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Draft Final

Focused Remedial Investigation Report

Site Location:
Nassau Uniform Services
525 Ray Street
Freeport, New York 11520

Site #130063

Report Date:
October 15, 1998
(Revised - January 27, 1999)

Prepared By:
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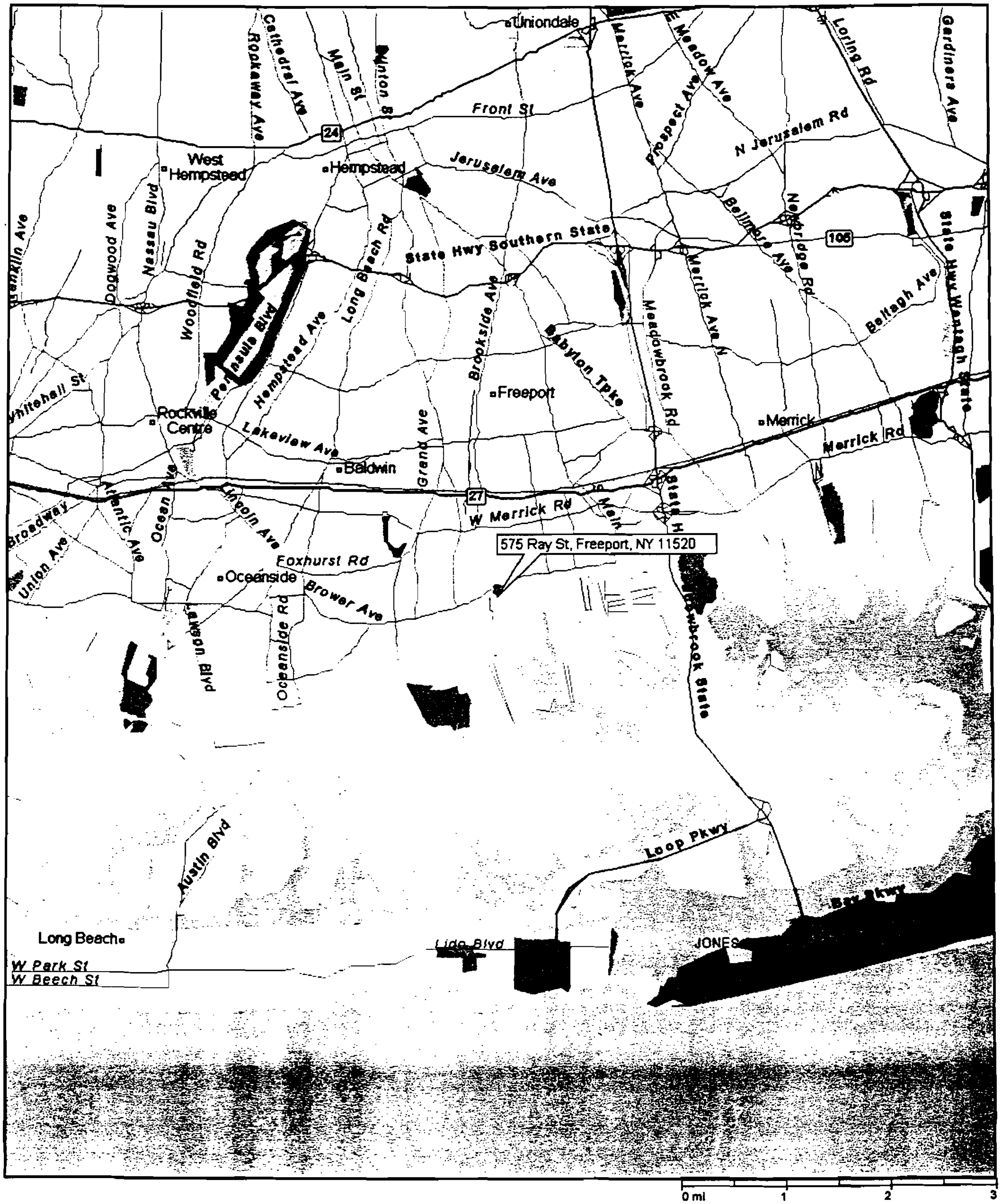
1.0 Introduction

The Nassau Uniform Services Site, herein identified as the "Site", is located at 525 Ray Street (Latitude 40 38' 31"N and Longitude 73 35' 52.5"W), Freeport, Town of Hempstead, Nassau County, New York and is approximately 0.5 acres in size, (See Figures 1-1 and 1-2). Site Operations for approximately 30 years include the washing and dry cleaning of industrial clothing and rags.

On April 27, 1990, a 2,000-gallon tetrachloroethene (PCE) tank was removed, after being in place for approximately 12 years. The tank itself was not perforated, but an excess of PCE was returned to the tank from dry cleaning machinery operations (together with sludge build-up) which caused an overflow. Excess PCE appeared to overflow down sides of the tank out of the return pipe connections. Soil samples were taken on December 17, 1991 from beneath the tank. Analysis indicated high contaminant concentrations; PCE at 2,900,000 ppb, 1,1,2-trichloroethylene at 130,000 ppb, and 1,2-dichloroethylene at 10,000 ppb, 1,1,2-trichloroethylene at 3,600 ppb and vinyl chloride at 1,200 ppb.

Nassau Uniform Services under the approval and oversight of the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH), is conducting an environmental study at their facility. This study consists of a Focused Remedial Investigation (FRI) which will determine the nature and extent of the on-site contamination. This investigation will provide sufficient data so that an Interim Remedial Measure (IRM) can be designed to remediate the contamination in a timely manner. The FRI and subsequent IRM are being performed in accordance with a Consent Order (legal agreement) between Nassau Uniform Services and the NYSDEC.

Anson Environmental Ltd. (AEL) is the environmental contractor for Nassau Uniform Services. AEL has performed both Phase One and Phase Two investigations associated with the Focused Remedial Investigation (FRI) Work Plan, dated March 25, 1997 for the Site. The objectives of the FRI are to determine the nature of volatile organic compound (VOC) contamination, its vertical and horizontal extent in the soils (vadose zone) and the quality of the groundwater beneath the site. The investigation was divided into two phases designated Phase One and Phase Two. The purpose of this division is to allow for the scope of Phase Two to be adjusted based on the findings of Phase One.



Streets Plus

Figure 1-1 - Site Location Map

Nassau Uniform Services

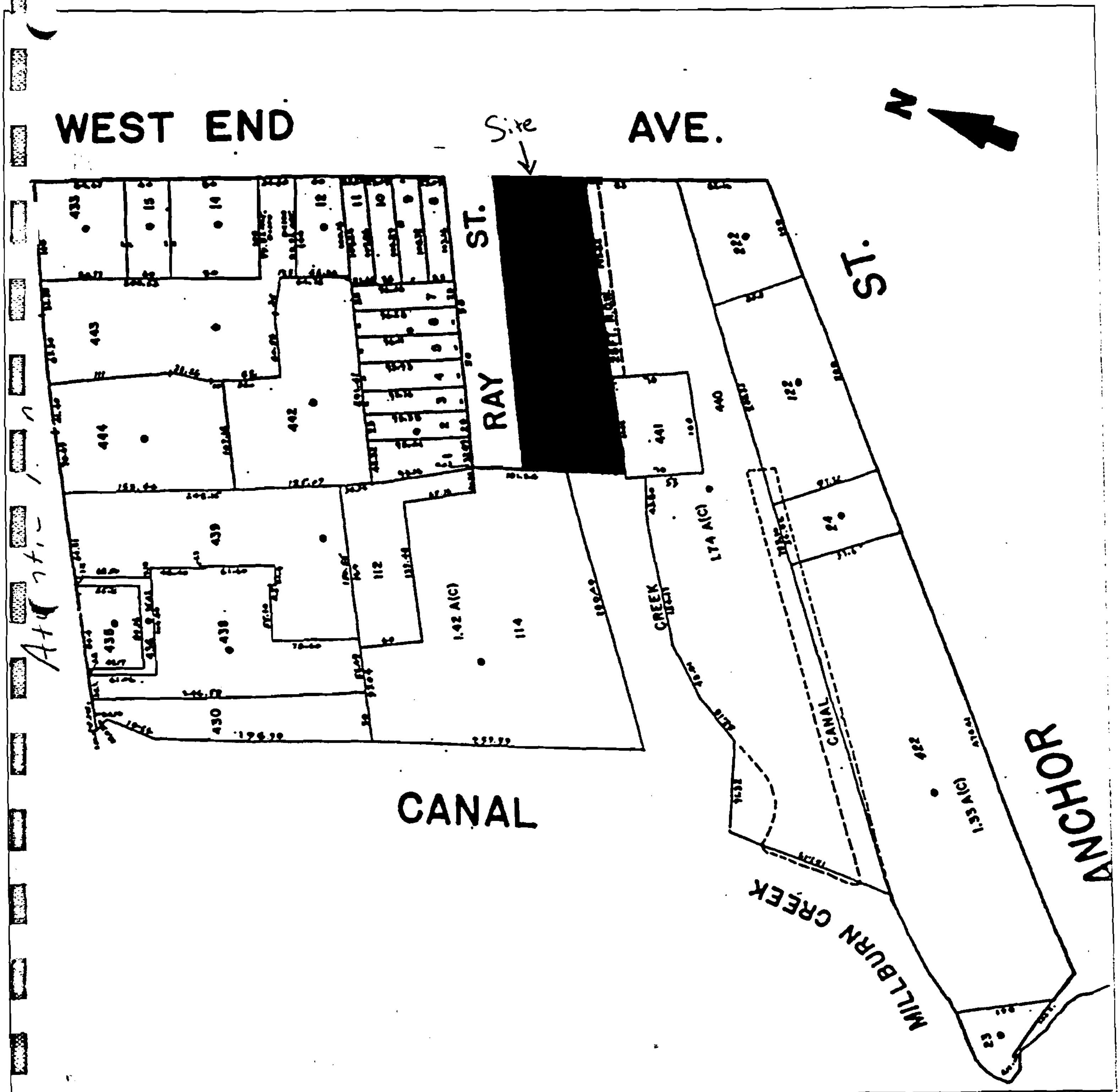


Figure 1-2 –Tax Map Information

Nassau Uniform Services

525 Ray Street

Freeport, NY 11520

1.1 Purpose of the Focused Remedial Investigation (FRI) Report

The purpose of the FRI was to characterize the Site with regard to the extent of possible soil and/or groundwater contamination that may have resulted from past activities at the Site. A FRI Work Plan was prepared in March 1997 to characterize the site, its history, and the tasks that were to be accomplished.

This FRI Report identifies and interprets the findings of the FRI Work Plan and provides the technical basis for choosing a preferred remedial alternative.

1.2 Site Background

In the early 1920's, the land currently occupied by the Nassau Uniform Services was reclaimed from its natural state and in 1925 the original portion of the building was constructed for commercial use. Site operations include the washing of industrial clothing and rags. For the past 30 years, the Site incorporated dry cleaning services in addition to washing industrial clothing and rags. Tetrachloroethene (perchloroethylene or PCE) is a common dry cleaning solvent used in the dry cleaning industry.

Currently, surrounding land use consists of residential and commercial buildings. To the north of the site, there are commercial buildings occupied by Baldwin Boat Basin, United Electo Mechanics and Hampton Garage. To the south and east of the site, the land use is residential. Abutting the Site to the south is a paved parking lot and housing units owned by Waters at West End Inc. To the west, and abutting the Site is a canal off Milburn Creek.

1.2.1 Site Description

The Site includes one building occupied by Nassau Uniform Services, which is in the business of selling, renting and cleaning industrial uniforms. The remainder of the Site is paved with asphalt and used as a parking lot. The property is not fenced and primary access is from Ray Street.

According Nassau County tax maps the Site has the following designation: Section 54, Block 315 and Lots 98 through and including Lot 107 (See Figure 1-2). The Site occupies approximately 0.5 acres on the south side of Ray Street and is bordered on its western side by the bulkhead for a small-man made canal off of Milburn Creek. The site is bordered on the north by commercial properties and on the south and east sides by residential properties.

1.2.2 Site History and Previous Investigations

The following is a brief chronological summary of events that have occurred on Site.

1925 to 1962

Village of Freeport information indicates that the building was originally constructed in 1925. This information was obtained from a site diagram updated in 1965.

No other information is available about the Site between 1925 and 1962.

1962 to 1965

Historical aerial photographs taken in 1962 and 1965 illustrated that there was an addition built on the building between those years. This addition was placed on the western end of the building and extended from the edge of the existing building to the bulkhead.

A permit from the Freeport Municipal sewer collection system was issued to the Site on November 5, 1962. (Permit #9135)

1964

In December of 1964, Nassau Uniform Services, Inc. agrees to purchase from American Permac, Inc.:

- two (2) 120 lb. SE Industrial dry cleaning machines
- one (1) Titan 700 Industrial dry cleaning machine
- one (1) Model 200 Activated Carbon Recovery Unit.

This equipment was delivered and installed in 1965.

1965

Nassau Industrial Uniform Services agrees to purchase a Permac Industrial Cleaning Machine (330 SE) in August 1965.

1975

A letter dated October 6, 1975 confirms Nassau Uniform Service's purchase of a Brill X-40 oil skimmer. This equipment was supplied by Western Environmental Engineering.

1982
In May of 1982, there was a spill from the oil/water separator that separates the oil washed from uniforms from the wastewater discharged to the sewer. Oily waste was accidentally discharged to the soils on Site and to Milburn Creek.

The oil-contaminated soil was excavated by Nassau Uniform, drummed and disposed of properly off-Site.

1984
On July 5, 1984, a hydrostatic test was performed on a 2,000-gallon underground gasoline storage tank that was located on the eastern side of the building near the front door. The failure of the tank to pass this test was reported to the NYSDEC. Site remediation included the removal of the tank and installation of three groundwater monitoring wells.

When the tank was removed from the ground, it was reported to have had several holes in it. The three wells were installed in the parking lot on the corner of Ray Street and West End Avenue. One well was installed in the center of the tank excavation and the other two to the northwest and southeast of the excavation. One of these wells could not be located during the recent site reconnaissance.

Spill #84-0959 was assigned to this event on the Site.

This spill location was inspected by NCDH on October 20, 1984.

The spill remains open as of September 1998.

1988
On February 1, 1988, Nassau County Department of Health issued a permit to Nassau Uniform to maintain the following storage:

Tank/Storage Area Number	Tank Capacity in gallons	Type of Toxic or Hazardous Material Stored
0001	260	multiple chemicals stored
0002	2000	oil, fuel #2
0003	30	multiple chemicals stored
0004	2000	oil, fuel #2
0005	2000	tetrachloroethene
0006	500	tetrachloroethene

This permit expiration date was February 1, 1993.

1990
On April 27, 1990, a 2,000-gallon waste oil/PERC tank was removed, after being in place for approximately 12 years. The tank itself was reported to not be leaking.

Laboratory analysis of soil samples collected from the tank excavation by NCDH identified 9,000,000 parts per billion (ppb) of tetrachloroethylene, 34,000 ppb of trichloroethene, 67,000 ppb of c-1,2-dichloroethylene and other volatile organic compounds in a soil sample collected under the tank.

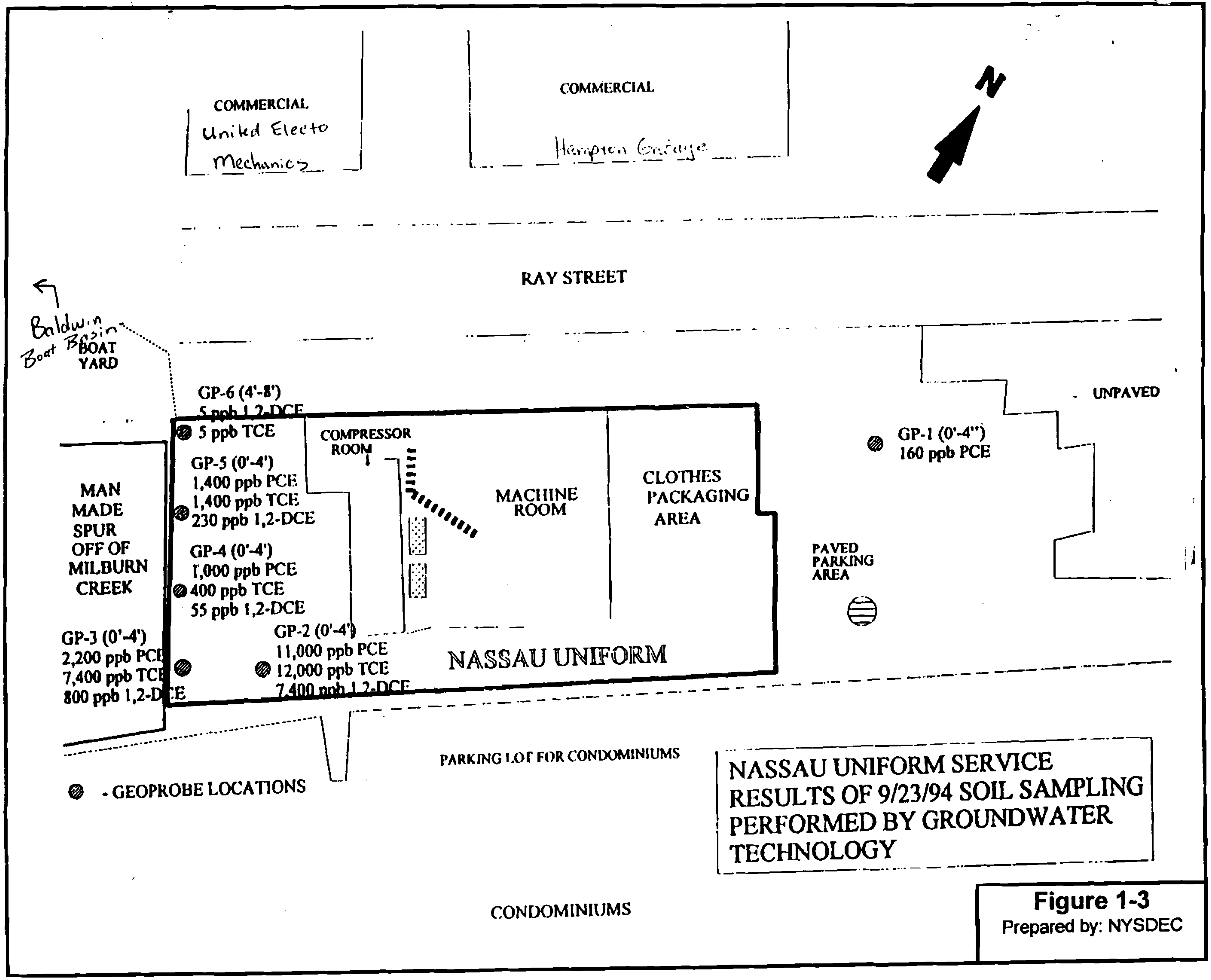
A June 1, 1990 letter from NCDH instructed Nassau Uniform to perform site remediation, as soon as possible.

1991
Soil samples were collected by NCDH on December 17, 1991 from 14 feet beneath the ground surface in the former tank excavation location. Analysis reported contaminant concentrations as follows: PCE at 2,900,000 ppb, 1,1,2-trichloroethene at 130,000 ppb and 1,2-dichloroethylene at 38,000 ppb.

Groundwater samples that were taken on the same day, downgradient of the tank location, also reported contamination with PCE at 20,000 ppb, 1,2-dichloroethylene at 10,000 ppb, 1,1,2-Trichloroethene at 3,600 ppb and vinyl chloride at 1,200 ppb.

1994
On September 23, 1994, Groundwater Technology, Inc. (GTI) supervised the installation of six Geoprobe points (GP-1, GP-2, GP-3, GP-4, GP-5, and GP-6) for the collection of soil and groundwater samples. A site map illustrating the locations of the points is presented in Figure 1-3 and 1-4.

Soil analysis reported that samples collected from two Geoprobe locations at 2 to 4 feet below grade, GP-2 and GP-3, exceeded the NYSDEC Recommended Soil Clean-up Objectives for 1,2-dichloroethene, trichloroethene, PERC and for total volatile organic compounds. Laboratory analysis of soil samples collected from Geoprobe location GP5 also indicated elevated levels of trichloroethene that exceeded the NYSDEC Recommended Soil Cleanup Objectives (Table 2 in Appendix 1).



NASSAU UNIFORM SERVICE
RESULTS OF 9/23/94 SOIL SAMPLING
PERFORMED BY GROUNDWATER TECHNOLOGY

Figure 1-3
Prepared by: NYSDEC

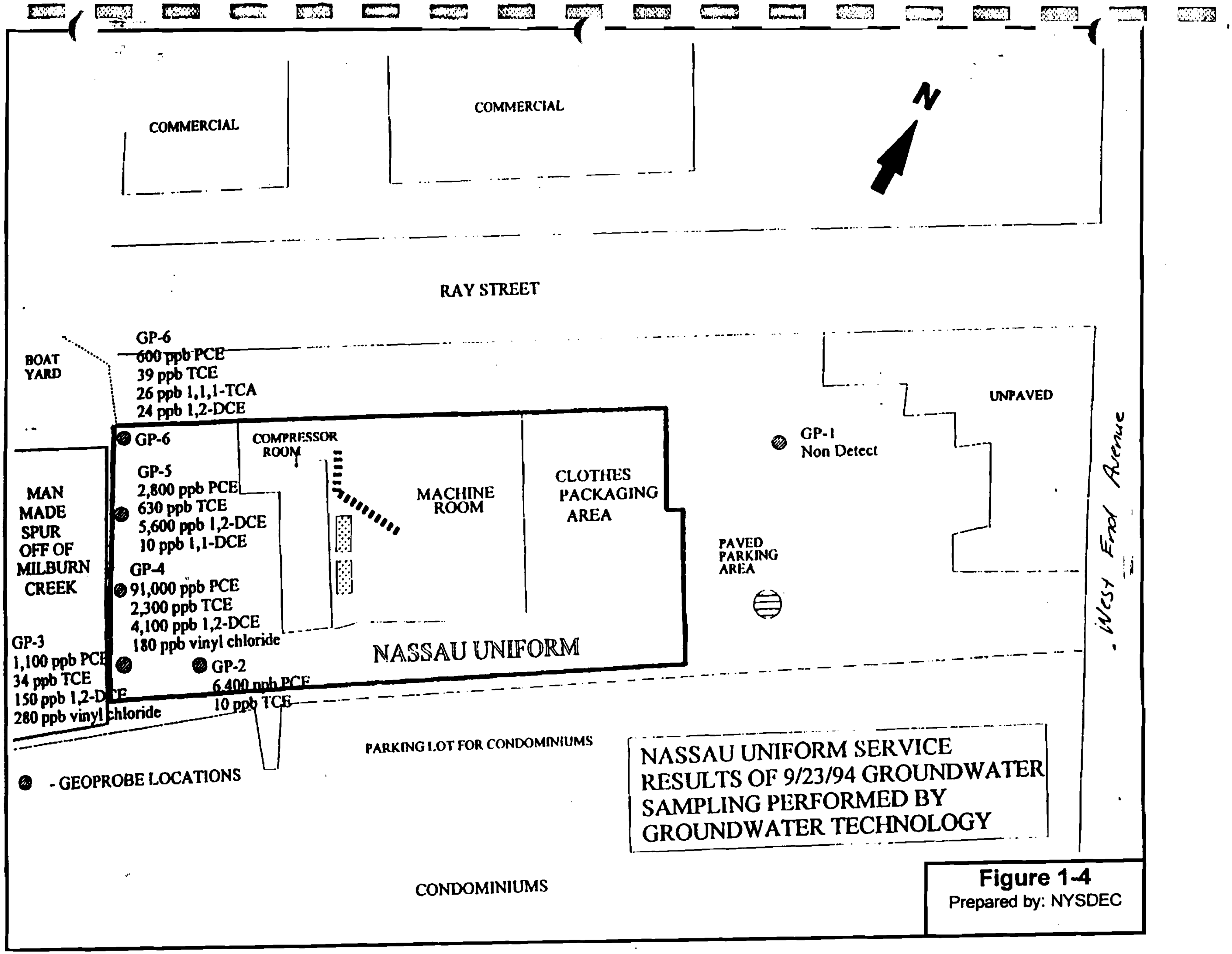


Figure 1-4
Prepared by: NYSDEC

Groundwater samples (approximately seven feet below grade) collected on the same day showed concentrations above the Class GA standards for tetrachloroethene, vinyl chloride, 1,2-dichloroethene, chlorobenzene, 1,1dichloroethene and 1,1,1-trichloroethane (Table 3 in Appendix 1). Groundwater samples collected upgradient from the site showed no elevated levels of contamination.

1996
On February 1, 1996, representatives of the NYSDEC and Anson Environmental Ltd. (AEL) conducted a site reconnaissance. The purpose of site reconnaissance was to observe the operations on Site, to determine constraints of the Site and to better determine sampling locations.

