01
Selenious acid	D		1E−01	2E+02
Selenoureа	D		2E−01	4E+02
Silver	D		(1)	2E+02
Silver cyanide	D		4E−00	8E+03
Sodium cyanide	D		1E−00	3E+03
Strychnine	D		1E−02	2E+01
Styrene	C		7E−00	2E+04
1,1,1,2-Tetrachloroethane	C	1E−00	1E−02	3E+02
1,2,4,5-Tetrachlorobenzene	D		1E−02	2E+01
1,1,1,2-Tetrachloroethane	C	1E−00	1E−02	3E+02
1,1,2,2-Tetrachloroethane	C	2E−01	2E−03	4E+01
Tetrachloroethylene	B2	1E−00	7E−04	1E+01
2,3,4,6-Tetrachlorophenol	D		1E−00	2E+03
Tetraethyl lead	D		4E−06	8E−03
Tetraethyldithiopyrophosphate	D		2E−02	4E+01
Thallic oxide	D		2E−03	6E−00
Thallium acetate	D		3E−03	7E−00
Thallium carbonate	D		3E−03	6E−00
Thallium chloride	D		3E−03	6E−00
Thallium nitrate	D		3E−03	7E−00
Thallium sulfate	D		3E−03	6E−00
Thiosemicarbazide	D		2E−01	5E+02
Thiram	D		2E−01	4E+02
Toluene	D	7E+03	1E+01	2E+04
Toxaphene	B2	3E−03	(1)	6E−01
1,2,4-Trichlorobenzene	D	1E+01	7E−01	2E+03
1,1,1-Trichloroethane	D	1E+03	3E−00	7E+03
1,1,2-Trichloroethane	C	6E−01	6E−03	1E+02
Trichloroethylene	B2		(1)	6E+01
Trichloromonofluoromethane	D	7E+02	1E+01	2E+04
2,4,5-Trichlorophenol	D		4E−00	8E+03
2,4,6-Trichlorophenol	B2	2E−01	2E−03	4E+01
2,4,5-Trichlorophenoxyacetic acid	D		(1)	8E+02
1,2,3-Trichloropropane	D		2E−01	5E+02
Vanadium pentoxide	D		3E−01	7E+02
Xylenes	D	1E+03	7E+01	2E+05
Zinc cyanide	D		2E−00	4E+03
Zinc phosphide	D		1E−02	2E+01

(1) (1) MCL available; see appendix B.
(2) The air action level for asbestos is measured in units of fibers/milliliters.
(3) There is an MCL for total trihalomethanes, which includes four constituents: bromoform, bromodichloromethane, chloroform, and dibromochloromethane. Concentration derived using exposure assumptions in appendix D and reference doses for systemic toxicants and verified risk-specific doses at 10−6 for Class A and B carcinogens and 10−5 for Class C carcinogens (see section VI.F.2.6 for further discussion).
A, B and C represents class A, B and C carcinogens, respectively; D represents a systemic toxicant.

REFERENCE 8

DEC
PUBLICATION

Division of Solid Waste

6 NYCRR Part 360 Solid Waste Management Facilities

Effective December 31, 1988

New York State Recycles Printed on Recycled Paper

New York State/Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233-4010

United States
Environmental Protection
Agency

Office of Solid Waste and
Emergency Response
Office of Emergency and
Remedial Response
Washington DC 20460

Office of Research and
Development
Municipal Environmental Res.
Laboratory
Cincinnati OH 45268

