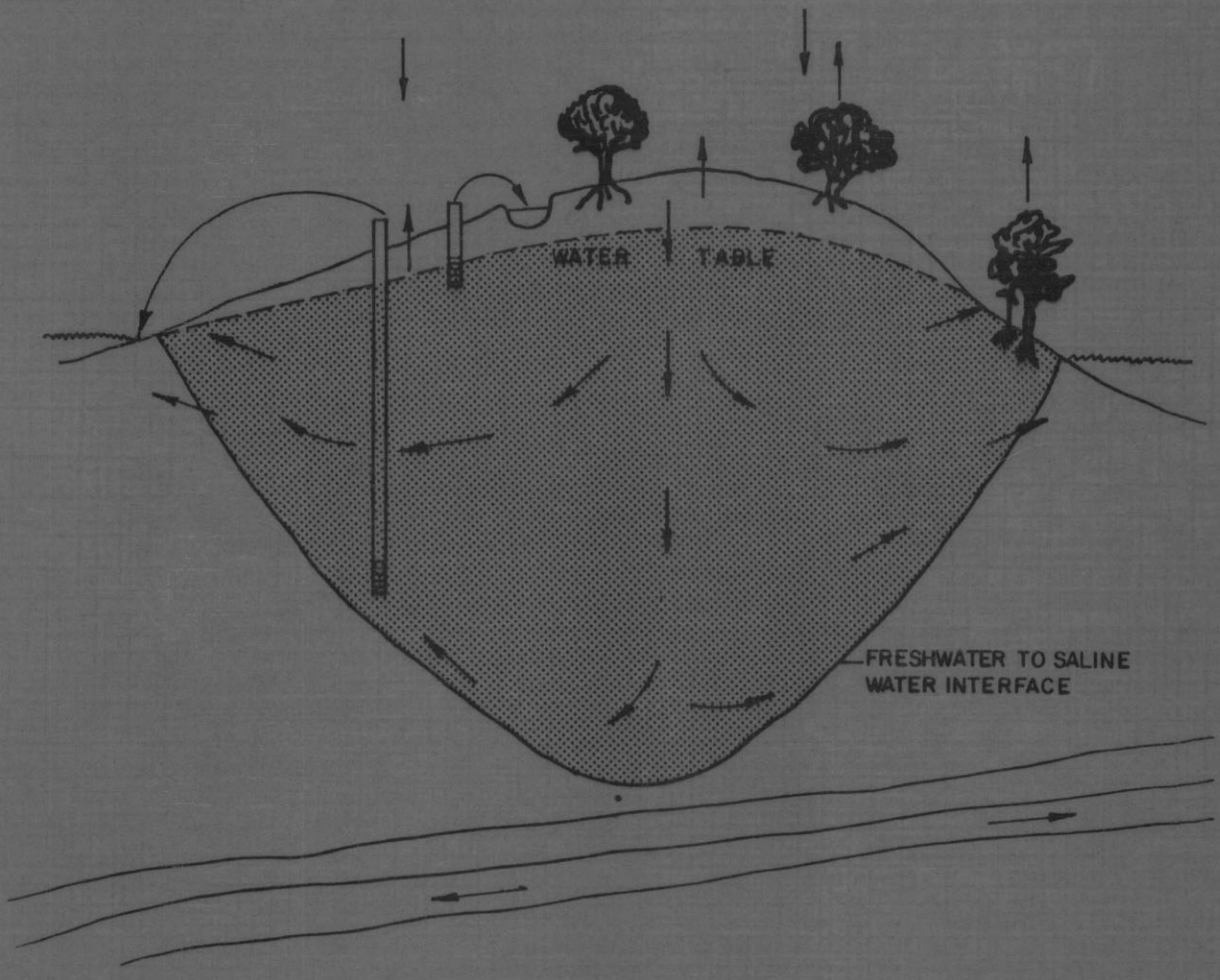
HYDROGEOLOGIC/PHASE II INVESTIGATION WORK PLAN
FOR
THE SPRINGS-FIREPLACE ROAD LANDFILL
(FACILITY ID # 52SO5 / 152058)

FOR COMPLIANCE WITH
6 NYCRR PART 360, SECTION 2.15
AND NYSDEC CHAPTER 857

PREPARED FOR
THE TOWN OF EAST HAMPTON



APRIL 1990

fanning, phillips & molnar
ENGINEERS
RONKONKOMA NEW YORK

Fairplace

4/22/90

Margaret O'Brien had done a PZ workplan but no work

Closure + PLZ

DHWR - to review this work plan

Dan M - wants at least 1 person in DHWR to review Wplan

Remarks in 1 month or less

file

To John Swartwout

From John Conover

Date 4/24/90

Re. Hydrogeologic / Phase 2 investigation work plan for the Springs fireplace road landfill, April 1990

Please have this reviewed & have the comments sent to Dan Morganelli, Region 1, who is the project manager. Please send the comments by 5/21/90

cc. Tony C
Dan M

360 lead
To Swanhart, Review
Dan M. - lead
want

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Need geophysical survey

RECEIVED
APR 13 1990
DIVISION OF SOLID WASTE

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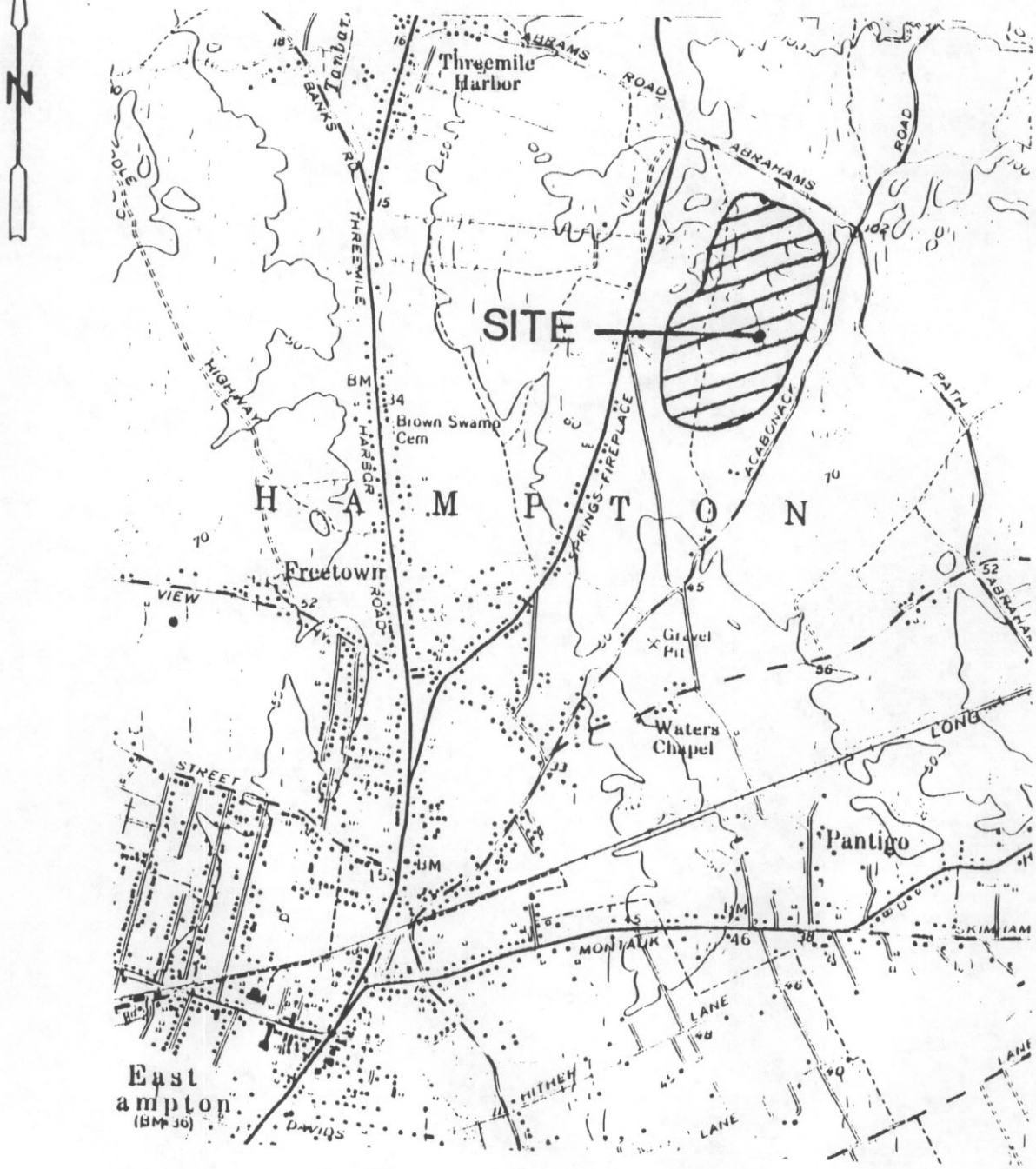
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SECTION 1.0
INTRODUCTION

The Springs-Fireplace Road Landfill, sometimes called the Accabonac Road Landfill, is an active municipal landfill located between Accabonac Road and Springs-Fireplace Road in the Village of Springs, New York (Figure 1.1). The landfill, which is owned and operated by the Town of East Hampton was established in the early 1960's and is presently close to 45 acres in size. It is reported to have accepted municipal, commercial, light industrial waste, and septage. This work plan has been developed for the purpose of compliance with 6NYCRR Part 360 Section 360-2.11 and Chapter 857 of the laws of 1982 ("New York State Superfund Law") for a Phase II investigation. The objectives of this plan are to establish an environmental monitoring system capable of detecting a contaminant release from the Springs-Fireplace Landfill and to determine if the site is contaminating the subsurface waters, which could impact an human population and/or the environment. It should also be noted that this plan is designed for an existing facility that will be closing. Thus, the proposed monitoring system is intended to be applicable to the closure requirements under Part 360-2.15 and Phase II.



SCALE: 1"=24,000'

F,P&M FIGURE 1.1-LOCATION OF SPRINGS-FIREPLACE ROAD LANDFILL

SECTION 2.0
LITERATURE SEARCH

For the purpose of determining the past and present site conditions, as well as the regional and site specific hydrogeologic conditions, a literature search was conducted. The literature search was designed to compile all pertinent available records and reports from the following sources: the Suffolk County Department of Health Services, the New York State Department of Environmental Conservation, the United States Geological Survey, the United States Soil Conservation Service, the Suffolk County Water Authority, H2M groundwater reports, A. Guerrera Associates, EA Science and Technology, Greenman-Pederson Associates engineering reports, professional papers, maps, charts, USEPA documents, and aerial photographs.

The information from the above listed sources was summarized in a format that presents the site history and present setting, the topography and drainage, soils, geologic and hydrogeologic setting, and past studies of groundwater quality. The summary is set forth in the following five subsections; 2.1, 2.2, 2.3, 2.4, and 2.5, respectively.

2.1 Site History and Present Setting

The Springs-Fireplace Road Landfill, also known as the East Hampton Landfill or the Accabonac Road Landfill, is located between Accabonac and Springs-Fireplace Roads on a forty-five acre parcel of property owned by the Town of East Hampton (See Figure 1.1 for site location). The Town of East Hampton established the landfill in the early 1960's on approximately 27 acres of undeveloped property to

replace the Town Dump which was an abandoned sand and gravel pit located on the west side of Accabonac Road. Presently, it is an active municipal landfill which has expanded to approximately 45 acres. It is reported to have accepted municipal, commercial, and light industrial waste along with septage and scrap metal. The landfill can be divided into two cells; one C and D and the other putresable. This will be reflected in the well placement and sampling plan. (see Plate 2.1 for site plan).

Landfilling on the site occurs by the trench method. Refuse is compacted in 2 foot lifts and 1 foot of cover is applied at the end of each day. Local residents have dumped enough refuse to create a substantial lift in the northwest corner of the property. In the southeast corner of the landfill there is an approximately 5 acre area where commercial haulers dump waste materials including household ground covered by 4-5 feet of sand. The sand is sloped radially inward and concrete rings were installed too aid in leachate monitoring. There are two (2) leachate collection wells presently within the putrescible mounds in the south and southeast portions of the landfill.

Septage lagoons, which used to accept septage waste from local haulers, are located just southwest of the entrance off Accabonac Road. In March of 1982, the Suffolk County Department of Health Services sampled sludge in one of the unlined septage lagoons and detected concentrations of methylene chloride (42,000 ppb), toluene and Technology, 1987). The Town of East Hampton no longer allows the dumping of septage at this landfill. They have constructed a septage treatment facility to treat such waste.

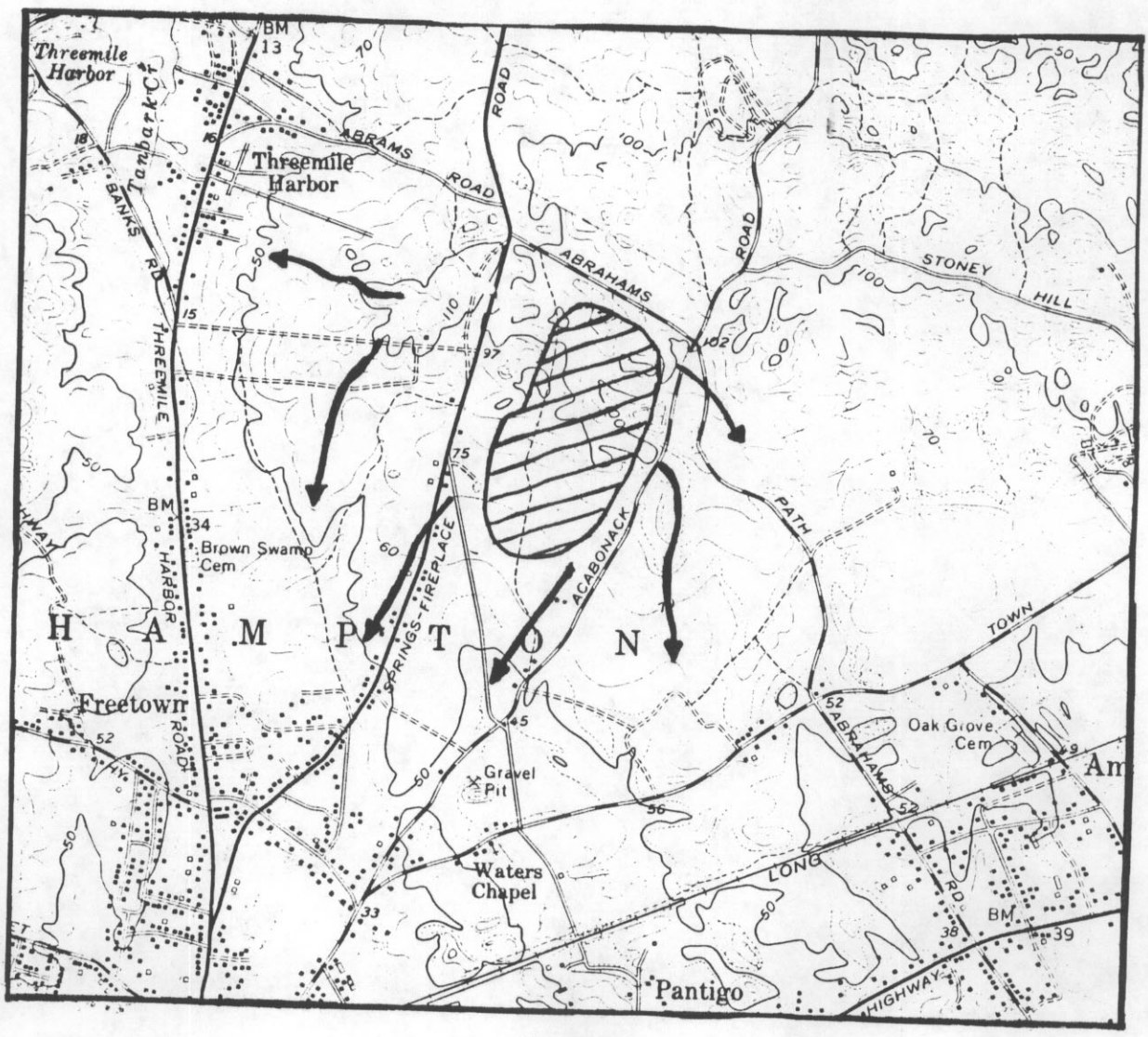
Construction and demolition (C & D) debris has been deposited in the northeast section of the landfill. There is a large brush pile located just north of this area.

There are several buildings on the property including an administration building, a town road, building, and the Quonset hut for machine storage. There are also three (3) waste oil tanks in the northwest section of the property.

The area surrounding the landfill is sparsely populated (residential and commercial) with public water available as a source of drinking water. The nearest municipal well field is owned by Suffolk County Water Authority (SCWA) and is located approximately one (1) mile south on Spring-Close Highway. In the past, private wells were the sole source of drinking water available. The nearest surface waters to the landfill are Three Mile Harbor and Tanbark Creek which are both located approximately one mile northwest of the site.

2.2 Topography and Drainage

The Springs-Fireplace Landfill is located on a topographically high point of the South Fork. This high point is known as the Ronkonkoma Moraine which runs along the length of the South Fork. The ground surface elevation of the site is approximately 70 feet above mean sea level (MSL) in the southern portion of the landfill and approximately 100 feet above MSL in the northern portion. The surface drainage in the vicinity of the landfill is generally southerly (See Figure 2.1 for generalized drainage). However, only several hundred feet north, the drainage is to the north. The landfill can therefore be considered as almost being on a surface water divide.



SOURCE: BASE MAP FROM U.S.G.S.

LEGEND

SPRINGS-FIREPLACE ROAD LANDFILL

SURFACE DRAINAGE FLOW DIRECTION

F,P&M

FIGURE 2.1 – GENERALIZED DRAINAGE OF AREA SURROUNDING THE SPRINGS-FIREPLACE RD. LANDFILL

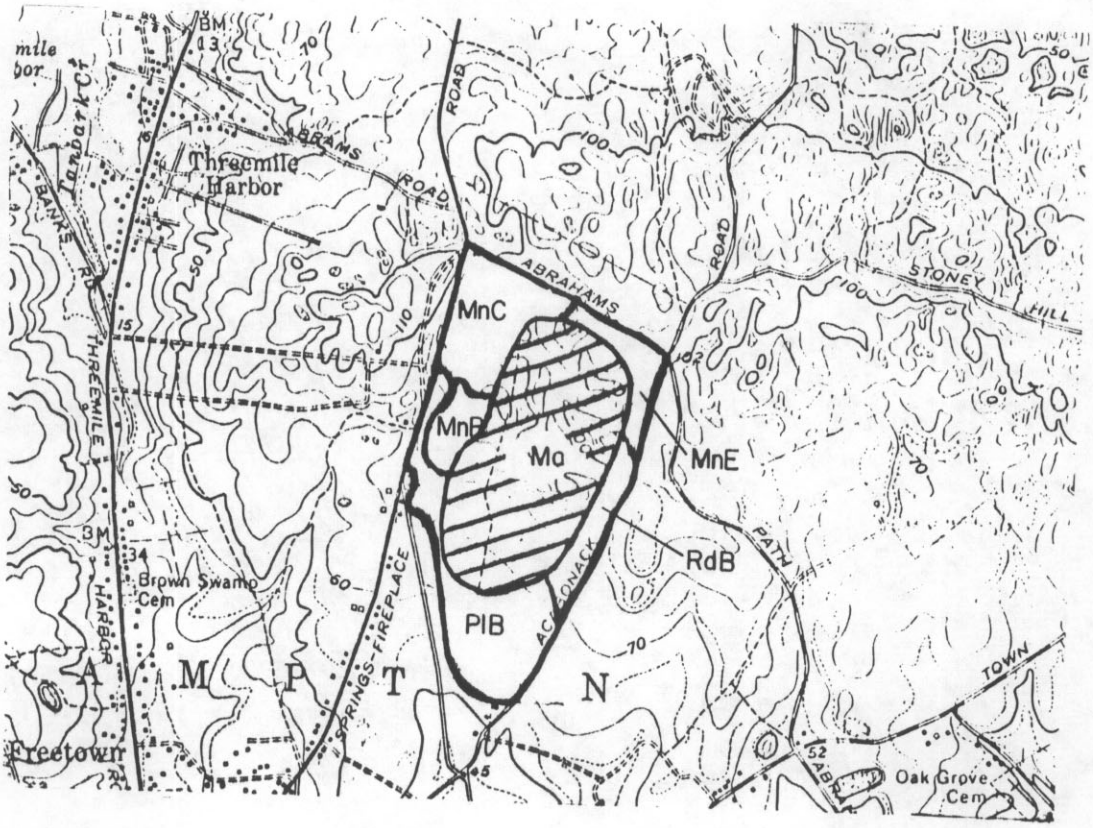
2.3 Soils

The surface soil interpretations and classifications in the site area are based on reports from the United States Soil Conservation Service. These reports show that there are four general soil types within the landfill area (See Figure 2.2). The Ma soil classification refers to Madeland which is a term that refers to land types that are used for sanitary landfills, garbage dumps, etc.. A description of this type of soil would require an on-site investigation to determine soil properties.

Soils identified to the west and north of the site were classified as MnB, MnC, and MnE which refer to Montauk soils. Montauk soils are described as deep, well-drained, moderately coarse to medium textured soils that formed in fine sandy loam or in a mantle of silt loam and loam. The permeability of this soil is moderate to moderately rapid in the root zone and moderately slow in the fragipan and underlying layer. These soils have moderate to high available moisture capacity.

Soils identified to the east of the site were noted as the RdB, which are classified as Riverhead soils. Characteristically, these soils are deep, well-drained, moderately coarse-textured that form in a layer of sandy loam or fine sandy loam over thick layers of coarse sand and gravel. The permeability is moderately rapid in the root zone and very rapid in the under lying layer. Riverhead soils have moderate to high available moisture capacities.

Soils identified to the south of the site were noted as Plb, which are classified as Plymouth Soils. These soils are deep, excessively drained, coarse-textured soils that formed in a layer of



SCALE 1:24000

1 0 1 MILE

LEGEND

Ma - MADELAND SOILS
PIB - PLYMOUTH SOILS
MnB - MONTAUK SOILS
RdB - RIVERHEAD SOILS
MnC - MONTAUK SOILS
MnE - MONTAUK SOILS

- SOIL TYPE BOUNDARY

- SPRINGS-FIREPLACE ROAD LANDFILL

SOURCE:
U.S. CONSERVATION SERVICE

F,P&M

FIGURE 2.2-SOILS MAP OF THE SPRINGS-FIREPLACE RD. LANDFILL

loamy sand or sand over thick layers of stratified coarse sand and gravel. The permeability of these soils is rapid. Available moisture capacity of these soils ranges from low to very low.

All naturally occurring soils in Suffolk County are acidic.

2.4 Geologic and Hydrogeologic Setting

Geology

The South Fork of Long Island is underlain by unconsolidated deposits of the upper Cretaceous and Quaternary Period that rest, unconformably, on the Upper Paleozoic basement complexes. The upper Cretaceous deposits include, in ascending order, (1) the Raritan formation, which consists of the Lloyd sand member and an overlying clay member, (2) the Magothy formation-Matawan group, undifferentiated (Magothy formation), and (3) the Monmouth group. Except for the Monmouth group, which occurs only at the eastern edge of the South Fork, the three units are continuous throughout the South Fork (Nemickas and Koszalka, USGS Paper 2073, 1982).

The Cretaceous deposits are overlain by Pleistocene deposits (upper glacial) which include a discontinuous marine clay unit that is overlain by glaciofluvial deposits.