Currently Site operations include the washing and dry-cleaning of uniforms and rags. The wastewater from the Site flows through troughs in the floor, to an oil/water separator and then to the Nassau County sewer system. Dry cleaning is accomplished in two machines manufactured by Spencer (model GT 165) and Bowe, respectively. PERC contaminated waste (lint and sludge) is hauled from the Site and disposed of properly by Safety Kleen. Safety Kleen also supplies raw materials (PERC) to Nassau Uniform.

The vast majority of the uniforms and rags cleaned on Site are washed not dry-cleaned.

1997
Anson Environmental Ltd. (AEL) conducted the Phase One FRI field investigation in July, August and September 1997. Mr. Robert Stewart from the New York State Department of Environmental Conservation (NYSDEC) provided regulatory oversight and split soil and groundwater samples with AEL during Phase One.

1998
Anson Environmental Ltd. (AEL) conducted the Phase Two FRI field investigation in April and May 1998. Mr. Robert Stewart from the New York State Department of Environmental Conservation (NYSDEC) provided regulatory oversight during Phase Two.

2.0 Study Area Investigation

Figure 2-1 contains a map of the Site and area surrounding the Site.

2.1 Surface Features

The surface features of the Site consist of urban land that is topographically flat. This classification includes areas where at least 85 percent of the surface is covered with asphalt, concrete or other impervious building materials. These areas are mostly parking lots, shopping centers, industrial parks or institutional sites. Most of these areas are nearly level or gently sloping. They are mostly adjacent to local main transportation thoroughfares.

The majority of the Site is paved or covered by building, with the exception of a small lawn area in front and along the northern boundary of the building. The building fronts on West End Avenue, a two-lane north-south thoroughfare in Freeport. The back of the building (west side) abuts a bulkhead off of a canal associated with Milburn Creek. To the north is Ray Street, a two-lane east-west thoroughfare used as the main access route to the Site. Further to the north, there are commercial properties. To the northwest is Baldwin Boat Basin. To the south, is a paved parking lot and residential housing units associated with Waters at West End Inc.

2.2 Geology

The Site is located on the outwash plain deposits approximately twelve miles south of the Ronkonkoma Recessional Moraine. These deposits consist of a well-sorted and stratified sand and gravel of fluvio-glacial origin (Isbister, 1966) and constitute the sediments of the Upper Glacial Aquifer. Figure 2-2 is a generalized geological cross-section (C-C') trending north to south across Long Island which shows a southward sloping wedge of unconsolidated deposits unconformably overlying a crystalline bedrock of metamorphic and igneous rock. Figure 2-3 illustrates the location of the cross section on Long Island.

As illustrated in Figure 2-2, there are three main hydraulically connected aquifers underlying Long Island: the Upper Glacial, Magothy and Lloyd Aquifers. The unconsolidated deposits of the aquifers are late Cretaceous, Pleistocene and Recent in age. The total thickness of the unconsolidated deposits under the Site area is approximately 1,000 feet (Isbister, 1966).

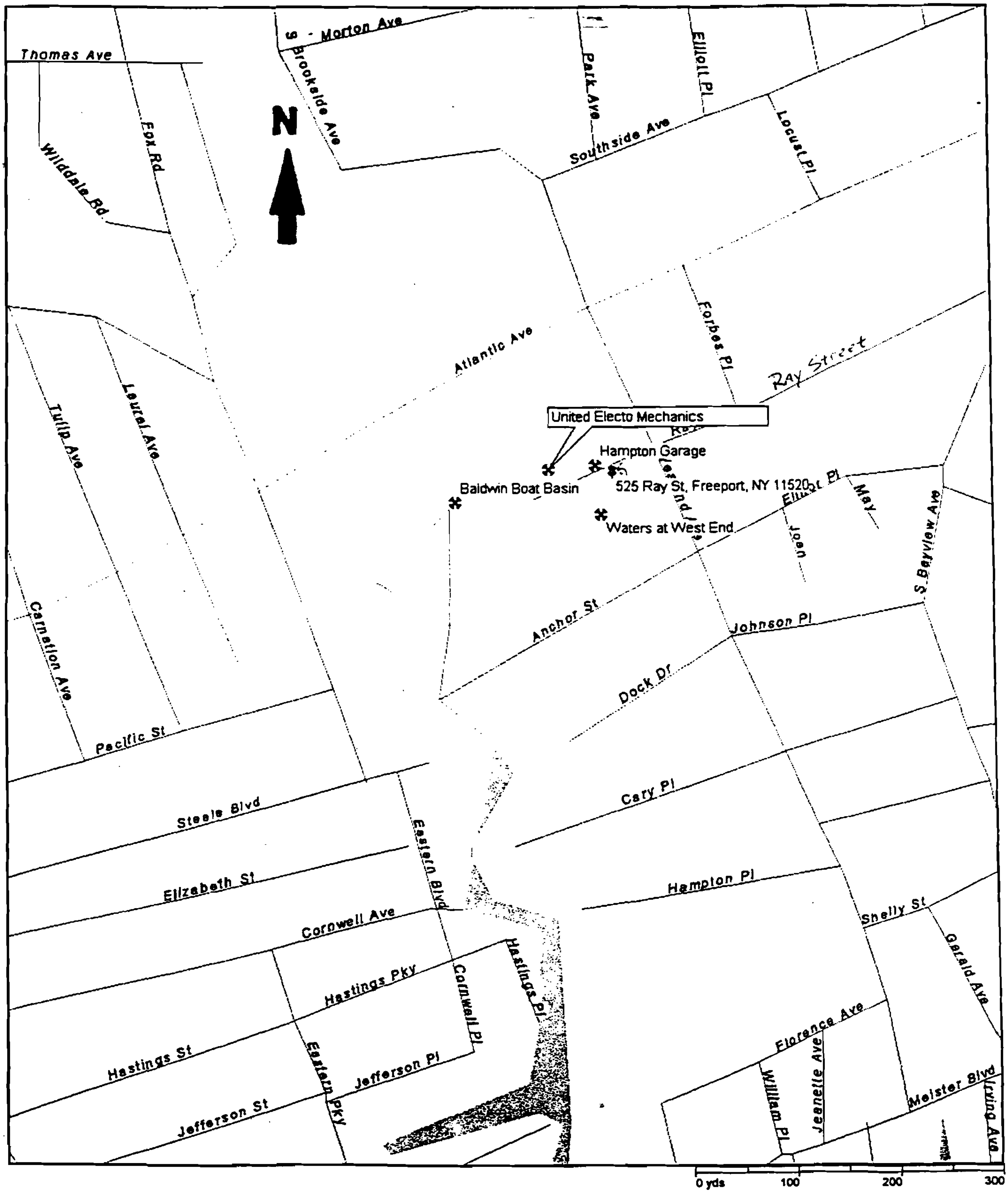
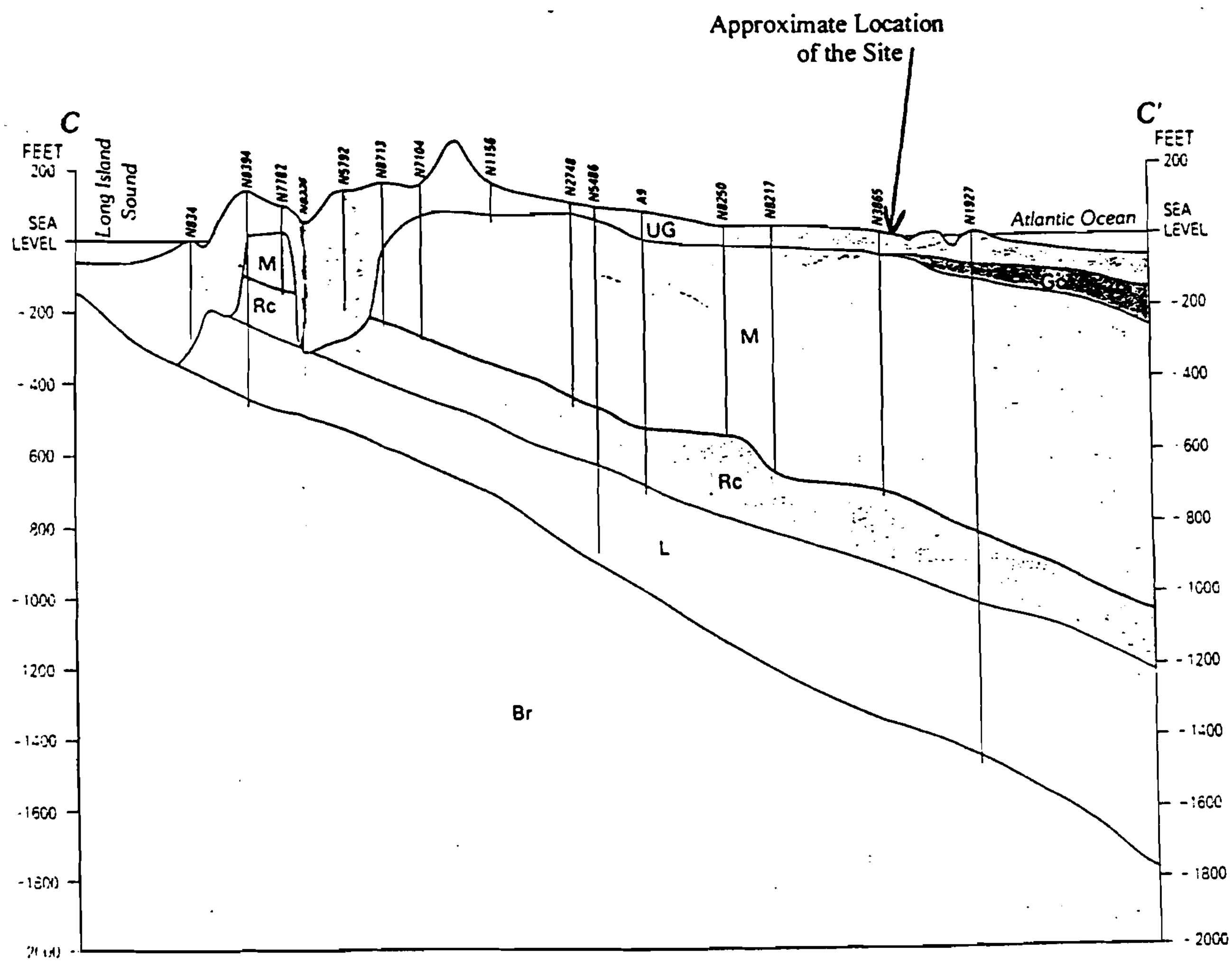


Figure 2-1
Areas Surrounding Site Location



Legend for Hydrogeological Units

UG Upper glacial aquifer
Gc Gardiners Clay
Mg Monmouth greensand
M Magothy aquifer
Rc Raritan confining unit
L Lloyd aquifer
Br Bedrock

Figure 2-2 –Hydrogeologic Cross Section of Site Area

Source: USGS 1989

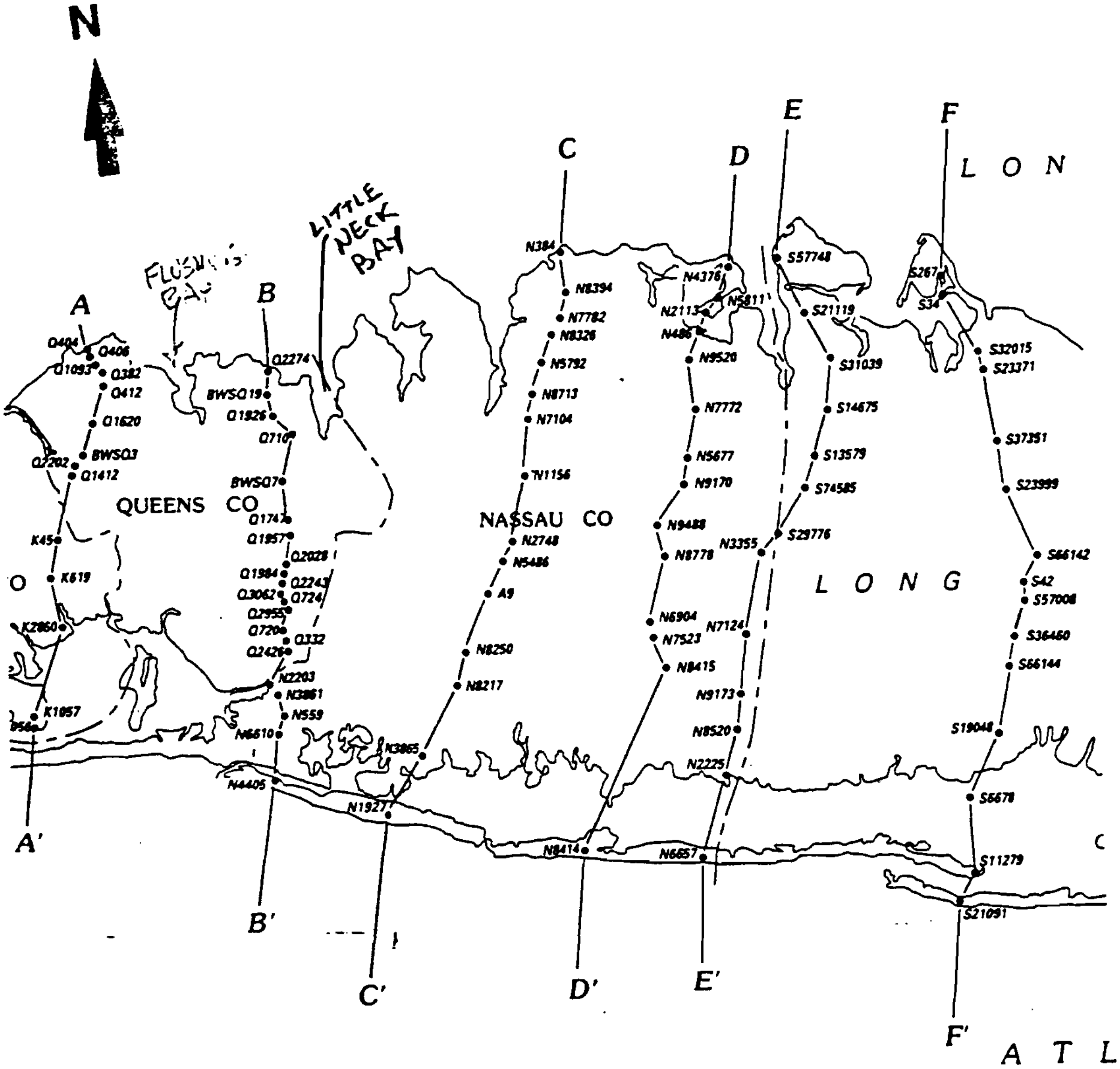


Figure 2-3 –Location of C-C' Cross Section on Long Island

Source: USGS 1989

2.2.1 Upper Cretaceous Series

Raritan Formation
The Raritan formation of the Late Cretaceous Age is the deepest formation of unconsolidated deposits in the Site area. It rests directly on the crystalline bedrock and is unconformably overlain by the Magothy formation. The Raritan formation occurs beneath the entire area of Long Island, but does not outcrop. Formation thickness ranges from 300 to 600 feet and is approximately 550 feet thick below the Site area. The formation is divided into a lower unit (the Lloyd sand member) and an upper unit (Raritan clay).

The Raritan clay member functions as an aquiclude (confining unit), is separating the Lloyd sand member from the overlying Magothy. In the vicinity of the Site, Raritan clay is approximately 200 feet thick.

Magothy Formation
The Magothy formation of the Early Cretaceous Age consists of sand and gravel interbedded with lenses of clay. In the vicinity of the Site, the Magothy formation is approximately 650 feet in thickness. The hydrogeologic unit associated with the formation is the Magothy Aquifer. The Upper Pleistocene deposits that comprise the Upper Glacial aquifer overlie the Magothy formation.

2.2.2 Pleistocene Series
The Upper Pleistocene deposits of the Quaternary age consist of outwash deposits originating from the Ronkonkoma terminal moraine. The outwash deposits consist of sand and gravel ranging from fine to coarse grained, and areas of clay. In the vicinity of the Site, this formation is approximately 50 feet in thickness. The hydrogeologic unit associated with this formation is the Upper Glacial aquifer.

2.2.3 Holocene Series

Recent Deposits
The Recent deposits, not including soil and artificial fill, occur beneath bays, in marshlands, on barrier beaches and in stream valleys. Recent deposits are the uppermost, stratigraphically the youngest sediments and are immediately underlain by outwash. The Recent deposits reach a maximum thickness of about 12 feet in the vicinity of the Site.

2.3 Soils

According to the Soil Survey of Nassau County, prepared by the United States Department of Agriculture, the surface soils in the vicinity of the Site are classified as Udipsamments (Ue), wet substratum. This unit consists mainly of nearly level low areas that have been filled with sandy material dredged primarily from adjacent waterways. The fill consists of sand 3.5 to 8 feet thick mostly over organic tidal marsh sediments.

Beneath the organic marsh sediment, the soils encountered during drilling at the Site typically consisted of fine to medium and coarse-grained quartz sands containing various amounts of gravel. Fine sands, silt and traces of clay were encountered at 33 to 53 feet below grade. The clay is gray in color and is not continuous. There was no defining clay layer noted during the collection of soil samples from the MW-3 and P2 borings. The most clay encountered was a 2-inch thick clay lens at the 40 to 42 foot interval noted at the MW-3 boring.

Some of the soil samples recovered contained hematite, a naturally occurring form of iron oxide. Soil samples where iron oxide is present generally exhibit a reddish coloration. This coloration was most apparent at the depths of 18 to 22 feet across the Site. This form of iron oxide is commonly identified in Long Island soils.

2.4 Hydrogeology

The aquifer system underlying Nassau County consists of three main water-bearing units: the Upper Glacial Aquifer, the Magothy Aquifer, and the Lloyd Aquifer. Of main concern in this study is the uppermost aquifer, the Upper Glacial, an unconfined aquifer which is a direct receptor of surface or near surface contamination. The Upper Glacial Aquifer consists mainly of sand and gravel deposits with some cobbles in an unstratified mixture. In the study area, the Upper Glacial Aquifer is about 50 feet thick, according to the United States Geological Survey (USGS).

The Pleistocene and Upper Cretaceous deposits, comprising sediments of the Magothy Aquifer, are poorly defined within the Freeport area (Kilburne and Krulikas, 1987). The confining units that separate the Upper Glacial and Magothy Aquifers are discontinuous in the Freeport area. These confining units include the Gardiners Clay and the "20 foot Clay" located in the Smithtown area (Kilburne and Krulikas, 1987). This lack of separation, or discontinuity of confining units, allows the two aquifers to be in direct contact; however the hydraulic connection between the two aquifers is limited due to the anisotropic character of the two aquifers. Anisotropy is the condition under which one or more of the hydraulic properties of an aquifer vary according to the direction of flow, (Fetter, 1994).

A small difference in head pressure from the Upper Glacial to the Magothy aquifers, limit the hydraulic connection between the two-aquifer systems. Furthermore, the horizontal stratification of the Pleistocene and Cretaceous sediments of the Magothy Aquifer creates a greater horizontal, rather than vertical movement of ground water. However, some vertical recharge of the underlying aquifers does occur.

2.5 Direction of Ground Water Flow
According to the Nassau County Department of Public Works (NCDPW) water-table elevation maps, regional groundwater flow in the Site area is towards the southeast. Two measurements (November 1997 & May 1998) of groundwater levels from on-site monitoring wells indicate a southeast flow direction and a tidal influence.

2.6 Drinking Water Supply Wells Survey
The Freeport Department of Public Works water district serves the area immediately surrounding the Site. The locations of the public water supply wells for the Freeport water district are shown in Figure 2-4. The nearest public supply wells are located 2.5 miles in a northerly direction, which is upgradient in relation to the direction of groundwater flow at the Site.

The locations of privately owned groundwater wells are shown in Figure 2-5. The wells are designated the following numbers:

1. N5906
2. N2411
3. N10661
4. N5709

Refer to Appendix 2 for the drill logs of the privately owned well.

3.0 Physical Characteristics of the Study Area
The building occupies the majority of the Site property. There are no fences and access is limited to entrances on Ray Street and West End Avenue.
There are overhead electrical lines and transformers located at the north side of the Site (Ray Street). The sewer and water lines are under the north side (Ray Street) of the Site. Other below-grade utilities include gas lines that are also

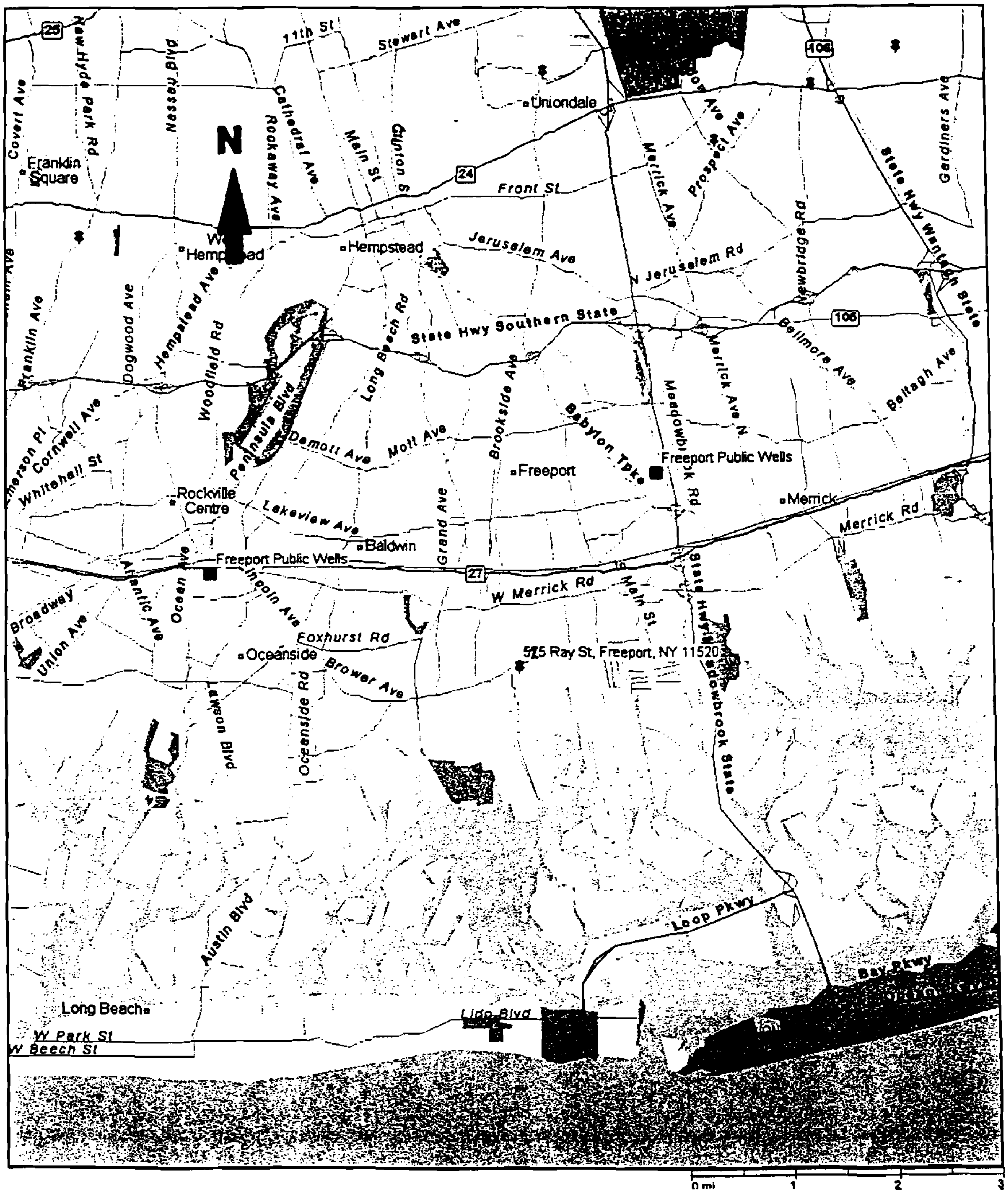


Figure 2-4

Locations of Freeport Public Supply Wells

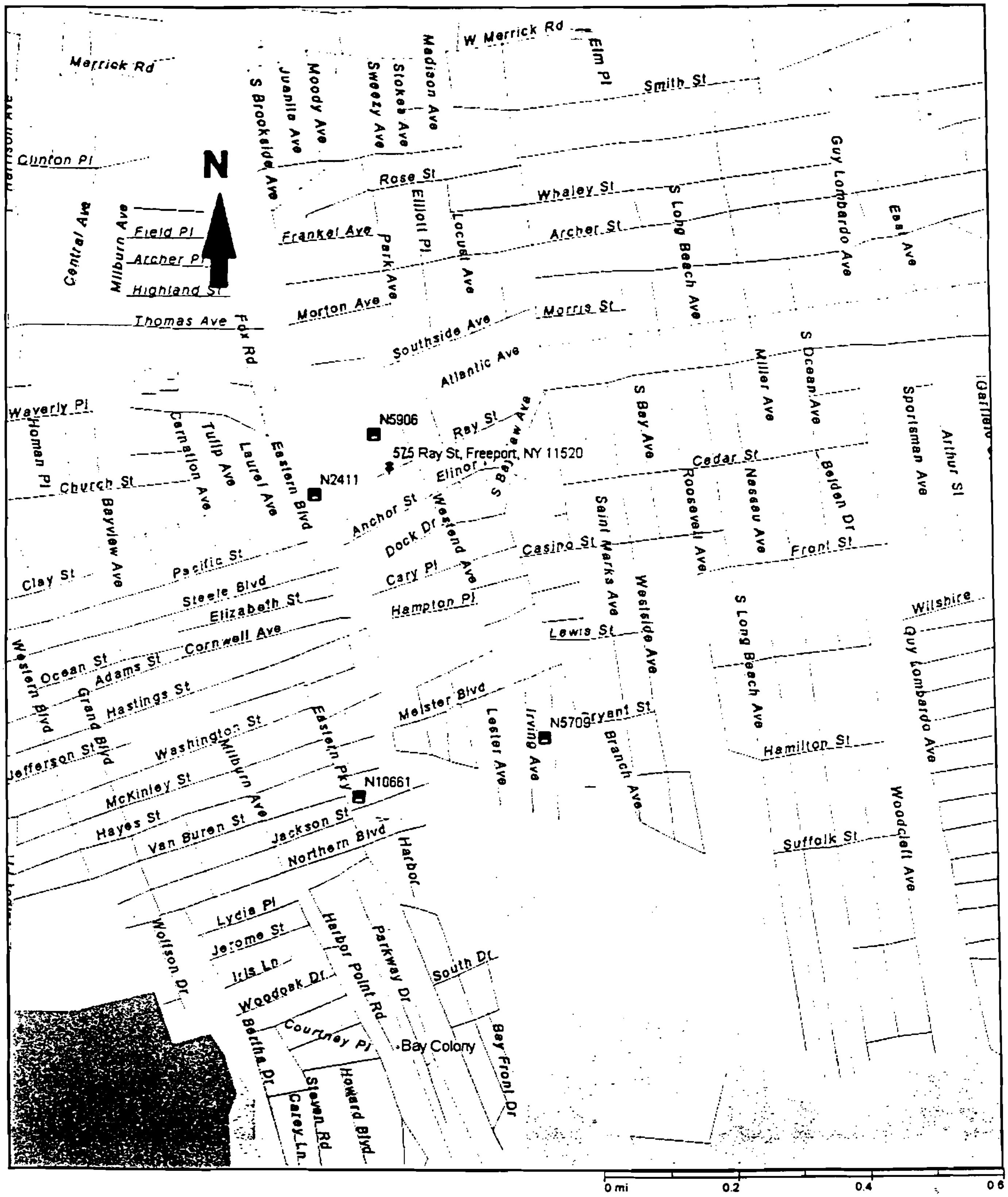


Figure 2-5
Locations of Private Wells

located on the north side. A parking lot drywell is located in the front of the building (West End Avenue).