Superfund

REFERENCE 9

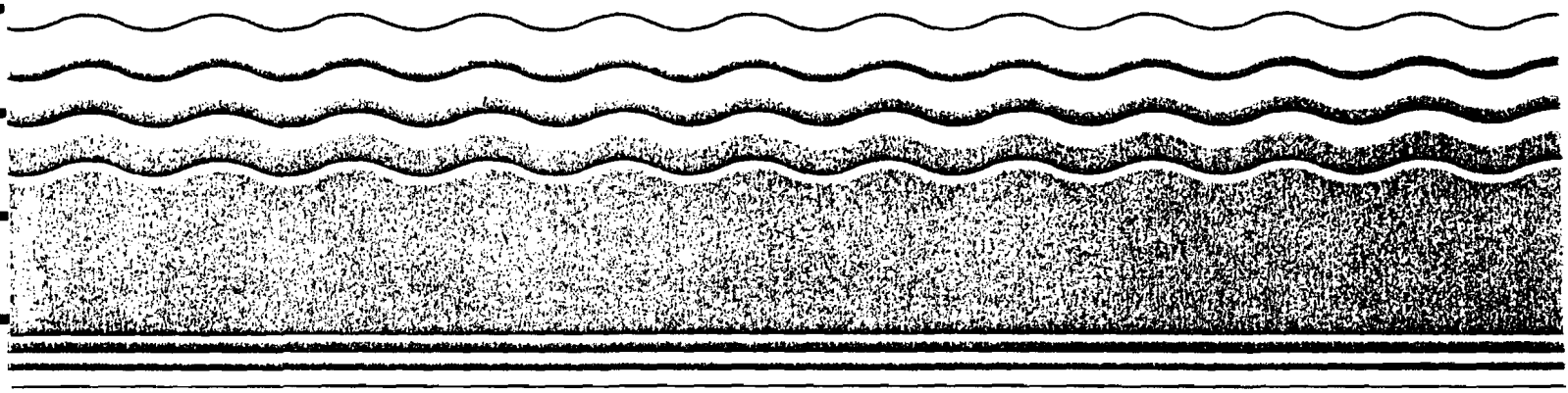
EPA-540/2-88-003a Sept. 19

EPA

Review of In-Place Treatment Techniques for Contaminated Surface Soils

Volume 1: Technical Evaluation

for Lib
HRR Waste



code of federal regulations

REFERENCE 10

Protection of Environment

40

PARTS 100 TO 149

Revised as of July 1, 1989

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY (CONTINUED)

(This book contains Parts 100 to 149)

SUBCHAPTER D—WATER PROGRAMS

Part		Page
100	[Reserved]	
104	Public hearings on effluent standards for toxic pollutants	5
108	Employee protection hearings	11
109	Criteria for State, local and regional oil removal contingency plans	12
110	Discharge of oil	15
112	Oil pollution prevention	18
113	Liability limits for small onshore storage facilities.	30
114	Civil penalties for violation of oil pollution prevention regulations	32
116	Designation of hazardous substances	34
117	Determination of reportable quantities for hazardous substances	45
121	State certification of activities requiring a Federal license or permit	54
122	EPA administered permit programs: The national pollutant discharge elimination system	58
123	State program requirements	108
124	Procedures for decisionmaking	129
125	Criteria and standards for the national pollutant discharge elimination system	181
129	Toxic pollutant effluent standards	217
130	Water quality planning and management	228
131	Water quality standards	238
133	Secondary treatment regulation	244
135	Prior notice of citizen suits	248
136	Guidelines establishing test procedures for the analysis of pollutants	249
140	Marine sanitation device standard	524
141	National primary drinking water regulations	526

REFERENCE 11

WATER QUALITY REGULATIONS

SURFACE WATER AND GROUNDWATER CLASSIFICATIONS AND STANDARDS

New York State
Codes, Rules and Regulations
Title 6, Chapter X
Parts 700-705

New York State Department of Environmental Conservation

REFERENCE 12

LONG ISLAND WATER RESOURCES
BULLETIN 13

HYDROLOGIC AND WATER-QUALITY APPRAISAL OF SOUTHEAST NASSAU COUNTY, LONG ISLAND, NEW YORK

Prepared by the
U.S. GEOLOGICAL SURVEY

in cooperation with the
NASSAU COUNTY DEPARTMENT OF PUBLIC WORKS

Published by
NASSAU COUNTY DEPARTMENT OF PUBLIC WORKS

1979

REFERENCE 13

HYDROGEOCHEMICAL DATA FROM INVESTIGATION OF WATER QUALITY IN SEWERED AND UNSEWERED AREAS, SOUTHERN NASSAU COUNTY, LONG ISLAND, NEW YORK

By

N. M. Perlmutter and Ellis Koch

U. S. Department of the Interior
Geological Survey

LONG ISLAND WATER RESOURCES
BULLETIN LIWR-4

Prepared by the U. S. Geological Survey in cooperation with the Nassau County Department of Public Works.