In the vicinity of the Springs-Fireplace Landfill site, the bedrock is located approximately 1,200 feet below the National Geodetic Vertical Datum (NGVD) of 1929 (approximately equal to mean sea level) and dips to the southeast at approximately 1 degree. The Magothy formation in this area is approximately 400 feet thick and the Upper Glacial deposits are approximately 325 feet thick. From the literature search, the Gardiners clay does not appear to extend into the area below the landfill site. However, a stratigraphic cross-

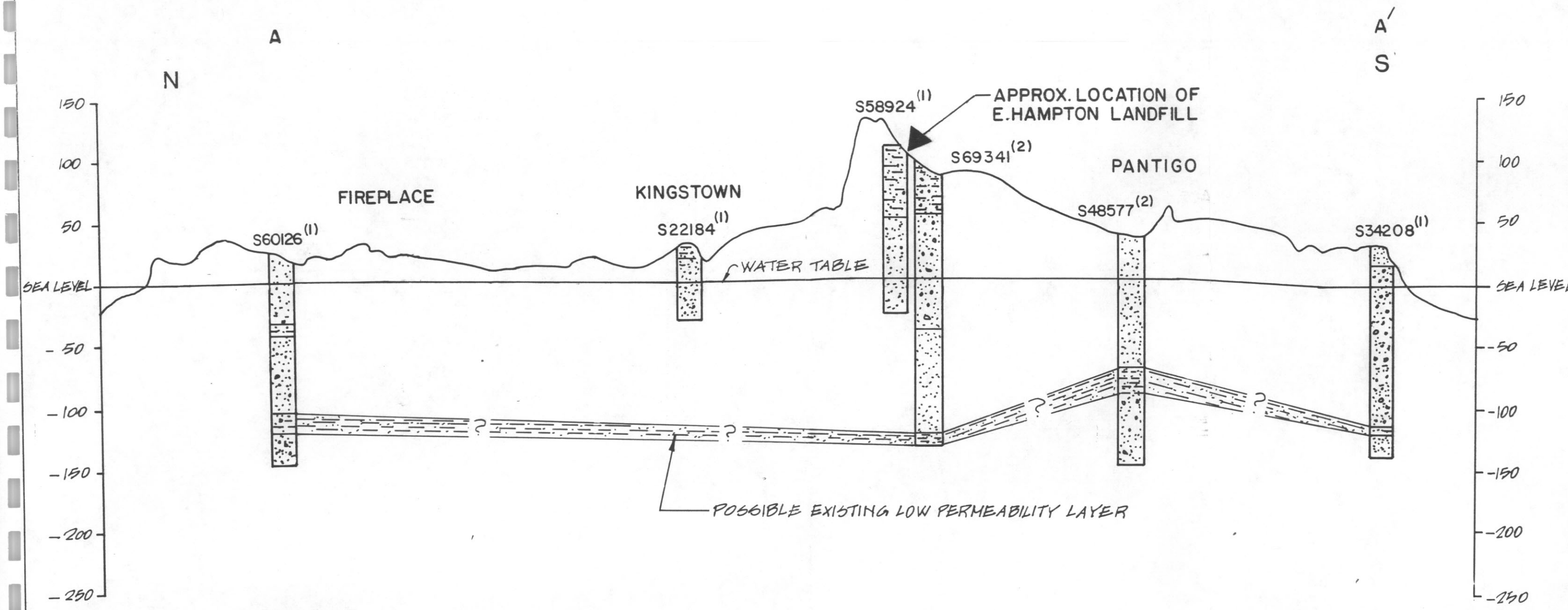
section of the South Fork across the landfill site (See Figures 2.3 for cross section and 2.4 for map locations of borings) show the possible presence of a clay layer at an approximate depth of 120 feet below mean sea level (MSL). This information is based on boring logs on record at the NYSDEC and USGS Paper 2073.

The landfill is located near the center of the Ronkonkoma Moraine, which runs along the length of the South Fork. Moraine and outwash deposits form most of the surficial deposits in the area. The Ronkonkoma Drift forms Moraine deposits that consist of sand and gravel with occasional lenses of clay. South of the Ronkonkoma Moraine are the outwash deposits which consist of stratified, fine to coarse sand with occasional gravel. To the north of the Ronkonkoma Moraine, outwash deposits of stratified sand and gravel exist in thickness from 20 to 80 feet. On Springs peninsula, the outwash overlies till deposits. Glaciofluvial kame deposits overlie the outwash deposits north of the Moraine. These kames consist of poorly sorted sand and gravel.

A boring log of a well in the vicinity of the site indicates that the Pleistocene glacial deposits are encountered at a depth of 239 feet below the NGVD. Since the surface elevation at the site ranges from 70 to 100 feet, this places the upper Glacial-Magothy interface at approximately 309-339 feet below grade.

Hydrogeology

The aquifers of the South Fork are the sole source of water for public supply, agriculture, and industry. Groundwater accumulates above the bedrock in the unconsolidated sediments of Pleistocene and Cretaceous Age. The Upper Glacial aquifer is the aquifer associated



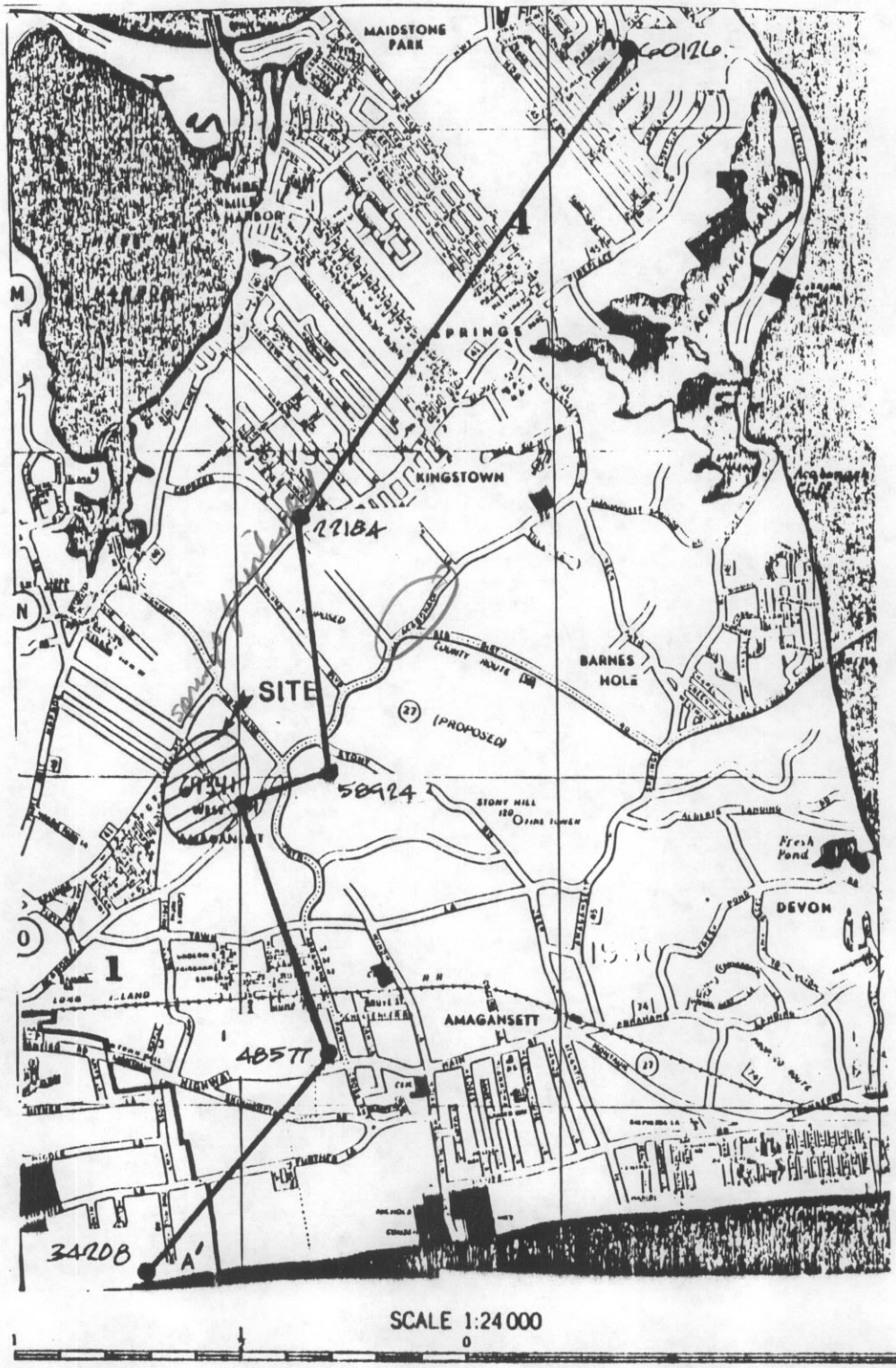
LEGEND:

- Sand and gravel
- Sand
- Sand, silt, and clay
- Clay

SOURCES: (1) FROM USGS, SCDHS, AND SCWA PAPER 2073
(2) FROM NYSDEC BORING LOG FILES

F,P&M

FIGURE 2.3-CROSS-SECTIONAL STRATIGRAPHY OF SOUTH FORK IN THE VICINITY OF SPRINGS-FIREPLACE RD. LANDFILL



LEGEND

● 34208 BORING LOCATION AND ID#
SEE FIGURE 2.3 FOR BORING LOGS.

F,P&M

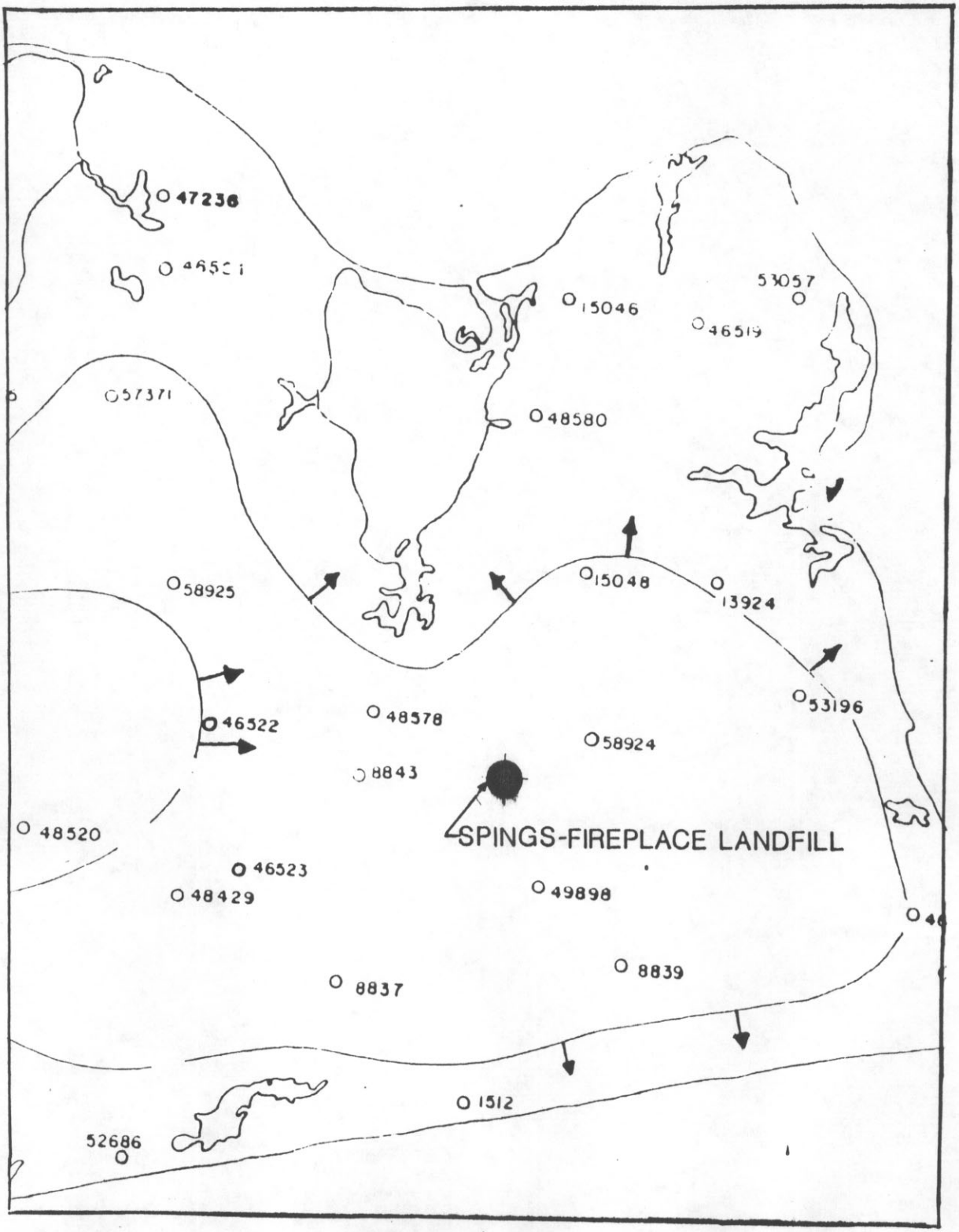
FIGURE 2.4 - MAP LOCATION OF BORINGS FROM A-A'

with Pleistocene deposits and the Magothy formation is associated with the Cretaceous Magothy formation deposits. The literature search found no evidence of the usage of the Lloyd Sand Member of the Raritan formation as a water supply due to its depth (approximately 700-800 feet below MSL). This aquifer is also confined by an overlying clay member. Because of the foregoing, the Upper Glacial and Magothy aquifers are the aquifers of concern.

Recharge of the Upper Glacial aquifer occurs mainly through precipitation. The average annual precipitation on the South Fork is 45 inches per year (average precipitation at Bridgehampton, NY from the National Weather Service) of which approximately half is lost to evapotranspiration and runoff with the remaining half infiltrating and recharging the aquifer. The Magothy aquifer is recharged by downward movement of water from the Upper Glacial aquifer.

The March, 1989 Water Table Contour Map (from the Suffolk County Department of Health Services) shows the water table to be between 5 and 10 feet above MSL (see Figure 2.5 for Water Table Contour Map). Water level measurements taken in January, 1984 report by A. Guerrera Associates (A. Guerrera Accabonac Landfill Report, April, 1984) within the landfill boundaries show groundwater elevations of 9.55 to 9.72 feet above MSL. It is estimated that the water table is approximately 65 to 90 feet below grade.

The depth to the fresh water-salt water interface, based on the theoretical Ghyben-Herzberg ratio of 40 feet of fresh water below every foot of water above sea level (approximately at 9.6 feet), is approximately 394 feet. However, this figure may be inaccurate if a clay layer or semi-continuous layer exists in the Upper Glacial unit



SCALE 1" = 1 MILE

LEGEND

⇨ GROUNDWATER FLOW DIRECTION

—5'— GROUNDWATER CONTOUR

FP&M

FIGURE 2.5- GROUNDWATER FLOW DIRECTIONS FROM THE 1988 SCDHS CONTOUR MAP

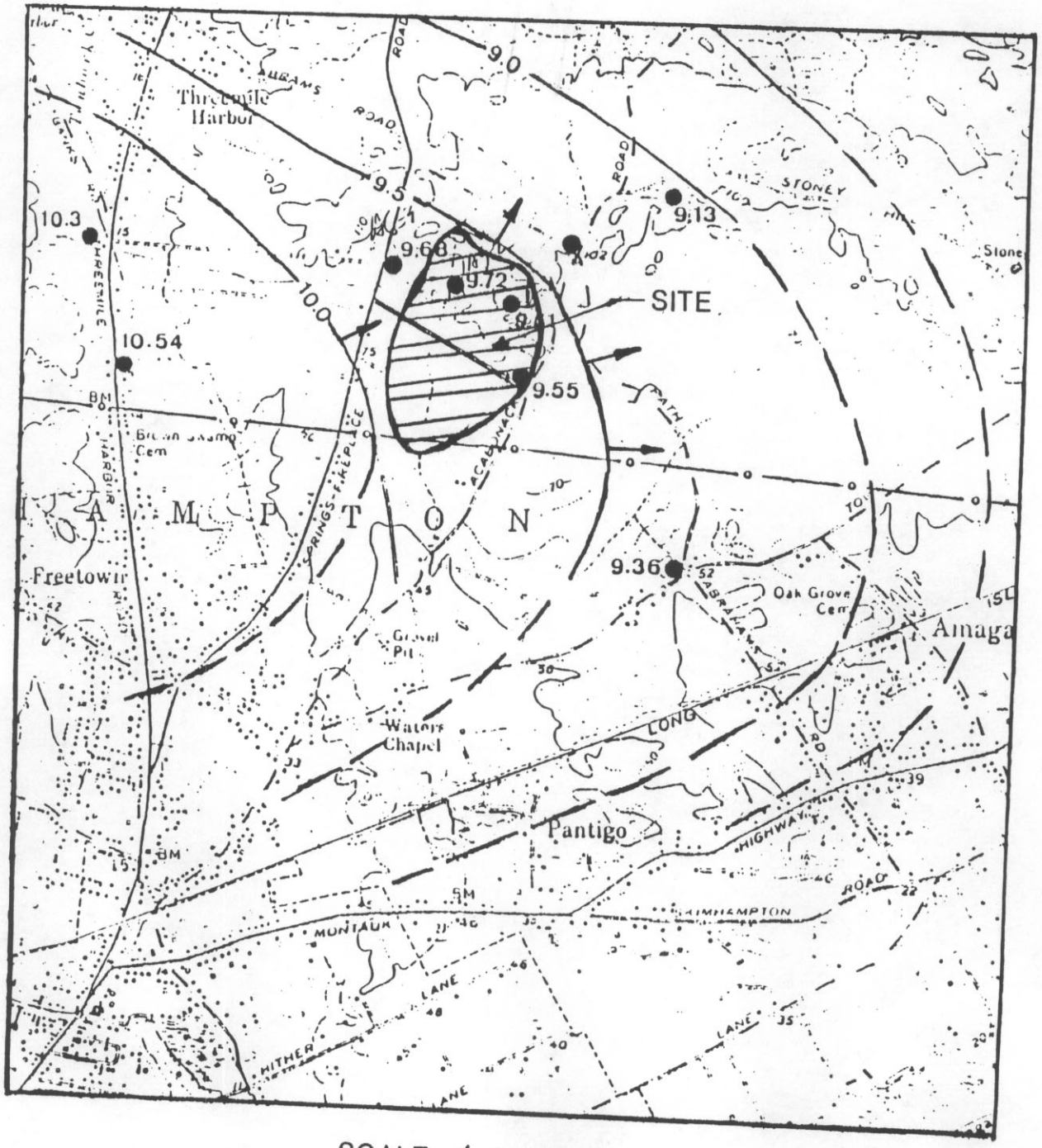
at an approximate elevation of -120 MSL as well borings indicate.

Due to the regional scope of the SCDHS groundwater contour map, the site specific groundwater flow direction in the vicinity of the landfill has not clearly been established. A paucity of wells in the immediate landfill area and the proximity to the groundwater divide have complicated this matter. A report by A. Guerrera Associates shows that 3 wells, installed in the northern section of the landfill, show a groundwater flow direction generally to the northeast (see Figure 2.6 for groundwater contour map by Guerrera Associates). The Guerrera report also hypothesized that the groundwater divide may be located to the immediate south of the landfill. The Suffolk County Department of Health Services contour map for 1989 indicates groundwater flow to the east. None of these studies have attempted to characterize the vertical groundwater migration.

The Springs-Fireplace Landfill, along with most of the Town of East Hampton, is located in Hydrogeologic Zone IV (from the Long Island 208 study by the Long Island Regional Planning Board). This area has been characterized by intensive agricultural activities which have resulted in nitrate-nitrogen concentrations in wells located in these agricultural areas. Residential areas still, for the most part, have good quality water.

2.5 **Past Studies on Groundwater Quality**

Based upon the laboratory analyses of the groundwater samples obtained from the four groundwater monitoring wells at the Springs-Fireplace Road Landfill, quality has shown a slight decrease with time (see Appendix A for Fanning, Phillips and Molnar's Hydrogeologic



LEGEND:

—9.5— GROUNDWATER CONTOUR

- - - - - INFERRED GROUNDWATER CONTOUR

→ GROUNDWATER FLOW DIRECTION

FP&M

FIGURE 2.6- GROUNDWATER FLOW DIRECTION FROM THE A. GUERRERA STUDY (1984)

Report for the Springs-Fireplace Road Landfill, November 1989).

In summary, based upon the laboratory results for 1984 for AG-1, no violations of the NYSDEC Class "GA" Groundwater Standards were noted. However, organic compounds were never tested for. This well no longer exists.

The file search and compilation of existing water quality data for well AG-2 has provided information for seven time periods, covering four years since 1984. Based upon the laboratory results, pH was detected outside of the NYSDEC GA Standards range 6 out of 7 times; iron exceeded the standards 2 out of 7; selenium exceeded the standards 1 out of 7; and phenol exceeded the standards 4 out of 7. The data indicated a high degree of variability indicating a variable waste stream or poor QA/QC during sampling, or at the laboratory during the four years of sampling. There were no data available for organic compounds.

The file search and compilation of existing water quality data for well AG-3 has provided information for three sampling periods in 1984. The laboratory analysis show manganese, pH, and phenol to violate NYSDEC standards. pH was outside the standard range 2 out of 3 times; manganese exceeded the standard 1 out of 3; and phenol exceeded the standard 2 out of 3 times. Organic compounds were not tested for. This well no longer exists.

The file search and compilation of existing water quality data for well GP-1 has provided information for twelve sampling rounds covering eight years (since 1980). Laboratory analysis for 12 sampling rounds did not include the same parameters each time. The laboratory analysis show iron to exceed NYSDEC groundwater standards 8

out of 12 samples and manganese 5 out of 12. Chloride was detected at high concentrations only once (in 1988) which exceeded NYSDEC standards and suggests a possible aberration. MBAS was detected at slightly high concentrations that exceeded the standards for forming agents in 1983 and 1984. Phenol exceeded the standards 7 out of 9 times. Arsenic and cadmium were also detected at high concentrations only once (in 1983), which exceeded NYSDEC standards. This well was the only well on the landfill that was tested and monitored for volatile organic compounds (VOCs). The data for VOCs shows an overall decrease in total VOCs with time. Groundwater samples from GP-1 that were obtained in 1981 indicate a concentration of benzene of 5 ppb which is the NYSDEC Standard. In 1988, benzene was detected at 22 ug/l which exceeded the standards. Other VOCs were detected above the state MCLs which include: Trichloroethylene in 1980 and 1981; tetrachlorethylene in 1980, 1981 and 1983; Vinyl Chloride in 1980; Dichlorobenzene in 1981, and 1,1,1 Trichloroethane in 1983.

For the data results of private wells and in the vicinity of the landfill, iron, manganese, and pH violations of "GA" Standards are found at levels which are common to Long Island, with the exception of sampling point "G" which, as discussed previously, was taken from well GP-1 within the landfill. GP-1, when compared to the other nine wells tested, had the lowest pH level and the highest concentrations of every parameter tested with the exception of chloride.

In general, the concentrations of detected chloride, iron, manganese, phenol, and the pH may be a result of the landfill. Iron and manganese normally occur at slightly high concentrations in the groundwaters of Long Island. However, concentrations of iron and

manganese were occasionally detected at concentrations significantly above background conditions. The sporadic chloride concentrations detected in GP-1 remain questionable and, therefore, eliminate any degree of confidence for interpretation. Phenol was detected in 7 out of 9 samples but the concentrations show a general decrease with time. In addition, organics that were detected in GP-1 show lack of consistency.

It should be pointed out that through the file search and data compilation, not enough information exists to perform data validation. No records of quality assurance/quality control were noted with regard to the sampling, data gathering, chain of custodies, sample holding times, filed blanks, trip blanks, duplicates, or spiked samples. Hence, the data can only be used on a preliminary basis to formulate hypotheses that must be tested within this plan.

As discussed previously, the groundwater flow direction beneath the site has not been clearly defined. Based upon the groundwater contour map constructed by the SCDHS, the land lies within the zone of the regional groundwater divide. Thus, groundwater may be moving radially away from the landfill in a north, south and easterly direction. The inconsistent well construction of the wells on the landfill do not allow for groundwater elevation correlation. Therefore, no site specific groundwater flow contour maps can be generated with accuracy.

In summary, no gross contamination has been indicated by the data in either on-site groundwater monitoring wells or surrounding private water supply wells. Furthermore, due to the inconsistency with the well construction, data collection, laboratory analysis and the lack

of chain of custody, there can be no accurate conclusions drawn from the interpretation of data at this facility.

2.6 Past Study of Septage Lagoons

In June of 1987, EA Science and Technology had completed a Phase I investigation report for the East Hampton Landfill site #152058. In that Phase I investigation, it was noted that there were septage pits on the site that had accepted septage waste from local haulers. Sludge from one of the sludge pits was sampled in 1982 and laboratory analysis indicated contamination by methylene chloride, toluene, and phenol.

In July of 1989, Fanning, Phillips and Molnar was contracted by the Town of East Hampton to ascertain the depth, content, and possible contamination of the two septage lagoons, located just west of Accobonac Road at the Springs Fireplace Road Landfill (see Appendix B for Fanning, Phillips and Molnar report on septage lagoons).

The Fanning, Phillips and Molnar investigation consisted of a preliminary site inspection to determine the dimensional characteristics of the lagoons and preparation of a photo log. This information as well previous work, was used to formulate a sampling plan. Laboratory analysis of the samples was performed to characterize the sludge in the lagoons. From the Fanning, Phillips and Molnar investigation and the sampling results, the following conclusions were drawn:

1. Both lagoons contain a sludge layer that is approximately 4.4' thick. Overlying the sludge was approximately 5.6' of water. The total volume of sludge in both lagoons was estimated to be 330,000 gallons with 414,000 of overlying water.

Was contamination bad enough to classified as hazardous waste??

2. The results from the sampling effort has shown that both lagoons contain similar chemical constituents. Both contain high concentrations of metals, volatile organic compounds and to a lesser extent semi-volatile organic compounds. No pesticides or PCBs were detected (see Appendix B and Tables 5.1 and 5.2).

3. Of the three chemical compounds detected in 1982 (by the SCDHS), only toluene was detected in the recent sampling. Methylene chloride and phenol were not detected.