3.1 Surface Features

William J. Welsh, a New York State registered land surveyor (Lic #49626), performed a topographic survey at the Site (Figure 3-1), the purpose of which was to determine the exact elevation of all monitoring wells, piezometers and the building. The survey was compiled on June 30, 1997 for Phase One and on June 8, 1998 for Phase Two.

The soils in the area of the Site consist of loamy sand from outwash deposits and fill. The soils are well drained and have slopes less than 3 percent. The entire surface of the Site, except a small front lawn area, is paved or covered by the building, so that all precipitation that occurs will drain as run-off. The run-off ultimately discharges into Milburn Creek and into one (1) drywell on the Site. The drywell is not connected to the sewer system, but instead drains directly into the soils.

The average depth to water groundwater in this area ranges from 3.5-feet to 6-feet below land surface and is dependant on the level of the tide. USGS water table contour maps (April 1984) indicate that the general direction of ground water flow in the area is from the north-northeast to south-southwest.

3.2 Contaminant Source Investigation

An investigation was undertaken to identify the potential sources of contaminants at the Site. The areas of investigation include the location of the former waste PCE tank, garbage container area, floor trough and drywell.

The investigation included the collection of soil and groundwater samples from areas of possible contaminant sources. The investigation was divided into two separate phases designated Phase One and Phase Two. The design of Phase Two was based on the findings of Phase One.

Phase One sampling included the collection and laboratory analysis of thirty-three (33) soil samples and six (6) groundwater samples. In addition, two (2) samples were collected from the effluent of the Floor Trough. The soil samples were collected from fifteen (15) interior locations, eight (8) exterior locations, one (1) drywell and four (4) soil samples were collected from the installation of MW-3 and five (5) soil samples from the installation of P2.

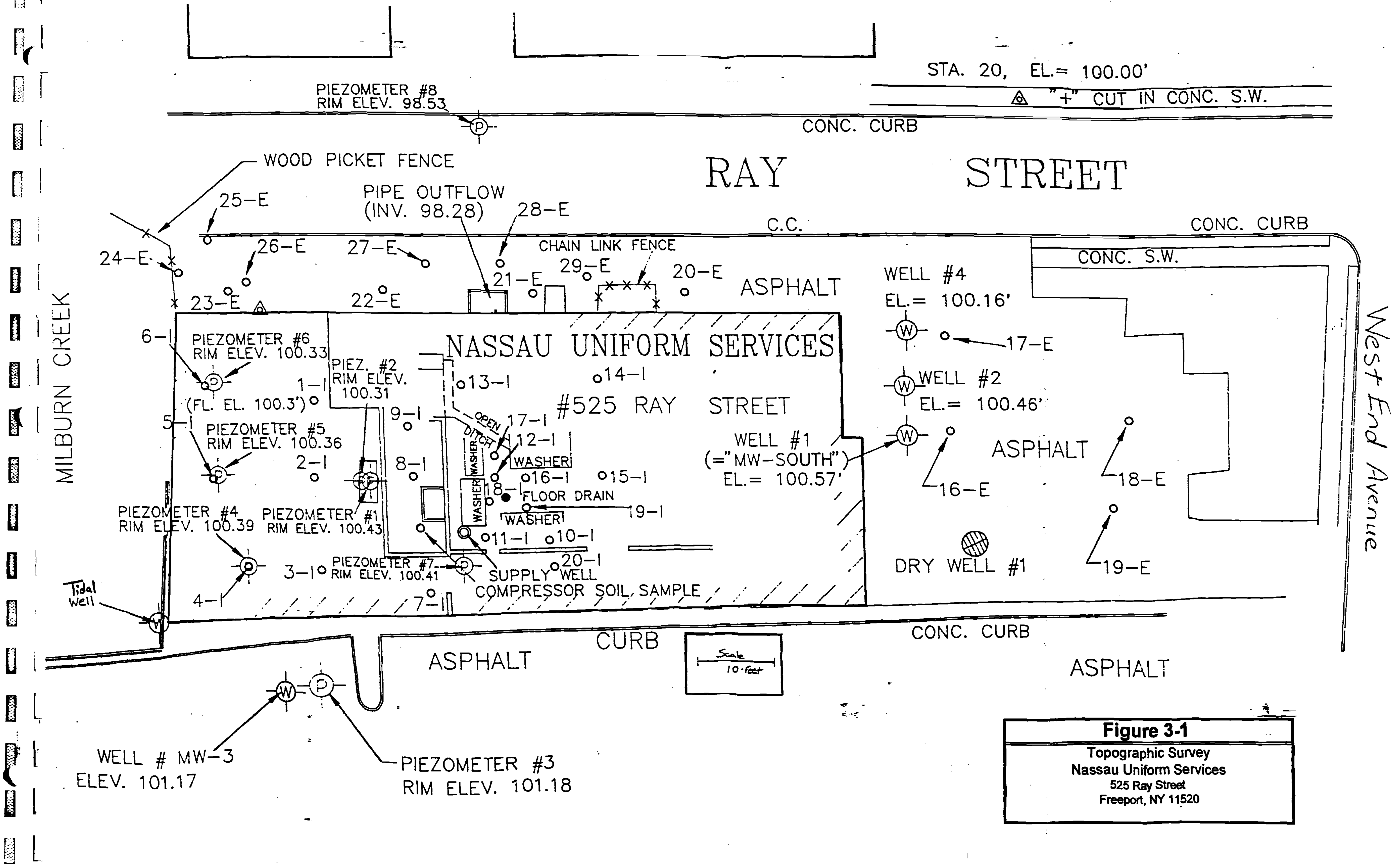


Figure 3-1
Topographic Survey
Nassau Uniform Services
525 Ray Street
Freeport, NY 11520

Groundwater samples were collected from MW-1, MW-3, Supply Well, P1, P2 and P3 during Phase One.

Phase Two sampling included the collection and laboratory analysis of nineteen (19) soil samples and ten (10) groundwater samples. The soil samples were collected from four (4) interior locations; six (6) exterior locations and nine (9) soil samples were collected from the installation of piezometers. A total of five (5) additional piezometers were installed during Phase Two, four (4) of which are located within the building and one (1) outside of the building. The Supply Well was not sampled during Phase Two.

Samples were submitted to Accredited Laboratories, Inc. and Environmental Standards, Inc. validated the analytical results during Phase One. During Phase Two, the samples were submitted to Environmental Testing Laboratories, Inc. The analytical results were not validated during Phase Two.

3.3 Site Climate

The following climatological data were assembled from the files for Nassau County recorded in Mineola, New York. Average temperatures are 33 degrees Fahrenheit (F) and 72 degrees F for winter and summer, respectively. The tempering influence of the Atlantic Ocean and Long Island Sound keep the mean annual temperature (between 52-53 degrees F) for the Island several degrees higher than the average for all of New York State. Average temperatures increase from west to east, and because of the effect of the Atlantic Ocean, the temperatures at the south shore are slightly lower than the corresponding longitude of the north shore temperatures. The maximum and minimum temperatures of record are 103 degrees F (39 degrees C) and -14 degrees F (-26 degrees C), respectively (Soil Conservation Service, USDA, 1974).

The prevailing wind direction is northwest during most of the year, except during the summer months, when south and southwest winds predominate (Franke and McClymonds, 1972). During spring the wind speed is highest, averaging 14 miles per hour (Wulforst, 1987).

The 50-year annual average precipitation recorded at Wantagh, Long Island, New York (ref; Nassau County Department of Public Works) is 44 inches. Approximately half of the precipitation falls between the months of April and September. The annual rainfall for 1997 was 39.33 inches and for 1996 the rainfall totaled 48.79 inches.

3.4 Demography and Land Use

Information on the current industrial profile of Freeport indicates that the area is urban and moderately industrialized by commercial service industries. The residential area in Freeport, south Merrick Road and southeast of the Site, is considered to be of intermediate density with approximately five to ten dwelling units per acre.

Commercial industries are concentrated generally along Sunrise Highway (Route 27) and Merrick Road, which run east and west though Freeport adjacent. The Freeport Department of Public Works Water District serves the Site area. Sanitary waste in the Site area is collected by the Freeport municipal sewer collection system, which is a part of Nassau County Sewer District.

The area has been developed for about 100 years, and has exhibited little recent growth.

3.5 Laboratory Quality Assurance/Quality Control

Phase One investigation sampling was conducted during July and August 1997. The samples were submitted to Accredited Laboratories, Inc. of Carteret, New Jersey. Due to a problem in the laboratory, soil samples submitted from MW-3 were not analyzed within the appropriate holding time. The sampling was conducted a second time on September 11, 1997 and the samples were resubmitted and properly analyzed.

The data received from Accredited Laboratories, Inc. was submitted, as per the FRI work plan, to a data validator, Environmental Standards Inc, Valley Forge, PA on October 10, 1997. The validator required additional information directly from the laboratory and finished their review in May 1998. The laboratory submitted revisions and responses to the comments in June 1998. The original comments, the validator's summary of the data, and the response by Accredited Laboratories is included in Appendix 3.

The NYSDEC approved the request made by AEL to change laboratories and the Phase Two investigation sampling was submitted to Environmental Testing Laboratories, Inc. of Farmingdale, New York. Sampling was conducted using ASP category B reportables. Laboratory data sheets are presented in Appendix 4.

3.6 Field Quality Assurance/Quality Control

During Phase One and Two Investigations of the FRI, soil and groundwater samples were collected in Level D personnel protective gear. Nitril gloves were worn and discarded after the collection of each soil and groundwater sample.

Samples collected for volatile organic analysis were quickly capped and placed in an ice-filled cooler. The laboratory supplied the appropriate glassware for the collection of soil and groundwater samples. Groundwater samples analyzed for metals and volatile organic compounds were preserved in the field following USEPA Contract Laboratory protocol.

For each round of sampling, trip and field blanks were submitted for laboratory analysis. The field blanks consist of de-ionized water prepared by the laboratory and were conducted after the collection of soil and groundwater samples. The de-ionized water is poured over the sampling equipment and collected for laboratory analysis.

Trip blanks accompanied each cooler and were provided by the laboratory and consisted of 40-milliliter vials filled with analyte-free water. Trip blanks accompanied soil and groundwater samples and the field blank sample. The trip blanks were not opened in the field and were only opened by the laboratory personnel during the time of analysis.

The purpose of the field blank and trip blank is to ensure sample integrity.

4.0 Phase One Investigation

The fieldwork associated with the Phase One investigation was conducted in July 1997 through September 1997. Soil and groundwater samples were collected and submitted to Accredited Laboratories, Inc. The fieldwork during Phase One included the following tasks:

1. Soil Sampling.
    - Soil gas, headspace and laboratory analysis of interior and exterior soil samples.
    - Discrete soil sample collection from MW-3 and P-2.
2. Groundwater Sampling.
    - Collection of groundwater samples from monitoring wells and piezometers.

3. Identification of Tidal Influence on Groundwater.
   - Determine direction of groundwater flow.
   - Conduct slug test to determine hydraulic conductivity.
4. Floor Trough Sampling.
   - Wastewater grab sample.
   - Determination of point sources.
5. Drywell Sampling.
   - Collection of bottom sediment sample.

4.1 Soil Sampling
Soil sampling was performed in interior and exterior areas associated with the building and during the installation of piezometer #2 and monitoring well #3, Figure 4-1.

4.1.1 Interior Soil Sampling
Soil samples were collected from fifteen (15) interior soil borings designated 1-I through 15-I and one (1) boring designated Compressor Room, (See Figure 4-1). At each soil boring location, soil gas readings, headspace readings and laboratory analysis of the soil sample was conducted.

In order to retrieve the soil samples from beneath the building's floor, a 2-inch hole was bored through the concrete flooring to allow access for the Geoprobe sampling equipment, (direct-push technology). A Bosch rotary hammer drill and solid core drill bit were used to bore through the concrete flooring. The thickness of the concrete flooring ranged from 1.5 feet in the main portion of the building to 8-inches in the garage area of the building.

After the 2-inch hole was bored through the concrete flooring, the manually operated Geoprobe equipment was used to collect soil samples from 2 to 4 feet below grade. When the sampling equipment was removed from the bore-hole, a Photovac 2020 Photoionization Detector (PID) was used to obtain soil gas readings. The soil sample was retrieved from the Geoprobe equipment and placed into two (2) glass laboratory jars. Aluminum foil was placed on the top of one half-filled jar and sealed. The other jar (volatile organic compounds) was filled completely and immediately placed into an iced cooler for transportation to the laboratory. The PID was used to obtain headspace readings from the soil sample with the aluminum foil seal.

The manually operated Geoprobe equipment consists of a sampler, drive rods, slide hammer and retrieval jack. To collect soil samples, the Geoprobe Large

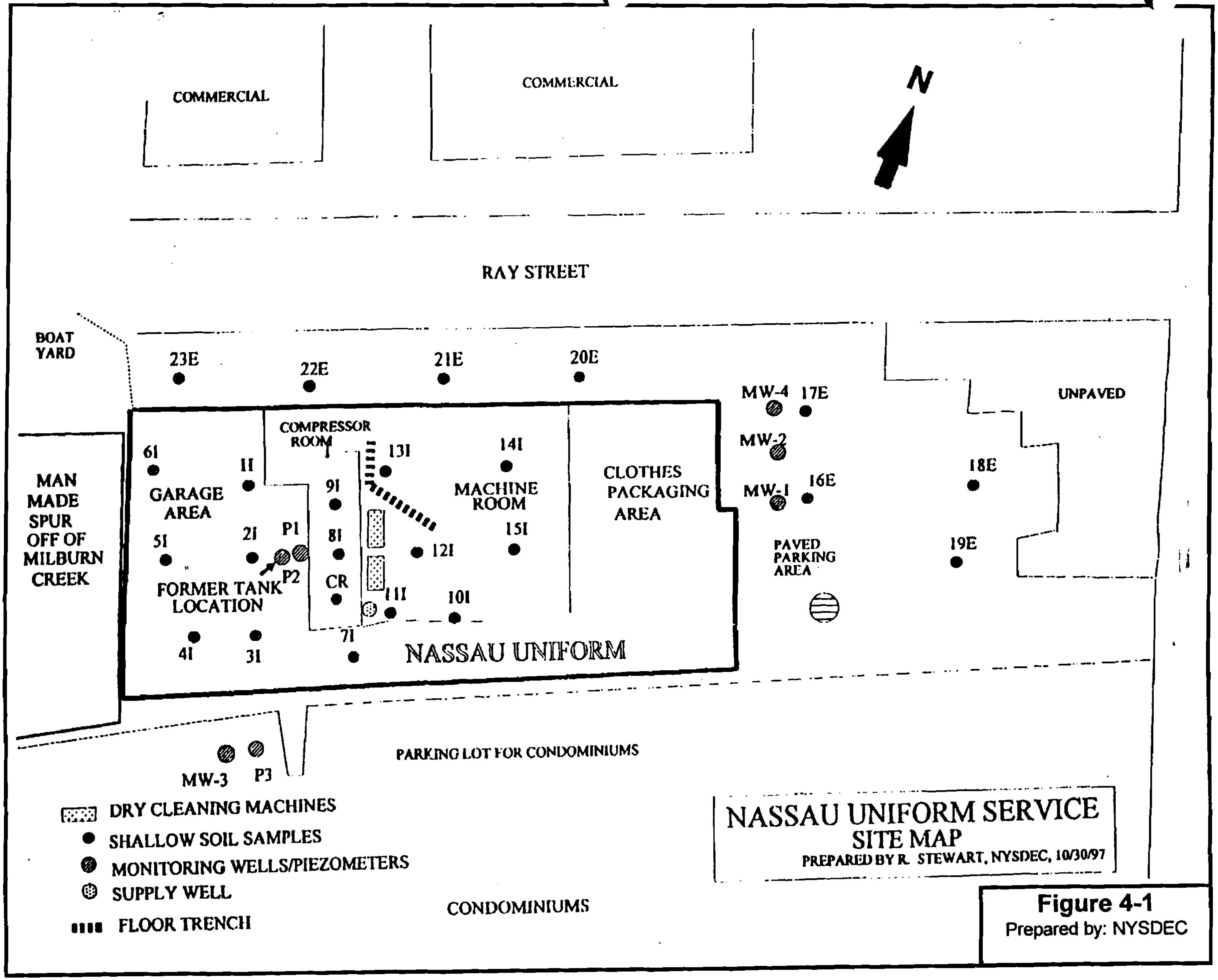


Figure 4-1
Prepared by: NYSDEC

Bore (LB) drive point sampler was used. The sampler is fitted with a removable cutting shoe and clear acetate liner. The sampler measures 2-feet in length and 1.5 inches in diameter. In order to ensure sample integrity and assist sample removal, new acetate liners were used for each sample collection point.

The soil gas samples were obtained after the Geoprobe sampler was retrieved from each boring. Polyethylene tubing was placed into the borehole of the soil sample location. A seal between the concrete flooring and tubing was made, and the tubing was connected to the PID meter. Once the PID readings stabilized, the highest PID reading was recorded. After the samples were collected, the annulus within the borehole was filled with clean sand and the concrete flooring was patched with new concrete.

The soil gas and headspace readings for interior soil samples 1-I through 15-I and the compressor room sample are presented in Table 4-1. A lithologic description of the soil samples is also included. The soil gas and headspace readings are illustrated in Figure 4-2 and Figure 4-3.

Soil samples 1-I through 15-I and the compressor room sample were submitted to Accredited Laboratories Inc. for laboratory analysis using EPA method 8240. Soil sample 6-I was not submitted for laboratory analysis, due to sample loss. This sample was duplicated during Phase Two sampling and is designated P6 (2'-4').

Table 4-2 and Figure 4-4 summarizes the laboratory analysis of the interior soil samples. Laboratory data sheets are presented in Appendix 3.

Based on the laboratory analysis of the Phase One interior soil samples, volatile organic compound contamination was detected above the NYSDEC TAGM Recommended Soil Cleanup Objectives at the following locations:

1. 3-I	4. Compressor Room
2. 8-I	5. 11-I
3. 9-I	6. 12-I

4.1.2 Exterior Soil Samples

Exterior soil samples were collected in areas to the north and east of the building, (See Figure 4-1). The exterior soil samples are designated 16-E through 23-E. The soil samples were collected using the same equipment and procedures as mentioned in section 4.1.1. Exterior soil samples were collected at

2 to 4 feet below surface grade. Soil gas and headspace readings were obtained and the soil samples were submitted for laboratory analysis.

Refer to Table 4-3 for the Exterior Soil Boring Log. This boring log includes the soil gas and headspace readings and a lithologic description of the exterior soil samples. The soil gas and headspace readings are illustrated in Figure 4-2 and Figure 4-3

Exterior soil samples 16-E through 22-E were submitted to Accredited Laboratories, Inc. and analyzed using EPA method 8240. Soil sample 23-E was submitted to Accredited Laboratories, Inc. for full TCL (Target Compound List) analysis. Refer to Table 4-4 and Figure 4-4 for a summary of the volatile organic compounds detected in the exterior soil samples.

Based on the laboratory analysis of the exterior soil samples, contamination volatile organic compound contamination was detected above the NYSDEC TAGM Recommended Soil Cleanup Objectives at the following locations:

1. 21-E
2. 22-E
3. 23-E

Based on the full TCL analysis of soil sample 23-E, semi-volatile and metals contamination was detected in addition to volatile organic compounds. Sample 23-E is located adjacent to the garbage container in the northwest corner of the Site property, see Figure 4-5.

4.1.3 Soil Samples Collected from Installation of MW-3

Monitoring well #3 was installed on September 7, 1997, using a hollow stem auger drill rig. The well is located in the parking lot associated with the property abutting the Site to the south, (Waters at West End Inc). During the installation of this well, continuous split spoon samples were collected at 2-foot intervals from the surface grade to a depth of 42-feet below grade. The soil samples were screened in the field by obtaining headspace readings using the PID, Refer to Table 4-5 for the boring log of MW-3.

Table 4-1 - Interior Soil Boring Log.

Soil Boring Location	Soil Gas Reading (ppm)	Headspace Reading (ppm)	Sample Description
1-I	> 2,000	1,177	Coarse sand and organic bog material, black.
2-I	606	581	Coarse sand and organic bog material, black.
3-I	1,410	1,178	2'-3' Coarse sand 3'-4' Bog material with strong odor.
4-I	128	449	Coarse sand, some gravel, dark brown.
5-I	102	267	Coarse sand, some gravel & bog, dark brown.
6-I	549	466	Coarse sand, some gravel, dark brown.
7-I	> 2,000	> 2,000	Coarse sand, some gravel, dark brown.
8-I	> 2,000	> 2,000	Coarse sand and bog material, black.
9-I	47	166	Fine grained sand and bog material, black.
10-I	> 2,000	268	Medium grained sand and bog material, black.
11-I	> 2,000	1,101	Coarse sand, bog at 3'-4', black.
12-I	> 2,000	473	Medium to coarse sand, some bog, dark brown.
13-I	876	127	Medium to coarse grained sand, brown.
14-I	104	34.2	Medium to coarse grained sand, dark brown.
15-I	1,515	639	Coarse grained sand and bog at 3', dark brown.
Compressor Room	> 2,000	> 2,000	Coarse sand and organic material, black, strong odor and oil stained.

Table 4-2 - Summary of Volatile Organic Compounds Detected in Interior Soil Samples.