Published by the

NASSAU COUNTY DEPARTMENT OF PUBLIC WORKS

1975

REFERENCE 14

LONG ISLAND WATER RESOURCES
BULLETIN LIWR — 8

GROUND-WATER QUALITY NEAR THE WATER TABLE IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK

By

Julian Soren

U.S. Department of the Interior
Geological Survey

Prepared by

U.S. GEOLOGICAL SURVEY

in cooperation with the

SUFFOLK COUNTY DEPARTMENT OF ENVIRONMENTAL CONTROL

Published by

SUFFOLK COUNTY DEPARTMENT OF ENVIRONMENTAL CONTROL

1977

Water Resources Data REFERENCE 15
New York
Water Year 1986

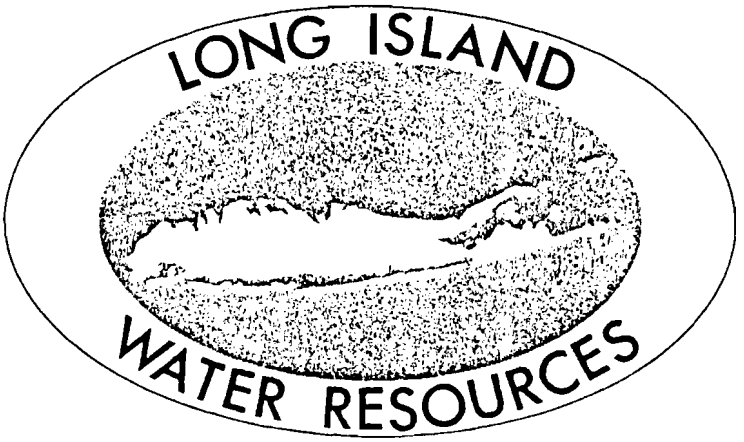
Volume 2. Long Island

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NY-86-2
Prepared in cooperation with the State of New York
and with other agencies

REFERENCE 16

LONG ISLAND WATER RESOURCES
BULLETIN 15

HYDROGEOLOGIC DATA FROM THE NORTHERN PART OF THE TOWN OF BROOKHAVEN, SUFFOLK COUNTY, NEW YORK



Prepared by the
U.S. GEOLOGICAL SURVEY

in cooperation with the
SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
SUFFOLK COUNTY WATER AUTHORITY

Published by
SUFFOLK COUNTY WATER AUTHORITY

1980

REFERENCE 17

Form 9-014

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WASHINGTON, D.C. 20242

CHEMICAL CONSTITUENTS IN WATER FROM SELECTED SOURCES IN NASSAU AND SUFFOLK COUNTIES, LONG ISLAND, NEW YORK

by

C. Albert Harr

Hydrologist, U.S. Geological Survey

Mineola, New York

Open-file report

Prepared by the U.S. Geological Survey in cooperation with the Nassau County Department of Public Works, the Suffolk County Department of Environmental Control, and the Suffolk County Water Authority

March 1973

☆ U. S. GOVERNMENT PRINTING OFFICE: 1967—274-822

REFERENCE 18

MICROORGANISMS IN STORMWATER--

A SUMMARY OF RECENT INVESTIGATIONS

U. S. GEOLOGICAL SURVEY

Open-File Report 80-1198

Prepared in cooperation with the
LONG ISLAND REGIONAL PLANNING BOARD

REFERENCE 20

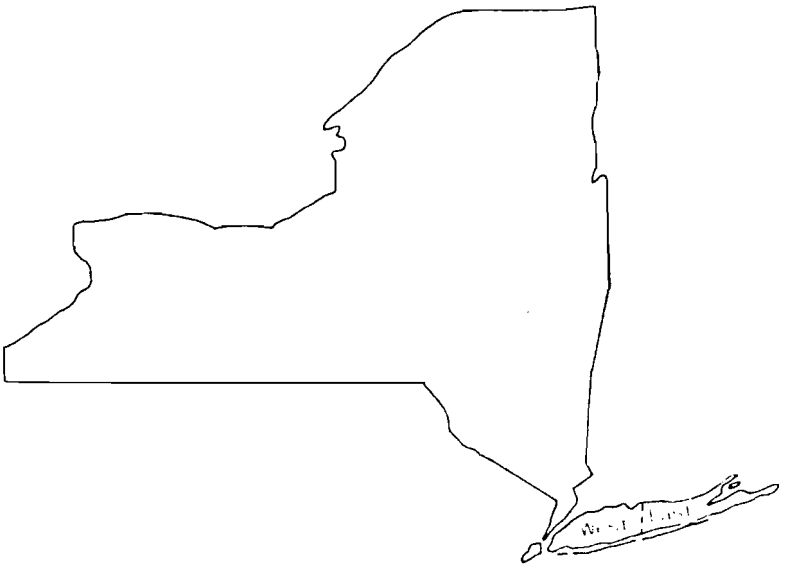
UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