Since it was concluded, from the sampling results, that high chemical concentrations exist within the sludge, the following recommendations were made:

The sludge does not present a significant risk through inhalation since it is covered by water which inhibits volitalization. Accidental dermal contact is minimal since the lagoons are relatively inaccessible and presently unused for sludge disposal. However, a pathway for ingestion does exist since it overlies an aquifer which has provided drinking water to the residents of the Town of East Hampton. It is therefore, recommended that 1) Two monitoring wells downgradient into the water table be installed and sampled for volatile organic compounds and metals; 2) the present water in the lagoons should be tested; 3) the overlying water should be removed from the present setting. The water, after testing, should be either treated at the adjacent septage treatment plant or disposed of on-site; 4) for the sludge in the lagoons, an engineering feasibility study should be prepared in order to select the most reliable and cost effective remedial alternative from those listed below:

- Remove sludge from the lagoons and place on an impervious pad in

the landfill.

- Remove the sludge from the lagoons, dewater in the scavenger waste treatment beds for the purpose of removal of volatile organics, and place dry sludge on the lined portion of the landfill.
- Have a licensed hauler cart the waste to an appropriate facility for incineration.



SECTION 3.0
THE HYDROGEOLOGIC INVESTIGATION WORK PLAN

In accordance with 6 NYCRR Part 360 - 2.11 and the Bureau of Hazardous Site Control (BHSC) Phase II requirements, this section will clearly define the methods that will be used in the hydrogeologic investigation.

3.1 Surficial Geologic Mapping

The site will be studied and a map generated to determine the characteristics and distribution of surficial deposits on and surrounding the site. The information that will be included on the map will be based upon hydrogeologic information obtained from reports, papers, publications, aerial photography and field inspection. A topographic map has been prepared by Louis K. McLean Associates in January-February 1990 and is presented in Plate 2.1 (which shows the site plan).

3.2 Water Well Survey

To investigate the ambient groundwater quality in the vicinity of the Springs-Fireplace Road Landfill, data was obtained from sampling efforts performed by Suffolk County Department of Health Services in 1980. Nine wells were sampled from private residents in the vicinity of the landfill. These samples are believed to have been extracted from private residences outdoor spigots. A tenth sample was taken from the landfill well GP-1. The data for these 10 wells is presented in Appendix A in the Fanning, Phillips and Molnar Hydrogeologic Report. The laboratory results show violations for pH in all 10 wells. Iron was found to exceed NYSDEC standards in 6 of the 10 wells sampled. Manganese exceeded the groundwater standards in 1 of the 10

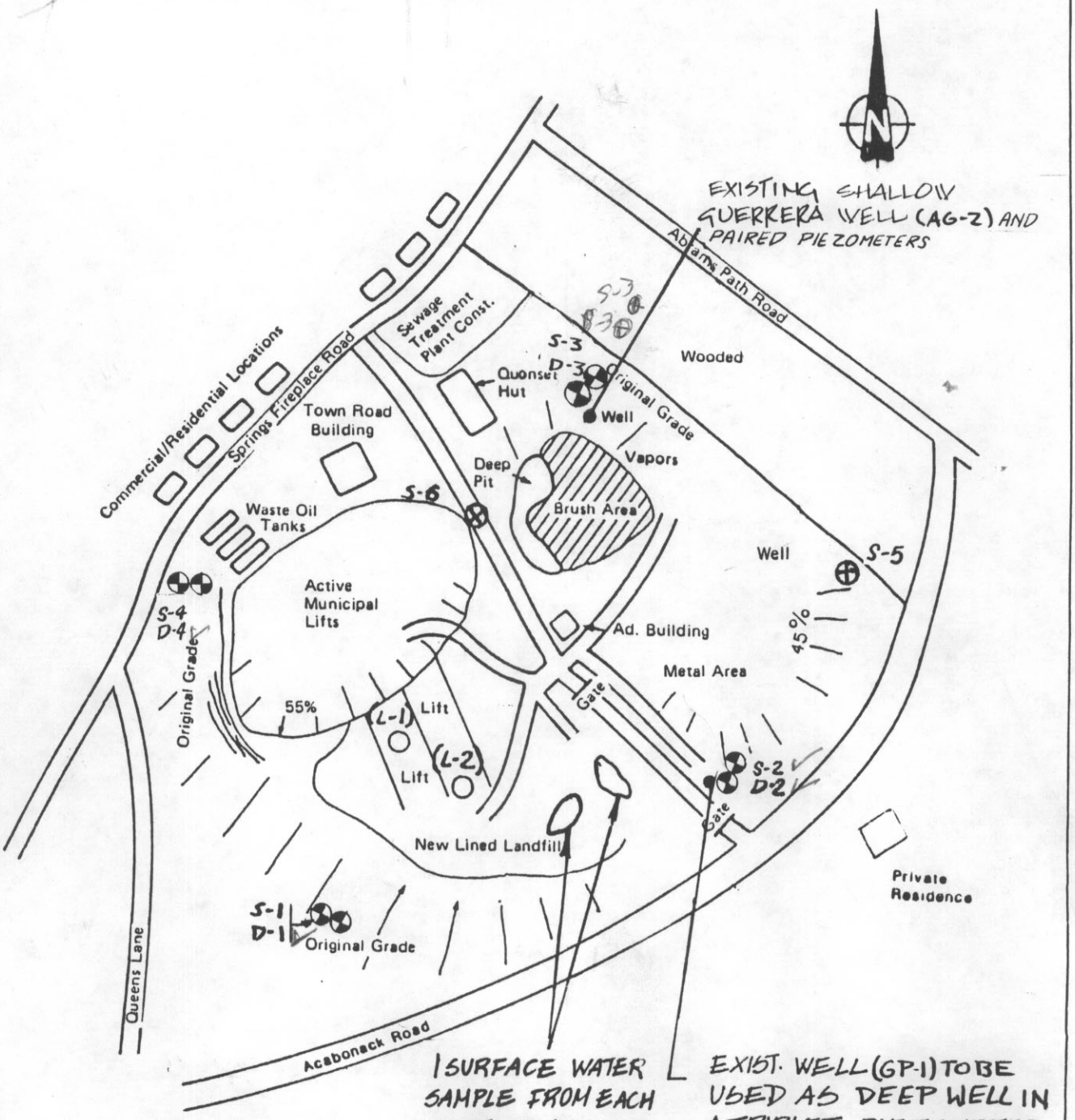
wells. Noteworthy for detected organic compounds was chloroform, which was detected in 5 of the 10 wells, the highest level was 3.6 micrograms per liter (ug/l). At the present time, there is a public water supply that has been provided for hook-up for the local residents surrounding the landfill. An updated well survey is not proposed in this investigation work plan.

3.3 **Leachate Collection Well Monitoring and Sampling**

There are 2 leachate collection wells (rings) located at the Springs-Fireplace Road Landfill (see Figure 3.1 for the location of the leachate rings). The 2 leachate rings were installed over what is reported to be a 2 acre lined area of the landfill. The lined area, installed in 1984, is reported to consist of two (2) 20 milliliter PVC liners, which were placed on virgin ground and covered with sand.

The western-most leachate collection well will be referred to as L-1 and the eastern-most collection well will be referred to as L-2 (as shown on Figure 3.1). Leachate collection well L-1 extends to a topographically higher elevation than leachate collection well L-2. Measurements of the depths of the leachate collection wells indicated that L-1 was 63.3 feet deep (measured from the top of the inner rim of the leachate collection well). This leachate collection well was determined to contain no leachate. Leachate collection well L-2 had a total depth of 41.1 feet. This well was measured to have 1.07 feet of leachate. Both leachate collection well locations are easily accessible and may be sampled (if leachate is present) with a bailer.

In accordance with the NYSDEC compliance schedule regarding leachate monitoring and control, the levels of leachate in the



H.T.S.

SOURCE OF BASE MAP:
EA SCIENCE AND TECHNOLOGY

NOTE: BASE MAP IS BEING REVISED. HENCE LOCATION OF MONITORING WELLS ARE APPROXIMATE

LEGEND

- ● EXISTING MONITORING WELL.
- ⊕⊕ (S-1/D-1) PROPOSED LOCATION OF PAIRED PIEZOMETERS
- ⊕ S-5 SHALLOW WELL ONLY
- ○ L-1 LEACHATE COLLECTION WELL

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FIGURE 3.1- LOCATIONS OF LEACHATE COLLECTION WELLS AND PROPOSED PIEZOMETERS

leachate collection wells should be monitored on a weekly basis and subsequently pumped out on a weekly basis, if possible. The leachate within the collection wells should be sampled semi-annually and tested for base-line parameters as will be discussed later in this section. Records should be maintained as to the leachate disposition at an approved sewage treatment facility. All leachate levels, quantities pumped out, and disposition of the leachate pumped will be reported to the NYSDEC on a quarterly basis and leachate analysis semi-annually.

Prior to sampling at each leachate collection well location, the depth to the leachate will be measured with a calibrated tape to the nearest 0.01 feet and recorded. The depth to the bottom of the concrete rings from the top will also be measured and recorded. To avoid contamination, the immersed portion of the tape or cable will be decontaminated before and after use. The leachate levels in each leachate collection well will be monitored on a weekly basis and recorded.

Since it has been determined by Fanning, Phillips and Molnar (during numerous site visits) that high levels of methane are present in the two leachate collection wells, it will be necessary to monitor the air in the sampler's breathing zone. The air will be monitored for methane concentrations (percent of LEL) and oxygen concentrations. If methane concentrations are found to be at or greater than 25% of the LEL, sampling should not take place. Also, if oxygen concentrations are found to be below 19.5 percent oxygen, this will be considered oxygen-deficient conditions and sampling should not take place.

The volatile organic vapor constituents other than methane should

be characterized by field gas chromatography. Until such time, it is recommended that level C personal protection equipment be employed by the person performing the sampling only after the explosive and oxygen deficient tests have been performed (see Table 3.1 for sample protective ensembles). This will include half-face respirators with organic vapor cartridges. Also, a plastic face shield should be employed to prevent facial contact with splashed leachate.

A decontaminated, dedicated bailer equipped with a check valve will be used to obtain the leachate sample (if leachate is present in the collection well). Prior to initial use, the bailer will be cleaned in accordance with the procedures described below:

a. Wash and scrub with potable water and alconox;

b. Potable water rinse;

c. Acetone rinse and air dried;

d. Distilled/deionized water rinse;

e. Air dry; and

f. Wrap in aluminum foil, shiny side out, if transported.

The bailer will then be lowered into the well carefully so as to minimize disturbance of the liquid surface, in an attempt to obtain the most representative sample of the leachate. A dedicated polypropylene rope will be used to slowly lower the bailer by hand with the excess rope left to lie on a tarp, or in a clean (decontaminated) container, placed next to the well.

The bailer will be handled with a **new** pair of disposable nitrite gloves (or chemically resistant equivalent). Prior to sampling, two bailers full of liquid will be removed for the purpose of acclimating the bailer. Leachate samples will be carefully and slowly transferred

TABLE 3.1
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.

from the bailer to the sample bottles to minimize the potential for aeration of the sample.

Each sample of leachate will be contained in laboratory prepared sample bottles and tested by a USEPA contract, NYSDEC Certified Laboratory for baseline parameters as indicated in Table 3.2. In addition to the sample analysis, a field blank will also be prepared by pouring distilled/deionized water over the cleaned, dedicated teflon hand bailer and recaptured in laboratory prepared sample bottles. The field blank should be tested for the same parameters as the samples. During sampling episodes that involve the sampling at more than one location (i.e., if leachate accumulates in L-1), then a trip blank should accompany the samples to the laboratory. The trip blank should be tested for volatile organic compounds only.

A number of laboratory prepared sample bottles will contain preservatives prior to use (see Table 3.3 for summary of sample requirements). Also, care must be taken to assure that the samples are submitted to the laboratory in a timely manner so as not to exceed the specified holding times (as shown in Table 3.3).

Sample bottles for the volatile organic compounds that will be analyzed must not contain any air bubbles. These sample bottles, after filling completely, should be turned upside-down to check for the presence of air bubbles.

Each bottle will be labeled with the following information:

a. Job name (Springs-Fireplace Road Landfill)

b. Sample location (L-1 or L-2)

c. Sample identification number or designation

d. Date

TABLE 3.2
PARAMETERS FOR LEACHATE ANALYSIS

Field Parameters	Leachate Indicators*	Metals
Static water level	Total Kjeldahl Nitrogen (TKN)	Potassium
Temperature	Ammonia	Sodium
Floaters or Sinkers[1]	Nitrate	Iron
	Chemical Oxygen Demand (COD)	Manganese
	Biochemical Oxygen Demand (BOD_5)	Magnesium
		Lead
Field Observations[2]	Total Organic Carbon (TOC)	Cadmium
	Total Dissolved Solids (TDS)	Aluminum
	Sulfate	Calcium
	Alkalinity	Toxic metals[3]
	Phenols	and cyanide
	Chloride	
	Total hardness as $CaCO_3$	
	Turbidity	
	Color	
	Boron	
	Volatile Organic Compounds[4]	

All samples will be unfiltered and will be tested by a NYSDEC CLP laboratory.

* Target compound list (TCL), Base Neutral/Acid extractables will be tested as per USEPA methods 625. Also TCL pesticides, herbicides and PCBs will be tested in accordance with NYSDEC CLP requirements.

1 Any floaters or sinkers found must be analyzed separately for baseline parameters.

2 Any unusual conditions (colors, odors, surface sheens, etc.) noticed during well development, purging, or sampling must be reported.

3 Toxic metals include: Antimony, Arsenic, Beryllium, Barium, Cadmium, Chromium (total), Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc.

4 Target compound list, volatile organics are to be analyzed using USEPA methods 624.

TABLE 3.3
SUMMARY OF SAMPLING REQUIREMENTS

Parameters	Lab Method	Detection Limit	Containerization	Preservation	Maximum Holding Time
pH	EPA 150.1	N/A(1)	P/G(2) 1 QT.cu.50 mls	4°C	immediate
EH	ASTMD 1498-76	N/A	P/G 1 Qt. cu. 50 mls	4°C	immediate
Total Kjeldahl Nitrogen (TKN)	EPA 351.3	0.2 ppm	P/G 1 Qt. Glass 100 mls	H_2SO_4	28 days/ 26 days(DEC)
Ammonia	EPA 350.1	0.02 ppm	P/G 1 QT. Cu. 50 mls	H_2SO_4	28 days/ 26 days(DEC)
Nitrate	EPA 353.2	0.1 ppm	P/G 1 QT. Cu. 50 mls	$H_2S_0 4$	28 days/ 26 days(DEC)
Chemical Oxygen Demand (COD)	SM 508C	15 ppm	P/G 1 QT. Cu. 50 mls	H_2SO_4	28 days/ 26 days(DEC)
Biochemical Oxygen Demand(BOD)	SM 507	2 ppm	P/G 1 Qt. Cu. (1QT.)	4°C	48 hrs/ 24 days(DEC)
Total Organic Carbon (TOC)	SM 505B	0.5 ppm	250 mg	H_2SO_4	28 days/ 26 days(DEC)
Total Dissolved Solids (TDS)	SM 209B	5 ppm	P/G 1 QT.Cu.100 mls	4°C	7 days/ 5 days(DEC)
Sulfate	SM 426C	5 ppm	P/G 1 QT.Cu.100 mls	4°C	28 days/ 26 days(DEC)
Alkalinity	SM 403	0.0 ppm	P/G 1 QT. Cu.100 mls	4°C	14 days/ 12 days(DEC)
Phenols	SM 510B	1.0 ppb	1 QT.	H_2SO_4	28 days/ 26 days(DEC)
Chloride	SM 407D	2.0 ppb	P/G 1 QT. Cu. 50 mls	4°C	28 days/ 26 days(DEC)
Total Hardness as $CaCO_3$	SM 314A	1.5 ppm	250 ml plastic	HNO_3	6 months
Turbidity	EPA 180.1	1.0 NTU	P/G 1 QT.Cu.100 mls	4°C	48 hrs/ 24 hrs(DEC)
Color	EPA 140.1	5 Cu.	P/G 1 QT.Cu.100 mls	4°C	48 hrs/ 24 hrs(DEC)
Boron	EPA 200.7	0.1 ppm	1000 mls plastic	HNO_3	6 months
Volatile Organic Compounds	EPA 624	5 ppb	(2)40 mls glass	4°C	7 days
Semi-Volatile Organic Compounds	EPA 625	10 ppb	1 liter Glass	4°C	Extract 5 days & analyze within 40 days
Pesticides	EPA 608	1.0 ppb	1 liter Glass	4°C	Extract 5 days & within 40 days days
PCBs (polychlorinated biphenols)	EPA 608	1.0 ppb	1 liter Glass	4°C	Extract 5 days & analyze within 40 days
Herbicides	NYSDOH 310.3	0.5 ppb	1 liter Glass	4°C	Extract within 5 days & analyze within 40 days
Potassium	EPA 200.7	0.2 ppm	1000 mls Plastic	HNO_3	6 months
Sodium	EPA 200.7	0.2 ppm	1000 mls Plastic	HNO_3	6 months
Iron	EPA 200.7	0.02 ppm	1000 mls Plastic	HNO_3	6 months
Manganese	EPA 200.7	0.02 ppm	1000 mls Plastic	HNO_3	6 months
Magnesium	EPA 200.7	0.02 ppm	1000 mls Plastic	HNO_3	6 months
Lead	EPA 239.2	5 ppb	1000 mls Plastic	HNO_3	6 months
Cadmium	EPA 200.7	5 ppb	1000 mls Plastic	HNO_3	6 months
Aluminum	EPA 200.7	0.2 ppm	1000 mls Plastic	HNO_3	6 months
Calcium	EPA 200.7	0.2 ppm	1000 mls Plastic	HNO_3	6 months
Antimony	EPA 200.7	60 ppb	1000 mls Plastic	HNO_3	6 months
Arsenic	EPA 206.2	10 ppb	1000 mls Plastic	HNO_3	6 months
Beryllium	EPA 200.7	5 ppb	1000 mls Plastic	HNO_3	6 months
Barium	EPA 200.7	0.2 ppm	1000 mls Plastic	HNO_3	6 months
Chromium	EPA 200.7	0.01 ppm	1000 mls Plastic	HNO_3	6 months
Copper	EPA 200.7	0.02 ppm	1000 mls Plastic	HNO_3	6 months
Mercury	EPA 245.1	0.2 ppb	1000 mls Plastic	HNO_3	26 days
Nickel	EPA 200.7	0.04 ppm	1000 mls Plastic	HNO_3	6 months
Selenium	EPA 270.2	5 ppb	1000 mls Plastic	HNO_3	6 months
Silver	EPA 200.7	10 ppb	1000 mls Plastic	HNO_3	6 months
Thallium	EPA 279.1	10 ppb	1000 mls Plastic	HNO_3	6 months
Zinc	EPA 200.7	0.02 ppm	1000 mls Plastic	HNO_3	6 months
Cyanide	EPA 335.2	0.01 ppm	P/G 1000 mls Plastic	NaOH pH<12	14 days

(1) N/A Indicate not applicable
(2) P/G Plastic or glass

e. Time

f. Type of laboratory analysis

g. Name of person collecting the sample

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

A chain of custody form will be recorded for the persons to whom the samples are transferred. Corrections are made by drawing a line through the error, initialing this deletion and then entering the correct information. The chain of custody form must include (and provide spaces for):

a. Project name (Springs-Fireplace Road Landfill)

b. The sampler's name

c. Date and time of sampling

d. Location at which the sample was taken

e. A description of the sample

f. Signatures of people involved in the chain of possession

g. Dates and times of transfer of possession of each person in the chain

h. Description of analyses requested

When the sample is not in someone's direct possession, it should be kept under lock and key.

The chain of custody form must accompany the samples to the laboratory. It should be placed in a zip-loc bag to keep it dry.

3.4 Monitoring Well Installation, Groundwater Sampling and Soil Sampling

All monitoring wells will be constructed to satisfy the monitoring well and piezometer specifications as outlined in 6 NYCRR Part 360 solid waste management facility, December 31, 1988 and the BHSC Phase II requirements (see Appendix C for NYSDEC well construction specifications for shallow groundwater monitoring wells). This site investigation has been devised to be executed in two stages, Stage 1 and Stage 2.

Stage 1 - Preliminary Hydrogeologic Exploration

1. **Groundwater Monitoring Wells**

There will be four (4) paired piezometers (8 wells) installed at the landfill situated in the arrangement (as shown in Figure 3.1) to augment the one (1) existing shallow Guerrera well and the Greenman-Pederson well. In addition, due to the concern for the septage lagoons and C and D cell at the landfill, 2 additional shallow wells are proposed to be installed (see Figure 3.1). The existing wells will be tested to confirm hydraulic connection to the aquifer. Figure 3.1 shows the site and locations of piezometers. Based on the information gained in Stage 1, additional wells may be placed on the site in order to further clarify and characterize any plume generated from this landfill. As Figure 3.1 shows, the four (4) paired piezometers are located in the northwest, northeast, south, and east sides of the landfill. These locations were selected based on the information obtained from the literature search which included studies on the regional and site specific hydrogeologic setting and recommendations by the NYSDEC. Each proposed paired piezometer will consist of one

shallow and one deep well. The paired piezometers on the east side, along Accabonac Road, will also incorporate a third well (GP-1). This previously existing well is screened from -119 to -124 feet MSL. The existing Guerrera well (AG-2) is screened at elevations from -10 to -17 MSL and will also be included in well cluster S-3/D-3.

The shallow wells will be installed via the hollow stem auger method to an estimated elevation of approximately 0 feet MSL. A 10 foot length of screen will be installed with 5 feet above the water table and 5 feet below the water table. Should the hollow stem auger method not be successful, an alternate drilling method will be proposed and employed upon NYSDEC approval (see Section 5.3 for Monitoring Well Installation Procedures).

The deep piezometers are proposed for the purpose of determining the pressure distribution and groundwater quality in the deeper portion of the aquifer beneath the landfill. The deep piezometers are intended to function for the compliance with 6 NYCRR Part 360-2.15 only. Based upon the results of the aquifer characterization and shallow well sampling in Stage 1, deep piezometers may be proposed (as needed) to comply with all requirements of the NYSDEC Bureau of Hazardous Site Control.

The deep wells will be installed via mud rotary method using pure bentonite to an elevation of approximately -100 feet MSL. Split spoon soil samples will be obtained from -80 feet MSL to -100 feet MSL in 5 foot intervals to determine the characteristics of the formation that is screened. Split spoon soil samples will also be obtained during the drilling prior to the depth of -100 MSL, as will be discussed in the latter part of this subsection.

In accordance with 360-2.11(a)(8)(ii)(h), it is hereby requested that a variance to 360-2.11(a)(8)(i)(g) be granted in that mud rotary drilling is proposed for the deep piezometer construction. Every effort will be made in order to minimize the amount of mud entering the borehole at -70 feet to -100 feet MSL. It is, therefore, anticipated that a reduced mud or water will be used during the drilling when within 10 feet of the screened interval of the deep piezometers. A 20 foot screen will be installed for the deep piezometers to provide more vertical coverage of the aquifer and intercept more groundwater flow lines. Drilling will, however, continue to a depth of -130 feet MSL with split spoon samples to be advanced in the borehole at 5 foot intervals when the drilling depth reaches -100 feet MSL. This is proposed for the purpose of determining the existence or absence of the suspected clay layer.

The function of the 4 paired piezometers, 2 shallow wells, and the existing 2 wells in Stage 1 are to:

1. Determine the hydraulic head at the top one-third and at the bottom one-third of the upper glacial aquifer in order to determine three dimensional pressure distribution and construct flow lines (see Figure 3.2 for schematic of Stage 1 piezometer network).
2. Delineate both vertical and aerial leachate distribution through groundwater sampling and laboratory analysis.