Sample Location	trans-1,2-Dichloroethene	Vinyl Chloride	Trichloroethene	Tetrachloroethene	cis-1,2-Dichloroethene
1-I			4	9	
2-I	5		5	11	57
3-I	48		9	76	720
4-I			5	39	
5-I			16	230	15
7-I			24	640	16
8-I	230		15,000	290,000	15,000
9-I	27		1,300	27,000	700
10-I			76	6,900	52
11-I			79	17,000	320
12-I			61	12,000	99
13-I				79	
14-I			18	460	24
15-I			42	890	26
Compressor Room			130	760	6,300
NYSDEC Objectives	300	200	700	1400	250

Note:

1. Concentration Units = ug/Kg (parts per billion).
2. Blank Spaces represent constituent levels below the method detection limit of the laboratory.
3. Table represents compounds with significant values of detection, refer to laboratory data sheets for the individual compounds detected.
4. Soil samples 1-I through 15-I collected on 7/22/97, compressor room sample collected on 8/7/97.
5. Methylene Chloride and Acetone were detected in associated blank.
6. Samples 1-I through 15-I and compressor room were analyzed by Accredited Laboratories Inc. using EPA method 8240.

Table 4-3 - Exterior Soil Boring Log.

Soil Boring Location	Soil Gas Reading (ppm)	Headspace Reading (ppm)	Sample Description
16-E	112	115	Medium to fine grained sands, gray.
17-E	795	52.7	Medium grained sand, some gravel, gray.
18-E	> 2,000	> 2,000	Coarse sand some gravel, brown.
19-E	142	320	Coarse to medium sand, some gravel, brown.
20-E	1,794	267	Coarse sand and gravel, brown.
21-E	154	492	Coarse sand, some bog material, dark brown.
22-E	291	993	Coarse sand and bog material, black.
23-E	970	> 2,000	Coarse sand and bog material, strong odor, black in color.

Table 4-4 - Summary of Volatile Organic Compounds Detected In Exterior Soil Samples.

Sample Location	trans-1,2-Dichloroethene	Vinyl Chloride	Trichloroethene	Tetrachloroethene	cis-1,2-Dichloroethene
16-E				12	
17-E			4	69	4
18-E				10	
19-E				5	
20-E				11	
21-E			35	**42,000**	7
22-E	**500**		92	470	**7,700**
23-E			**21,000**	**110,000**	**10,000**
Drywell #1					
NYSDEC Objectives	**300**	**200**	**700**	**1,400**	**250**

Note:

1. Concentration Units = ug/Kg (parts per billion).
2. Blank Spaces represent constituent levels below the method detection limit of the laboratory.
3. Table represents compounds with significant values of detection, refer to laboratory data sheets for the individual compounds detected.
4. Soil samples 16-E through 23-E collected on 7/22/97, drywell #1 sample collected on 9/11/97.
5. Methylene Chloride and Acetone were detected in associated blank.
6. Samples 16-E through 23-E and drywell #1 were analyzed by Accredited Laboratories Inc. using EPA method 8240.

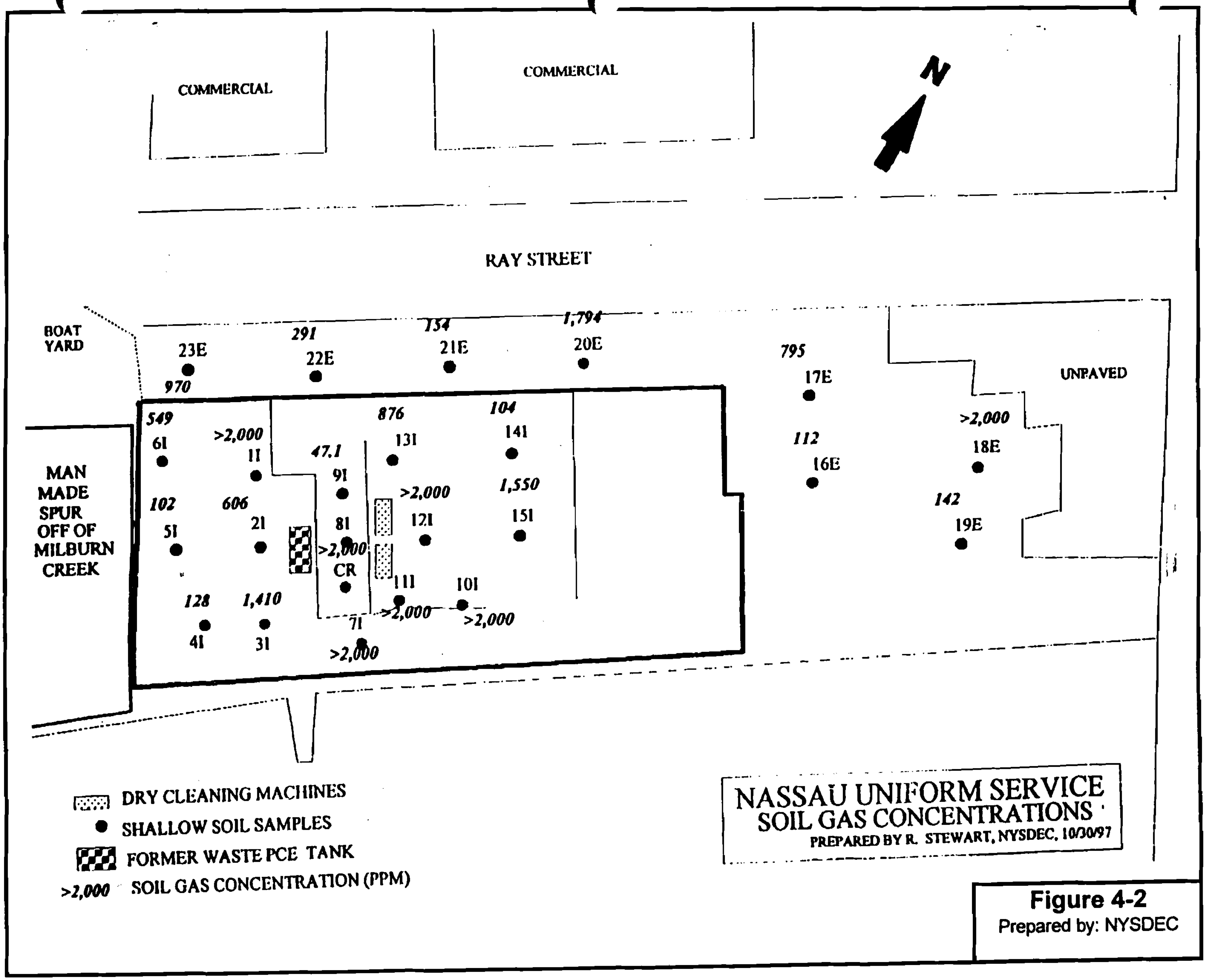


Figure 4-2
Prepared by: NYSDEC

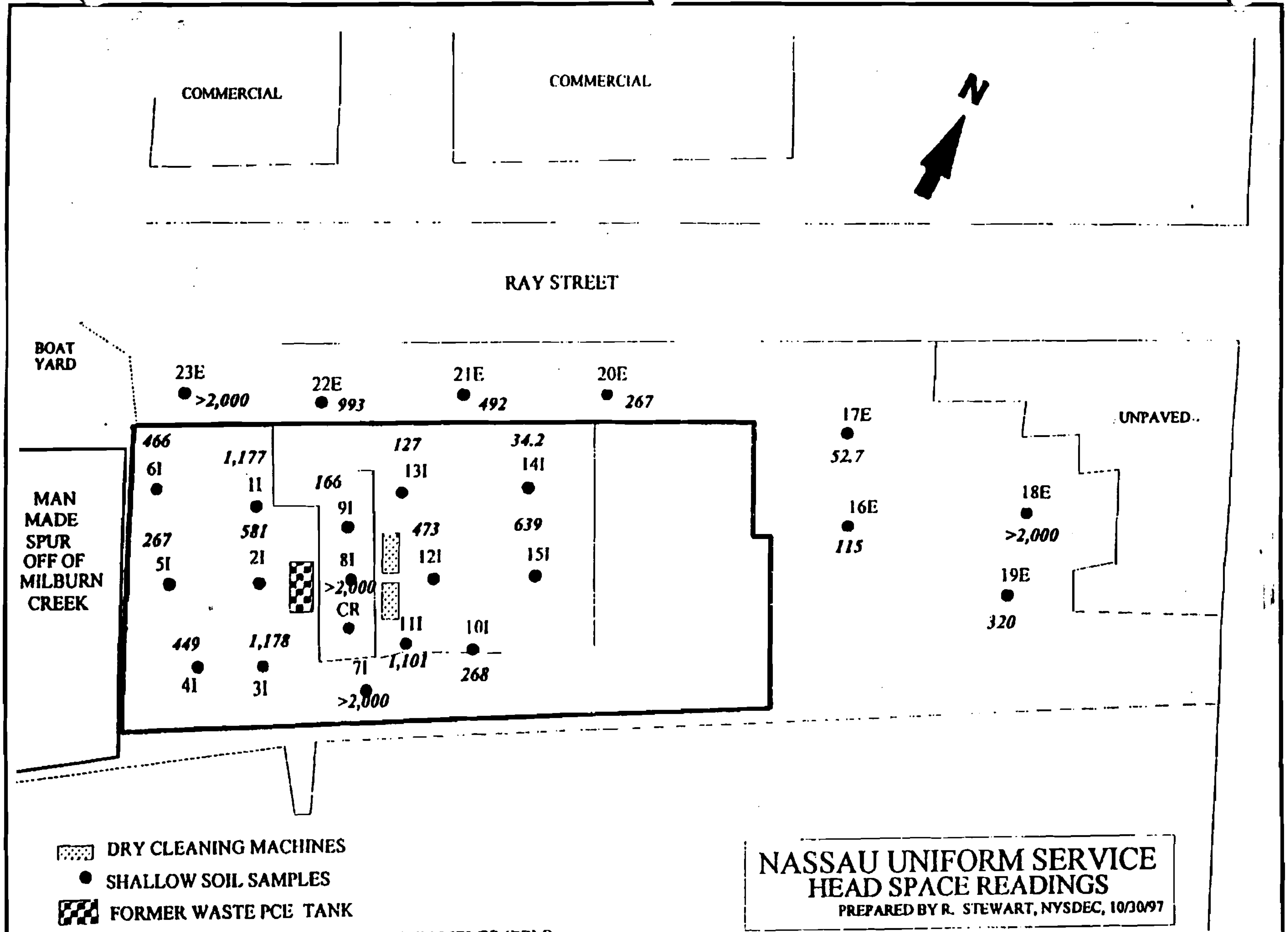


Figure 4-3
Prepared by: NYSDEC

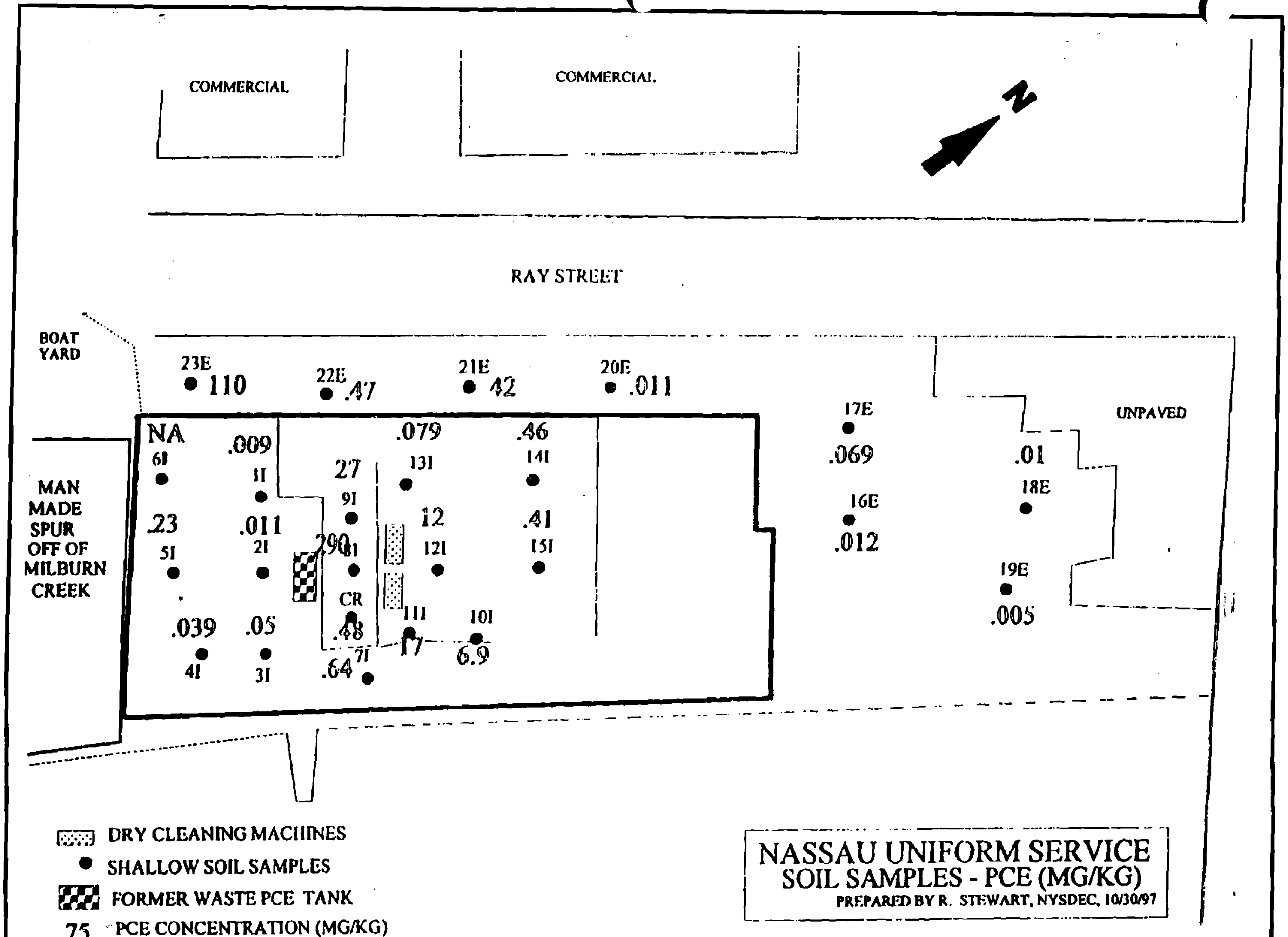


Figure 4-4
Prepared by: NYSDEC

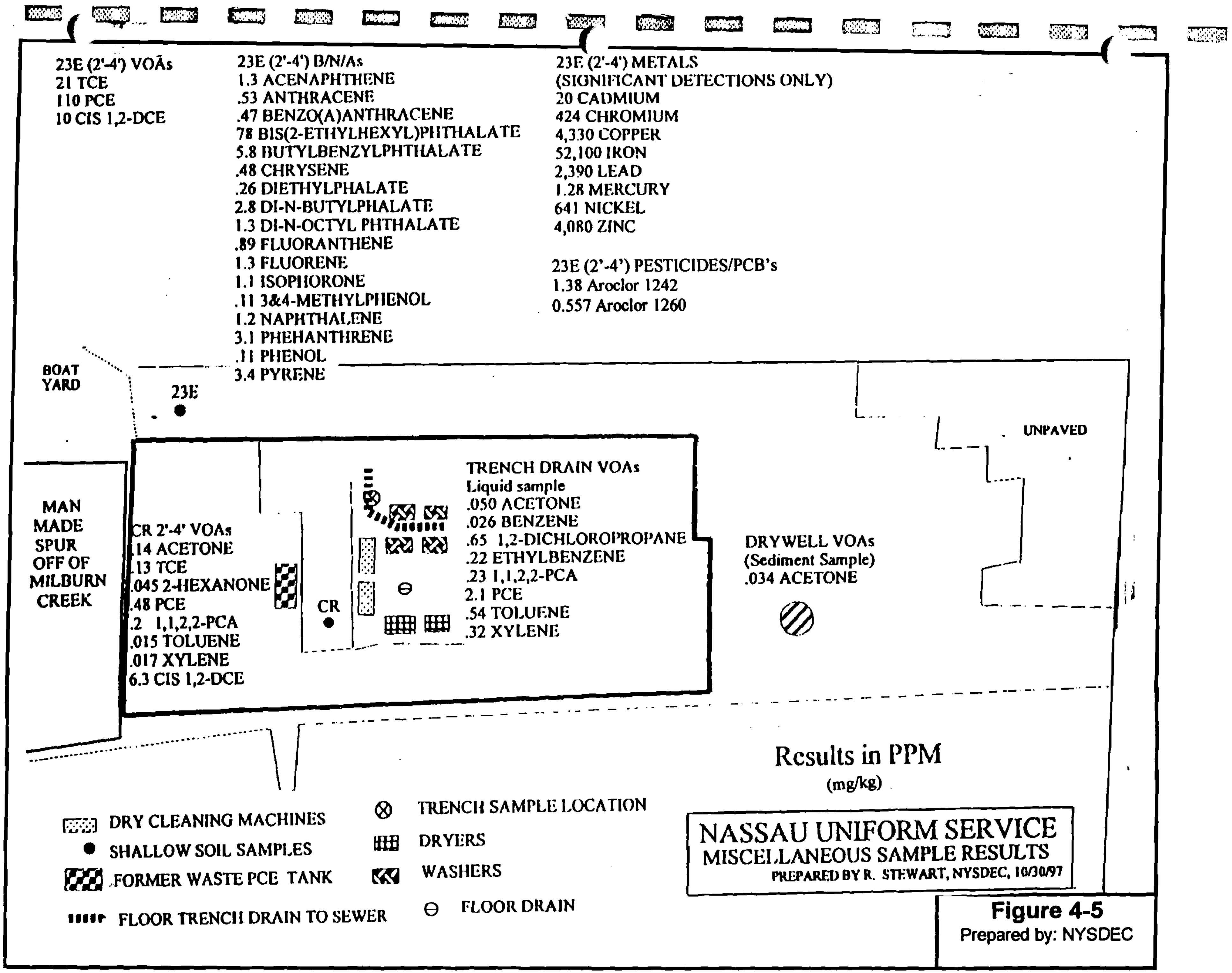


Figure 4-5
Prepared by: NYSDEC

Four (4) soil samples were submitted to Accredited Laboratories, Inc. for laboratory analysis using EPA method 8240. The four samples were submitted to the laboratory based on the following criteria:

1. Sample with highest PID reading, (16'-18').
2. Sample at groundwater interface, (6'-8').
3. Sample above organic bog material, (8'-10').
4. Sample above clay, (40'-42').

Accredited Laboratories, Inc exceeded the analysis holding time for the above samples. Therefore, the samples were deemed void and AEL collected new samples at the same depth intervals to replicate the MW-3 sampling event.

On September 11, 1997, AEL re-sampled the MW-3 sample locations using a truck mounted Geoprobe unit. The soil boring point was located 3-feet to the south of MW-3. Discrete soil samples were obtained using the Geoprobe LB sampler used in conjunction with acetate liners. The samples were submitted to Accredited Laboratories, Inc. for analysis using EPA method 8240. The samples were analyzed within the holding time and the analytical data is reported in Table 4-5 and Appendix 3.

Based on the laboratory analysis of the soil samples collected from the MW-3 boring, no volatile organic compounds were detected as exceeding the NYSDEC TAGM Recommended Soil Cleanup Objectives.

4.1.4 Soil Samples Collected from Installation of Piezometer #2 (P2)

On August 7 & 8, 1997, AEL collected discrete 2-foot soil samples from the surface grade to 53-feet below grade at the P2 location. The samples were obtained using a truck mounted Geoprobe unit and 2-foot LB sampler with acetate liners. P2 is located within the building at the former waste PCE tank location.

The boring log for P2 is presented in Table 4-6. This table summarizes the sample depth, headspace readings, lithologic description and the analytical results of the soil samples submitted for laboratory analysis.

AEL submitted the following samples to Accredited Laboratories, Inc. for laboratory analysis:

1. P2 (2-4) full TCL analysis
2. P2 (6-8) 8240 analysis
3. P2 (24-26) full TCL analysis

Table 4-5 - Monitoring Well #3 Boring Log.

Depth Below Grade (Feet)	PID Reading (ppm)	Sample Description	Soil Sample Analysis (ug/kg)
0-2	4.9	Asphalt, gravel, medium to fine grained sand, yellowish-brown.	
2-4	10	Coarse to medium grained sand, some gravel, very dark brown.	
4-6	Not sampled	Coarse grained sand, some gravel, brown.	
6-8	12	Coarse to medium grained sand, some fines and gravel, dark brown.	Toluene - 1 ppb
8-10	18	Organic bog layer @ 8.5-feet, then fine to medium sands, dark brown.	None Detected
10-12	6.2	10-11 feet - Coarse sand & gravel. 11-12 feet - Medium to fine sands.	
12-14	5.6	Coarse grained sand, some gravel, fines @ 14-feet, reddish-brown.	
14-16	7.5	Coarse to medium grained sand, some gravel, dark yellowish brown.	
16-18	7.8	16-17 - medium to fine sands. 17-18 - coarse sand & some gravel.	None Detected
18-20	2.1	Coarse to medium grained sand, some gravel, dark yellowish brown.	
20-22	4.5	Coarse grained sand, some gravel, reddish-brown.	
22-24	No Sample Obtained - Too much heaving.		
25-27	6.3	25-26 - Coarse some gravel. 26-27 - Fine sand, some clay & gravel.	
27-29	6.4	27-28 - Medium to coarse sand. 28-29 - fine sand & silt, trace of clay.	
29-31	4.8	Fine sands and silt, trace of clay, gray.	
31-33	4.2	Fine sands and silt, trace of clay, gray.	
35-37	No Sample Obtained - Too much heaving.		
40-42	3.4	40-40.5 - medium to fine sands & silt 40.5-42 - clay w/medium plasticity, dark gray.	Toluene - 2 ppb

Note:

1. Methylene Chloride and Acetone detections were not listed due to the presence of these compounds in blanks.
2. Refer to validated laboratory data sheets in Appendix 3.

Table 4-6 - Piezometer #2 Boring Log

Depth Below Grade (Feet)	PID Reading (ppm)	Sample Description	Soil Sample Results (mg/kg)
0-3	Not sampled	Fill material consisting of coarse sand, yellowish-brown.	
3-4	>2,000	Coarse sand and organic bog material, back, odor.	**VOAs:** **AEL Sample** 1.0 PCE .043 1,2-Dichloropropane .021 Toluene .0051 cis 1,2-DCE **B/N/As:** 2.2 Butybenzylphthalate .32 Benzoic Acid 18 Bis(2-Ethylhexyl)Phthalate .071 Anthracene .48 Di-n-Butylphthalate .15 Fluoranthene 2.9 Di-n-octylphthalate .66 Phenanthrene .28 2-Methylnapthalene .4 Pyrene .25 3&4 Methylphenol .19 Napthalene **Pesticides/PCBs:** .0074 A-Chlodane .0436 Aroclor-1260 .00422 G-Chlordane
4-6	>2,000	Organic bog material and coarse sand, black, wet @ 5.5' to 6', odor.	**VOAs:** **NYSDEC Sample** 3.8 PCE 9.8 1,2-DCE .2 Xylene .97 Total VOA TICs **B/N/As:** .9 Phenol .058 1,2-Dichlorobenzene .044 2-Methylphenol .49 4-Methylphenol .14 Napthalene .12 2-Methylnapthalene .058 Phenanthrene 2.8 Bis(2-Ethylhexyl)Phthalate .39 Di-n-octylphthalate 39.61 TotalB/N/A TICs **Pesticides/PCBs:** .0012 Heptachlor Epoxide .0021 4,4-DDD .022 Methoxyclor .0041 alpha-Chlordane .0051 gamma-Chlordane .058 Arclo-1016 .027 Arclor-1260
6-8	>2,000	Coarse grained sand, some gravel and fines,odor, brown.	**VOAs:** **AEL Sample** 160 PCE 7.7 TCE 12 cis 1,2-DCE
8-10	>2,000	Coarse to medium grained sand, trace of gravel, odor, dark yellowish-brown.	
10-12	>2,000	Coarse grained sand and some gravel, strong odor, dark yellowish-brown.	**VOAs:** **NYSDEC Sample** 580 PCE 7.8 TCE .59 1,2-DCE .025 Toluene .008 Ethylbenzene .057 Xylene 11.12 Total Voa TICs
12-14	>2,000	Coarse grained sand and some gravel, odor, dark yellowish-brown.	