POTENTIOMETRIC-SURFACE OF THE WATER-TABLE, MAGOTHY, AND LLOYD AQUIFERS ON LONG ISLAND, NEW YORK, IN 1984

By

Thomas P. Doriski



WATER-RESOURCES INVESTIGATIONS REPORT 86-4189

Plate 1. Water-table altitude

Plate 2. Water-table well numbers

Plate 3. Potentiometric surface of Magothy aquifer

Plate 4. Potentiometric surface of Lloyd aquifer

Prepared in cooperation with the

NASSAU COUNTY DEPARTMENT OF PUBLIC WORKS

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES

SUFFOLK COUNTY WATER AUTHORITY

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Syosset, New York

REFERENCE 21

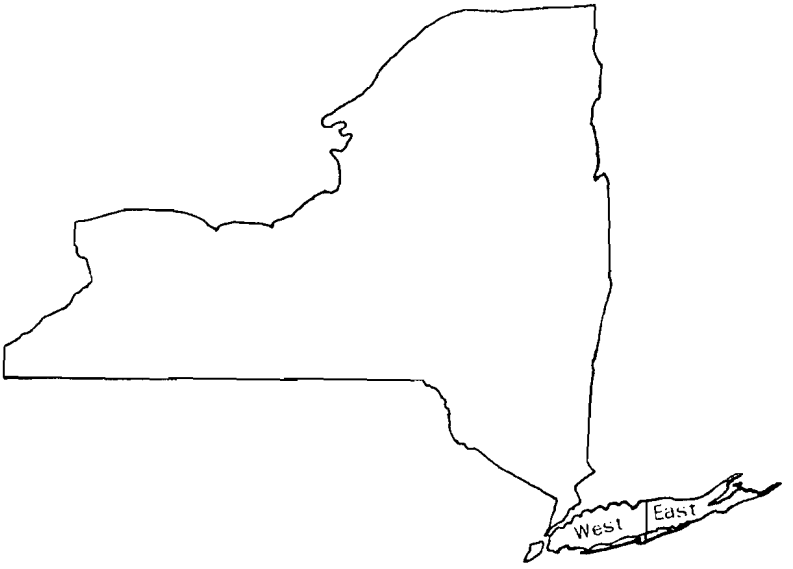
UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

POTENTIOMETRIC-SURFACE ALTITUDE OF MAJOR AQUIFERS ON LONG ISLAND, NEW YORK, IN 1983

By

Thomas P. Doriski



WATER-RESOURCES INVESTIGATIONS REPORT 85-4321

Plate 1. Water-table altitude

Plate 2. Water-table well numbers

Plate 3. Potentiometric surface of Magothy aquifer

Plate 4. Potentiometric surface of Lloyd aquifer

Prepared in cooperation with the

NASSAU COUNTY DEPARTMENT OF PUBLIC WORKS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES

SUFFOLK COUNTY WATER AUTHORITY

Syosset, New York

1986

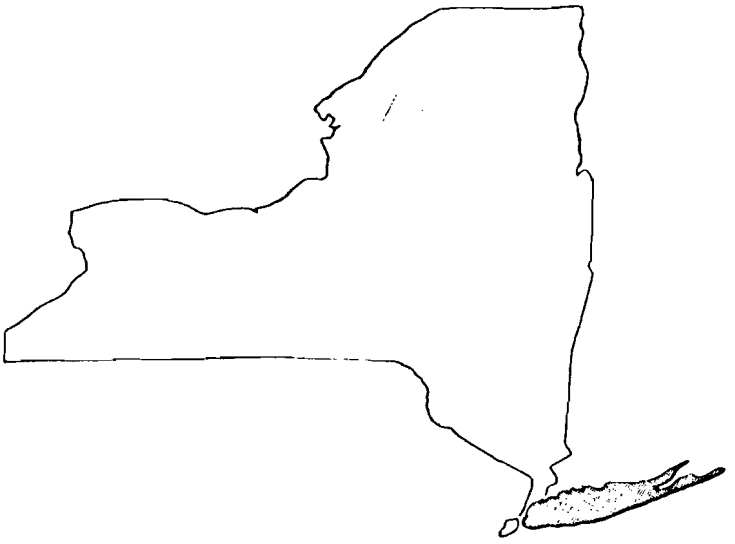
REFERENCE 22

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Water Table on Long Island, New York, March 1979