In addition, due to the locations of the proposed paired piezometers relative to the sewage treatment plant and active putrescible landfill cell, local groundwater mounding may be detected. Although local groundwater mounding may be evident in the shallow

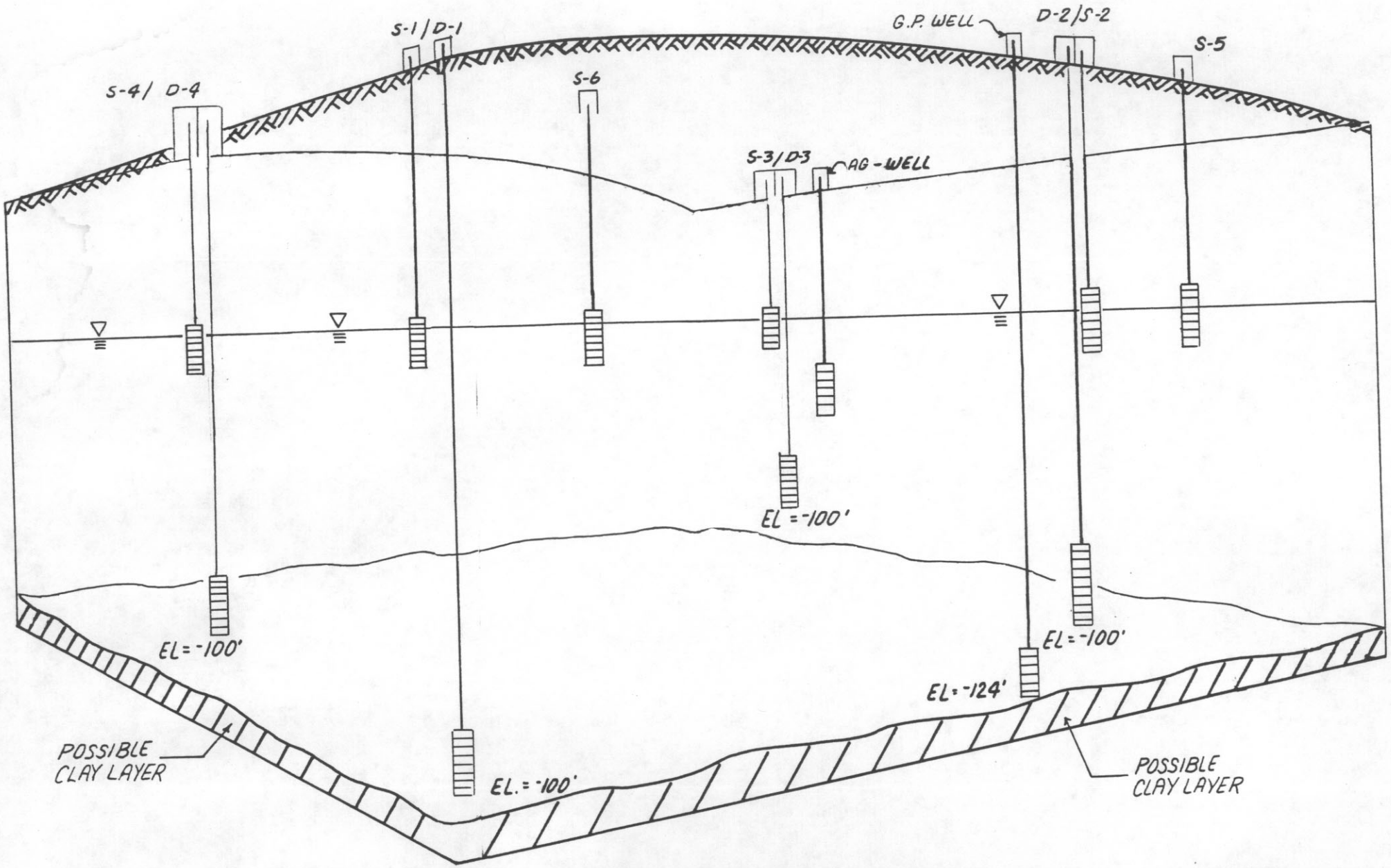


FIGURE 3.2-SCHEMATIC DRAWING OF POTENTIOMETRIC WELL NETWORK FOR STAGE 1
SPRINGS – FIREPLACE ROAD LANDFILL

FP&M

piezometers, it will not effect the deeper piezometers (-100 MSL). Thus, the deep piezometers will reflect the regional flow direction. In addition, the deep piezometers in comparison with the shallow will indicate vertical pressure gradients. Consistent vertical gradients in all wells will imply a regional vertically deep flow system. This information will be used to determine the positioning and depth of additional piezometers in Stage 2, if necessary.

2. **Soil Sampling**

During the installation of the shallow monitoring wells, split spoon soil samples will be obtained from each stratigraphic unit encountered and described by the project hydrogeologist using the Unified Soil Classification System (USCS). The USCS visual method will be supplemented by the USCS laboratory tests on 2 samples from each stratigraphic unit encountered.

During the installation of two (2) deep monitoring wells, soil samples will be obtained from each stratigraphic unit encountered and described by the Project Hydrogeologist using the USCS visual method. The USCS method will be supplemented by USCS laboratory tests in 2 soil samples from each unit.

3. **Groundwater Sampling**

A total of 12 groundwater samples will be initially collected from each of the 12 piezometers. These samples will include 7 shallow piezometers, 5 deep piezometers. All groundwater samples will be collected in accordance with the summary of the methodology and procedures for the sampling plan in Section 4.0 and the Quality Assurance/Quality Control procedures outlined in Section 5.0. All groundwater samples will be analyzed in accordance with NYSDEC CLP

protocol (see Table 3.2 for NYSDEC baseline parameters and Table 3.3 for summary of sample requirements).

All groundwater samples will be collected for a specific purpose. Table 3.4 shows the shallow wells have been placed at locations up and down gradient (anticipated up and down gradient) of areas of concern within the landfill. Namely, the putrescible mounds; septage lagoons; and C & D mounds. Also, the deep piezometers will function to determine the vertical and overall groundwater flow regime beneath the landfill for long term monitoring.

Field blanks will be prepared for each analytical parameter for every 20 samples analyzed for that parameter or 1 for each parameter sampled for each day in the field. Trip blanks will be present during sampling and will be included with each delivery to the laboratory. The field blanks will be analyzed for the same parameters as the groundwater samples, and the trip blanks will be analyzed for volatile organic compounds only. Duplicate, samples will also be submitted to a NYSDEC certified laboratory for analysis (see Section 5.0 for QA/QC).

4. **Aquifer Characterization**

During drilling of two shallow wells and two deep wells, a soil sample will be obtained from within the saturated zone by use of a standard split spoon and analyzed for hydraulic conductivity as per the Moretrench American Corporation method (see Appendix D). Measurements of water levels within all the wells will provide data that will be used to determine the onsite flow direction, gradient (horizontal and vertical) and the site specific groundwater flow velocity.

TABLE 3.4*
SUMMARY OF STAGE 1
PRELIMINARY HYDROGEOLOGIC EXPLORATION

WELL ID	ESTIMATED DEPTH OF WELL	PURPOSE OF SAMPLING
S-1	0'MSL	Upgradient of Landfill
S-2	0'MSL	Downgradient of Septage Lagoons
S-3	0'MSL	Downgradient of putrescible mound and brush area
S-4	0'MSL	Upgradient of Landfill
S-5	0'MSL	Downgradient of Septage Lagoons and C & D
S-6	0'MSL	Downgradient of putrescible and brush mounds
AG-2	-17'MSL	Downgradient of putrescible and brush (deeper zone)
D-1	-100'MSL	Deep water quality and pressure (upgradient of landfill)
D-2	-100'MSL	Deep water quality and pressure (downgradient of septage lagoons)
D-3	-100'MSL	Deep water quality and pressure (downgradient of putrescible and brush)
D-4	-100'MSL	Deep water quality and pressure (upgradient of landfill)
GP-1	-124'MSL	Deep water quality and pressure (down gradient of of septage lagoons)

*All proposed wells will be installed in accordance with acceptable methods as per NYSDEC 6 NYCRR 360. All shallow "S" wells will be installed in accordance with acceptable methods as per NYSDEC BHSC. Based upon the results of Stage 1, additional shallow and deep wells will be proposed and constructed in accordance with all applicable NYSDEC Requirements and Protocol.

A Bouwer-Rice slug test will be performed at 2 shallow and 2 deep well locations. The slug test will be performed on each piezometer to estimate the hydraulic conductivity of the aquifer system. This method will be applied because the piezometers will be partially penetrating and partially screened. This method requires the withdrawal of a volume of water from a well and measuring the subsequent rate of rise or recovery of the water level in the well.

Piezometric data will be compiled by measuring the depth to water, and the elevation will be determined based upon measurements from a designated measuring point at the top of the well. The designated measuring point will be surveyed for an elevation, which will be tied into a true datum point by a New York State Licensed Surveyor (tied into a bench mark). The piezometric and permeability data will be utilized to define adjective groundwater flow and contaminant transport pathways by comparing the head distribution of all the piezometers and the estimates of permeability from the soil sampling. Comparison of the heads measured from all the piezometers will determine gradients in both vertical and horizontal directions. Estimates of permeability and hydraulic conductivity values for high and low permeable layers will be performed using the Moretrench American Corporation method. The Bouwer and Rice slug test will be performed on 4 piezometers, 2 shallow and 2 deep.

The results of the hydraulic conductivities and the vertical and horizontal gradients will enable the construction of a flow net with subsequent groundwater flow velocity comparison between the horizontal and vertical direction. This information and the water quality data will be used to interpret the overall groundwater flow system.

Vertical hydraulic conductivity will be estimated to be one-tenth of the horizontal, which is characteristic of Long Island as per USGS publications. Furthermore, a pump test may be proposed if large variation in hydraulic conductivities are reported.

5. **Surface Water Sampling**

The proximity of the Springs-Fireplace Road Landfill to the two surface water bodies known as Three Mile Harbor and Tanbark Creek will not be investigated during the Stage 1 investigation because the direction of the plume is unknown. Therefore, it is recommended that sampling of surface water bodies be delayed until the results of Stage 1 have been completed. Surface water sampling procedures and analysis will then be proposed to the NYSDEC and implemented upon approval.

Surface water samples from the two (2) septage lagoons will however, be obtained and tested for the list of parameters as indicated in Table 3.2. The results of the laboratory analysis will be used to determine the means of disposal of this water (as discussed in the Fanning, Phillips and Molnar report in Appendix B).

Stage 2 - Supplemental Hydrogeologic Exploration

1. **Groundwater Monitoring Wells**

There may be a necessity for additional monitoring wells placed at locations to be determined from the results of Stage 1. The selection of the additional wells will be based on pressure gradients as determined from the paired piezometers, shallow wells, pre-existing wells, and water quality measurements of groundwater in the specific zone screened. For example, if the pressure gradient measurements indicate a strong vertical gradient downward with a minimal horizontal gradient, Stage 2 will recommend deeper wells based on calculated flow

paths. The concentrations detected, pressure distribution, and geologic information will be utilized to identify representative "window exits" from the landfill via the groundwater. Monitoring wells will be installed at these locations.

2. **Soil Sampling**

Soils will be sampled at changes in strata via use of a split spoon soil sampler during hollow stem auger and mud rotary drilling. Each of the soil samples will be described using the USCS visual method.

3. **Groundwater Sampling**

Groundwater samples will be obtained from all additional and exiting wells and tested for select parameters from Table 3.1. The procedures and QA/QC outlined in Sections 4.0 and 5.0 will be followed, respectively.

4. **Aquifer Characterization**

Results of water level measurement, soil sampling, and groundwater sampling will provide data for a more complete determination of the groundwater system beneath the landfill. However, in the event that contamination released from the landfill has been confirmed to have migrated off the site, it may necessitate sampling of the nearest receiving surface water body. This will be based upon groundwater flow directions, velocities, as well as chemical composition of the plume.

5. **Surface Water Sampling**

Surface water samples will only be obtained from either Three Mile Harbor or Tanbark or both based upon the Stage 1 results in that if Stage 1 determines the chemical composition of the contaminant

plume and the direction and flow velocity in which it is flowing.

SECTION 4.0
SUMMARY OF THE METHODOLOGY AND PROCEDURES FOR THE SAMPLING PLAN

This is a summary of the methodology and procedures for the groundwater monitoring well installation, soil sampling, and groundwater sampling. Section 5.0 will present Quality Assurance/Quality Control (QA/QC) procedures that will be implemented during this work plan.

4.1 Groundwater Monitoring Well Installation

Shallow groundwater monitoring wells will be installed to evaluate concentrations of the constituents of concern in the upgradient and downgradient groundwater. These wells will further define the geohydraulic regime of the site and serve as an indicator of site water quality in the upper glacial aquifer. The depth to the water table is anticipated to be between 65 to 90 feet or 5-10 feet MSL based on data presented in the literature search Section 2.0. The wells will be constructed to be hydraulically developed. Figure 3.1, as previously mentioned, indicates the proposed locations of the three (3) shallow groundwater monitoring wells. The wells will be installed in accordance with the QA/QC procedures outlined in this summary (Section 5.0) and in accordance with NYSDEC standard monitoring well specifications (Appendix C).

Deep groundwater monitoring wells will be installed at the same locations as the shallow monitoring wells to provide paired piezometers at the four (4) selected locations upgradient and downgradient of the site. The deeper wells are anticipated to be a minimum of 200 feet in depth or -100 feet MSL, which will provide a space between the shallow well screen and the deep well screen of

approximately 100 feet. This will allow for a comparison between the total head measurements between the shallow portion of the aquifer and the deeper portion of the aquifer.

4.2 Soil Sampling

Split spoon soil samples will be collected during well drilling on the site. All soil samples will be retained for geologic interpretation by the project hydrogeologist and described using the Unified Soil Classification System (USCS) visual method. In addition, two (2) representative soil samples of each strata will be USCS laboratory tested.

Natural gamma logs will be performed on each cased bore hole. and will be used to support the drilling log records. In addition, open hole resistivity will be performed on all borings in order determine possible perched water or leachate in the vadose zone and the groundwater system.

4.3 Groundwater Sampling

A total of twelve (12) groundwater samples will be initially collected from each of the twelve (12) piezometers. These samples will include seven (7) shallow piezometers and five (5) deep piezometers. All groundwater samples will be collected in accordance with the quality assurance/quality control procedures outlined in Section 5.0 and will be analyzed in accordance with NYSDEC CLP protocol (see Table 4.1 for NYSDEC baseline parameters).

Field blanks will be prepared for each analytical parameter for every 20 samples analyzed for that parameter or one for each parameter sampled for each day in the field. Trip blanks will be present during

TABLE 4.1
NYSDEC BASELINE PARAMETERS FOR
WATER QUALITY ANALYSIS

Field Parameters	Leachate Indicators*	Metals
Static water level (in wells and sumps)	Total Kjeldahl Nitrogen (TKN)	Potassium
Specific Conductance	Ammonia	Sodium
Temperature	Nitrate	Iron
Floaters or Sinkers[1]	Chemical Oxygen Demand (COD)	Manganese
	Biochemical Oxygen Demand (BOD_5)	Magnesium
pH		Lead
Eh	Total Organic Carbon (TOC)	Cadmium
Dissolved Oxygen[2]	Total Dissolved Solids (TDS)	Aluminum
Field Observations[3]	Sulfate	Calcium
	Alkalinity	Toxic metals[4] and cyanide
	Phenols	
	Chloride	
	Total hardness as $CaCO_3$	
	Turbidity	
	Color	
	Boron	
	Volatile Organic Compounds[5]	

All and groundwater samples will be unfiltered for total metals analysis will be tested by a NYSDEC CLP laboratory.

* Target compound list (TCL), Base Neutral/Acid extractables will be tested as per USEPA methods 625. Also TCL pesticides, herbicides and PCBs will be tested in accordance with NYSDEC CLP.

1 Any floaters or sinkers found must be analyzed separately for baseline parameters.

2 Surface water only.

3 Any unusual conditions (colors, odors, surface sheens, etc.) noticed during well development, purging, or sampling must be reported.

4 Toxic metals include: Antimony, Arsenic, Beryllium, Barium, Cadmium, Chromium (total), Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc.

5 Volatile organics are to be analyzed using EPA method 624.

sampling and will be included with each delivery to the laboratory. The field blanks will be analyzed for the same parameters as the groundwater samples and the trip blanks will be analyzed for VOCs only. Duplicate samples will also be prepared and submitted to a NYSDEC certified laboratory for analysis (see Section 5.0 for QA/QC).

all samples should go to a NYSDEC/DHWR approved lab

SECTION 5.0
QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) PROCEDURES

This portion of the summary will discuss the QA/QC Procedures to be used during field activities described in this sampling plan.

5.1 Sampling Methods

Sampling procedures, standards, and techniques will be in accordance with the New York State Department of Environmental Conservation guidelines and regulations. In situations not covered by these guidelines and regulations, the procedures will be designed to be appropriate for the sample type, location, and analysis to be performed.

5.2 Sampling Equipment Decontamination Procedures

All sampling equipment (i.e., split spoons, bailers, augers, drill rod, scoops and trowels) will be constructed of inert materials and will be decontaminated prior to use in the field. The sampling equipment will be decontaminated between samples and all augers and drill rods will be steam cleaned prior to use at a new sampling location. 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. ~~Distilled, deionized water rinse~~ Hexane wash OR Steam
4. Acetone rinse, and air dried
5. ~~Deionized~~ water rinse
6. Air dry
7. Wrap in aluminum foil (shiny side out), if transported

does not comply w oversight guidance

5.3 Groundwater Monitoring Well Installation Procedures

The shallow borings for the monitoring wells will be drilled with a hollow stem auger drill rig. The augers will be steamed cleaned between each well location to minimize the possibility of contaminants entering the bore hole. Each shallow 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 to approximately 2 feet above the ground or grade. All wells installed during this investigation will be completed and developed as will be described below (See Appendix C for NYSDEC well construction for overburden monitoring wells). Should the hollow stem auger method be unsuccessful, mud rotary will be employed.

Each deep piezometer will be drilled using a mud rotary drill rig. The use of mud will be halted at a depth within 10' of the screened interval. Each deep piezometer will be constructed using a 20 foot length of screen. An appropriate length of riser pipe will be attached to the screen and will extend to approximately 2 feet above the ground. 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 PVC. No solvent or glue will be used to assemble the well screen and riser casing.
Screen Slot Size:	0.010 - inch machine slotted.
Storage of Casing and Screen:	The PVC casing and screen lengths will not be stored on the ground. The well string will be assembled on racks or on a clean tarp spreading over level ground.
Cleaning of Casing and Screen:	Casing and screen will be steam cleaned before they are installed in the boring.

Bottom Cap:	A bottom cap will be installed below the well screen in all monitoring wells.
Decontamination:	All downhole equipment will be steam cleaned. The procedure will be repeated between drilling each well. The circulating system and water tank debris will be flushed with clean before prior to drilling. The rinse water will be collected and disposed of properly.
Sand Pack:	By weight, <2% percent of the sand pack material must pass a No. 200 sieve and have a uniformity coefficient of 2.5 or higher. Samples of sand pack material will be provided to Fanning, Phillips and Molnar by the Contractor. Certified detailed Specifications will be provided by the driller of all sand/gravel pack materials used.
Placement of the Sand Pack:	The sand pack will extend more than two feet above the top of the well screen and six inches below. This extension will be confirmed by measuring down the annular space with a weighted tape. The sand pack will be poured directly into the annular space.
Bentonite Seal:	At a minimum, a 3 foot bentonite seal will be placed in the annular space around the sand pack of each well by placing 1/4 inch diameter bentonite pellets into the annular space.
Grouting Annular Space:	A bentonite-cement grout will be 95% cement/5% bentonite mixture. The mixture will be pumped into the annular space to fill the space from top of the bentonite seal to the ground surface. The grout will be tremie-piped into the annular space. Care will be taken not to disrupt the bentonite seal.
Well Development:	~~Will be performed in~~ accordance with Part 360-2.11(b)(8)(iii). incorrect → a
Protective Casing:	~~A 5 foot-long section~~ of 6 inch I.D. steel casing will be placed over the 4 inch well casing, to protect the well. The casing will be set approximately 2 to 3 feet into the bentonite-cement grout in the annular

space, and will stick up above the ground surface, approximately 3 feet. 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 protective steel casing.

Surveying: A survey will be performed in which the elevation of top of the PVC well casing and the surrounding steel protective casing of each well will be determined to a 0.01 foot, and the reference point marked. The horizontal coordinates of each will be tied into the site map. In addition, all existing wells will be surveyed in the same manner.

Replacement of Well: All wells will be properly protected to ensure their integrity. If, in the opinion of the department, water quality or other data show that the integrity of a well is lost, the well will be replaced and sampled within a time period acceptable to the department, but not to exceed 120 days. After written notification by the department, the initial sample for the replacement well will be analyzed for base line parameters.

Abandonment of Wells: All soil borings that are not completed as monitoring wells or piezometers, and other abandoned wells 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.

Logs: Complete and accurate drilling logs will be provided to the department for all soil borings. These logs will provide detailed soil classification according to the Unified Soil Classification System (USCS). The USCS visual method will be used on all samples supplemented by the USGS laboratory tests on two (2) samples for each stratigraphic unit. Logs will also contain

a description of matrix and clasts, minerology, roundness, color, appearance, odor, and behavior of materials. A clear description will be included with the logs, as well as all pertinent information and other field observations.

Geophysical Testing: Down hole natural gamma logs will be recorded for each cased monitoring well. Down hole resistivity logs will be recorded on all open holes prior to casing.

5.4 Soil Sampling Procedures

1. Collection of split spoon soil samples will be performed using a clean standard split spoon, cleaned in accordance with Section 5.2. When retrieved, the sampler will be opened, and the soil will be placed into a jar using a clean, stainless steel scoop or trowel.

2. Each sample bottle will be labeled with the following information. This information will also be recorded in a bound sampling log book:
   A. Owner/Client
   B. Sample number or designation and location if possible
   C. Date
   D. Time
   E. Type of analysis to be performed (USCS, Sieve, Moretrench etc.)

5.5 Groundwater Sampling Procedures

1. Prior to groundwater sampling, the depth to the static water level in each well will be measured with a calibrated tape or cable 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 and the immersed portion of the tape or cable will be decontaminated in accordance with the procedures described in Section 5.2.

2. The laboratory-provided sample-bottle cooler (shuttle) will be inspected to ensure that all the required bottles are present and labeled.

3. Using a bailer, centrifugal, or positive displacement pump, the wells will be purged. During well purging, pH, temperature, and specific conductance will be monitored. Sample development will occur after all three characteristics have stabilized. Stability will be achieved when each parameter is within plus or minus 10 percent of the previous value. Should any well not stabilize, five volumes of the borehole will be removed. Sampling of the groundwater will then commence. A flow meter or a calibrated bucket will be used to estimate the pumping rate. Groundwater will be handled in accordance with applicable 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, the bailer will be cleaned in accordance with the procedures described in Section 5.2. All groundwater samples will be taken from bailer after it has been acclimated to the observation well by 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 5.2.

5. For each well sampled, a dedicated 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 designation

   C. Sample identification number or designation

   D. Date

   E. Time

   F. Type of laboratory analysis (i.e., Total Phenols, 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 5.2.

8. As a standard operating procedure, each groundwater sample will be analyzed for base line parameters by a NYS CLP Laboratory.

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

10. The chain-of-custody and recording procedures will be observed.

5.6 **Field Blanks, Trip Blanks, and Duplicate Samples**

Field blanks will be prepared for each analytical parameter for every 20 samples analyzed for that parameter or one for each parameter sampled for each day in the field. Trip blanks will be present during sampling and will be included with each delivery to the laboratory. The field blanks will be tested for the same parameters as groundwater samples, and the trip blanks will be tested for VOCs only.

A duplicate groundwater sample will be obtained from a monitoring well chosen at random. The duplicate sample will not be identified and will be tested for the same parameters as the other groundwater samples.

5.7 Groundwater Mapping Procedures

To ascertain the maximum information available from the monitoring wells, a groundwater contour map will be prepared for the water table aquifer and the potentiometric surface will also be mapped. Groundwater depths will be determined by the procedure presented in subsection 5.5. These data will be compared to analytical results for interpretation of potential source areas and/or contaminant migration influences.

SECTION 6.0
HEALTH AND SAFETY PLAN

The Springs-Fireplace Road Landfill is an active municipal landfill which is approximately 70-100 feet above sea level. The landfill accepts municipal refuse, sheet metal brush debris, and sludge. The sludge lagoons are suspected of having accepted hazardous waste in the past. The area surrounding the landfill is a sparsely populated residential area.

PURPOSE

The purpose of this Plan is to assign responsibilities, establish personnel protection standards and 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 of 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 Century Model 128 OVA/GC or PID (microTip) will be utilized to monitor the ambient air at the site and at the specific work area daily, prior to beginning work. At test bore hole, vapor well, and monitoring well installation, the location will be screened with the OVA (FID)/PID and will be continually monitored at grade level during drilling and will have head space analysis completed for each soil sample. The FID/PID will also be utilized to monitor the air at the worker's breathing level. FID/PID steady state readings above 5 parts per million will require upgrading safety equipment to Level C. A Combustible Gas Indicator (CGI) will be utilized to determine explosive potential in areas where very high (>1000 ppm) OVA readings are encountered. The wind direction will also be noted in the field during each day and recorded. A log of events and observations will be recorded daily in a field notebook.

SOP Personnel Protective Equipment

Level D personal protective equipment will be utilized by the drilling crew and site hydrogeologist during monitoring well installation, test boring, sampling and decontamination. This will include protective clothing, eye protection, hard hats and work boots. If steady state above 5 parts per million (ppm) readings are encountered with the OVA 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 FID/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 and New York State Department of Environmental Conservation personnel, 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 personnel 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.

In the event that the conditions on-site become unsafe for drilling activity, as determined by the field hydrogeologist and NYSDEC personnel, 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 for subsequent lab testing 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. A field telephone will be present and operable each day in the field. 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 Sampling

Air Monitoring Equipment	Monitoring Frequency* (in the Breathing Zone)
OVA/GC or PID	Monitor every 10 min/every sample retrieved.
CGI	Monitor it when total organic vapor >1000 ppb

* 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.

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 air concentrations exceed 50 ppm, evacuate the site.