(con't)

Table 4-6 - Piezometer #2
Boring Log

14-16	>2,000	Coarse grained sand and some gravel, soil is stained w/oily substance. Strong odor.	**VOAs: NYSDEC Sample** 190 PCE .23 TCE .1 1,2-DCE .021 Toluene 6.09 Total VOA TICs **B/N/As:** .17 2-Methylnaphthalene .38 Acenaphthalene .3 Dibenzofuran .36 Fluorene .92 Phenanthrene .19 Anthracene .45 Fluoranthene .33 Pyrene .13 Benzo(a)anthracene .15 Chrysene 21 Bis(2-Ethylhexyl)Phthalate 2.4 Di-n-octylphthalate .042 Benzo(g,h,i)pyrene 12.4 Total B/N/A TICs
16-18	>2,000	Coarse grained sand and gravel, slight oil residue, odor, dark brown.	
18-20	667	Medium to coarse grained sand, some fines, odor, reddish-brown.	
20-22	1,900	Coarse grained sand and gravel, odor, orange-brown.	
22-24	>2,000	Coarse to medium grained sand, odor, yellowish-brown.	**VOAs: NYSDEC Sample** .007 PCE
24-26	15	Fine to medium grained sand, some gravel, odor, pale brown.	**VOAs: AEL Sample** 2.9 PCE .4 TCE .072 cis 1,2-DCE **B/N/As:** 0.74 Bis(2-Ethylhexyl)Phthalate .069 Di-n-octylphthalate .18 Di-n-Butylphthalate
26-28	96.6	Fine grained sand and silts, trace of gravel, odor, dark yellowish-brown.	
28-30	215	Fine sands and silts, gray. Slight odor.	
30-32	121	Fine sands and silts, gray.	
32-34	127	Fine sands and silts, gray.	
34-36	481	Fine sands and silts, gray.	
36-38	719	Fine sands and silts, gray.	
38-39.5	982	Fine sands and silts, gray, trace of clay at 39.5-feet.	

(con't)

Table 4-6 - Piezometer #2
Boring Log

39.5-41	>2,000	Coarse grained sand and silts, trace of clay, dark gray.	**VOAs: AEL Sample** .005 PCE **VOAs: NYSDEC Sample** .005 2-Butanone
41-43	>2,000	41-41.5 - coarse sands and silt. 41.5-43 - silty clay and fine sand	
43-45	1,393	Silts and traces of clay, dark gray.	
45-47	667	Silts and some fine grained sand, dark gray.	
47-49	499	Fine grained sands and silt, dark gray.	
49-51	537	Fine grained sands and silt, dark gray.	
51-53	313	Fine grained sands and silt, dark gray.	**VOAs: AEL Sample** None Detected

End.

Note:
1. Methylene Chloride and Acetone detections were not listed due to the presence of these compounds in blanks.
2. Sample results presented are based on a dilution factor of 1, refer to validated laboratory data sheets in Appendix 3.

4. P2 (39.5-41) 8240 analysis
5. P2 (51-53) 8240 analysis

Mr. Bob Stewart from the NYSDEC collected soil samples for laboratory analysis at the following locations:

1. P2 (4-6) full TCL analysis
2. P2 (10-12) 8240 analysis
3. P2 (14-16) full TCL analysis
4. P2 (22-24) 8240 analysis
5. P2 (39.5-41) 8240 analysis

Based on the analytical data from the samples submitted by both AEL and the NYSDEC, soil contamination extends from 2-feet to approximately 26-feet below grade at the P2 location. Soil samples were collected at two-foot intervals below the sample collected at 26-feet. Based on the headspace readings and physical observations of these soils, the samples collected at 39.5 to 41.5 and 51 to 53 feet below grade were submitted for laboratory analysis. Based on the laboratory analysis of these samples, low levels of volatile organic compounds were detected.

4.2 Groundwater Sampling

Groundwater sampling was performed from two (2) monitoring wells and three (3) piezometers, Refer to Figure 1 for sample locations. The monitoring wells are designated MW-1, MW-3 and Supply Well. The piezometers are designated P1, P2 & P3. MW-1, P1 and P3 intercept shallow groundwater while MW-3 and P2 intercept deeper groundwater.

4.2.1 Well Construction

MW-1 is an existing well located in the front parking lot of the Site. The well was installed in 1984 to monitor groundwater quality after the removal of a 2,000-gallon underground gasoline tank. The well measures 4-inches in diameter and is constructed of PVC slotted well screen. The depth to bottom measures 15.41 feet and the depth to water measured 4.59 feet during the time of sample collection. The well is secured with a locking manhole cover and J-plug. No additional information is known about the construction of this well.

MW-3 was installed on July 16, 1997, using hollow stem drill augers measuring 6 $^{5}/_{8}$-inch inside diameter. The well was installed according to the NYSDEC high specifications for monitoring wells. MW-3 is constructed as follows:

1. 30 feet of 4-inch PVC (schedule 40) Riser pipe.

2. 10 feet of 4-inch PVC (schedule 40) screen material with a slot size measuring 0.01-inch. Screened interval is 30 to 40 feet below grade.
3. The annulus surrounding the screen and formation was filled with #1 sand pack from a depth of 41 to 23 feet below grade. The sand pack extends 3-feet above the screen.
4. The annulus from 23 to 21 feet below grade was filled with bentonite pellets.
5. A high displacement pump and tremie pipe were used to grout the remaining annulus from 21-feet to 1-foot below grade. The grout consists of a Portland cement and bentonite mixture.
6. A locking manhole and J-plug secure the well from surface run-off and vehicular traffic.

The Supply Well is an existing well located within the building and adjacent to the dry-cleaning machine. The well is constructed of steel casing measuring 1.5-inches in diameter. The depth to the bottom of the well is 12.20 feet; the depth to water is 12.02. The well has poor recharge characteristics and contains organic bog material. No additional information is known about the construction or purpose of this well.

Piezometer #2 was installed on August 18, 1997; using a truck mounted Geoprobe unit and is constructed of schedule 40 PVC. The Piezometer measures 1-inch in diameter and is screened from 28-feet to 38-feet below grade (0.01 slot size). The solid riser extends from the surface grade to 28-feet below grade. After the piezometer was installed, #0 sand pack was poured from the surface to fill the annulus between the formation and PVC piping. Granular bentonite was then poured in the remaining 3-foot portion of the annulus. A locking manhole cover and J-plug secure the piezometer.

Piezometer #1 and Piezometer #3 were installed on August 18, 1997, using a truck mounted Geoprobe unit. The wells are constructed and installed in the same manner as noted above with the exception of the screened interval. The screened interval of P1 measures 2.6-feet to 12.6-feet below grade. The screened interval for P3 measures 2.12-feet to 12.12-feet below grade.

The piezometers were installed using Geoprobe equipment specially designed for the installation of small diameter wells. The probe rods measure $2^1/_8$ inch in diameter, which allows the placement of up to 1-inch PVC wells. In order to install the PVC piezometers using the rod/casing, an expendable drive point is fitted into the leading rod and the rod/casing is then driven to the desired depth. Once the rod/casing is at the appropriate depth, flush threaded PVC is inserted down the interior cavity and the rod/casing is then retrieved leaving the expendable point and PVC screen and riser in place.

4.2.2 Groundwater Sampling Event

On August 28, 1997, groundwater samples were collected from MW-1, MW-3, Supply Well, P1, P2 and P3. Prior to sampling, the wells were developed and purged 3 to 5 well volumes. A submersible Whale (ES-60) centrifugal pump was used to develop the 4-inch monitoring wells (MW-1 & MW-3). A Watera stainless steel foot valve connected to ½-inch polyethylene tubing was oscillated in order to purge, develop and sample P1, P2, P3 and the Supply Well. The stainless steel foot valve was decontaminated between wells and new polyethylene tubing was dedicated to each well.

A Horiba U-10 water quality meter was used to measure Ph, conductivity, turbidity, dissolved oxygen, temperature and salinity in MW-1, MW-3, P1, P2 and P3. A Solinst electronic water level indicator was used to measure the depth to water and depth to bottom in both the monitoring wells and piezometeres. The water quality and depth measurements were recorded on August 28, 1997 and are as follows:

Well Location	Depth To Water	Depth To Bottom	Ph	Cond. mS/cm	Turbidity NTU	Dissolved Oxygen mg/l	Temp. C°	Salinity %
MW-1	4.59	15.41	6.35	.641	3	.84	23.5	.02
MW-3	6.46	39.25	6.97	.079	890	1.92	19.4	0
P1	5.31	12.11	6.30	.95	668	.95	21	.04
P2	4.95	36.95	6.94	.089	389	.70	20.2	0
P3	6.74	12.21	6.75	.608	877	.57	20.6	.02
Supply Well	12.02	12.20	NS	NS	NS	NS	NS	NS

The supply well was too dirty for the Horiba Meter and no measurements were recorded.

Groundwater samples were obtained from MW-1 and MW-3 using a stainless steel bailer and nylon rope. The groundwater samples collected from P1, P2, P3 and the Supply Well were collected using the foot check valve and polyethylene tubing. The samples were placed into the appropriate glassware and shipped to Accredited Laboratories, Inc. in an ice filled cooler.

The laboratory analysis methods for the groundwater samples collected are as follows:

Sample Location	Analysis Method
MW-1	8240 + Library Search
MW-3	Full TCL
MW-3	Full TCL – MS/MSD
Supply Well	8240 + Library Search
Piezometer #1	Full TCL (CLP)
Piezometer #2	SW-846, 8240 level A reportables, w/o TIC's
Piezometer #3	Full TCL
Field Blank	Full TCL, 8240
Trip Blank	Full TCL, 8240

- Full TCL excluding cyanide.
- Salinity analyzed in P1, P3 & MW-3.

A matrix spike/matrix duplicate sample was collected from MW-3. The groundwater samples that were submitted for metals analysis were decanted in the field to reduce turbidity. The groundwater samples that were decanted include MW-3, P1 and P3. The organic bog material increased the turbidity of these groundwater samples.

Based on the laboratory analysis of the groundwater samples, contamination of volatile organic compounds was detected in MW-1, P1, P2, P3 and the Supply Well. Refer to Table 4-7 and Figure 4-6 for a summary of the analytical results of the groundwater samples: laboratory data sheets are presented in Appendix 3. Contamination of tetrachloroethene, trichloroethene and associated breakdown constituents were the main contaminants detected in P1, P2, P3 and the Supply Well. Fuel oil constituents contaminate MW-1 and P3.

Semi-volatile organic compounds were detected in P1, P3 and MW-3, see Figure 4-7. Contamination of pesticides was detected in P1, see Figure 4-8. Refer to Appendix 3 for laboratory data sheets.

Based on the inorganic analysis of P1, P3 and MW-3, elevated concentrations of calcium, iron, magnesium, potassium and sodium were detected, see Figure 4-9. Refer to Appendix 3 for laboratory data sheets. The total concentration of these dissolved solids are below 1,000 mg/L. Therefore the groundwater is classified as class GA fresh groundwaters according to the NYSDEC Water Quality

Table 4-7 - Summary of Volatile Organic Compounds Detected in Phase One Groundwater Sampling.

Sample Location	Vinyl Chloride	TCE	m,p-Xylene	PCE	1,1-DCE	t-1,2-DCE
MW-1		4	210	5		
MW-3				2		
P1	180	19,000		140,000	18,000	
P2		200		2,100		
P3		58		900	22	
Supply Well	370	5,400		100,000	64	91
Drinking Water Standards	2	5	5	5	5	5

Note:

1. Methylene Chloride and Acetone detections were not listed due to the presence of these compounds in blanks.
2. Refer to Appendix 3 for validated laboratory data sheets.

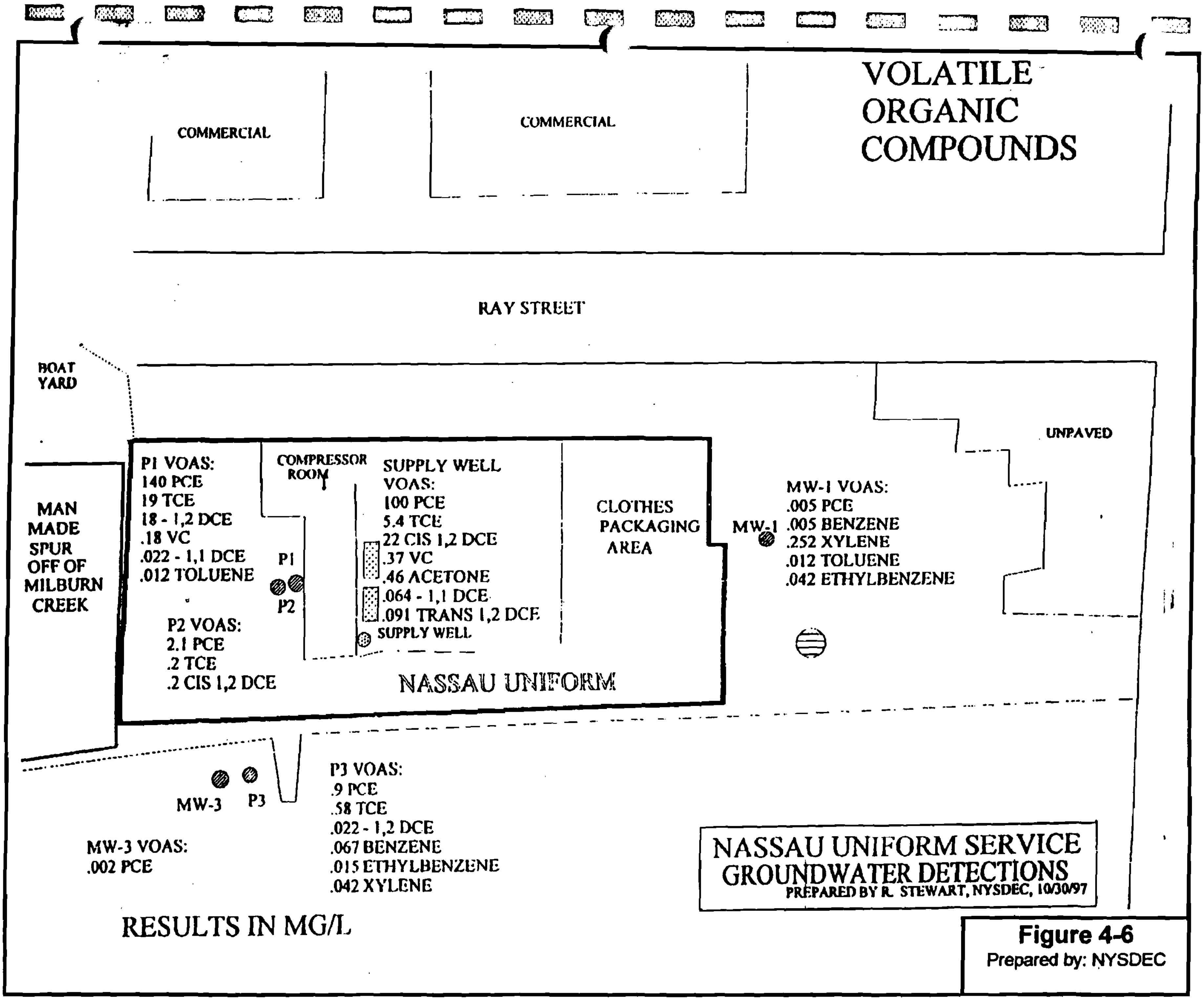


Figure 4-6
Prepared by: NYSDEC

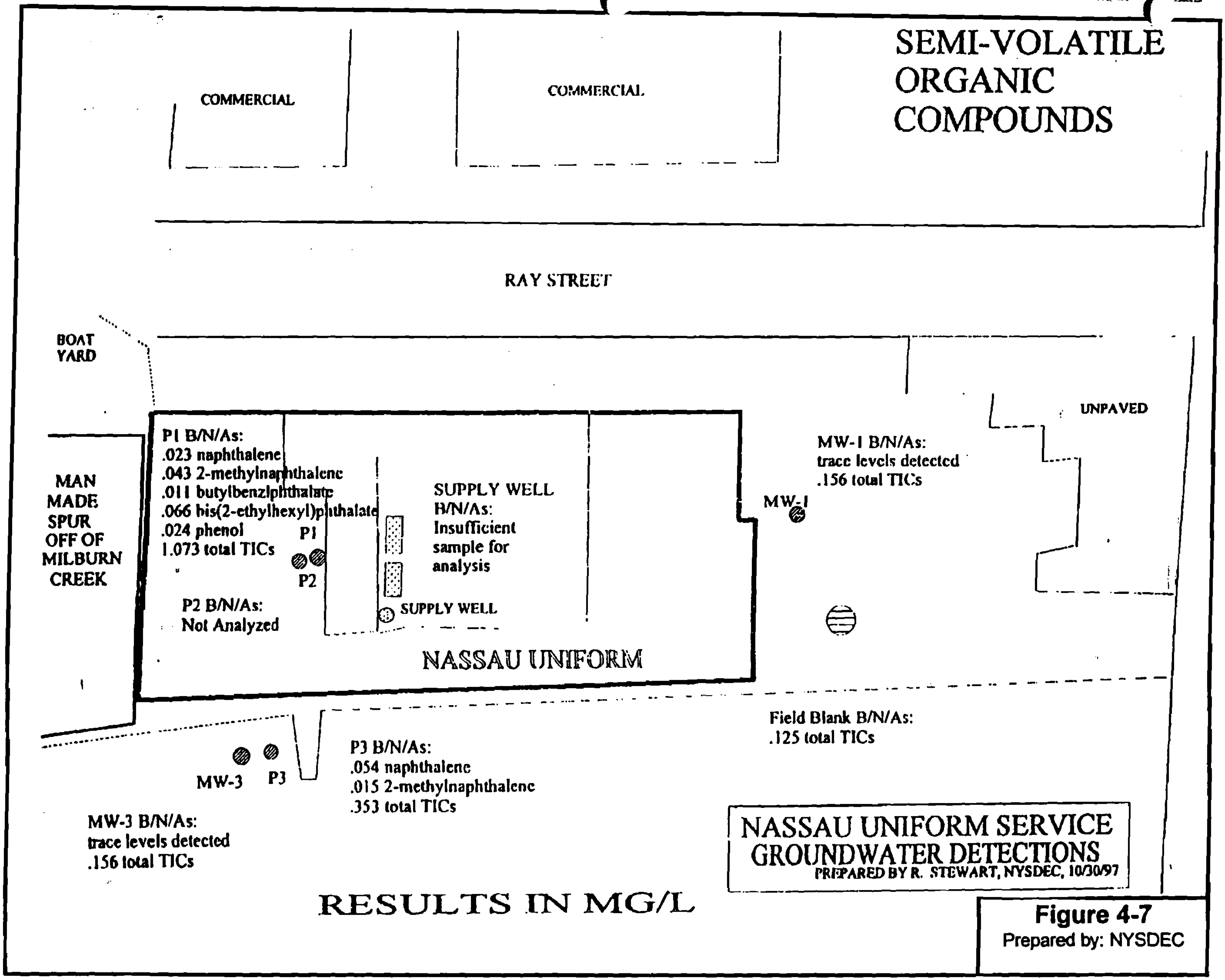


Figure 4-7
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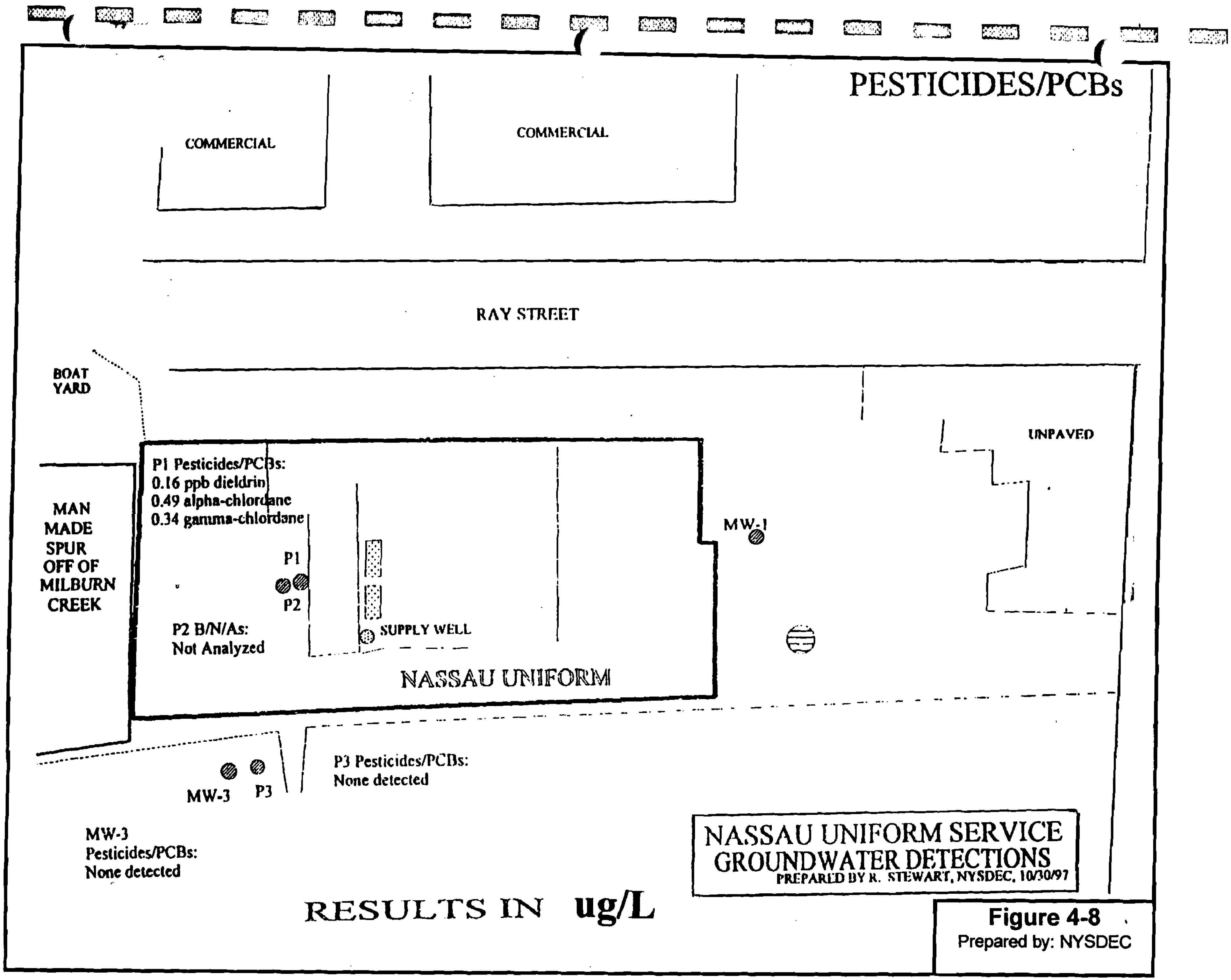


Figure 4-8
Prepared by: NYSDEC

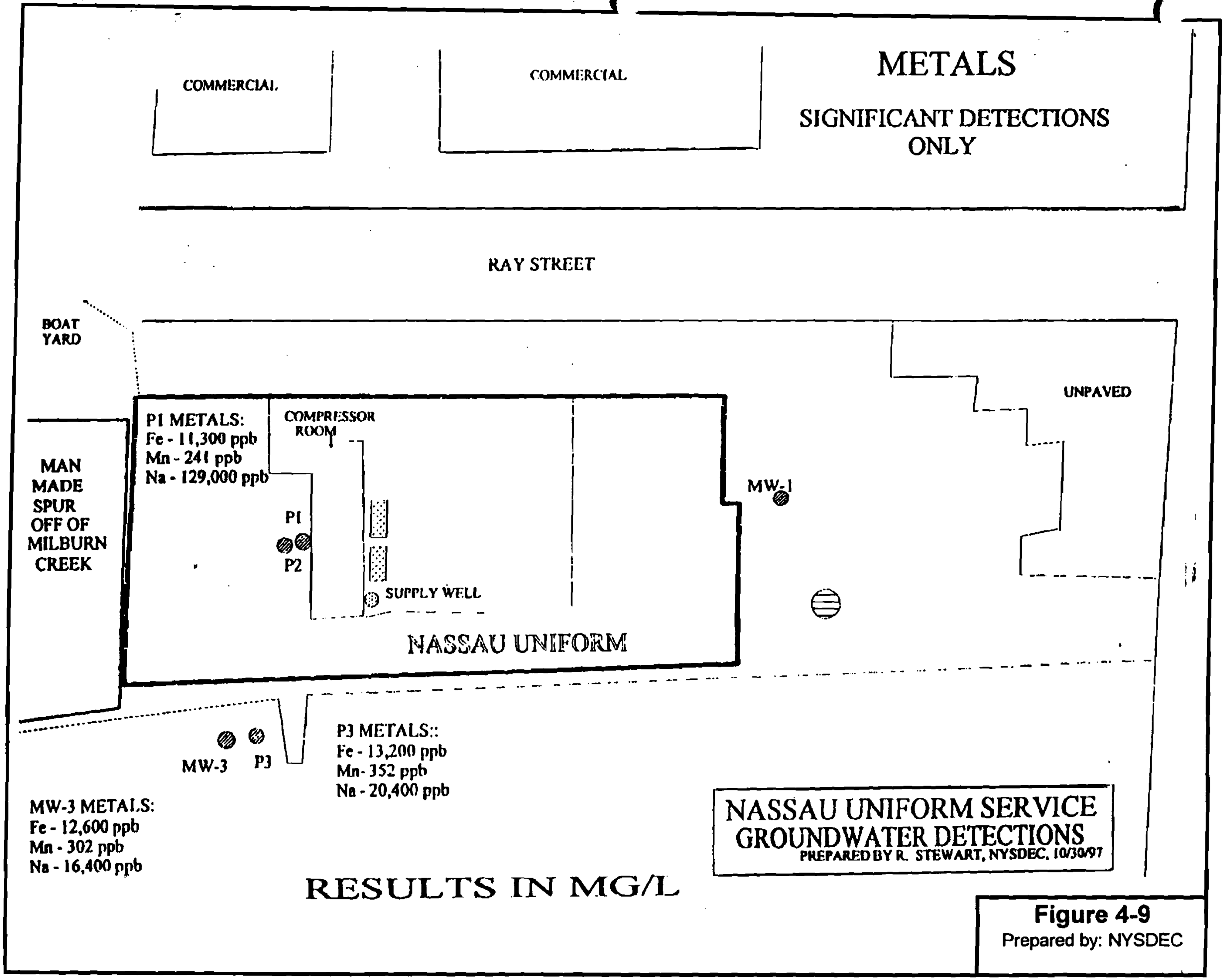


Figure 4-9
Prepared by: NYSDEC

Regulations. In addition, the laboratory analysis of salinity for these samples indicated non-detectable concentrations, (Appendix 3).