By

Cynthia D. Donaldson and Edward J. Koszalka



Prepared in cooperation with

NASSAU COUNTY DEPARTMENT OF PUBLIC WORKS
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SUFFOLK COUNTY DEPARTMENT OF HEALTH SERVICES
SUFFOLK COUNTY WATER AUTHORITY

U.S. GEOLOGICAL SURVEY
Open-File Report 82-163

Syosset, New York
1983

REFERENCE 23

REGIONAL RATES OF GROUND-WATER MOVEMENT ON LONG ISLAND, NEW YORK

By O. L. FRANKE and PHILIP COHEN, Mineola, N.Y.

Work done in cooperation with Nassau County Department of Public Works, the New York State Department of Environmental Conservation, the Suffolk County Department of Environmental Control, and the Suffolk County Water Authority

Abstract.—Regional rates of ground-water movement on Long Island, N.Y., computed with the aid of a steady-state electrical analog model, indicate that near the boundary between Nassau and Suffolk Counties the length of time required for ground-water recharge to move seaward of the barrier beaches is about 800 years for water entering the Magothy aquifer and 3,000 years for water entering the Lloyd aquifer. These computations are based upon an assumed rate of natural recharge of 21 inches per year and upon the configuration of the natural ground-water flow net associated with that rate of recharge. About 25–30 years is the maximum time required for water to drain from one of the shallow ground-water subsystems into East Meadow Brook. If the dissolved substances are assumed to move at the same rate as the water, then these lengths of time indicate the orders of magnitude of the times required for ground water containing substances of sewage origin (largely derived from cesspools and septic tanks) to be flushed from the ground-water system after completion of planned wide-scale sanitary sewering systems in Nassau and Suffolk Counties.

Rates of ground-water movement on Long Island, N.Y., are of considerable concern to individuals and agencies responsible for developing and managing the water resources on the island. In recent years, much of the concern has been directed toward time of travel and disposition of waste water from hundreds of thousands of cesspools and septic tanks. This report provides preliminary information on the rates of ground-water movement on Long Island and on the implications of those rates deduced from information developed largely from ongoing cooperative water-resources studies by the U.S. Geological Survey and several local and State agencies.

HYDROGEOLOGIC SETTING

Long Island is underlain by a wedge-shaped mass of unconsolidated deposits that attain a maximum thickness of about 2,000 feet in south-central Suffolk County. Pertinent characteristics of these deposits are listed in table 1.

Under natural, predevelopment conditions, precipitation on Long Island was the source of all the fresh ground water

Table 1.—*Major hydrogeologic units on Long Island, N.Y.*

Hydrogeologic unit[1]	Approximate maximum thickness (feet)	Description	Estimated average hydraulic conductivity[2] (feet per day)	
			Horizontal	Vertical
Upper glacial aquifer.	400	Mainly sand and gravel; some thin beds of clayey material.	270	27
Gardiners Clay.	150	Clay, silty clay, and a little fine sand.	.01	.001
Jameco aquifer.	200	Mainly medium to coarse sand. Not found along section $A-A'$ (figs. 1, 2, and 3).	...	...
Magothy aquifer.	1,000	Mainly very fine sand, silt, and clay; some coarse to fine sand; locally contains gravel.	50	1.4
Raritan clay.	300	Clay; some silt and fine sand.	.01	.001
Lloyd aquifer.	300	Sand and gravel; some clayey material.	40	7
Bedrock	...	Crystalline rock of very low interstitial hydraulic conductivity.	...	...

[1] Nomenclature after Cohen, Franke, and Foxworthy (1968).
[2] Data mainly from McClymonds and Franke (1970), and G. D. Bennett (written commun., 1968).

U.S. GEOL. SURVEY PROF. PAPER 800-C, PAGES C271-C277

Water-Transmitting Properties of Aquifers on Long Island, New York

REFERENCE 24

By N. E. McCLYMONDS *and* O. L. FRANKE

HYDROLOGY AND SOME EFFECTS OF URBANIZATION ON LONG ISLAND, NEW YORK

GEOLOGICAL SURVEY PROFESSIONAL PAPER 627-E

Prepared in cooperation with the New York State Department of Conservation, Division of Water Resources; the Nassau County Department of Public Works; the Suffolk County Board of Supervisors; and the Suffolk County Water Authority

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1972