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 EAST HAMPTON IS 516)

Fire Department	911
Police Department	911
Ambulance	324-0024
Poison Control Center	524-2323
Southampton Hospital	283-2600

Directions to hospital: Montauk Highway (west) to Old Town Road (left) to Meeting House Road (right): 240 Meeting House Road.
Approximate Distance -- 20 miles

Fanning, Phillips and Molnar 737-6200

CONTACT PERSONNEL AT FANNING, PHILLIPS AND MOLNAR

Kevin Phillips - Project Manager
Martin O. Klein - Project Hydrogeologist
Peter Dermody - Health and Safety Officer

SPRINGS-FIREPLACE ROAD LANDFILL FACILITY DIRECTOR

Stan Steckowski - 324-2199
Dave Paolilli - 324-2199

SECTION 7.0
HYDROGEOLOGIC SITE INVESTIGATION REPORT OUTLINE

Upon completion of the work outlined in this investigation plan, a draft hydrogeologic report will be prepared as outlined below.The draft report will be stamped by a professional engineer (NYS Licensed P.E.) and an appropriate number of copies will be distributed to the NYSDEC as required. Correction/comments will then be incorporated into a final report.

Section	Title
1.0	Objectives
2.0	Summary of Site History
3.0	Summary of Methodology and Procedures for the Investigation Plan
4.0	Contaminant Sources
4.1	Leachate Collection in Wells
4.2	Putrescibles
4.3	Septage Lagoons (water & sediment)
4.4	Construction and Demolition (C&D)
5.0	Hydrogeological Characteristics
5.1	Monitoring well locations and well logs.
5.2	Static water levels and top of well casing elevations, dated, and referenced to MSL.
5.3	Identification of site specific conditions of the unconsolidated materials. (This is to be accompanied by detailed boring logs, geophysical logs) and cross sections).

Section	Title
5.4	Regional setting including a discussion of the glacial geology and drainage basin characteristics.
5.5	Depth to groundwater, profiled and mapped in reference to mean sea level (MSL).
5.6	Aquifer characteristics*
	o Direction of flow, horizontal and vertical
	o Confined/unconfined potentiometric surfaces
	o Recharge/discharge (Information on flow velocity, permeability, specific yield, transmissivity and geometric/ geographic extent(s) will be provided)
6.0	Groundwater Sampling Results
6.1	Upgradient groundwater quality
6.2	Downgradient groundwater quality
7.0	Quality Assurance/ Quality Control (QA/QC)
8.0	Conclusions
9.0	Recommendations
9.1	Environmental Monitoring Plan (This section of the Hydrogeologic Site Investigation Report will be prepared for the purpose of compliance with Part 360, Section 2.11(c) and Phase II requirements as determined by the BHSC.
9.2	Hazardous ranking A score (HRS) and additional investigation, if warranted.

* Groundwater modeling, if any, shall be compatible with IBM-PC XT with a DOS of 2.1 and submitted with report.

APPENDIX A
FANNING, PHILLIPS AND MOLNAR
HYDROGEOLOGIC REPORT
FOR THE SPRINGS-FIREPLACE ROAD LANDFILL
NOVEMBER 1989

HYDROGEOLOGIC REPORT

FOR

THE SPRINGS-FIREPLACE ROAD LANDFILL

PREPARED FOR

THE TOWN OF EASTHAMPTON

NOVEMBER 1989

fanning, phillips & molnar
ENGINEERS
HUNTINGTON NEW YORK

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III	Summary	13
IV	Conclusions and Recommendations	17
Appendix A	Summary Table of Sampling Results	19

SECTION I
INTRODUCTION

The purpose of this report is to present and interpret the groundwater monitoring data for the Springs-Fireplace Road Landfill. Laboratory data from on-site and off-site wells were researched from files and reports. The Suffolk County Department of Health Services' files, New York State Department of Environmental Conservation's files, the A. Guerrera Associates Report (1984), and the Greenman-Pedersen data were reviewed and existing data compiled.

Through the review and interpretation of the data, it was the intent of Fanning, Phillips and Molnar to shed light on the existing hydrogeologic conditions at the Springs-Fireplace Road Landfill with regard to groundwater quality and flow. This report will present an interpretation of the existing groundwater quality monitoring data, will summarize that information, and will present conclusions and recommendations.

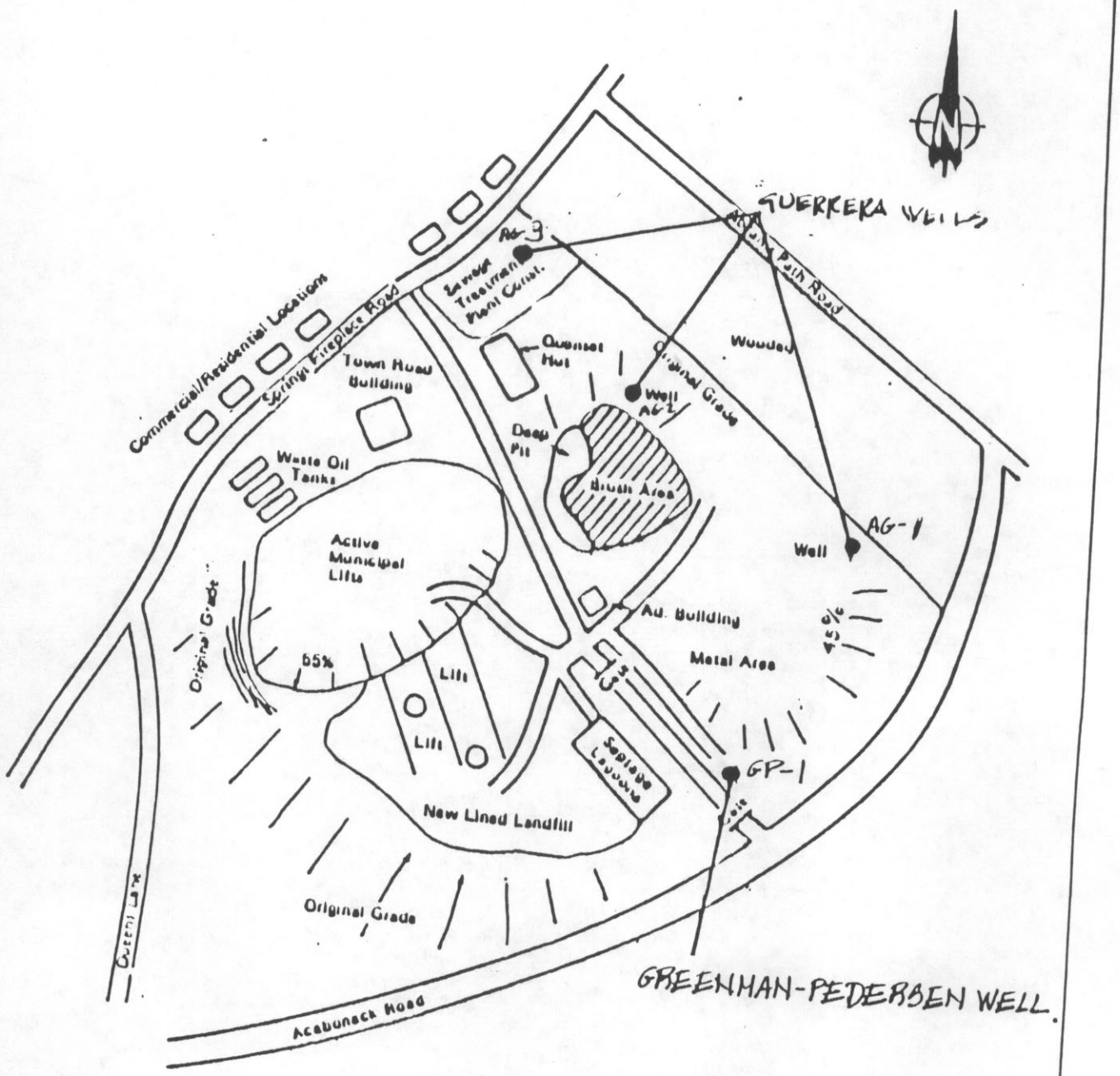
SECTION II
INTERPRETATION OF GROUNDWATER QUALITY MONITORING DATA

For the purpose of investigating groundwater quality within and in the vicinity of the Springs-Fireplace Road Landfill, groundwater analysis data was obtained for interpretation. Laboratory analysis results were obtained from the Suffolk County Department of Health Services (SCDHS) sampling data, A. Guerrera Associates Report (1984), and Greenman-Pedersen analysis data.

A total of four wells are known to have existed, or presently exist, at the landfill (see Figure 2.1 for well locations). One well was installed by Greenman-Pedersen & Associates in 1980 and is known as GP-1. This well extends to a depth of 204 feet below grade and has a 5-foot screen (screened interval is 199-204 feet). This well extends 126 feet into the water table. It is located near Accabonac Road.

The other three wells were installed in 1984 by A. Guerrera & Associates. These wells were installed generally along the northern border of the landfill and are known as AG-1, AG-2, and AG-3. These wells contain 7-foot screened intervals and extend to depths below the water table of 22-29 feet for AG-1, 15-22 feet for AG-2, and 8-15 feet for AG-3. It is not known why these screen depths are staggered or why they are 7 feet. Hydraulic gradient measurements by Guerrera in 1984 have indicated a groundwater flow direction of north-northeast. However, since these piezometers are at different depths in an aquifer that is close to a groundwater divide, such wells cannot be relied on for true groundwater directions.

Discussions with landfill supervisor David Paolelli have indicated that Guerrera wells AG-1 and AG-3 no longer exist. AG-3 was



N.T.S.

LEGEND

- AG-1 - LOCATION OF GUERRERA WELLS
- GP-1 - LOCATION OF GREENMAN - PEDERSON WELL

F,P&M

FIGURE 2.1 - LOCATIONS OF GUERRERA WELLS (PRESENTLY OR FORMERLY EXISTING) AT THE SPRINGS - FIREPLACE ROAD LANDFILL

destroyed when the sewage treatment plant was constructed in 1987. AG-1 was destroyed in a fire in 1988. Therefore, the two remaining wells are AG-2 and GP-1.

Groundwater analysis results for all four wells has been obtained. It is known that Greenman-Pedersen Associates sampled well GP-1 on one occasion in 1981 (inorganics and organics). The three Guerrera wells were sampled by Guerrera Associates on one occasion in 1984 (inorganics only). The SCDHS is known to have sampled all four wells on a number of occasions. Some confusion had existed concerning the SCDHS results since their well identification system was not consistent with the aforementioned numbering of the four wells. Such terms as "Quonsett Hut", "East Gate", "South Gate", "West Site", "Main Dump", and "Behind Brush Area" were used to identify well locations by the SCDHS. With the assistance of David Paolelli (the landfill supervisor), these descriptive terms were translated to their appropriate well numbers (AG-1, AG-2, AG-3, or GP-1) where identifications could be made. In instances where the descriptive well names could not be assigned to a well number, the data was discarded.

The analysis data from the four landfill wells was reviewed and summarized from all known sampling efforts. These summaries are contained in Tables 2.1 (AG-1), 2.2 (AG-2), 2.3 (AG-3), and 2.4 (GP-1). These summaries were constructed to present only violations of the NYSDEC Class "GA" groundwater standards and state maximum contaminant levels (MCLs) (see Appendix A for summary table of sampling results). Table 2.1 shows that at AG-1, no violations of "GA" Standards occurred. However, this well is known to have been

TABLE 2.1
SAMPLING SUMMARY OF
CLASS "GA" VIOLATIONS FOR INORGANICS (PLUS PHENOL)
WELL AG-1

Parameters	Date Sampled 1984
Inorganic Parameters (Mg/l)	
No inorganic parameters detected above NYSDEC "GA" Standards	

* Organic compounds were not tested.

TABLE 2.2
SAMPLING SUMMARY OF
CLASS "GA" VIOLATIONS FOR INORGANICS (PLUS PHENOL)
WELL AG-2
(ALL RESULTS IN MG/L)

Parameters	NYSDEC Class "GA" Standards	Dates Sampled						
		1984	4-30-84	9-26-84	3-27-85	6-29-87	10-5-87	6-6-88
Inorganic Parameters (mg/l)								
pH	6.5-8.5	5.6	6.41	5.7	--	5.2	4.9	5.60
Iron	0.3	0.40	0.64	--	--	--	--	--
Selenium	0.02	NT	--	--	--	0.03	--	--
Phenol	0.001	NT	0.1	--	--	8.46	0.04	0.92

-- Detected at levels within "GA" Standards.

TABLE 2.3
SAMPLING SUMMARY OF
CLASS "GA" VIOLATIONS FOR INORGANICS (PLUS PHENOL)
WELL AG-3

Parameters	NYSDEC Class "GA" Standards	Dates Sampled		
		1984	4-30-84	9-26-84
pH	6.5-8.5	6.2	--	6.1
Manganese	0.3	0.38	--	--
Phenol	0.001	--	0.1	0.05

-- Detected at levels within "GA" Standards.

TABLE 2.4
SAMPLING SUMMARY OF
CLASS "GA" VIOLATIONS FOR INORGANICS
AND ORGANICS FOR WELL GP-1
(ALL RESULTS IN MG/L)

Parameters	NYSDEC Class "GA" Standards	5-5-80	7-1-81	7-17-83	5-23-83	9-26-83	4-30-84	9-26-84	3-27-85	6-29-87	10-5-87	4-5-88	6-6-88
Inorganic Parameters (mg/l)													
pH	6.5-8.5	5.5	5.5	NT	--	6.04	--	--	--	6.1	5.5	--	6.46
Iron	0.3	5.6	1.45	NT	9.44	1.49	--	5.11	--	--	0.61	10.0	2.04
Manganese	0.3	0.5	0.71	NT	0.52	--	--	--	--	0.37	--	1.0	--
Phenol	0.001	NT	NT	0.06	--	0.01	0.2	--	0.1	6.0	0.14	NT	0.080
Detergents (Foaming Agents)	0.5	--	--	NT	0.76	--	0.77	--		--	--	NT	--
Chloride	250.0	--	--	NT	--	--	--	--	--	--	--	590.0	--
Cadmium	0.01	--	--	0.02	--	--	--	--	--	--	--	--	--
Arsenic	0.025	--	--	0.05	--	--	--	--	--	--	--	--	--
Organic Parameters (ug/l)													
Benzene	ND	--	5.0	--	NT	NT	NT	NT	NT	--	NT	22.0	NT
Trichloroethylene	5.0*	9.8	8.0	--	NT	NT	NT	NT	NT	--	NT	--	NT
1,1,1 Trichloroethane	5.0*	--	--	10.0	NT	NT	NT	NT	NT	--	NT	--	NT
Vinyl Chloride	2.0*	2.5	--	--	NT	NT	NT	NT	NT	--	NT	--	NT
Dichlorobenzene	5.0*	--	10.0	--	NT	NT	NT	NT	NT	--	NT	--	NT
Tetrachloroethylene	5.0*	59.2	43.0	23.7	NT	NT	NT	NT	NT	--	NT	--	NT

-- Detected at levels within "GA" Standards.
ND Not detectable levels.
* State Proposed MCL is listed as no GA Standards exist for the parameter.
NT Not Tested

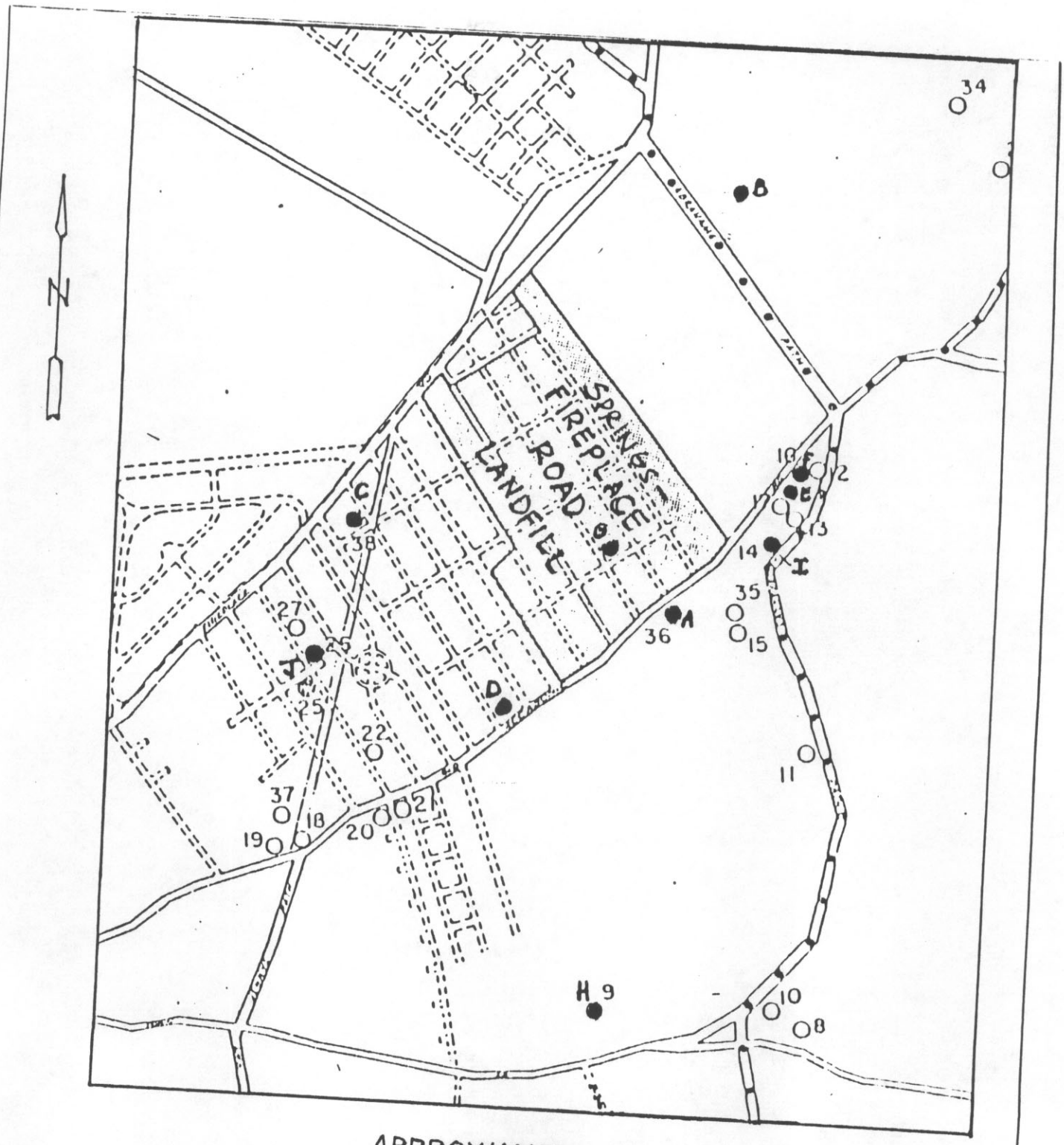
sampled only once and only for inorganic parameters. Well AG-2 has been sampled on seven occasions for inorganic parameters and pH, and six occasions for phenol. Iron, selenium, phenol and pH were found at AG-2 in violation of "GA" Standards. Well AG-3 was sampled three times for inorganics, pH and phenol. The NYSDEC "GA" Standards were violated for pH, manganese, and phenol at AG-3.

Well GP-1 was sampled at least 12 times. Inorganic results (plus pH and phenol) for GP-1 show violations for iron, pH, and manganese from the years 1980 to 1988. Iron concentrations as high as 10.0 mg/l were recorded. Chloride exceeded "GA" Standards once in the 12 sampling rounds (590 mg/l, 4-5-88). MBAS (detergents) was detected at concentrations that exceeded standards for foaming agents in 1983 and 1984. Phenol was found to violate the GA standard 7 times. Also, arsenic and cadmium were detected above "GA" Standards in 1981.

Organic parameters were tested on five out of the twelve rounds of sampling at GP-1. For organic parameters at GP-1, 12 different compounds have been detected since 1980. The July 1, 1981, sampling showed total organics concentrations of 124 ug/l (7 compounds). The July 17, 1983, sampling showed total organics concentrations of 60.86 ug/l. Benzene exceeded "GA" Standards on two occasions with levels as high as 22 ug/l. Other VOCs exceeded the state maximum contaminant levels such as: Trichloroethylene in 1980 and 1981; Tetrachloroethylene in 1980, 1981, and 1983; Vinyl Chloride in 1980; Dichlorobenzene in 1981; and 1,1,1 Trichloroethane in 1983.

To investigate ambient groundwater quality, data was obtained from a sampling effort performed by the SCDHS in 1980. Nine wells were sampled from private residence wells in the vicinity of the landfill. These samples are believed to have been extracted from the

private residences' outdoor spigots. A tenth sample was taken from the landfill well GP-1. These ten wells are labeled A through J and their locations can be found in Figure 2.2. Results of the sample analysis can be found in Table 2.5. Table 2.5 shows the results for inorganic parameters plus detected organic parameters. The results indicate violations for pH in all ten wells. Iron was found to exceed "GA" Standards in six of the ten wells sampled. Manganese exceeded "GA" Standards in one of the ten wells. Noteworthy for detected organic compounds was chloroform, which was detected in five of the ten wells at levels as high as 3.6 ug/l.



APPROXIMATE SCALE:
1" = .25 MILES

LEGEND

• A – PRIVATE WELL LOCATION

F,P&M

FIGURE 2.2 – LOCATION OF PRIVATE WELLS SAMPLED NEAR THE SPRINGS – FIREPLACE ROAD LANDFILL

TABLE 2.5
RESULTS OF SCDHS ANALYSIS OF
PRIVATE WELLS IN THE VICINITY OF THE
SPRINGS-FIREPLACE LANDFILL (MAY 5, 1980)

PARAMETER	WELL DESIGNATIONS(1) A	B	C	D	E	F	G	H	I	J	Applicable NYSDEC Class "GA" Standards (ppm)
Free Ammonia	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	
Nitrites & Nitrates	<0.4	<0.4	2.9	0.7	<0.4	<0.4	0.9	<0.4	<0.4	<0.4	10 (Nitrates)
MBAS	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5
pH	[6.1](4)	[6.4]	[6.0]	[6.2]	[6.3]	[6.3]	[5.5]	[6.0]	[6.3]	[5.8]	6.5-8.5
Specific Conductivity (umhos/cm)	56	86	195	90	105	88	205	64	77	46	
Chloride	10	13	36	11	21	16	22	15	14	8	250
Sulfates	<4	5	14	13	4	6.0	7	6.0	5	5	250
Iron	[2.4]	[0.67]	0.19	[0.75]	[0.54]	<0.1	[5.6]	0.11	[1.3]	<0.1	0.3
Manganese	<0.05	<0.05	0.24	<0.05	<0.05	<0.05	[0.5]	<0.05	0.05	<0.05	0.3
Copper	<0.1	<0.1	<0.1	<0.10	0.16	<0.1	<0.1	0.24	0.11	0.11	1.0
Zinc	1.8	1.6	2.6	2.4	0.7	1.7	<0.4	0.5	4.4	0.6	5.0
Sodium	7.7	9.0	26.2	9.1	14.9	11.5	19.3	10.8	4.1	6.8	
Total Hardness	32	40	32	32	64	28	60	NT	NT	NT	
Total Alkalinity	10	18	10	32	16	14	52	NT	NT	NT	
Arsenic	<0.02	<0.02	<0.02	<0.02	NT	<0.02	<0.02	NT	NT	NT	0.025
Selenium	<0.005	<0.005	<0.005	<0.005	NT	<0.005	<0.005	NT	NT	NT	0.02
Cadmium	<0.002	<0.002	<0.002	<0.002	NT	<0.002	<0.002	NT	NT	NT	0.01
Silver	<0.01	<0.01	<0.01	<0.01	NT	<0.01	<0.01	NT	NT	NT	0.05
Lead	<0.01	<0.01	<0.01	<0.01	NT	<0.01	<0.01	NT	NT	NT	0.025
Chromium	<0.01	<0.01	<0.01	<0.01	NT	<0.01	<0.01	NT	NT	NT	
Mercury	<0.2	NT	<0.2	NT	NT	NT	<0.2	NT	NT	NT	0.002
Methane	2	2	2	2	2	2	4600	NT	NT	NT	
Free CO_2	NT[2]	14.5	20.3	12.8	16.3	14.2	NT	NT	NT	NT	
Phenol	NT	NT	NT	NT	NT	NT	NT	<0.002	<0.002	<0.002	0.001
DETECTED VOLATILE ORGANICS (ppb)											
Chloroform	1.9	ND	ND	3.6	3.6	2.7	1.5	NT	NT	NT	100 ug/l
Vinyl Chloride	ND(3)	ND	ND	ND	ND	ND	[2.5]	NT	NT	NT	2 ug/l*
Trichloroethylene	ND	ND	ND	ND	ND	ND	[9.8]	NT	NT	NT	5 ug/l*
Tetrachloroethylene	ND	ND	ND	ND	ND	ND	[59.2]	NT	NT	NT	5 ug/l*

(1) See Figure 2.2 for Locations of Wells
(2) NT - Not Tested
(3) ND - Not Detected
(4) "Boxed" numbers indicate violation of "GA" Standards or MCL
* State MCL (no GA Standards exist for these parameters)

SECTION III

SUMMARY

Based upon the laboratory analyses of the groundwater samples obtained from the four groundwater monitoring wells at the Springs-Fireplace Road Landfill, quality has shown a slight decrease with time.