4.3 Tidal Influence and Groundwater Flow.

The western portion of the Site abuts a bulkhead off of Milburn Creek. Milburn Creek flows to the south into Baldwin Bay. Baldwin Bay is influenced by tidal fluctuations associated with the Atlantic Ocean. Jones Inlet connects Baldwin Bay to the Atlantic Ocean. Tidal fluctuations of approximately 5-feet have been noted at the canal bulkhead abutting the Site.

4.3.1 Tidal Influence

In order to determine if there is a correlation between tidal change and the elevation of the groundwater table, AEL constructed a Tidal Well and recorded water level measurements in both the tidal well and MW-3 throughout the duration of a tidal cycle.

The tidal well is constructed 4-inch diameter PVC with a screened interval of 10-feet and 1.5-feet of solid riser. The slot size of the screen measures 0.01-inch in size. The tidal well was driven into the bottom sediment of the canal and secured to the wooden bulkhead using metal strapping.

On September 11, 1997, pressure transducers manufactured by Solinst (Levelogger) were placed into both the tidal well and MW-3. The pressure transducers were programmed to record simultaneously at fifteen-minute intervals for the duration of twenty-four (24) hours. AEL then downloaded the recorded pressure readings using computer software (Levelogger Dataprocessing v3.2) manufactured by Solinst. Graphs illustrating the changes in pressure with elapsed time were produced using the data processing program. Refer to Figures 4-10, 4-11 and 4-12.

Figure 4-10 illustrates the change in pressure over time for the Tidal Well and Figure 4-11 illustrates the change in pressure over time for MW-3. Both Figure 4-10 and Figure 4-11 were overlapped to produce a graph illustrating the relationship between tidal change and the corresponding change to the elevation of the groundwater table, see Figure 4-12.

Based on the findings of the pressure recordings, there is a direct relationship between tidal change and the elevation of the groundwater table. As the tide floods, the elevation of the groundwater table rises at a slightly slower rate, (lag time). When the tide ebbs, the elevation of the groundwater table decreases at a

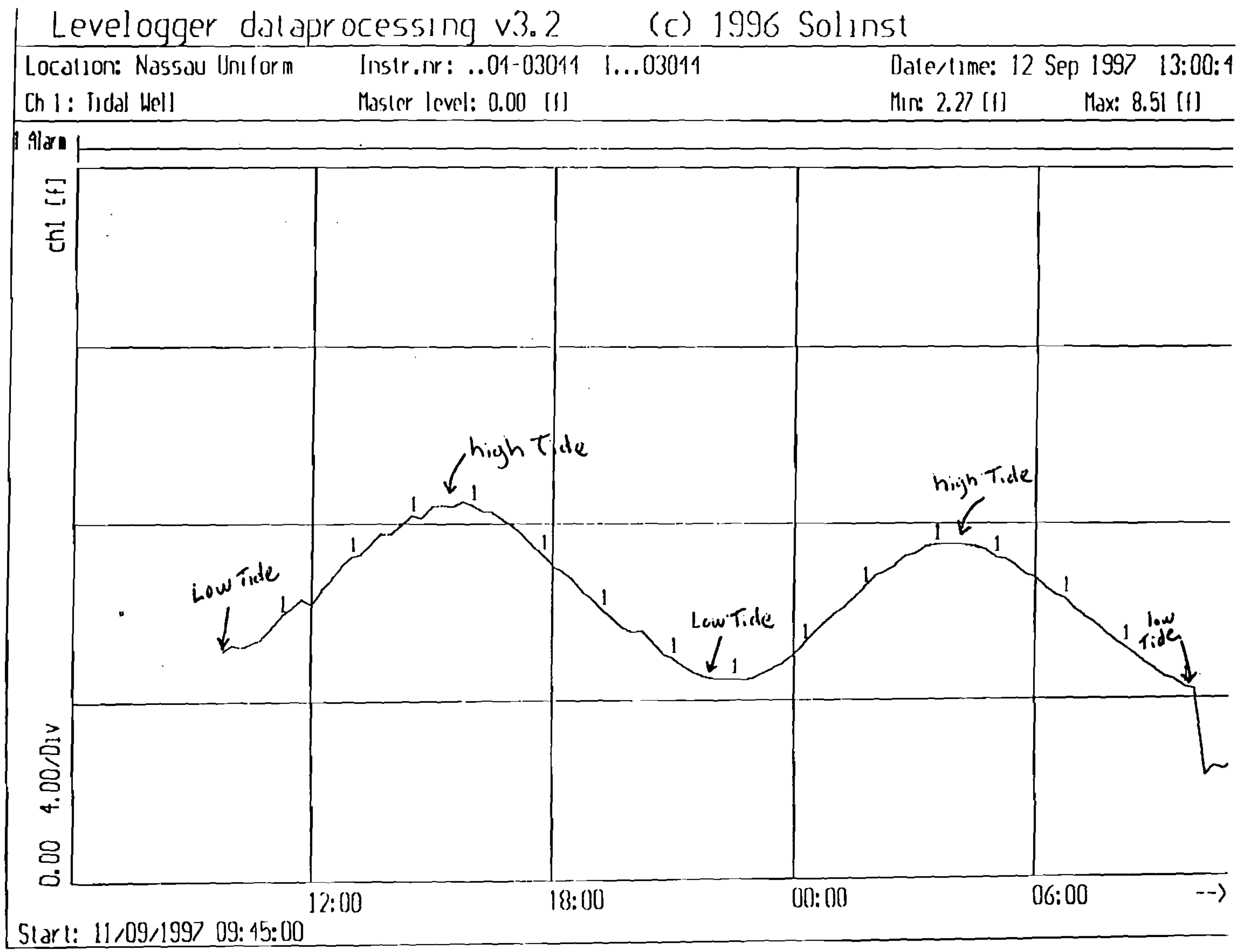


Figure 4-10
Tidal Well

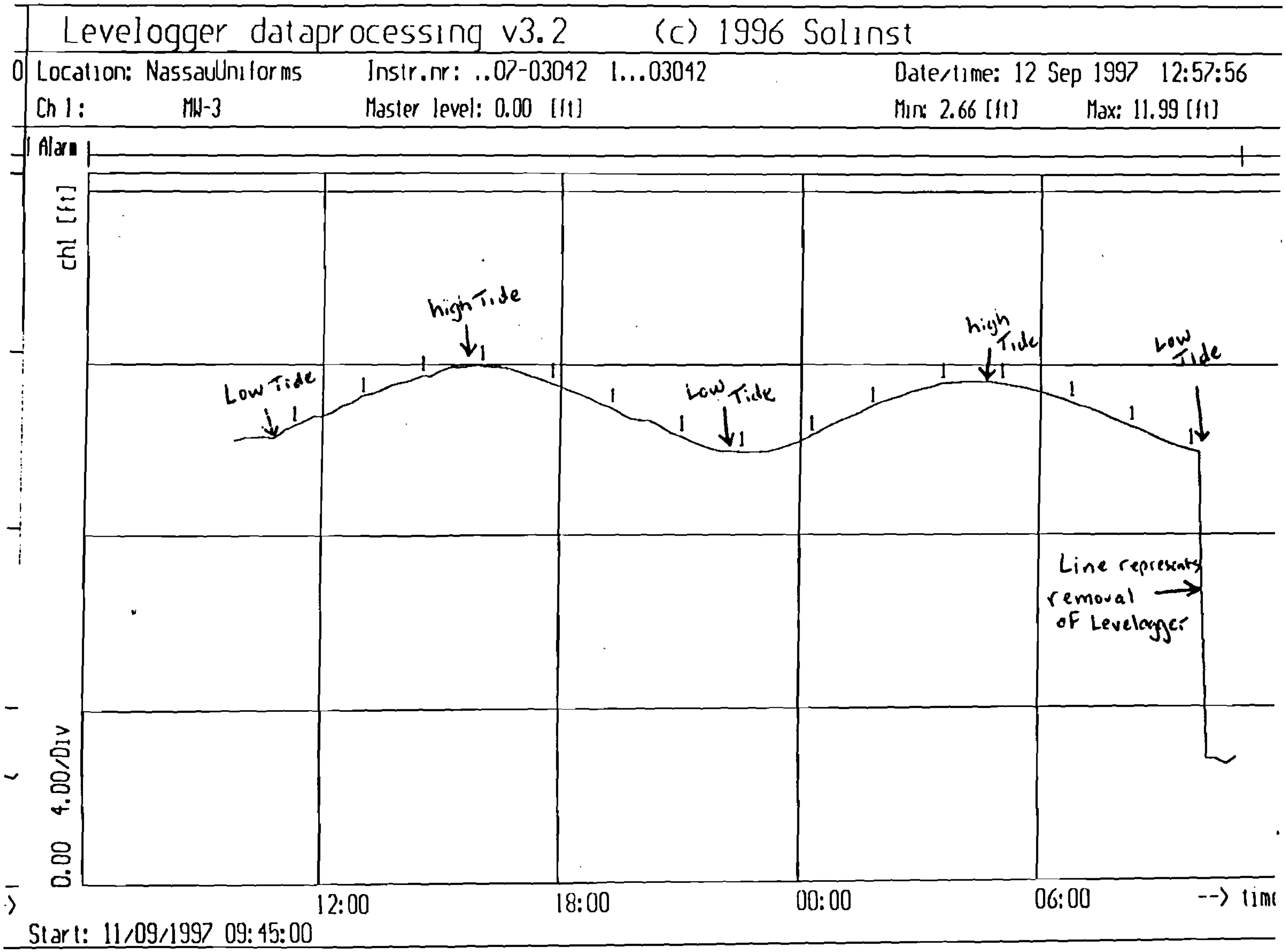


Figure 4-11
MW-3

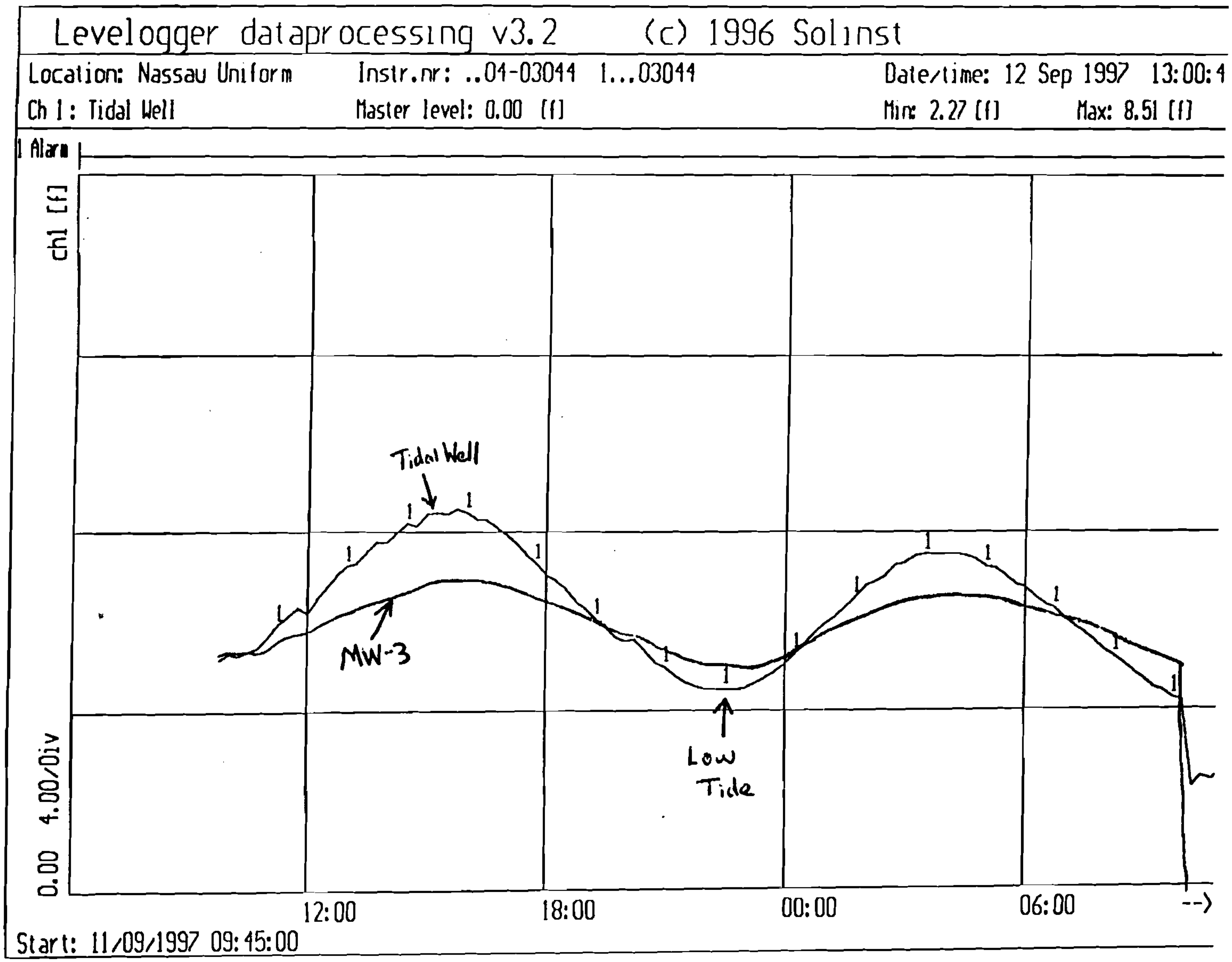


Figure 4-12
MW-3 & Tidal Well Overlay

slower rate then the tide. At extreme low tide, the elevation of the groundwater table is higher than the elevation of the tide. Therefore at low tide, the groundwater discharges into the canal. Physical observations of water seeping from the joints of the bulkhead were noted during low tide conditions at the Site.

4.3.2 Direction of Groundwater Flow (outgoing tide)

AEL has calculated the direction of groundwater flow in conjunction with a tidal change at the Site. The purpose of recording depth to water readings at different tidal levels is to determine the effects the tide has on the direction of shallow groundwater flow.

On November 17, 1997, three (3) representatives from AEL simultaneously collected depth to water readings from MW-1, P-1, P-3 and the tidal well. Measurements were recorded at one (1) hour intervals starting at high tide and ending at low tide. The following Tables 1-7 summarize the data used to calculate the direction of shallow groundwater flow. Refer to Figure 4-13 for the direction of groundwater flow with tidal fluctuations.

Table 1 – Depth to Water Measurements Recorded at 10:45 a.m. (High Tide).

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.46	100.57	96.11	0
P-1	4.18	100.43	96.25	0.14
P-3	5.07	101.18	96.11	0
Tidal Well	5.27	100.41	95.14	N/A

Table 2 – Depth to Water Measurements Recorded at 11:45 a.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.48	100.57	96.09	0.34
P-1	4.54	100.43	95.89	0.14
P-3	5.43	101.18	95.75	0
Tidal Well	6.40	100.41	94.01	N/A

Table 3 – Depth to Water Measurements Recorded at 12:45 p.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.58	100.57	95.99	0.74
P-1	5.00	100.43	95.43	0.18
P-3	5.93	101.18	95.25	0

Tidal Well	7.37	100.41	93.04	N/A

Table 4 – Depth to Water Measurements Recorded at 1:45 p.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.72	100.57	95.85	1.12
P-1	5.50	100.43	94.93	0.2
P-3	6.45	101.18	94.73	0
Tidal Well	8.36	100.41	92.05	N/A

Table 5 – Depth to Water Measurements Recorded at 2:45 p.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.87	100.57	95.70	1.50
P-1	5.99	100.43	94.44	0.24
P-3	6.98	101.18	94.20	0
Tidal Well	9.28	100.41	91.13	N/A

Table 6 – Depth to Water Measurements Recorded at 3:45 p.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.99	100.57	95.58	1.80
P-1	6.40	100.43	94.03	0.25
P-3	7.40	101.18	93.78	0
Tidal Well	10.02	100.41	90.39	N/A

Table 7 – Depth to Water Measurements Recorded at 4:10 p.m. (Low Tide).

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	5.05	100.57	95.52	1.87
P-1	6.52	100.43	93.91	0.26
P-3	7.53	101.18	93.65	0
Tidal Well	10.21	100.41	90.20	N/A

The direction of groundwater flow during a high tide situation flows towards the south and southeast, as the tide ebbs the direction of groundwater flow shifts to the west towards Milburn Creek. At low tide the direction of groundwater flow is towards the southwest, (see Figure 4-13).

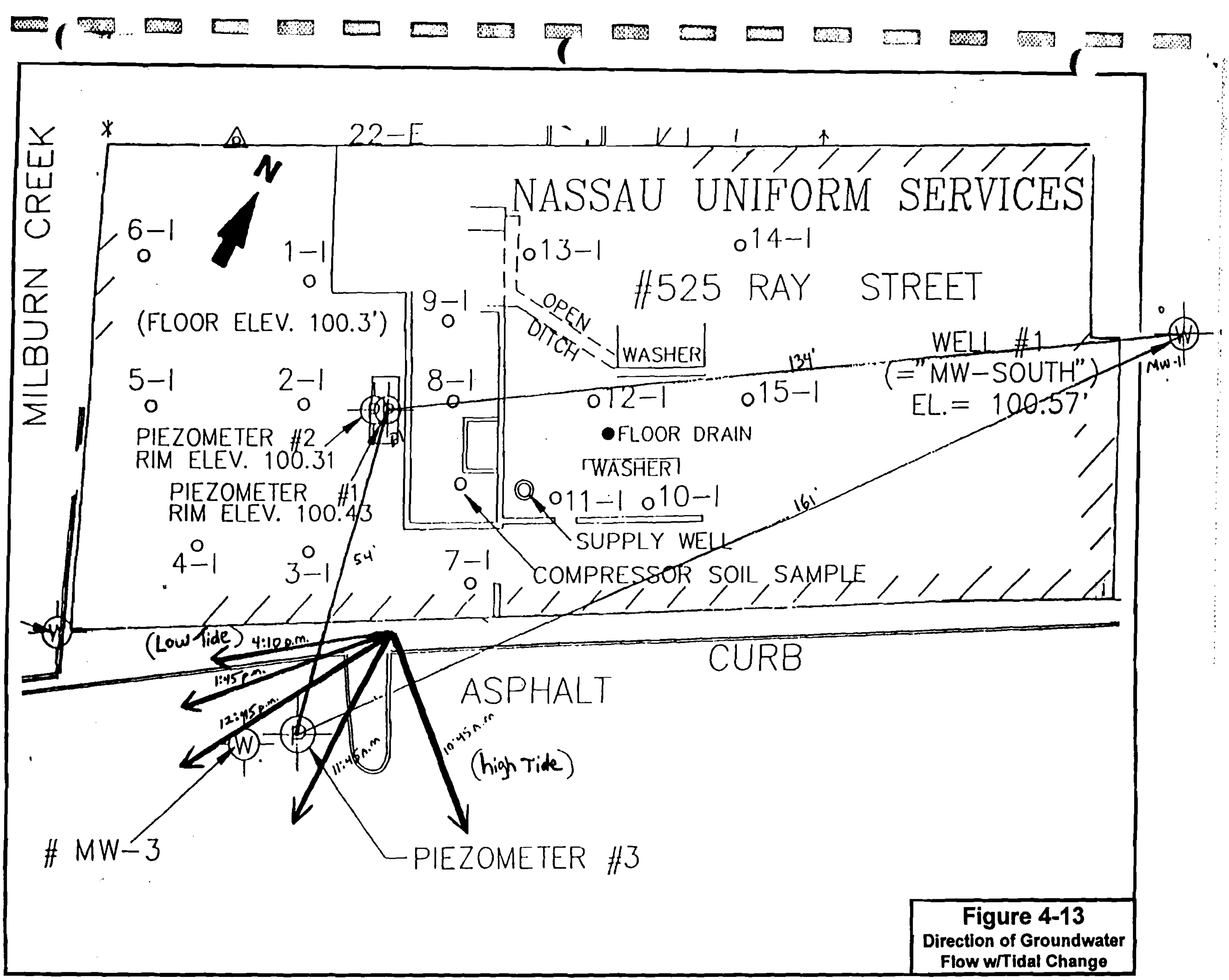


Figure 4-13
Direction of Groundwater Flow w/Tidal Change

4.3.3 Hydraulic Conductivity

On September 9, 1997, AEL conducted a slug test in MW-3 in order to determine the hydraulic conductivity of the water-bearing formation beneath the Site. A slug test is an aquifer test made by either pouring a small instantaneous charge of water into a well or by withdrawing a slug of water from the well. A synonym for this test, when a slug of water is removed from the well, is a bail-down test, (Fetter, 1994).

The slug test was performed in the following manner:

1. Install pressure transducer (Solinst-Levelogger) into MW-3.
2. Install 5-foot PVC slug to displace water within MW-3.
3. Rapidly removed PVC slug from MW-3.
4. Allocated 30-minutes for well to reach equilibrium
5. Removed pressure transducer.
6. Downloaded pressure readings using Levelogger Dataprocessing version 3.2 manufactured by Solinst.
7. Imported pressure recordings to the computer program Aquifer Test manufactured by Waterloo Hydrogeologic.
8. Conducted the Bouwer & Rice slug test calculations to determine the hydraulic conductivity.

The Bouwer & Rice slug test is designed to estimate the hydraulic conductivity of the aquifer material surrounding the screen of a monitoring well in an unconfined aquifer. The Bouwer & Rice method accounts for the geometry of the screen (partially penetrating), the gravel pack, finite saturated thickness, height of stagnant water column in the well and an effective radial distance over which the initial drawdown is dissipated.

Based on the Bouwer & Rice slug test method, the hydraulic conductivity is calculated to be 2.38×10^{-3} feet/minute in MW-3. Refer to Figure 4-14 for the slug testing data.

4.4 Floor Trough Sampling

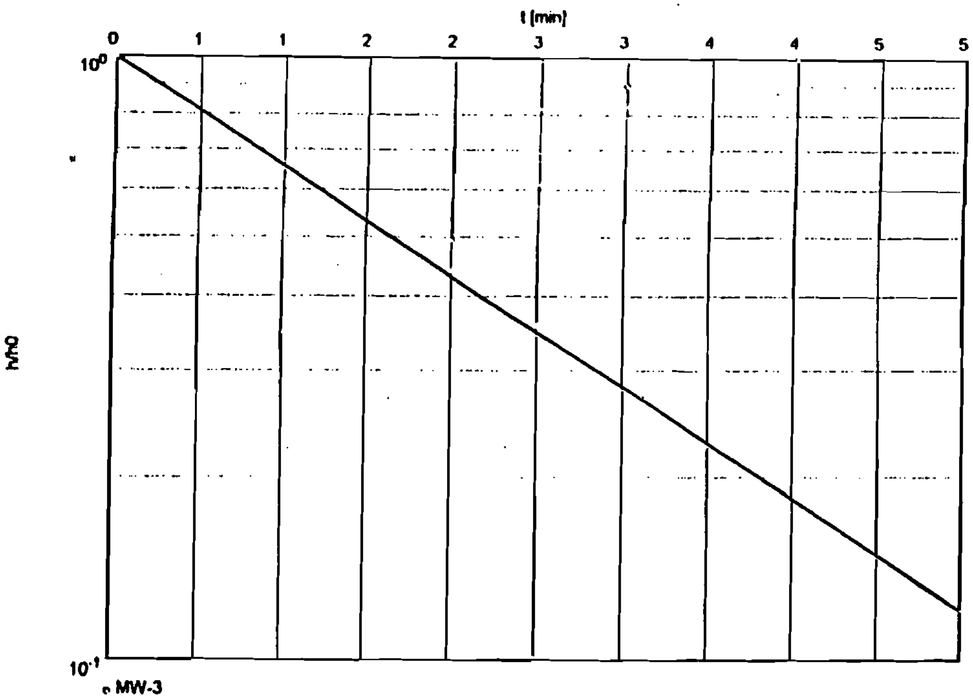
The concrete floor trough is located within the building and is used for the drainage of wastewater from washing machines to the sewer connection on Ray Street. The floor trough is an open ditch within the concrete flooring of the building. The bottom and sides of the trough are concrete. A small floor drain located near the dry-cleaning machines, discharges standing liquid from the floor area to the floor trough via a ¾-inch PVC pipe. In addition, small condensate pipes from two (2) dry-cleaning machines discharge a low volume of

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 07.11.1997 Project: Nassau Uniforms Evaluated by: JB

Slug Test No. 1	Test conducted on: September 10, 1997
MW-3	MW-3

Static water level: 5.73 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]
1	0.00	7.50	1.77
2	1.00	0.22	-5.51
3	2.00	4.86	-0.87
4	3.00	7.32	1.59
5	4.00	7.50	1.77



Hydraulic conductivity [ft/min]: 2.38×10^{-3}

Figure 4-14
Slug Testing Data

steam and liquid to the floor trough, (see Figure 4-15). The integrity of this trough was not investigated.