The file search and compilation of existing water quality data for well AG-1 has not provided adequate information for interpretation. Based upon the laboratory results for 1984, no violations of the NYSDEC Class "GA" Groundwater Standards were noted for this well. Organic compounds were never tested for. This well is no longer exists.

The file search and compilation of existing water quality data for well AG-2 has provided information for seven time periods, covering four years since 1984. Based upon the laboratory results, pH was detected outside of the NYSDEC GA Standards range 6 out of 7 times; Iron exceeded the standards 2 out of 7; selenium exceeded the standards 1 out of 7; and phenol exceeded the standards 4 out of 7. The data indicated a high degree of variability during the four years of sampling. There were no data available for organic compounds.

The file search and compilation of existing water quality data for well AG-3 has provided information for three sampling efforts in 1984. The laboratory analysis show manganese, pH, and phenol to violate NYSDEC standards. pH was outside the standard range 2 out of 3 times; manganese exceeded the standard 1 out of 3; and phenol exceeded the standard 2 out of 3 times. Organic compounds were not tested for. This well no longer exists.

The file search and compilation of existing water quality data for well GP-1 has provided information for twelve sampling rounds covering eight years (since 1980). Laboratory analysis for 12 sampling rounds did not include the same parameters each time. The laboratory analysis show iron to exceed NYSDEC groundwater standards 8 out of 12 samples and manganese 5 out of 12. Chloride was detected at high concentrations only once (in 1988) which exceeded NYSDEC standards and suggests a possible aberration. MBAS was detected at slightly high concentrations that exceeded the standards for forming agents in 1983 and 1984. Phenol exceeded the standards 7 out of 9 times. Arsenic and cadmium were also detected at high concentrations only once (in 1983), which exceeded NYSDEC standards. This well was the only well on the landfill that was tested and monitored for volatile organic compounds (VOCs). The data for VOCs shows an overall decrease in total VOCs with time. Groundwater samples from GP-1 that were obtained in 1981 indicate a high concentration of benzene (5 ppb) which exceeded the NYSDEC Standard. In 1988, benzene was detected at 22 ug/l which exceeded the standards. Other VOCs were detected above the state MCLs which include: Trichloroethylene in 1980 and 1981; tetrachlorethylene in 1980, 1981 and 1983; Vinyl Chloride in 1980; Dichlorobenzene in 1981, and 1,1,1 Trichloroethane in 1983.

For the data results of private wells and in the vicinity of the landfill, iron, manganese, and pH violations of "GA" Standards are found at levels which are common to Long Island, with the exception of sampling point "G" which, as discussed previously, was taken from well GP-1 within the landfill. GP-1, when compared to the other nine wells tested, had the lowest pH level and the highest concentrations of every parameter tested with the exception of chloride.

In general, the concentrations of detected chloride, iron, manganese, phenol, and the pH may be a result of the landfill. Iron and manganese normally occur at slightly high concentrations in the groundwaters of Long Island. However, concentrations of iron and manganese were occasionally detected at concentrations significantly above background conditions. The sporadic chloride concentrations detected in GP-1 remain questionable and, therefore, eliminate any degree of confidence for interpretation. Phenol was detected in 7 out of 9 samples but the concentrations show a general decrease with time. In addition, organics were not consistently detected in GP-1 and in fact show a decrease.

It should be pointed out that through the file search and data compilation, there were no records or indication of data validation. No records of quality assurance/quality control were noted with regard to the sampling, data gathering, chain of custodies, sample holding times, filed blanks, trip blanks, duplicates, or spiked samples.

The groundwater flow direction beneath the site has not been clearly defined. Based upon the groundwater contour map constructed by the USGS (Nemickas and Koszalka, 1975). The land lies within the zone of the regional groundwater divide. Thus, groundwater may be moving radially away from the landfill in a north, south and easterly direction. The inconsistent well construction of the wells on the landfill do not allow for groundwater elevation correlation. Therefore, no site specific groundwater flow contour maps can be generated with accuracy.

In summary, no gross contamination has been indicated by the data in either on-site groundwater monitoring wells or surrounding private water supply wells. Furthermore, due to the inconsistency with the well construction, data collection, laboratory analysis and the lack of chain of custody, there can be no accurate conclusions drawn from the interpretation of data at this facility.

SECTION IV
CONCLUSIONS AND RECOMMENDATIONS

Based upon the file search and compiled groundwater data for the Springs-Fireplace Road Landfill, the following conclusions and recommendations are made:

Conclusions

* No site specific groundwater flow data has been presented due to the inconsistent well construction measurement.
* Regional Data shows groundwater divide (USGS).
* The A. Guerrera wells (AG-1, AG-2 & AG-3) do not show any gross contamination in the shallow groundwater.
* There is no data for organics from the shallow wells (AG-1, AG-2 & AG-3).
* The deeper Greenman-Pedersen well (GP-1) was detected with slightly elevated concentrations of organics and inorganics.
* There are inconsistent lab results.
* There is no information to validate the laboratory data (QA/QC, Blanks, Chain of Custodies, etc.).

Recommendations

To define the groundwater flow direction and to determine water quality beneath the landfill the following recommendations are made:

* Locate and install three paired piezometers (one shallow and one deep) in the southern, southwest and northern portions of the site. Thus, one upgradient and two down gradient (according to the USGS, 1975). The shallow and deep piezometers will provide water quality data in these zones and will provide data for interpretation of the horizontal and vertical flow gradients. The data provided by these

piezometers will determine the placement of additional wells for the delineation of a plume, if it exists.

* Wells should be installed in accordance with NYSDEC Specifications.
* All wells should be tested for the same parameters on the same day.
* Data should be validated by following strict sampling procedures (approved by the NYSDEC) and QA/QC.

APPENDIX A

SUMMARY TABLE OF SAMPLING RESULTS (EXCLUDING VOLATILE ORGANICS)

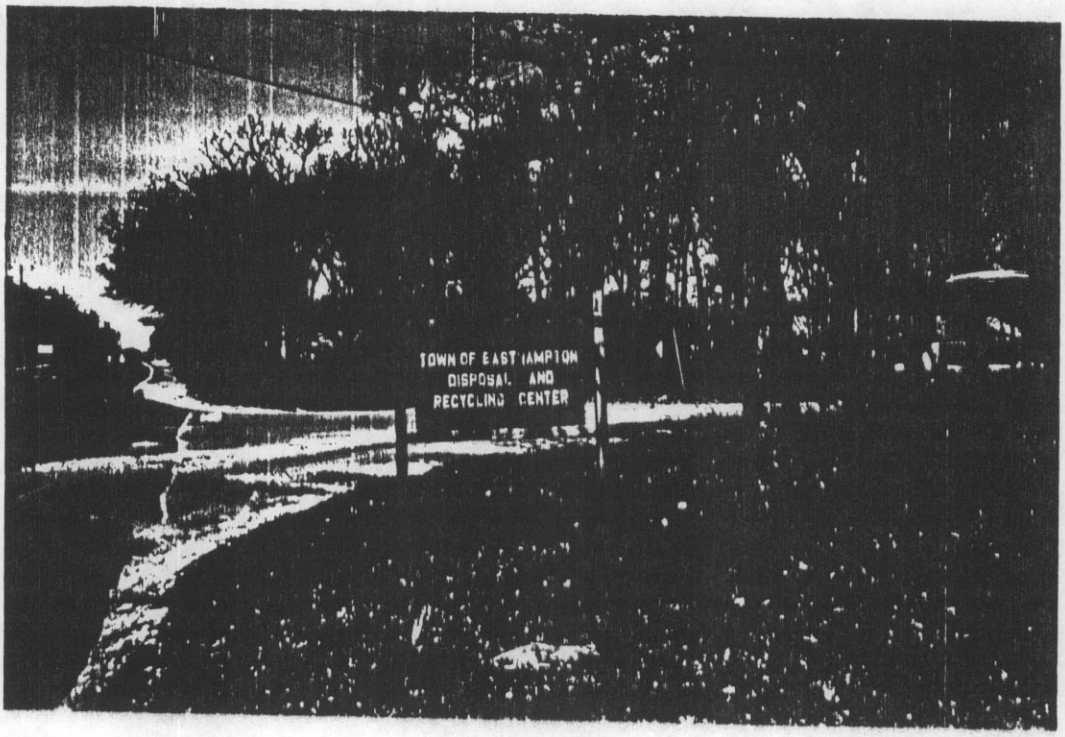
PARAMETERS	AG-2 1984	AG-2 4-30-84	AG-2 9-26-84	AG-2 3-27-85	AG-2 6-29-87	AG-2 10-5-87	AG-2 6-6-88	AG-3 1984	AG-3 4-30-84	AG-3 9-26-84	GP-1 7-1-81	GP-1 7-17-81	GP-1 5-23-83	GP-1 9-26-83	GP-1 4-3-84	GP-1 5-5-80	GP-1 9-26-84	GP-1 3-27-85	GP-1 6-29-87	GP-1 10-5-87	GP-1 4-5-88	GP-1 6-6-88	AG-1 1984
PH	5.6	6.41	5.7	6.7	5.2	4.5	5.60	6.2	6.7	6.1	5.5		6.75	5.04	7.29	5.5	6.7	7.1	6.1	5.5	7.6	6.46	5.5
CADMIUM	(2)	<0.01	<0.01	<0.01	0.01	0.01	<0.01		<0.01	<0.01	<0.002	0.02	<0.01	0.01	<0.01	<0.002	<0.01	<0.01	<0.01	<0.01	<0.001	<0.01	
CHROMIUM (total)		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	
COPPER		<0.05	0.05	<0.05	0.02	<0.01	0.01		<0.05	<0.05	<0.10	0.05	<0.05	0.06	<0.05	<0.1	<0.05	<0.01	<0.01	<0.01	<0.02	0.10	
IRON	0.40	0.64	<0.06	0.18	0.13	0.19	0.13	0.10	<0.06	<0.06	1.45		9.44	1.49	0.14	5.6	5.11	0.29	0.26	0.61	110	2.04	0.18
NICKEL		<0.01	<0.01	<0.01	<0.01	0.01	<0.01		0.02	<0.01		0.06	<0.01	.041	<0.01		<0.01	<0.01	0.01	0.01	0.01	0.01	
SILVER		<0.01	<0.01	<0.01	<0.01	<0.01	0.01		<0.01	<0.01		0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	
ZINC		<0.05	<0.05	<0.05	<0.01	0.04	0.05		<0.05	<0.05	<0.4	0.05	<0.05	<0.05	<0.05	<0.4	<0.05	<0.05	<0.01	<0.01	0.02	0.09	
LEAD		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	
SULFATE	10	3.0	14.0	13.0	11	26.6	9.784	5	2.0	<0.01	14.0		0.1	5.0	7.50	7	16.0	<0.01	3.0	6.85	93	2.254	<5
COLOR UNITS		5	5	0	<5	10	10		5	5			160		10		80	15	45	10		10	
PHENOL		<0.001	<0.001	<0.001	8.46	0.04	0.97		0.1	<0.01		0.06	<0.001	0.01	0.2		<0.001	0.1	6	0.14		0.940	
CHLORIDE	12	9.03	9.71	11.01	7.8	15	10.51	14	13.30	12.14	24		12.07	15.8	10.45	22	9.21	11.48	12.1	30	590	10.62	12
DETERGENT	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.10	<0.1	<0.01	<0.01	<0.1		0.76	0.39	0.77	<0.1	<0.01	<0.01	<0.01	<0.01		<0.10	<0.1
SPECIFIC GRAVITY		1.000	1.000	1.00	1.0	1.000	1.0		1.000	1.000			0.995	1.000	1.000		1.000	1.00	1.0	1.000		1.0	
TOTAL DISSOLVED SOLIDS		76.0	78.0	81.0	600	74	467		967.0	66.0			102.0	77.0	110.0		111.0	35.0	400	80	2800	40	
MANGANESE	0.12	0.01	0.01	0.02	0.01	0.01	0.07	0.38	0.02	0.01	0.71		0.52	0.12	0.29	0.5	0.22	0.27	0.37	0.05	1.0	0.30	0.30
SODIUM	8.0	17.3	20.10	15.0	7.67	7.72	0.08	9.0	17.3	24.20	19.1		50.2	9.46	15.9	19.3	20.40	17.9	7.54	7.78	520	5.93	9.3
ALUMINUM		<0.2	<0.2	<0.2	<0.01	0.01	<0.01		<0.2	<0.2			0.31	0.42	<0.2		<0.2	<0.2	<0.01	<0.01	0.62	1.51	
ACIDITY (mg/l $CaCO_3$)		10.0	168	4720	10	10	<10		10.0	48			10	20.0	10.0		24	3920	<10	<10		<10	
ALKALINITY (mg/l $CaCO_3$)	34	20.0	30	28.0	35	35.3	48.2	16	20.0	20			31	100.0	55.0	52	24	16	149	20.2	150	128.4	36
HARDNESS (mg/l $CaCO_3$)		74.0	36	24.0	39.6	9.09	60.8		28.0	20			96	92.0	70.0	60	20	24	19.8	22.4		147.2	
BARIUM		<0.2	<0.2	<0.2	0.02	0.04	0.02		<0.2	<0.2			0.23	0.06	<0.2		<0.2	<0.2	0.01	0.04	0.14	6.03	
CALCIUM	5.6	4.56	5.27	3.06	2.66	6.69	2.04	4.7	3.03	3.02			11.31	13.2	8.02		3.77	2.91	168	3.28	170	1.77	5.0
ARSENIC		<0.01	<0.01	<0.01	<0.01	<0.5	<0.01		<0.01	<0.01	<0.02	0.05	<0.01	0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.5	0.017	<0.01	
SELENIUM		<0.01	<0.01	<0.01	0.03	<0.5	<0.01		<0.01	<0.01	<0.005	0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.07	<0.5		<0.01	
BOD		6.57	-	6.0	6.0	5	<1.6		7.36	NT			1220	85.7	11.62			9.0	8	4		4.8	
MERCURY		<0.001	<0.001	<0.001	<0.001	<0.1	<0.001		<0.001	<0.001		0.002			<0.001	<0.02	<0.001	<0.001	<0.001	<0.1		<0.001	
TOTAL COLIFORM			<2 2 0/5	<2 2 0/5	<2 2	<1/100ml	<1/100ml			<2 2 0/5	<2 2		<2 2 0/5	<2 2 0/5			<2 2 0/5	<2 2 0/5	<2 2 0/5	<1/100ml	4/100ml	<1/100ml	
FREE AMMONIA	<0.05							<0.05			<0.04					<0.04					350		<0.05
NITRATES	<0.5							<0.5			0.5					0.9					<0.5		<0.5
SPECIFIC CONDUCTIVITY	120							90			220					205					6300		100
ANTIMONY												0.01									<0.010		
BERYLLIUM												0.05									<0.001		
COBALT																					<0.012		
MAGNESIUM	4.2							1.7													110		3.5
THALLIUM												0.01									<0.010		
VANADIUM																					<0.10		
PETROLEUM HYDROCARBONS																					<0.4		
TOTAL KJELDAHL NITROGEN																					375		
PHOSPHATE							<0.01															<0.01	
CYANIDE												0.01											
POTASSIUM	1.0							1.0													360		0.9
METHANE																4600							

(1) - Boxed results indicate violation of GA standards
(2) - Blank slot indicates that the parameter was not tested for

APPENDIX B
FANNING, PHILLIPS AND MOLNAR
SEPTAGE LAGOON SAMPLING AND ANALYSIS
JULY 1989

ACCABONAC ROAD LANDFILL
SEPTAGE LAGOON
SAMPLING REPORT

PREPARED FOR THE
TOWN OF EAST HAMPTON



JULY, 1989

fanning, phillips & molnar
ENGINEERS
NEW YORK

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SECTION I

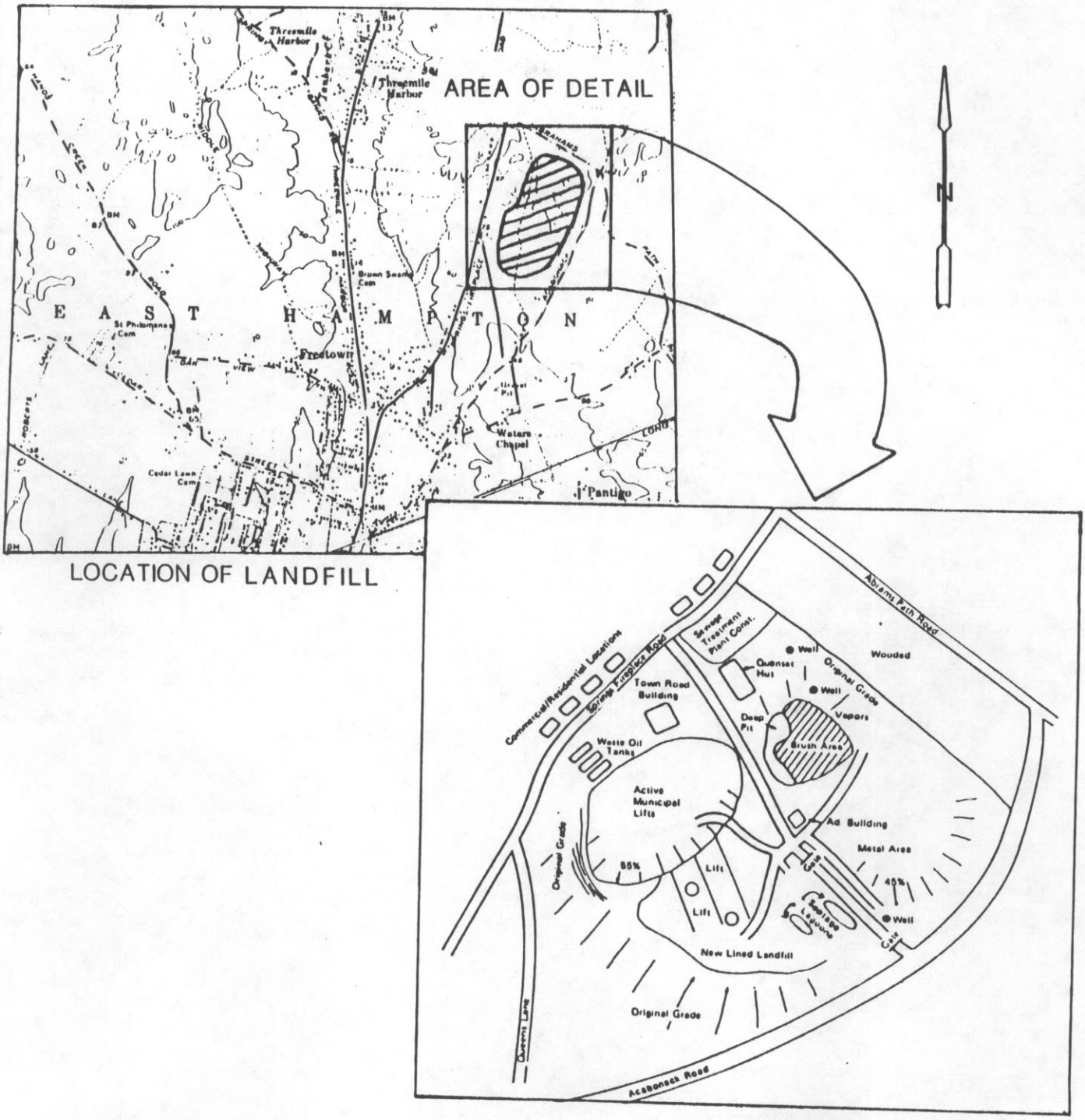
INTRODUCTION

Fanning, Phillips and Molnar was contracted by the Town of East Hampton to ascertain the depth, content, and possible contamination of the two septage lagoons located just west of Accabonac Road at the Accabonac Road Landfill (See Figure 1.1).

The lagoons may have, in the past, unknowingly received hazardous substances in the form of sludge. In March, 1982, the Suffolk County Department of Health Services sampled the upper surface of the sludge and performed priority pollutant analysis on the samples. The results showed concentrations of methylene chloride (42,000 ug/l), phenol (39 ug/l), and toluene (250 ug/l).

For this investigation, a preliminary site inspection was performed to determine the dimensional characteristics of the lagoons and prepare a photo log. This information, as well as previous work, was used to formulate a sampling plan. Laboratory analysis of the samples was performed to characterize the sludge.

Finally, using all data gathered, conclusions are drawn and recommendations presented.



LANDFILL SITE SKETCH

N.T.S.

SOURCE: LOCATION MAP - U.S.G.S.
SITE SKETCH - EA SCIENCE & TECHNOLOGY.

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FIGURE 1.1 ACCABONAC LANDFILL SITE PLAN

SECTION II

SITE INSPECTION

A site inspection was performed to ascertain the dimensional characteristics of the lagoons, compile a photo log (See Section III for photo log), and devise a sampling plan.

Upon arrival at the Accabonac Road Landfill, David Paolilli, Landfill Supervisor, was contacted. Mr. Paolilli confirmed that septage dumping had ceased in 1987 and the septage is now being handled by the newly constructed scavenger waste treatment facility adjacent to the landfill.

The sludge in each lagoon accumulates rain water to a depth of several feet. There are two lagoons; one has been labeled north and the other south.

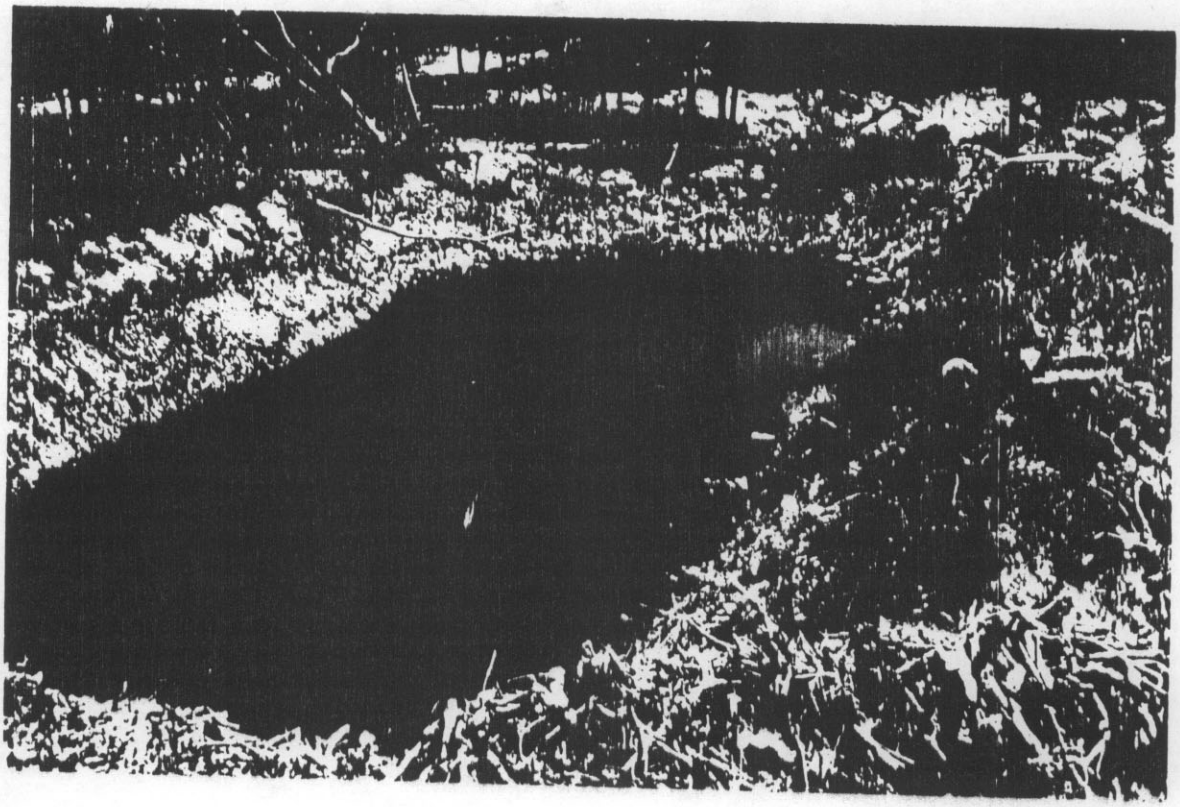
Measurements were taken (which will be presented in Section IV) to estimate the surface area of the water overlying the sludge. The walls of both lagoons were estimated to slope at 45°. In the north lagoon, a wood chip pile lies on the west wall of the lagoon.

The difficulty in extracting a sample from compacted sludge overlain by water caused several aborted sampling plans. Finally, an auger was utilized to extract samples while the boat was stabilized by anchoring it to each shore. The auger was rotated downward into the sludge and samples were removed at approximately one foot above the maximum depth of the sludge.

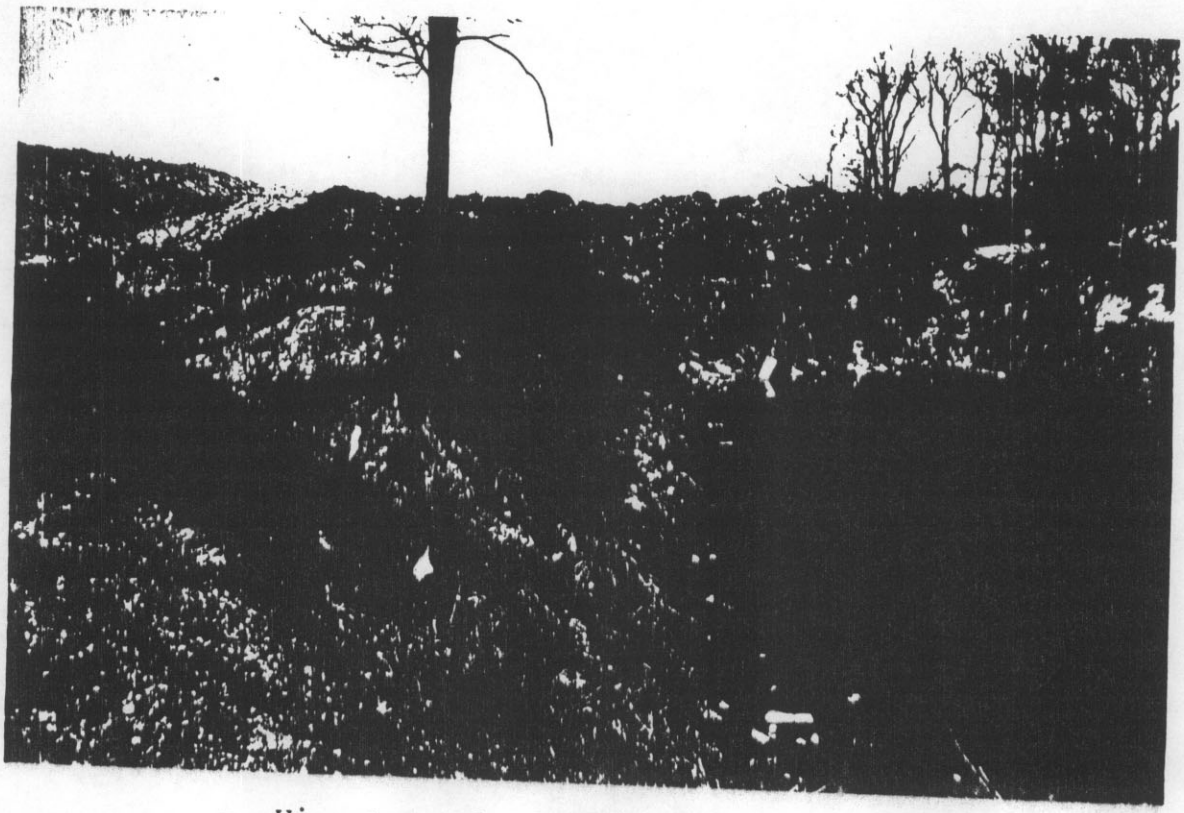
SECTION III

PHOTO LOG

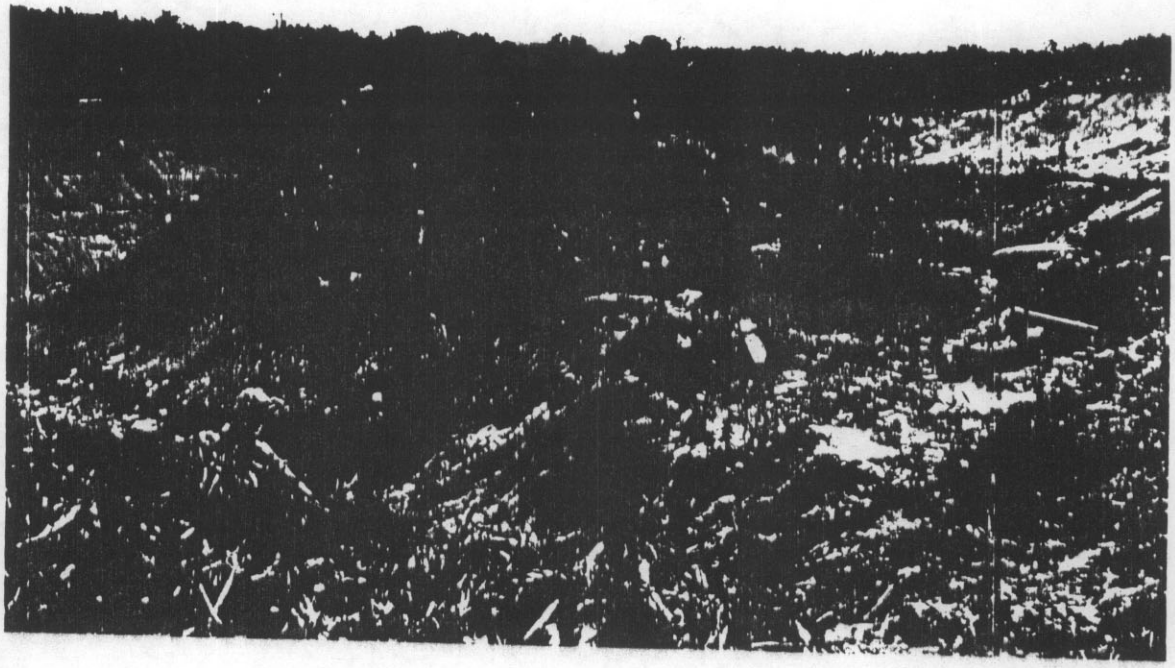
Photographs were taken to record physical conditions during the site inspection. Explanations are provided by captions.



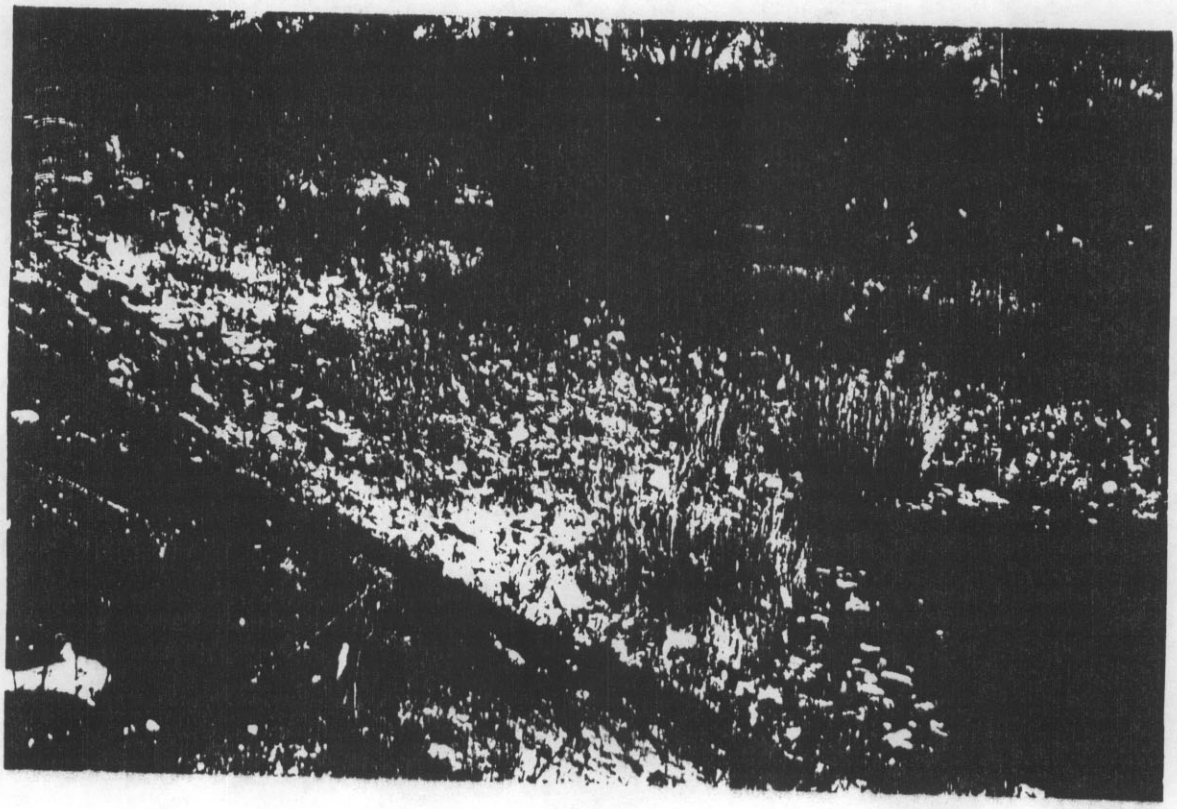
- View towards east of the north lagoon.



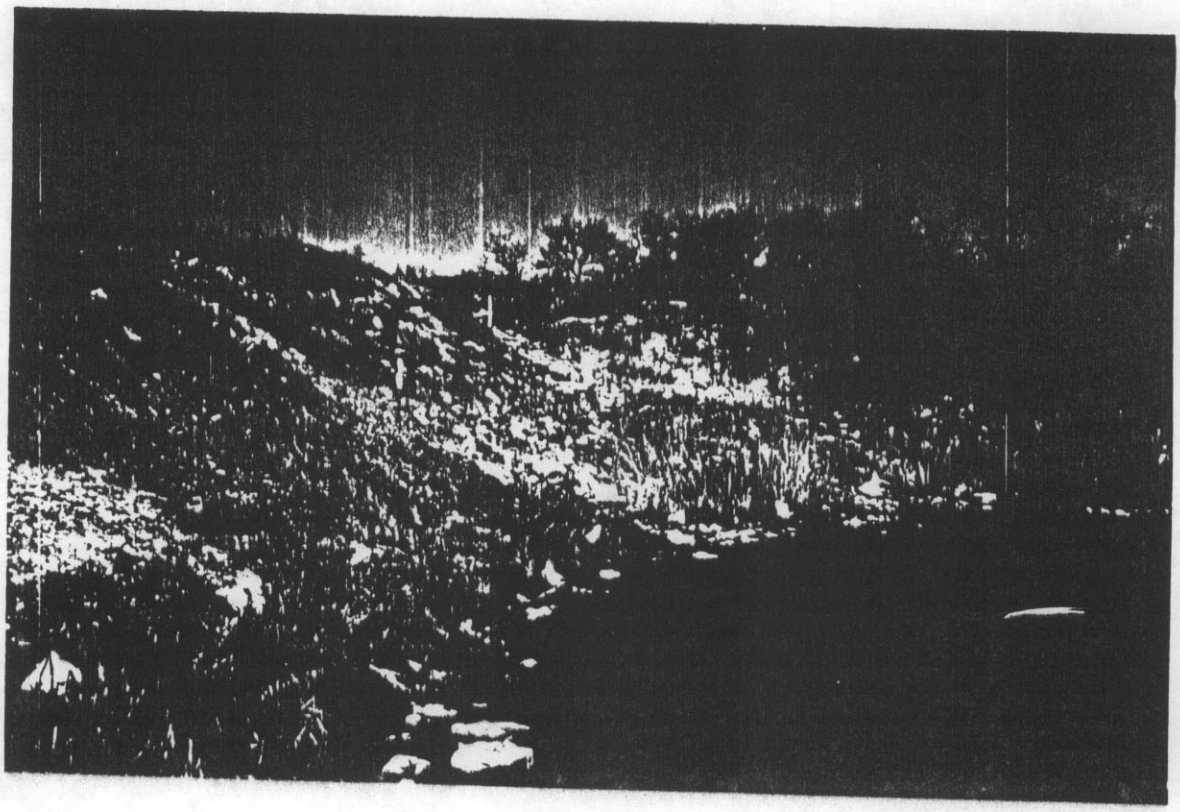
- View towards west of the north lagoons. Note the wood chip pile at the west end of the lagoon.



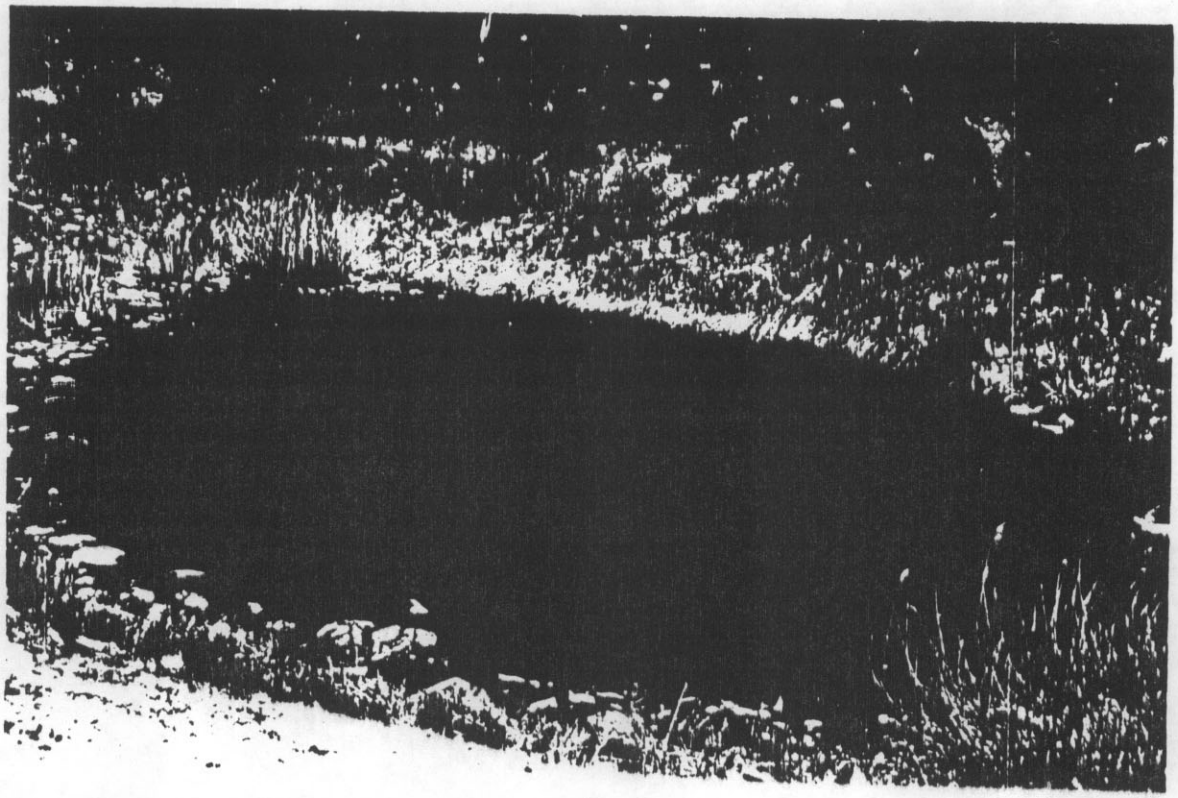
South lagoon as seen from atop the wood chip pile.



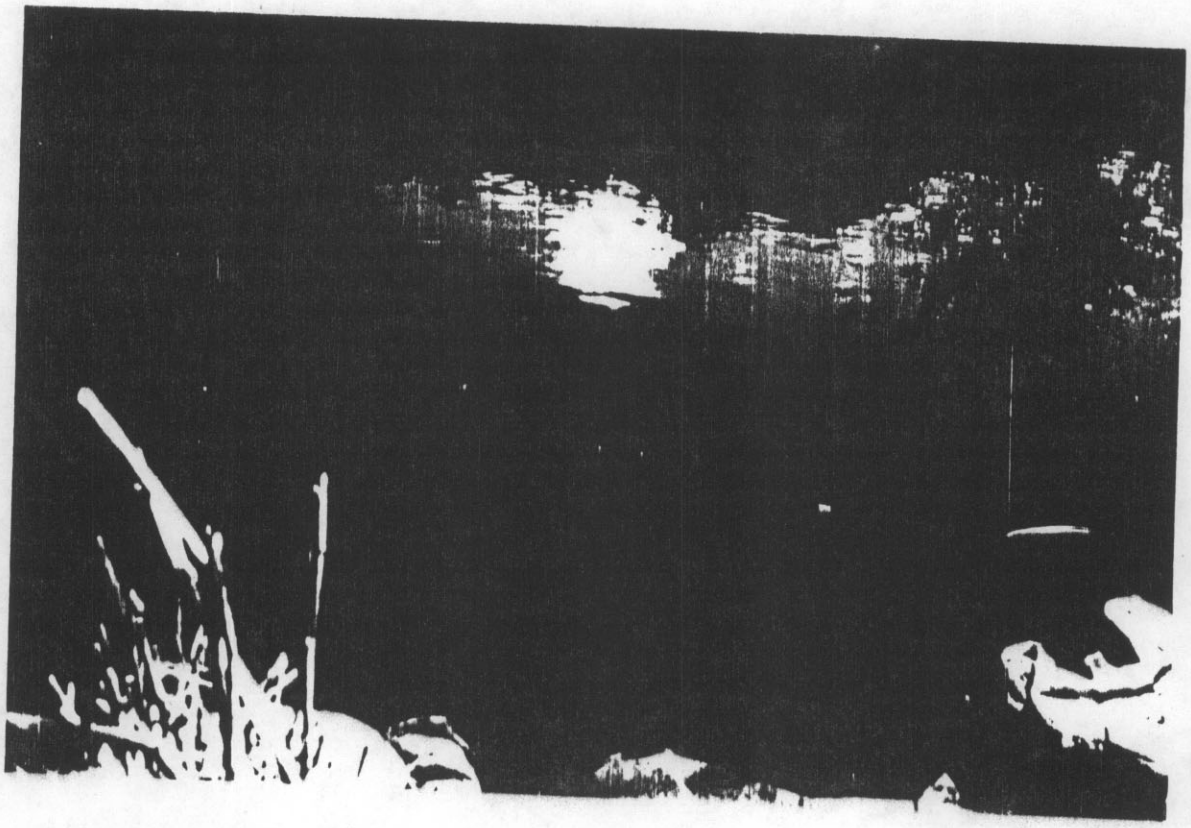
- The south lagoon. Note woodchip pile at upper left.



- South lagoon. Note the roughly 45 degree angle of the slope.



- South lagoon. Note the debris in the water and on the slopes.



- Close-up of south lagoon. Note debris and algae. The water was fairly clear in both lagoons.

unnecessary unprofessional remark - pure H_2SO_4 is clear but I wouldn't drink it

SECTION IV

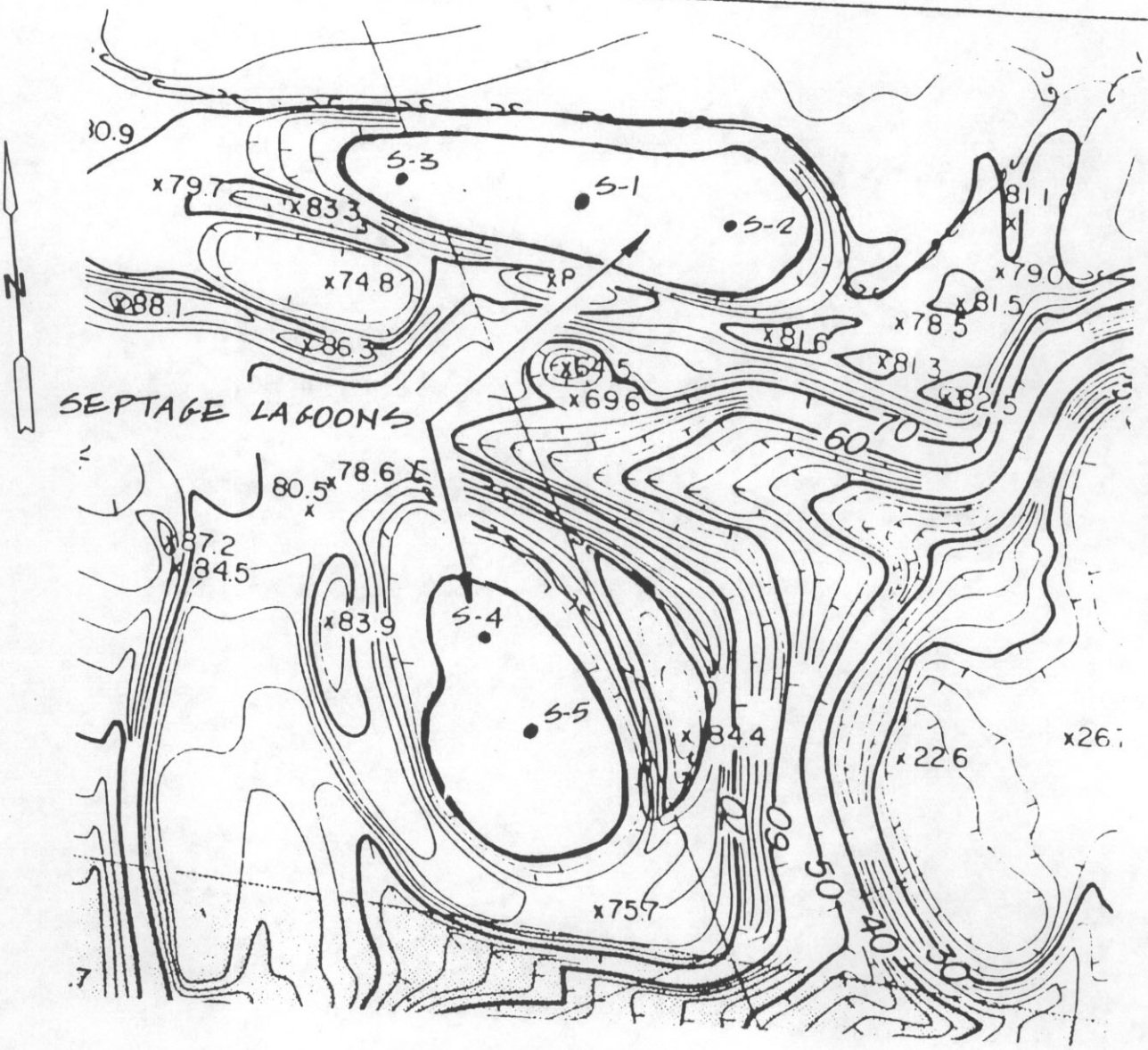
SAMPLING AND VOLUME CALCULATIONS

Samples were extracted with a hand auger which was decontaminated prior to use at each sampling location. The decontamination procedure consisted of scrubbing the auger in a bath of liquinox and water and then rinsing with methanol, followed by hexane, followed by nitric acid. Finally, the auger was rinsed with distilled water.

All samples were obtained at a point 6-12 inches above the sludge-sand interface. This interface was clearly discernible by the distinct "scratching" of sand grains as the metal auger rotated downward. All samples were taken from an aluminum rowboat provided by the Town of East Hampton Natural Resources Department. The boat was stabilized with bow and stern lines to trees on either side of the lagoon to facilitate augering. The sampling locations can be found in Figure 4.1.

Samples S-1, S-2, and S-3 were obtained from the north lagoon with sample S-1 receiving target compound list (TCL) analysis and S-2 and S-3 were tested for TCL volatile organic compounds (VOCs). In the south lagoon, two samples were extracted: Sample S-4 for TCL parameters and S-5 for VOCs. All samples were placed in a cooler with ice and delivered to the laboratory for analysis.

At each sample location, the depth of the overlying water was obtained by using a weighted measuring tape. Then, the auger was advanced to the sludge-sand interface and the depth of the interface was recorded. Subtraction of the depth of the water from the depth to the sludge-sand interface yielded the thickness of the sludge (See Table 4.1 for results). Visual inspection of both lagoons showed that



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FIGURE 4.1 - SEPTAGE LAGOON SAMPLING LOCATIONS

TABLE 4.1

THICKNESSES OF SLUDGE AND WATER LAYERS

SEPTAGE LAGOON	SAMPLE LOCATION	DEPTH OF OVERLYING WATER	APPROXIMATE DEPTH TO SLUDGE-SAND INTERFACE	APPROXIMATE THICKNESS OF SLUDGE
North	S - 1	6′	10′	4′
North	S - 2	5′	9′	4′
North	S - 3	3′	8′	5′
North	Average	4.7′	9′	4.3′
South	S - 4	6′	10′	4′
South	S - 5	7′	12′	5′
South	Average	6.5′	11′	4.5′

sludge did not lie flat (parallel to the water surface) but appeared to be slightly mounded at the sides. Diagrams of the lagoons with approximate thickness can be found in Figures 4.2 (north lagoon) and 4.3 (south lagoon).

To calculate the volume of sludge and the volume of the overlying water, surface area calculations were performed. The two lagoons are both roughly elliptical and were treated mathematically as such. The north lagoon measured 140 ft. and 50 ft. on the major and minor axes, respectively. The south lagoon measured 105 ft. and 55 ft. The surface area was calculated using the formula for the area of an ellipse: π ab, where a and b represent the radii of the major and minor axes. These areas were multiplied by the measured average thicknesses of the sludge and water (from Table 4.1) to yield volumes in cubic feet which were then converted to gallons. Results of these calculations can be found in Table 4.2.