The floor trough is connected to the Freeport municipal sewer collection system, which is a part of the Nassau County sewer system. The sanitary waste is treated at the Cedar Creek facility, operated by Nassau County. The Site was connected to the sewer system on November 5, 1962. The sewer connection is prior to on-Site dry-cleaning operations.

A grab sample was taken from the effluent of the floor trough on July 28, 1997 and submitted to Accredited laboratories, Inc. for analysis using EPA method 8240. On December 16, 1997, another sample was taken from the floor trough effluent and submitted to EcoTest Laboratories, Inc. for analysis using EPA method 624.

Based on the laboratory analysis of both samples, volatile organic compounds were detected within the effluent of the wastewater. The July 28, 1997 sample identified 2,100 ppb of tetrachloroethene and the December 16, 1997 sample identified 660 ppb of tetrachloroethene. According to the Nassau County Department of Public Works, the maximum concentration of tetrachloroethene to be discharged to the sewer is 10,000 ppb. Therefore, the Site is in compliance with wastewater discharge to the sewer. Refer to Appendix 3 for the laboratory data sheets associated with the floor trough sampling.

4.5 Drywell Sampling

Surface run-off is collected in one (1) drywell located in the front parking lot of the Site, (Figure 4-15). The depth to the bottom sediment in drywell #1 is 5.5-feet. The drywell is constructed of one (1) below grade concrete ring with perforation to allow for drainage to surrounding soils. The top one (1) to two (2) feet of bottom sediment material was sampled for volatile organic compounds using EPA method 8240. The bottom sediment sample was submitted to Accredited Laboratories, Inc.

Based on the laboratory analysis of the bottom sediment sample, no volatile organic compounds were detected above the NYSDEC TAGM Recommended Soil Cleanup Objectives, refer to Table 4-4 (laboratory data sheets are presented in Appendix 3).

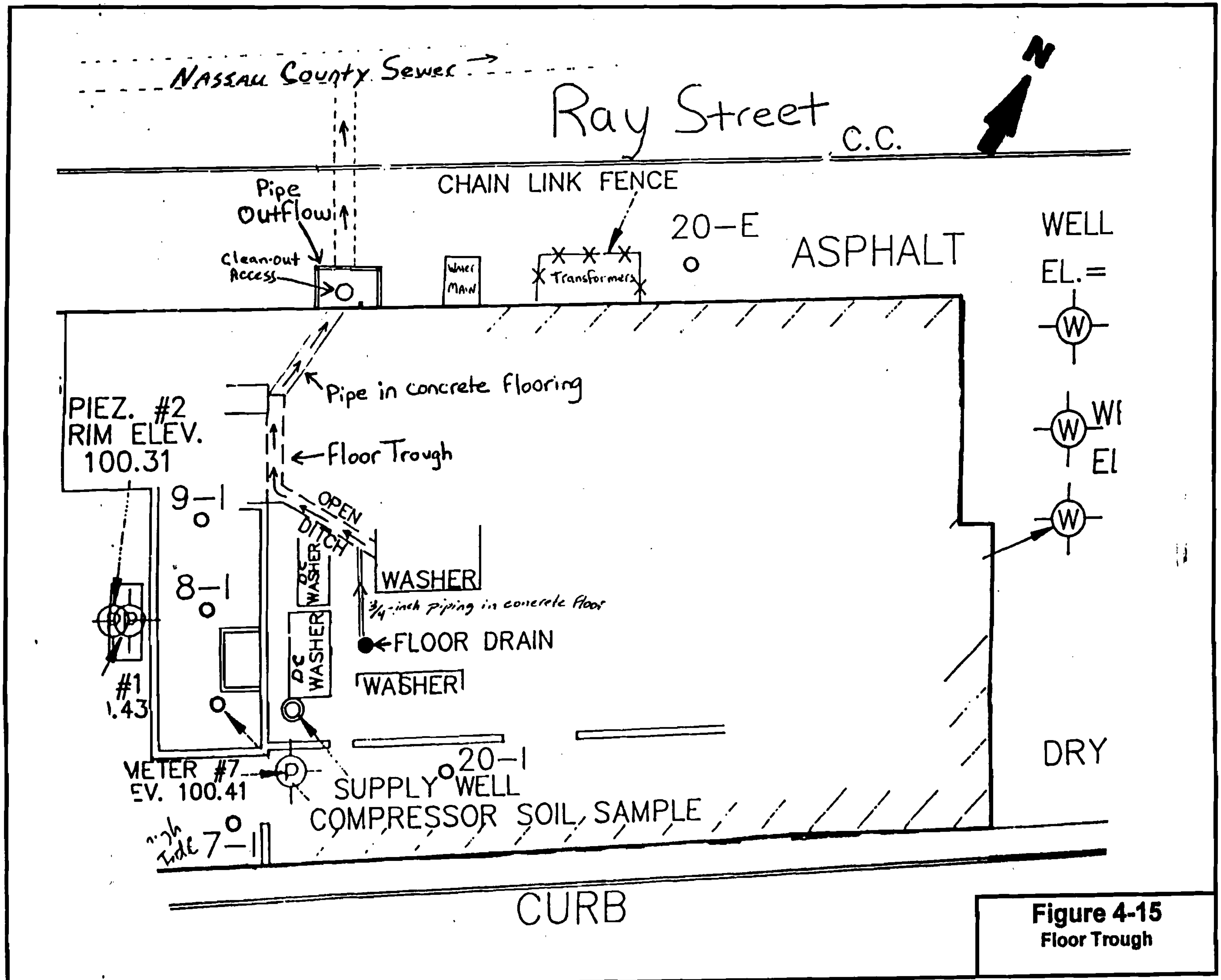


Figure 4-15
Floor Trough

5.0 Phase Two Sampling

The fieldwork associated with the Phase Two investigation was conducted in April 1998 through May 1998. The work conducted during Phase Two is based on the work plan submitted by AEL to the NYSDEC. The Phase Two work plan is dated March 9, 1998 and was approved by the NYSDEC on March 11, 1998. Based on the findings from Phase One, additional soil and groundwater sampling was conducted under Phase Two.

Soil and groundwater samples were collected and submitted to Environmental Testing Laboratories, Inc. (ETL). The laboratory data is presented using Level B reportables and was not validated during Phase Two.

5.1 Soil Sampling

Soil Sampling was conducted in areas where soil contamination was identified during Phase One. The purpose of this sampling is to delineate the extent of the soil contamination and identify possible sources, if any.

Soil samples were collected using Geoprobe equipment (LB Sampler). At each sample location, headspace readings were obtained from the soil sample collected. A photoionization detector (PID) was used for recording these measurements.

The soil samples were collected from the following areas, (Refer to Figure 5-1 for Soil Sampling Locations):

1. <u>Source Area near Garbage Container (23-E)</u> – Three (3) soil samples were collected at depths of 2-feet to 4-feet below grade and are designated 24-E, 25-E and 26-E. In order to delineate this source area, the soil samples were collected north, west and east of soil sample 23-E. The samples were analyzed for volatile organic compounds using EPA method 8010 and the 8 RCRA metals.

2. <u>Soil Sampling near 21-E and 22-E</u> – Three (3) soil samples were collected at depths of 2-feet to 4-feet below grade in this location. The samples are designated 27-E, 28-E and 29-E. The samples were analyzed using EPA method 8010.

3. <u>Soil sampling at 6-I location</u> – During the installation of a piezometer in this location, soil samples were collected at 2-feet to 4-feet, 6-feet to 8-feet and 10-feet to 12-feet below grade. Based on the headspace readings,

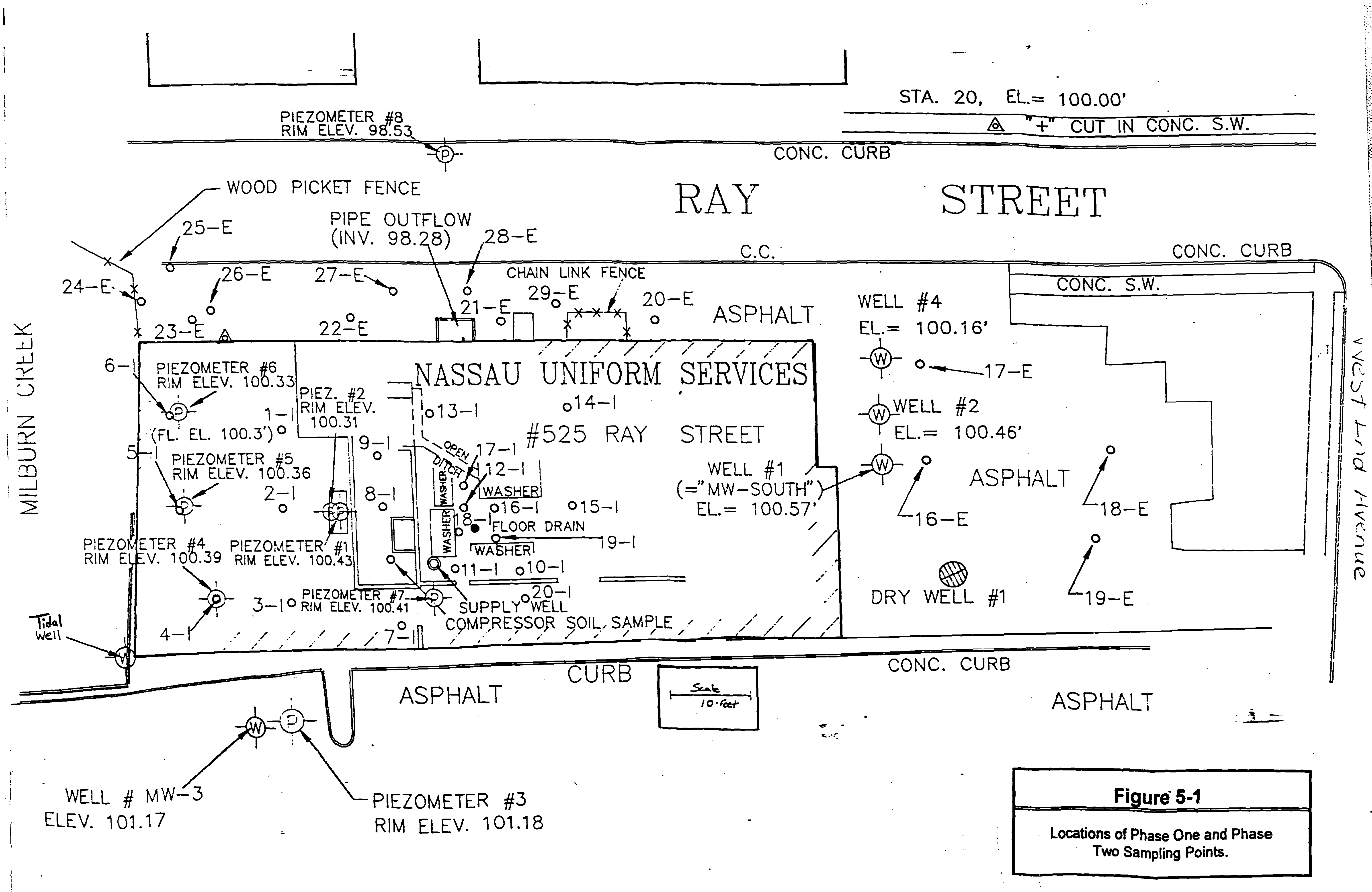


Figure 5-1

Locations of Phase One and Phase Two Sampling Points.

samples P6 (2-4) and P6 (10-12) were submitted for analysis using EPA 8010.

4. Soil Sampling during Piezometer Installations - A total of five (5) piezometers were installed during Phase Two. The following Table 1 summarizes the soil sampling at each of the piezometer locations.

Table 1 – Soil Sampling at Proposed Piezometer Locations.

Piezometer Number	Sample Interval	Number of Samples Submitted for Analysis	Laboratory Analysis
#4	6'-8' 10'-12'	Both samples Submitted.	8010
#5	4'-6' 6'-8' 8'-10' 10'-12' 12'-14'	(2) – Based on Headspace.	8010
#6	2'-4' 6'-8' 10'-12'	(2) – Based on Headspace.	8010
#7	0'-2' 2'-4' 4'-6' 6'-8' 8'-10' 10'-12' 12'-14'	(2) – Based on Headspace.	8010
#8	2'-4' 6'-8'	(1) – Based on Headspace.	8010

To obtain lithological information, continuous soil sampling was performed at the piezometer #7 location.

5. Soil Sampling near dry-cleaning machines – Four (4) soil borings designated 16-I, 17-I, 18-I, and 19-I were conducted in this location, (one boring in front of each dry-cleaning machine, washer and dryer). To obtain the sample from the soil beneath the machines, the sample was

obtained at an angle within the boring. The soil samples were submitted for laboratory analysis using EPA method 8010.

6. Soil Sampling near detergent dispensing area – One (1) soil sample designated 20-I was collected at 2-feet to 4-feet below grade in this location. Laboratory analysis was via EPA method 8010.

The analytical results of the soil samples collected from the installation of piezometers are summarized in the boring logs presented in Table 5-1, laboratory data sheets are presented in Appendix 4. The analytical results of the interior (16-I – 20-I) and exterior (24-E – 29-E) soil samples are summarized in Tables 5-2 and 5-3, the laboratory data sheets are presented in Appendix 4. Headspace readings and a description of the interior and exterior soil samples are summarized in Table 5-4.

Based on the laboratory analysis of 16-I through 20-I, soil contamination of volatile organic compounds was identified as being above the NYSDEC TAGM Recommended Soil Cleanup Objectives at the following locations:

1. 16-I
2. 17-I
3. 18-I
4. 19-I

Based on the laboratory analysis of the 8 RCRA Metals, contamination of mercury was identified at the following locations:

1. 25-E
2. 26-E

The analytical results of soil samples collected from the installation of piezometers and exterior soil samples (24-E – 29-E) indicate no volatile organic compounds as exceeding the NYSDEC TAGM Recommended Soil Cleanup Objectives.

5.2 Groundwater Sampling

Groundwater sampling performed during Phase Two included the collection of groundwater samples from eight (8) piezometers and two (2) monitoring wells. Groundwater samples were unattainable from the Supply Well during Phase Two.

Table 5-1 - Boring Log of Piezometers #4 Through #8.

Sample Location	Depth Below Grade (feet)	PID Reading	Sample Description	Soil Sample Analysis (ug/kg)
Piezometer #4	6-8	41.4	Medium to coarse sand, trace of bog material, odor, dark gray.	6.2 ppb - PCE (J)
	10-12	468	Coarse sand and gravel, no odor, gray.	147 ppb - PCE
Piezometer #5	4-6	46.4	Organic bog material, brown to black in color.	
	6-8	17.8	Medium to coarse grained sand, some fines & gravel, grayish-brown.	
	8-10	175	Coarse sand and trace of gravel, grayish-brown.	None Detected
	10-12	282	Coarse sand and some gravel, yellowish-brown.	63.8 ppb - PCE
	12-14	9.3	Coarse to medium sand, some gravel, yellowish-brown.	
Piezometer #6	2-4	0	Medium to fine grained sand, some bog material, dark brown.	52.0 ppb - PCE (J)
	6-8	0	Medium grained sands, some gravel & fines, grayish-brown.	
	10-12	4.8	Coarse sand and gravel, dark grayish-brown.	None Detected
Piezometer #7	0-2	820	Coarse grained sand and black organic material.	
	2-4	398	Medium grained sand, some organic material, dark grayish brown.	
	4-6	649	Organic bog material, strong odor, black.	None Detected
	6-8	80.5	Coarse grained sand and gravel, grayish-brown.	
	8-10	313	Coarse grained sand and gravel, odor, dark gray.	
	10-12	328	Coarse sand and gravel, dark grayish-brown.	384 ppb - PCE 9.8 ppb - TCE
	12-14	180	Coarse grained sand, some gravel, yellowish-brown.	
Piezometer #8	2-4	0	Medium grained sands, trace of fines & gravel, grayish-brown.	
	6-8	0	Coarse grained sand, trace of gravel, yellowish-brown.	None Detected

Note:

1. Soil samples were analyzed by Environmental Testing Laboratories Inc., using EPA method 8010.
2. Refer to laboratory data sheets in Appendix 4.
3. **Any positive results in the volatile analysis of these samples should be qualified as (J), estimated data. Any non-detected results in the volatile analysis of these two samples should be qualified as "R", unusable results.**

Table 5-2 - Summary of Volatile Organic Compounds Detected in Interior Soil Samples.

Sample Location	trans-1,2-Dichloroethene	Vinyl Chloride	Trichloroethene	Tetrachloroethene	1,1 - Dichloroethene
16-I			151	8,100	
17-I			134	3,530	
18-I	333	517	10,800	1,600,000	23.3
19-I (J)			500	95,000	
20-I			12.9	1,230	
NYSDEC Objectives	300	200	700	1400	400

Table 5-3 - Summary of Volatile Organic Compounds Detected in Exterior Soil Samples.

Sample Location	trans-1,2-Dichloroethene	Vinyl Chloride	Trichloroethene	Tetrachloroethene	1,1 - Dichloroethene
24-E (J)	165		111	445	
25-E		29.7		11.7	
26-E	6	58.1	21	127	
27-E				614	
28-E				18.7	
29-E			14.8	285	
NYSDEC Objectives	300	200	700	1,400	400

Note:

1. Concentration Units = ug/Kg (parts per billion).
2. Blank Spaces represent constituent levels below the method detection limit of the laboratory.
3. Table represents compounds with significant values of detection, refer to laboratory data sheets for the individual compounds detected.
4. Soil samples collected on 4/21/98.
5. Soil samples were analyzed by Environmental Testing Laboratories using EPA method 8010.
6. **Any positive results in the volatile analysis of sample 19-I and 24-E should be qualified as (J), estimated data, due to high recovery of the surrogate.**

Table 5-4 - Boring Log of Interior and Exterior Soil Borings.

Soil Boring Location	Depth Below Grade (Ft.)	Headspace Reading (ppm)	Sample Description
16-I	3 to 3.5 (1)	364	Coarse sand and gravel, dark brown.
17-I	2 to 5 (1)	415	Coarse sand and gravel, brown.
18-I	3 to 5 (1)	> 2,000	2'-3' Coarse sand 3'-4' Bog material with strong odor, black.
19-I	3 to 5 (1)	> 2,000	2'-3' Coarse sand 3'-4' Bog material with strong odor, black.
20-I	3 to 5 (1)	617	2'-3' Coarse sand 3'-4' Bog material with strong odor, black.
24-E	2 to 4	74.3	Medium grained sand and bog at 3 to 4 feet, black.
25-E	2 to 4	27.2	Coarse to medium grained sand and bog, dark brown.
26-E	2 to 4	47.6	Medium grained sand and bog, dark brown..
27-E	2 to 4	16.2	Bog at 2-3 feet and 3-4 feet gray sand.
28-E	2 to 4	9	Bog at 2-3 feet and 3-4 feet gray sand.
29-E	2 to 4	12.8	Bog at 2-3 feet, at 3-4 feet gray sand and trace of gravel.

Note:

1. Samples had to be overdriven in order to obtain a sufficient quantity of soil due to loose soil conditions. beneath the concrete flooring of the building.

Five (5) additional piezometers were installed during Phase Two, (refer to Figure 1 for locations). The piezometers were installed using Geoprobe equipment and constructed of 1-inch PVC, with 10-feet of 0.01-inch slot screening. The maximum depth of the piezometers is 14-feet below grade.

On April 22, 1998, groundwater samples were collected from each of the newly installed piezometers, along with existing piezometers and monitoring wells #1 and #3. The groundwater samples were analyzed using EPA method 601. Groundwater samples collected from Piezometer #6 were analyzed using EPA method 601 and the 8 RCRA metals. Trip and field blanks were conducted and analyzed using EPA method 601.

The wells and piezometers were purged 3 to 5 well volumes prior to sampling. MW-1 and MW-3 were purged using a Grundfos Redi-Flow 2 submersible pump. Piezometers 1 through 8 were purged and sampled using dedicated polyethylene tubing in conjunction with a stainless steel check valve. Groundwater samples were obtained from MW-1 and MW-3 using dedicated polyethylene bailers and nylon string.

The groundwater sample collected from P6 and analyzed for the 8 RCRA metals was decanted prior to collection in order to reduce the turbidity caused by organic matter.

Based on the laboratory analysis of the groundwater samples, contamination of volatile organic compounds was identified at the following locations:

1. MW-1
2. P1
3. P3
4. P4
5. P5
6. P6
7. P7

Refer to Table 5-5 for the summary of volatile organic compounds detected within the groundwater samples, laboratory data sheets are presented in Appendix 4.

The majority of groundwater contamination was identified at P1, P4, P5 and P6. The main contaminants include tetrachloroethene, trichloroethene and vinyl chloride. Metals contamination was not identified within the P6 groundwater sample. No constituents were detected above the method detection limit of the laboratory for the Trip and Field Blank samples.

Comparing the groundwater sampling conducted during Phase One on 8/28/97 to the groundwater sampling during Phase Two on 4/22/98, the concentrations of volatile organic compounds decreased in MW-1, MW-3, P1, P2 and P3, refer to Tables 5-5 and 5-6.

5.3 Direction of Groundwater Flow (incoming tide)

AEL has calculated the direction of groundwater flow in conjunction with a tidal change at the Site. The purpose of recording depth to water readings at different tidal levels is to determine the effects the tide has on the direction of shallow groundwater flow.

On May 20, 1998, three (3) representatives from AEL simultaneously collected depth to water readings from MW-1, P-3, P-6 and the tidal well. Measurements were recorded at one (1) hour intervals starting at low tide and ending at high tide. The following Tables 1-6 summarize the data used to calculate the direction of shallow groundwater flow. Refer to Figure 5-2 for the direction of groundwater flow in response to tidal fluctuations.

<u>Table 1</u> – Depth to Water Measurements Recorded at 10:45 a.m. (Low Tide).

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.28	100.57	96.29	2.01
P-3	6.50	101.18	94.68	0.4
P-6	6.05	100.33	94.28	0
Tidal Well	8.50	100.41	91.91	N/A

<u>Table 2</u> – Depth to Water Measurements Recorded at 11:47 a.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.22	100.57	96.35	1.5
P-3	6.11	101.18	95.07	0.22
P-6	5.48	100.33	94.85	0
Tidal Well	7.77	100.41	92.64	N/A

<u>Table 3</u> – Depth to Water Measurements Recorded at 12:45 p.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.19	100.57	96.38	0.87
P-3	5.62	101.18	95.56	0.05
P-6	4.82	100.33	95.51	0

Table 5-5 - Summary of Volatile Organic Compounds Detected in Phase Two Groundwater Sampling.

Sample Location	Vinyl Chloride	TCE	1,1,1-TCA	PCE	1,1-DCE	t-1,2-DCE
MW-1	2.9					
MW-3						
P1	426	17,700	34.5	128,000	9.4	33
P2						
P3		5.6		1		
P4	954	2,480	13.8	25,500	2.2	12.7
P5	1,770	2,800	12.3	19,500	4.9	11.4
P6	41.9	7.2	18.4	84.3		2.4
P7	3.5	5.9		38.9		
P8						
Field Blank						
Trip Blank						
Drinking Water Standards	2	5	5	5	5	5

Note:
1. Concentration Units = ug/Kg (parts per billion).
2. Blank Spaces represent constituent levels below the method detection limit of the laboratory.
3. Groundwater samples collecte on 4/22/98 and submitted to Environmental Testing Laboratories, Inc. using EPA method 601.

Table 5-6 - Summary of Volatile Organic Compounds Detected in Phase One Groundwater Sampling.