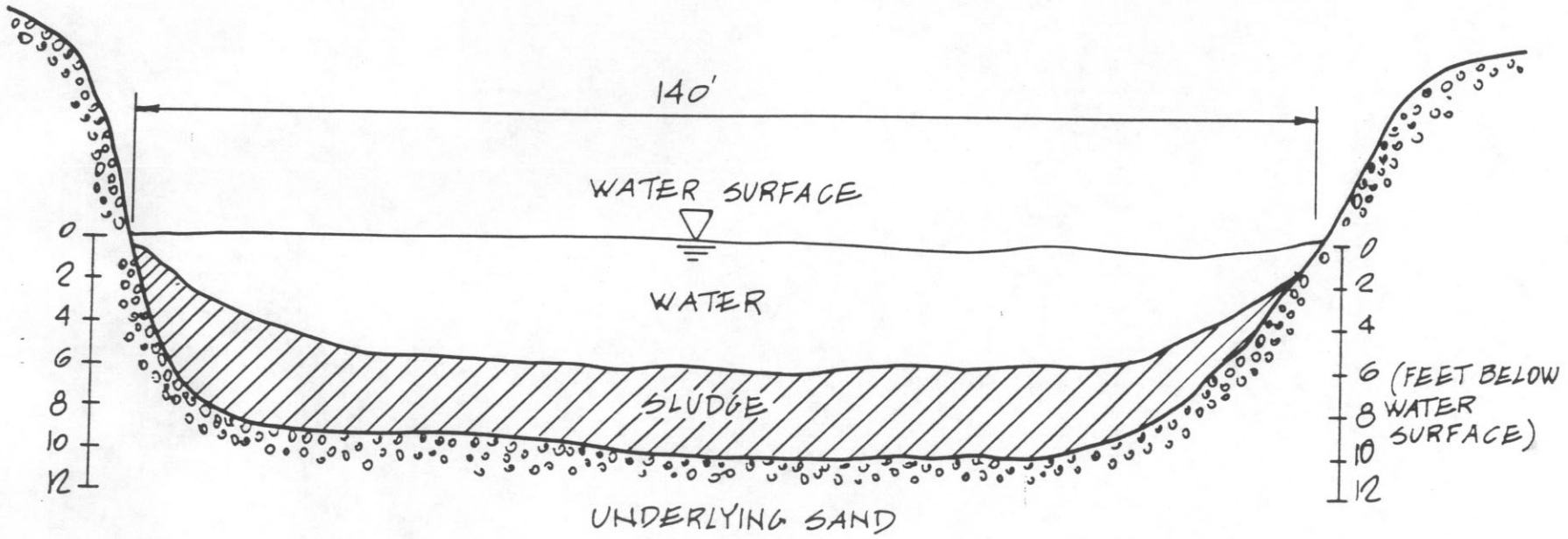


FIGURE 4.2 CROSS-SECTION OF THE LONG AXIS OF THE NORTH LAGOON

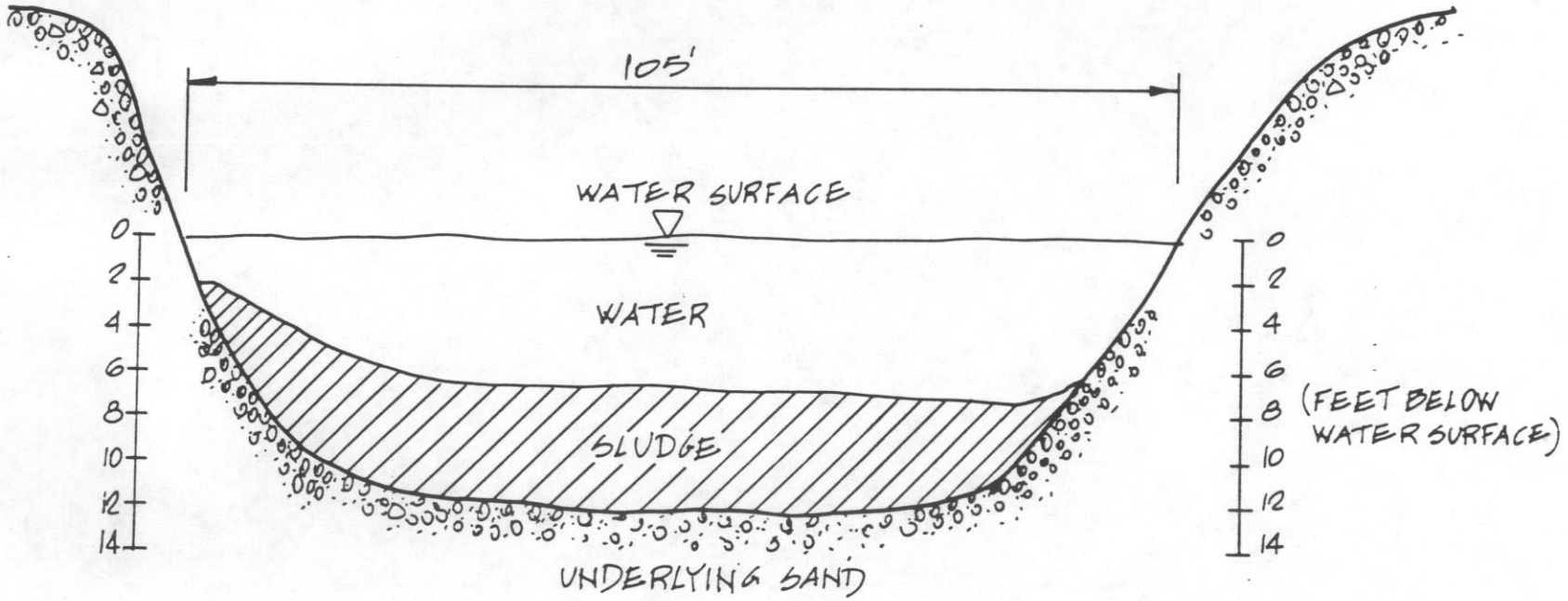


FIGURE 4.3 CROSS-SECTION OF THE LONG AXIS OF THE SOUTH LAGOON

TABLE 4.2

VOLUME CALCULATIONS AND DATA

NORTH LAGOON	
LENGTH AND WIDTH -	140 ft. x 50 ft.
SURFACE AREA (πab) -	5498 ft.^{2}
AVERAGE THICKNESS OF SLUDGE LAYER -	4.3 ft.
AVERAGE THICKNESS OF WATER LAYER -	4.7 ft.
VOLUME OF SLUDGE -	176,835 gal.
VOLUME OF WATER -	193,291 gal.
SOUTH LAGOON	
LENGTH AND WIDTH -	105 ft. X 55 ft.
SURFACE AREA (πab) -	4536 ft.^{2}
AVERAGE THICKNESS OF SLUDGE LAYER -	4.5 ft.
AVERAGE THICKNESS OF WATER LAYER -	6.5 ft.
VOLUME OF SLUDGE -	152,682 gal.
VOLUME OF WATER -	220,540 gal.
TOTAL	
VOLUME OF SLUDGE -	329,517 gal.
VOLUME OF WATER -	413,831 gal.

SECTION V
SAMPLING RESULTS AND DISCUSSION

The results of the sampling are presented in Table 5.1 (metals) and 5.2 (organics). These results were compared to background concentrations of metals in natural soils, the New Jersey Department of Environmental Protection (NJDEP) Environmental Cleanup Responsibility Act (ECRA) action levels, United State Environmental Protection Agency (USEPA) Superfund Records on Decision (RODs), and the New York State Department of Environmental Conservation (NYSDEC) Superfund Guidelines.

For the purpose of determining background levels of metals, concentrations in natural soils were used, which represent a common range for metals in natural soils in the continental United States (see Table 5.3). Since these sources exhibit a wide range of concentrations, the results were then compared to guidelines which use a health-based approach. The ECRA guidelines establish action levels for cleanup of contaminants. The USEPA RODs were derived from 35 Superfund sites with similar characteristics in the eastern United States (EPA Region I, II, and III) and are presented to establish acceptable cleanup levels from prior EPA decisions which are based on risk assessment studies. Finally, at the state level, the New York State DEC Superfund guidelines were used. Organic compounds in the sludge were compared to the ECRA, RODs, and NYSDEC guidelines (see Table 5.4 for ECRA, RODs and DEC guidelines).

Metals which exceed "natural soils" concentrations will be compared to the health-based criteria. Constituents of the sediment which exceed health-based guidelines will be targeted and followed up with recommendations for possible remediation.

TABLE 5.1

North Lagoon

DETECTED METALS FROM SAMPLES S-1 AND S-4
(ALL CONCENTRATIONS AND RESULTS IN mg/kg)

Parameter	Samples S-1	S-4
Aluminum	7,120	6,650
Arsenic	2.60	6.70
Barium	262	498
Cadmium	3.60	10.8
Chromium	26.2	44.0
Copper	1,020	1,550
Sodium	1,740	2,370
Zinc	1,210	1,880
Calcium	5,020	7,350
Iron	8,640	9,170
Lead	146	484
Magnesium	833	1,050
Manganese	64.3	61.5
Mercury	2.90	4.20
Nickel	19.0	26.4
Potassium	224	214
Selenium	1.40	2.90
Silver	21.4	26.4

TABLE 5.2

DETECTED ORGANIC COMPOUNDS
(ALL RESULTS IN ug/kg)

Parameters	North Lagoon S-1	North Lagoon S-2	South Lagoon S-3	South Lagoon S-4	South Lagoon S-5
Volatile Organic Compounds					
Toluene	1,100	16,000	1,700	2,700	3,300
Chlorobenzene	240	U	12,000	U	U
1,2-Dichlorobenzene	1,700	12,000	13,000	61,000	27,000
1,3-Dichlorobenzene	470	4,200	350	11,000	5,500
1,4-Dichlorobenzene	970	8,800	3,100	17,000	9,100
Acetone	360	3,700	1,100	1,300	2,000
Xylenes	144	1,100	180	17,000	8,100
Carbon Disulfide	U	1,500	210		2,000
Ethylbenzene	U	U	U	3,300	1,700
Total Volatile Organic Compounds	4,984	47,300	31,640	113,300	58,700
Pesticides & PCBs					
Total Pesticides & PCBs	U	-	-	U	-
Semi-Volatile Organics					
4-Chloroaniline	3,000	-	-	9,800	-
2-Methylnaphthalene	U	-	-	6,200	-
Total Semi-Volatile Organics	3,000	-	-	16,000	-

U - Undetected
\- - Not tested for

TABLE 5.3

CONCENTRATIONS OF METALS
IN "NATURAL" SOILS*

Parameter	Range from Various Sources(1)	USEPA Natural Soils Common Range(2)	Mean Ambient Background Soils In Eastern U.S.(3)	Upper Limit of Three Sources
Aluminum	-	10,000-300,000	33,000	300,000
Arsenic	0.1 - 194	1-50	5.4	194
Barium	-	100-3,000	500	3,000
Cadmium	0.01- 7	0.01-0.7	1	7
Chromium	5-3,000	1-1,000	36	3,000
Copper	2-100	2-100	14	100
Sodium	-	-	-	-
Zinc	10-2,000	10-300	36	2,000
Calcium	<150-320,000	-	-	320,000
Iron	100->100,000	-	15,000	>100,000
Lead	> 1-888	2-200	14	888
Magnesium	-	600-6,000	-	6,000
Manganese	50-18,300	20-3,000	290	18,300
Mercury	0.01-4.6	0.01-0.3	0.096	4.6
Nickel	0.1-1,530	5-500	13	1,530
Potassium	-	-	-	-
Selenium	0.1-3.8	0.1-2	0.39	38
Silver	0.01-8	0.01-5	-	8

* All concentrations are in mg/kg (ppm)

(1) The range from various sources is referenced to:
McClanahan 847C, revised June 22, 1984.

(2) The USEPA Natural Soils common range is referenced to:
USEPA office of solid waste and emergency response, HAZARDOUS WASTE LAND TREATMENT, SW-874 (April, 1983) p. 273, Table 6.46.

(3) The mean ambient background soils in Eastern United States is referenced to:
Geochemistry of some rocks, soil, plant and vegetables in conterminous United States. Geological Survey professional paper 574 F, 1975.

\- No listing

TABLE 5.4

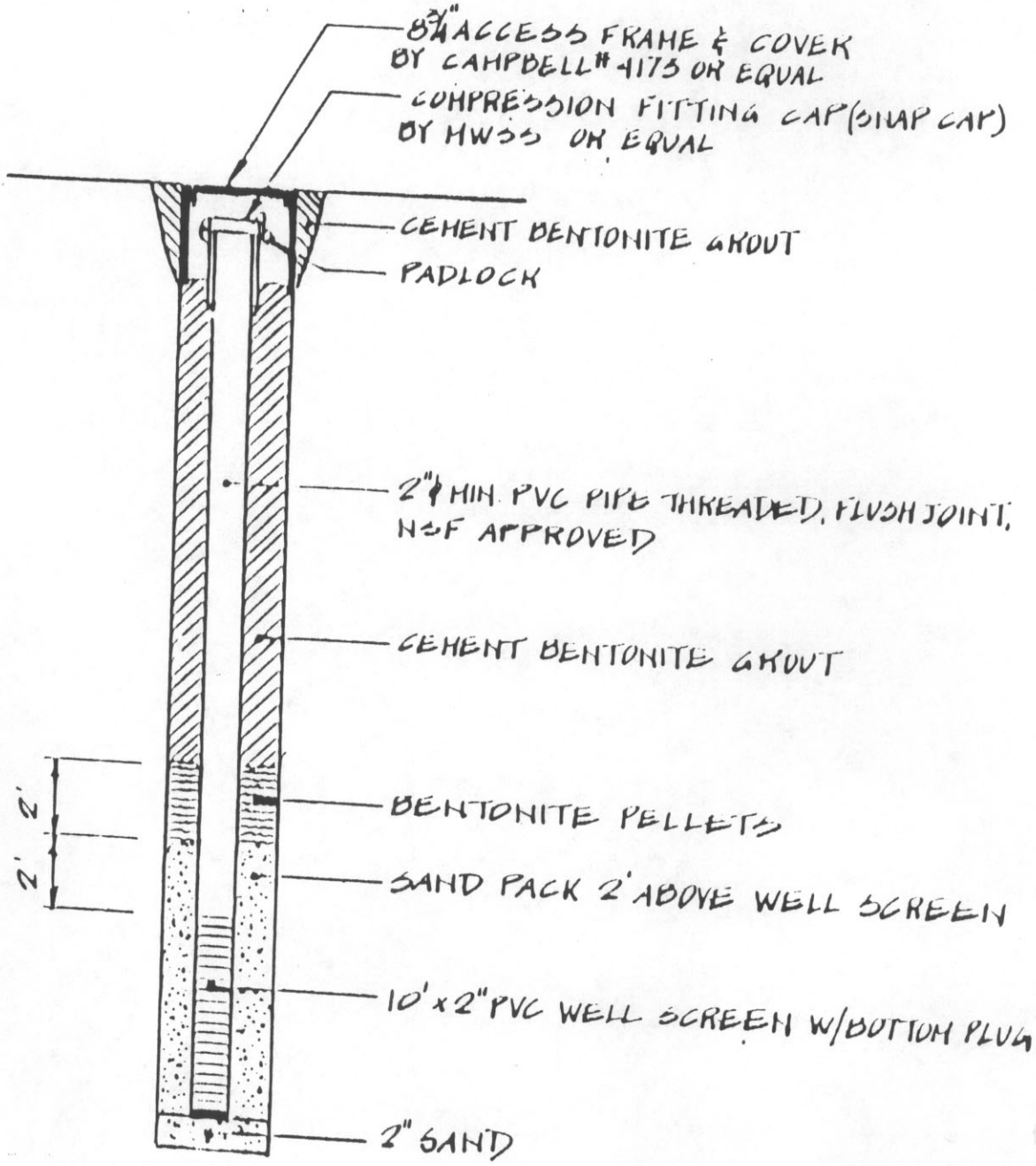
NJDEP(ECRA), USEPA (RODs), AND NYSDEC GUIDELINES FOR CONTAMINANTS IN SOILS

PARAMETERS	ERCA ACTION LEVELS Mg./Kg	USEPA SUPERFUND RODS RANGE Mg./Kg	NYSDEC SUPERFUND GUIDELINES
Aluminum	-	-	Background
Arsenic	20	(5-20)	Background
Barium	400	100	Background
Cadmium	3	(1-3)	Background
Chromium	100	(15-100)	Background
Copper	170	(9.7-170)	Background
Sodium	-	-	Background
Zinc	350	(53-350)	Background
Calcium	-	-	Background
Iron	-	-	Background
Lead	(250-1000)	(5-1000)	Background
Magnesium	-	-	Background
Manganese	-	-	Background
Mercury	1	(0.2-1)	Background
Nickel	100	(18-26.3)	Background
Potassium	-	-	Background
Selenium	4	1	Background
Silver	5	(0.6-5)	Background
Total VOCs	1	1	10
Total Semi-Volatiles	10	100	-

- No listing

APPENDIX C
NYSDEC STANDARD MONITORING WELL SPECIFICATIONS

N.Y.S.D.E.C. STANDARD MONITORING WELL SPECIFICATIONS



OVERBURDEN WELL

fanning, phillips & molnar

ENGINEERS

KUNKUNUMA NEW YORK

APPENDIX D
MORETRENCH AMERICAN CORPORATION METHOD FOR CALCULATING HYDRAULIC CONDUCTIVITY

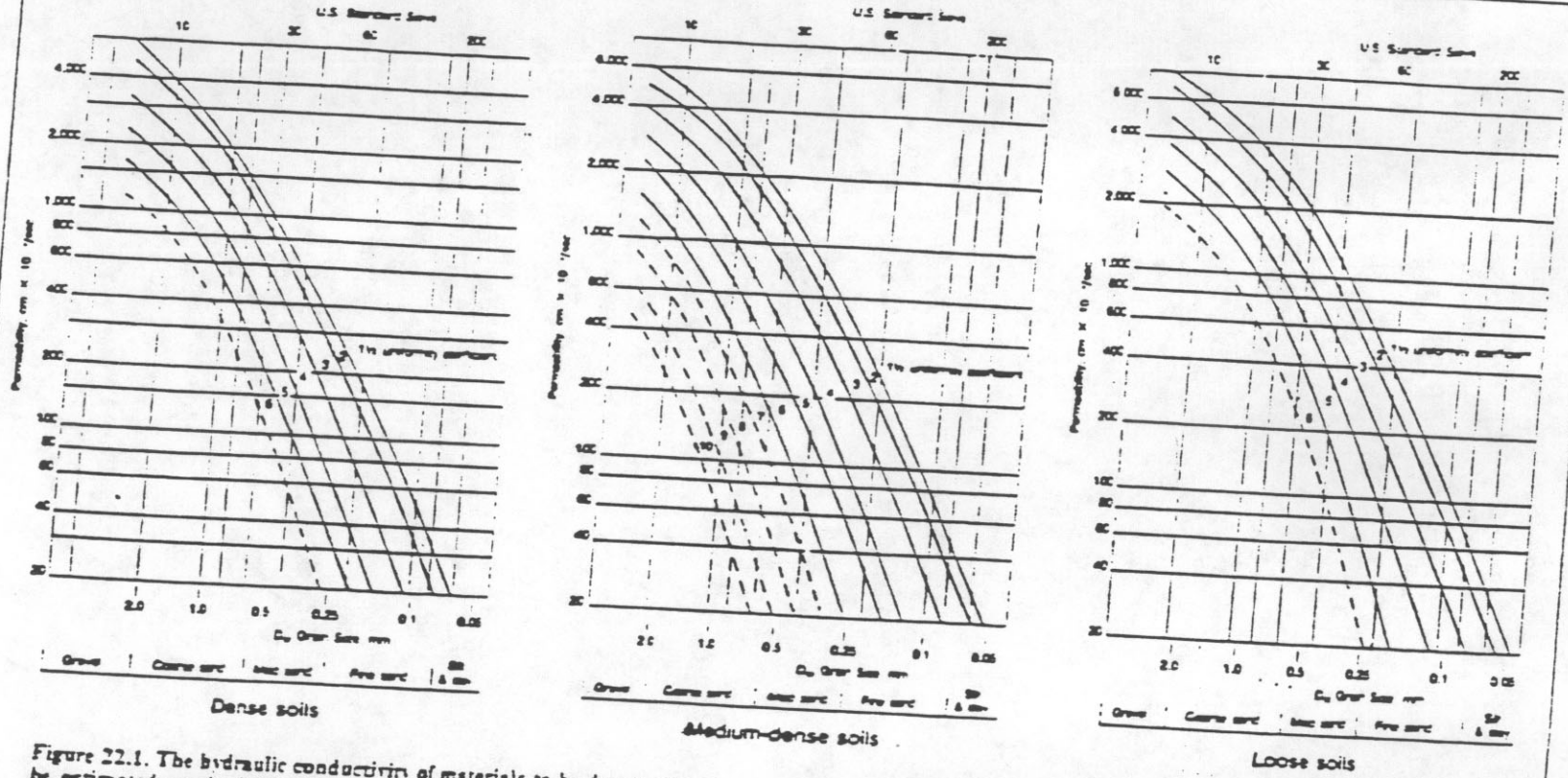


Figure 22.1. The hydraulic conductivity of materials to be dewatered can be estimated on the basis of particle size, uniformity coefficient, and density when information from pumping tests is not available. In these graphs, the D50 grain size represents the diameter of the 50-percent-retained size. To convert permeability in cm × 10^{-4}/sec to hydraulic conductivity in gpd/ft², multiply by 2.13. *(Moretrench American Corporation)*

F,P&M

MORETRENCH AMERICAN CORPORATION
METHOD FOR CALCULATING HYDRAULIC CONDUCTIVITY

SEWAGE TREATMENT PLANT

QUONSET HUT

TOWN ROAD BLDG.

MISC. COMPOST DUMPING

STOCK

CONC

CONC

MAC

EL. 85.2

AG-2

S-3

D-3

S-4

D-4

N

GEOMAPS INTERNATIONAL INC.

AutoCAD Extended Line and Symbol Key

POLE	SPOTELEV	SWAMP	TREE
SIGN	DTM		EVERGR
FIREH	CBASINC	LPOLE	BUSH
MAILBOX	POST		CONTROL POINT
FLAG	VALVE	TRPOLE	DOOR
MANHOLE	BENCH	PMETER	CELDOOR
TB			

TR_PAVED	CO_INDEX	WE_WATER	PR_ATHLET
TR_DIRT	CO_INDEXOB	WE_DRAIN	PR_FIELDL
TR_CURB	CO_SPOT	VE_FOREST	PR_FENCE
TR_TRAIL	CO_DTM	VE_BRUSH	PR_STONEW
TR_PAINTL	ST_STEPS	VE_HEDGE	PR_WALL
TR_CATCHB	ST_CULVER	VE_ORCHARD	PR_RETAIN
TR_RAILR	ST_TOWER	PR_ROCK	PR_GOLF_TEE
TR_BRIDGE	ST_BUILD	PR_STOCK	PR_GOLF_FAIR
TEXT	ST_FOUNDA	PR_SHEET	PR_GOLF_TRAP
CO_INTER	WE_SWAMP	PR_JOB	PR_GOLF_GREEN
CO_INTEROB	VE_HIGHT	PR_GUIDR	

LEGEND:

- S-1/D-1 PROPOSED LOCATION OF PAIRED PIEZOMETERS (ONE SHALLOW/ONE DEEP)
- S-6 PROPOSED LOCATION OF SHALLOW PIEZOMETER
- L-1 LEACHATE COLLECTION WELL
- APPROXIMATE LOCATION OF EXISTING WELL

NOTE: THESE LOCATIONS ARE APPROXIMATE AND MAY BE SUBJECT TO RELOCATION BASED UPON ACCESS AND EXACT LOCATIONS OF EXISTING WELLS. ALL WELLS WILL BE SURVEYED UPON COMPLETION OF INSTALLATION.

PHOTOGRAMMETRY BY:

GEOMAPS INTERNATIONAL

235 East Jericho Turnpike Mineola, N.Y. 11501
Telephone (516) 742-7373 FAX (516) 746-1599

Scale 1 inch = 50 feet
Contour Interval: 2
Photo Date: DEC. 14, 1989
SPRINGS FIREPLACE ROAD LANDFILL

S-5

C & D

S-6

GP-1

S-2
D-2

SEPTAGE LAGOON

WOOD CHIPS

DRAINAGE SWALE

EXCAVATED PIT

SEPTAGE LAGOON

WOOD DEBRIS

PUTRESCIBLES

L-1

L-2

S-1
D-1

APPROXIMATE LIMIT OF EXISTING P.V.C. LINER

SOURCE: LOUIS K. McLEAN ASSOC. (FEBRUARY 1990)

REVISED: F, P & M (MARCH 1990)

PLATE 2.1

TOPOGRAPHIC SURVEY OF SITE AND APPROXIMATE LOCATIONS OF PROPOSED GROUNDWATER MONITORING NETWORK

SPRINGS-FIREPLACE RD. LANDFILL

fanning, phillips & molnar
ENGINEERS
RONKONKOMA NEW YORK