Sample Location	Vinyl Chloride	TCE	m,p-Xylene	PCE	1,1-DCE	t-1,2-DCE
MW-1		4	210	5		
MW-3				2		
P1	180	19,000		140,000	18,000	
P2		200		2,100		
P3		58		900	22	
Supply Well	370	5,400		100,000	64	91
Drinking Water Standards	2	5	5	5	5	5

Note:

1. Methylene Chloride and Acetone detections were not listed due to the presence of these compounds in blanks.
2. Refer to Appendix 3 for validated laboratory data sheets.

Tidal Well	6.71	100.41	93.7	N/A

Table 4 – Depth to Water Measurements Recorded at 1:55 p.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	4.20	100.57	96.37	0.25
P-3	5.06	101.18	96.12	0
P-6	4.11	100.33	96.22	0.1
Tidal Well	5.32	100.41	95.09	N/A

Table 5 – Depth to Water Measurements Recorded at 2:45 p.m.

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	3.85	100.57	96.72	0.24
P-3	4.70	101.18	96.48	0
P-6	3.61	100.33	96.72	0.24
Tidal Well	4.85	100.41	95.56	N/A

Table 6 – Depth to Water Measurements Recorded at 3:45 p.m., (High Tide).

Well #	Depth to Water	Relative Elevation	Head	Corrected Head
MW-1	3.72	100.57	96.85	0.27
P-3	4.42	101.18	96.76	0.36
P-6	3.21	100.33	97.12	0
Tidal Well	4.60	100.41	95.81	N/A

The direction of groundwater flow during a low tide situation flows towards Milburn Creek (west), as the tide floods the direction of groundwater flow shifts to the south and southeast, (Figure 5-2).

Phase Two calculations of groundwater flow were recorded during an incoming tide, while Phase One calculations of groundwater flow were recorded during an outgoing tide. The direction of groundwater flow in relationship to the elevation of the tide is similar during both Phase One and Phase Two calculations.

6.0 Contaminate Fate and Transport

This section of the FRI evaluates the potential sources of chemical compounds discovered on-Site during the FRI investigation, and the potential routes of migration of these compounds.

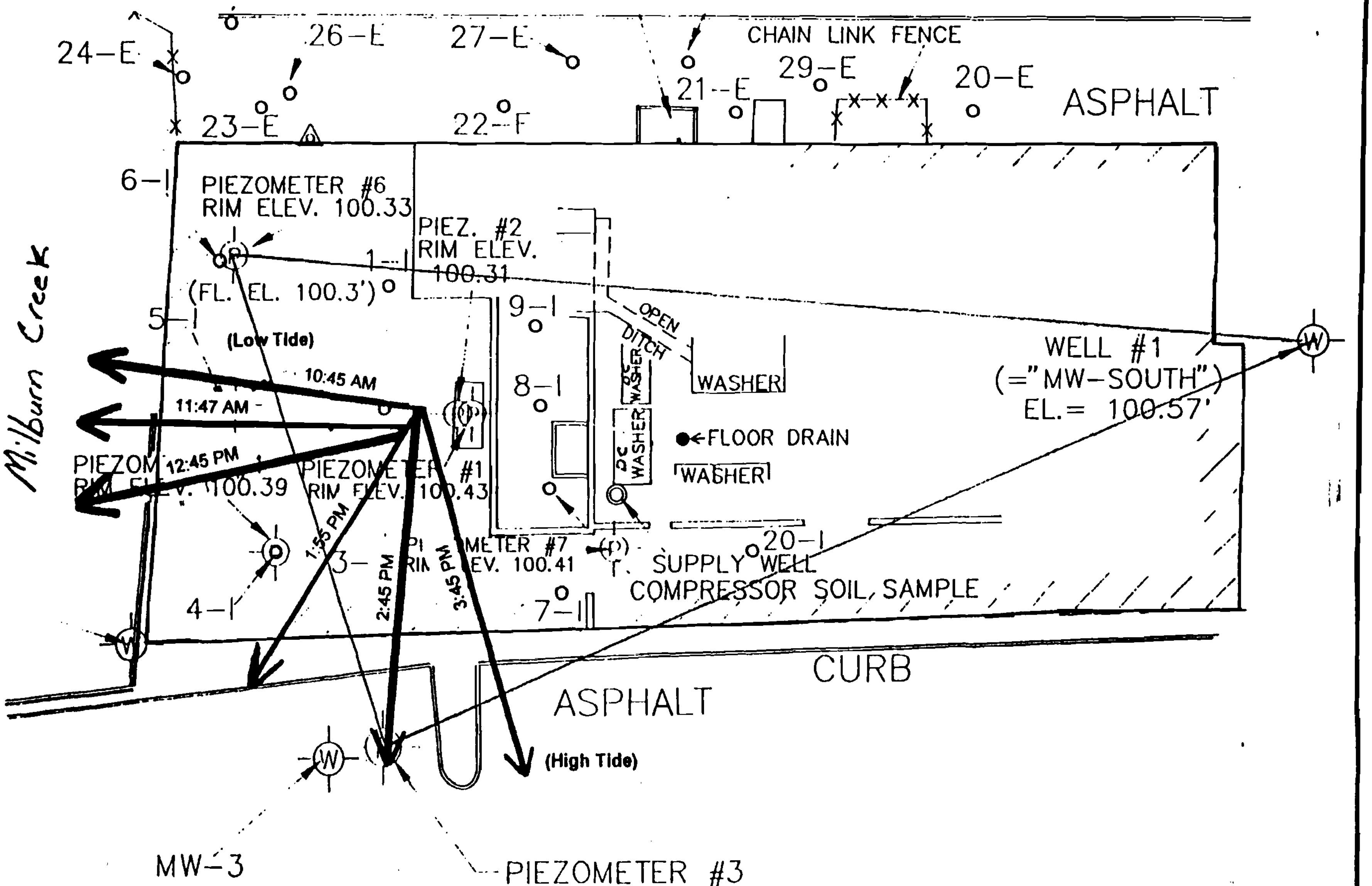


Figure 5-2
Direction of Groundwater Flow w/Tidal Change

The compounds detected in the soils and groundwater under the Site are chlorinated volatile organic compounds. Chlorinated hydrocarbons such as tetrachloroethene degrade in the environment through dechloro-hydrogenation. Through this process chlorine atoms are removed and replaced by hydrogen. Tetrachloroethene can degrade to trichloroethene; trichloroethene and 1, 1, 1 trichloroethene can degrade to form various dichloroethene isomers; and so on, (see Figure 6-1). This can be the result of hydrolysis or biological degradation. The process is controlled by the quantity and type of bacteria present and whether the aquifer is aerobic or anaerobic. The rate of degradation is greater for anaerobic bacteria.

Several forces control the transport of these compounds in the subsurface. In general, the following three conditions must be evaluated to understand the transport of the compounds of concern.

1. Movement of the compounds in the aqueous phase in the unsaturated soil.
2. Transport in the groundwater below the water table.
3. Volatilization of the compounds from the groundwater and migration of the vapors through the soil.

Movement of solubilized compounds through the soil is controlled by local saturation. As a pore space becomes saturated, the fluid moves down to the next pore. When the grain size is constant the movement of the fluid is nearly vertical; however, when the grain size changes the fluids will move laterally along the boundary of the change in grain size. This phenomenon does not only occur at clay-sand interfaces but will occur along bedding planes. This lateral dispersion can result in lateral migration of tens of feet in soils like those found at the site.

Once the compounds of concern have reached the groundwater their movement is governed by advection (the movement of the groundwater), dispersion, density gradients, and molecular diffusion. Advection will cause the plume to move down hydraulic gradient. Dispersion will cause the plume to expand laterally and cause the concentration gradient to decrease. Density gradients will cause the denser contaminants within the water to sink as they move down gradient. Molecular diffusion will decrease the concentration gradient.

Once the compounds of concern reach the water table the forces acting on them will cause them to move down gradient and to cause the concentration of the

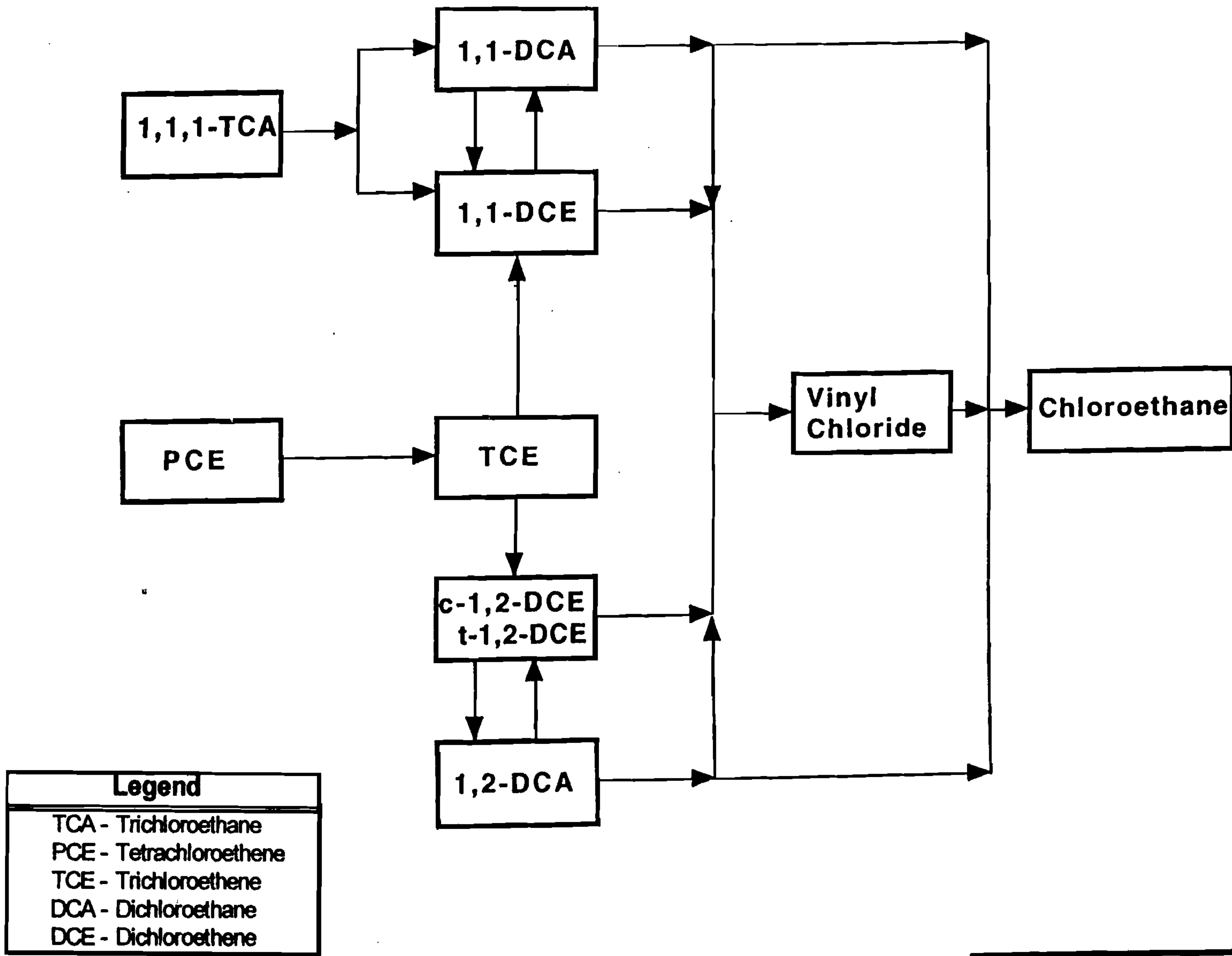


Figure 6-1
Transformation Pathways for Chlorinated Hydrocarbons

compounds to decrease. These factors tend to merge compounds from several sources and make source identification of old plumes difficult.

Finally, the volatile compounds found in the groundwater will partition into the vapor phase above the water table. The volatilized compounds will migrate though the soil and can result in low concentration of compounds of concern being detected in soil samples above the groundwater. Elevated concentrations of these compounds may be detected in areas where the soil moisture is higher than average for the soil.

6.1 Contaminant Persistence

The physiochemical and chemical properties determine the persistence of chemical compounds in the vadose and saturated zones. Moore and Ramamoothy (1984) and Palmer (1991) divided these properties into two groups that are as follows:

1. Physiochemical Properties
    - solubility
    - vapor pressure
    - partition coefficient
    - sorption/desorption
    - volatilization
2. Chemical Transformation
    - oxidation-reduction behavior
    - hydrolysis
    - halogenation/dehalogentation
    - photochemical breakdown

6.2 Contaminant Persistence and Migration in the Vadose Zone

The soil samples containing contamination consist of fine to coarse-grained sands and organic bog material with a high moisture content. This particular soil condition tends to adhere contamination to the pore spaces of the soil. Fluctuations in the tide appear to migrate soil contamination from the source area (former PCE tank) to areas beneath the compressor room and washing machines. During extreme high tide situations, the unsaturated soils can become saturated, thereby increasing contaminant mobility in the inter-tidal zone. Contamination of off-Site soils was not apparent during Phase One and Phase Two investigations.

6.3 Contaminant Persistence and Migration in the Saturated Zone

Since many dense nonaqueous phase liquids (DNAPLS), such as tetrachloroethene, are immiscible with or sparingly soluble in water, when spilled, they begin to move downward through the unsaturated (vadose) zone as a separate phase, creating a system with three fluid phases: air, water, and DNAPL, in addition to the soil phase itself. If no impermeable unit is encountered, the DNAPL should be able to continue its migration, displacing air as it moves downward under the influence of gravity and capillary forces. As the DNAPL passes downward through the porous medium, some of the DNAPL coats the soil matrix, some dissolves in the soil moisture, some volatilizes, and some becomes trapped in the pore spaces in response to capillary forces. The DNAPL is denied access to an interstitial pore until the capillary pressure exceeds the threshold value associated with the largest throat already in contact with the DNAPL, (sorption). The amount trapped is referred to as the residual saturation, (Suthersan, 1997).

Because of the ability of the porous medium to retain some of the infiltrating DNAPL, as the fluid further infiltrates the unsaturated zone, the fraction of the spill that remains mobile is decreased. Depending on the size of the spill, as well as the depth to groundwater and the retention capacity of the soil matrix, it is possible for a spill to be completely immobilized before it reaches the water table. This does not, however, mean that dissolved phase groundwater contamination is prevented, since infiltrating precipitation or tidal fluctuations can dissolve some of the immobilized DNAPL and carry contaminants downward to the water table, (Suthersan, 1997).

If the volume of the spill exceeds the retention capacity of the unsaturated zone soil, the DNAPL will eventually reach the capillary fringe. The system now consists of just two immiscible phases. For the DNAPL to continue its downward migration, it must be able to displace water from the pores. At this point, the density of the DNAPL plays an important role in determining its subsequent movement. Dense nonaqueous phase liquids (DNAPL) will, however, continue to migrate through the saturated zone until either the volume required to sustain migration is inadequate due to solubilization or soil coating, or an impermeable unit is encountered, (Suthersan, 1997).

The laboratory analysis of groundwater samples collected during previous investigations and Phase One and Phase Two investigations indicate that the concentrations of volatile organic compounds have continued to decline within the groundwater at the Site. The decrease in volatile organic compounds can be attributed to tidal fluctuations, volatilization, dispersion, and biological degradation of the contaminants.

Soil samples collected from the saturated zone at the P2 location; indicate that the contamination has migrated to a depth of 26-feet below grade. P2 is located within the area of the former waste PCE tank. The density of tetrachloroethene is greater than groundwater; therefore the PCE sank to a depth of approximately 26-feet below grade in the source area.

7.0 Summary

The previous sections of the FRI report have detailed the background of the Site, the findings of previous environmental investigations and the investigations conducted during Phase One and Phase Two.

Based on the sampling conducted during Phase One and Phase Two, the primary source areas of contamination are as follows, (see Figure 7-1):

1. The former waste PCE tank.
2. The soils in the vicinity of the garbage container
3. Former Hole in the Compressor Floor
4. Former Supply Well
5. Dry Cleaning Machines
6. Sample 19-I Location

Former Waste PCE Tank

The Site has conducted dry-cleaning services for the past 30 years. Tetrachloroethene (PCE) is the primary chemical used in the dry-cleaning process. When the PCE became unusable (waste), it was stored in an underground storage tank (UST). The UST leaked due to poor housekeeping procedures and was subsequently removed. The waste PCE contaminated underlying soils and groundwater at the Site. Other contaminants were evidently contained within the waste PCE and originated from the cleaning of industrial clothing and rags. These contaminants were identified during Phase One sampling.

Garbage Container

The soils surrounding the garbage container area were evidently contaminated by poor housekeeping practices. Contamination of volatile organic compounds and metals were identified in the vicinity of the garbage container. The area of contamination appears to be isolated to this location.

Former Hole in the Compressor Floor

The soils collected at 2 to 4 feet directly beneath this hole were black with a strong solvent odor and appeared to be heavily oil stained. Laboratory analysis of the soil sample revealed cis-1,2-Dichloroethene at a concentration of 6.3 mg/kg. After sample collection, the hole in the compressor floor was filled with concrete in order to prevent further possible discharges.

Former Supply Well

The liquids retrieved from this well were extremely oily suggesting that waste oils may have been discharged at this location in the past. A high concentration of solvents was detected in the groundwater sample collected during Phase One from this well. The well recharges very poorly and will be abandoned according to NYSDEC well abandonment procedures.

Dry Cleaning Machines

The samples collected at an angle beneath both of the dry cleaning machines contained significant concentrations of solvents. The concentrations detected in the soil sample beneath the south dry cleaning machine, which has been placed out of service, are so high (1,600 mg/kg of PCE) that leakage from this machine in the past is probable. It is recommended that this machine not be used in the future unless it is completely tested for leakage and is found to be in compliance with all regulatory requirements. Furthermore, it is strongly recommended that the storage tank in the bottom of this machine not be used to store solvents unless it is first leak tested and found to meet all regulatory requirements for product storage.

Sample 19-I Location

Due to the high levels of PCE (95 mg/kg) detected under the dryer at this location, this machine or an earlier machine is considered as another possible source of solvent contamination.

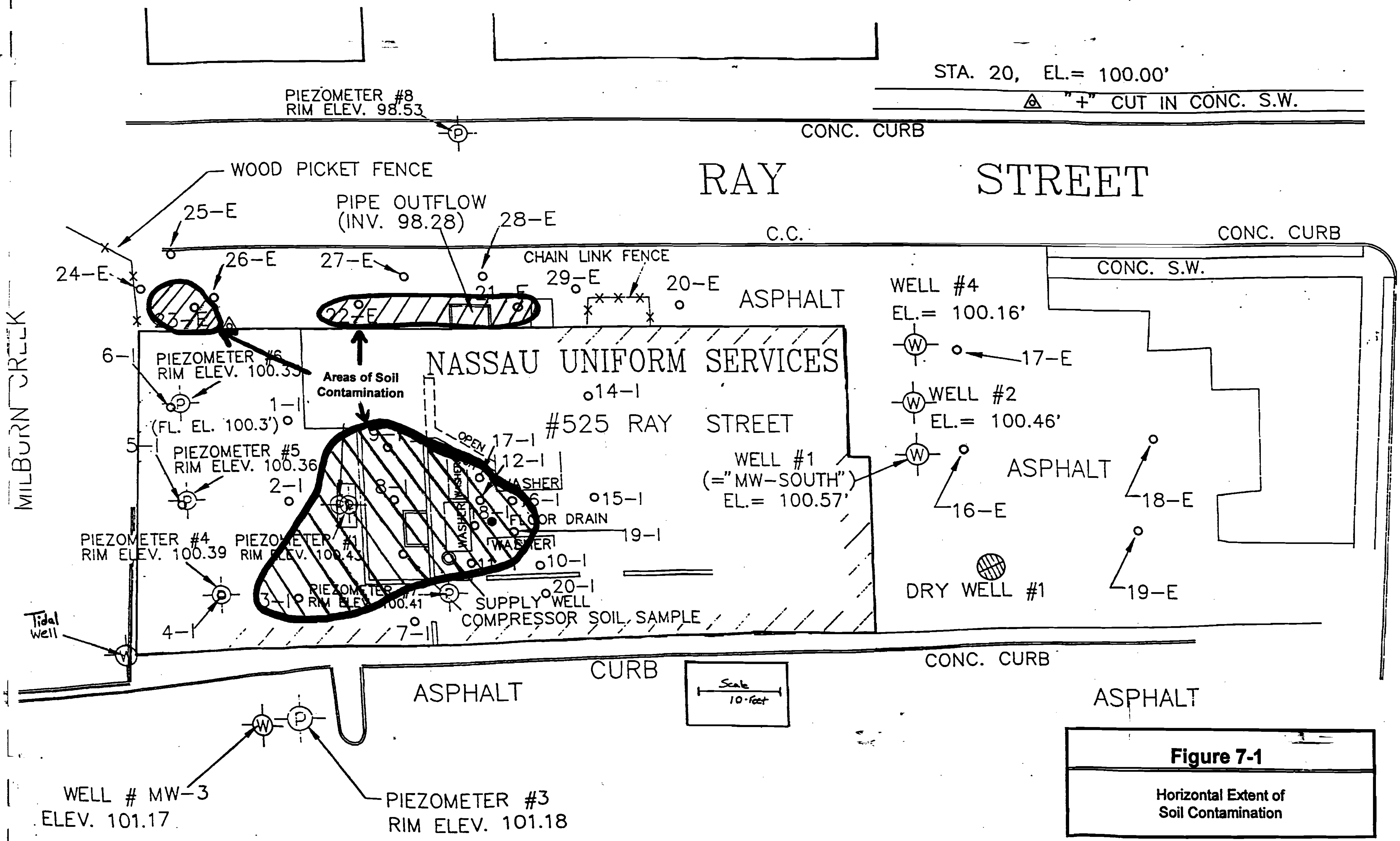


Figure 7-1

Horizontal Extent of Soil Contamination

Prepared By: Anson Environmental Ltd	Cross Sectional Survey
525 Ray Street Freeport, N.Y.	Nassau Uniforms Freeport Site
Scale: 1" = 20'	Date: 10/31/97
Drawn By: J.B.	Job Number: 95100

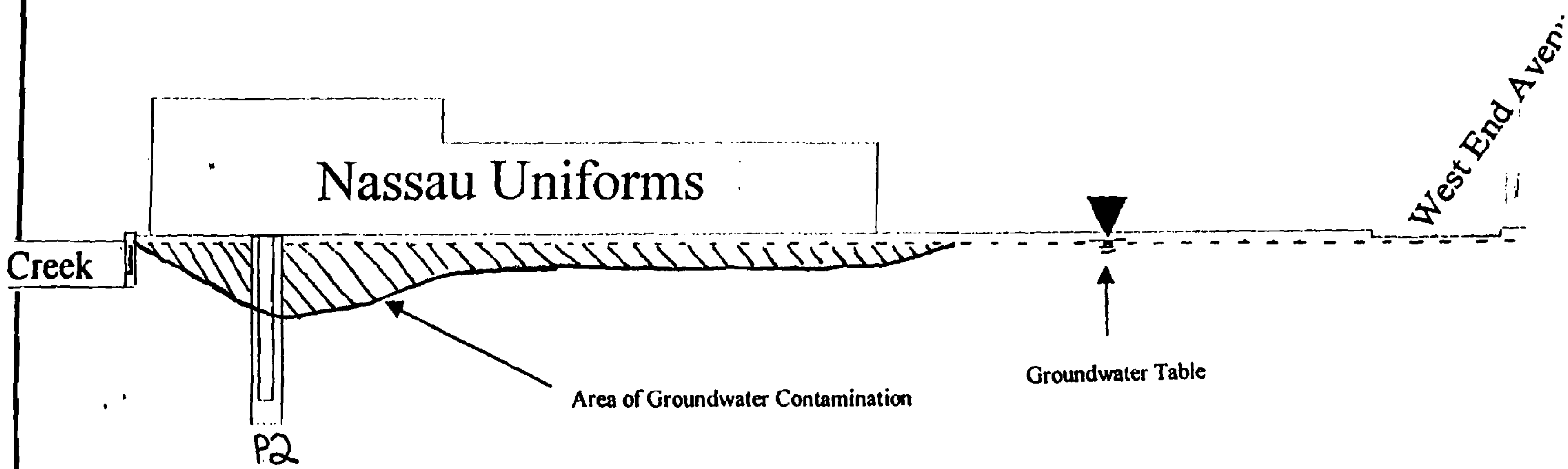


Figure 7-4
Vertical Extent of Groundwater Contamination

A complete design plan will be submitted to the NYSDEC to address the construction of the soil vapor extraction system, shallow pump and treat system and the excavation of on-Site soils.

Operable Unit #2 will include the investigation of deep groundwater and off-Site contamination, if any. In addition, off-Site sampling may include the collection of samples from the canal abutting the Site to the west.

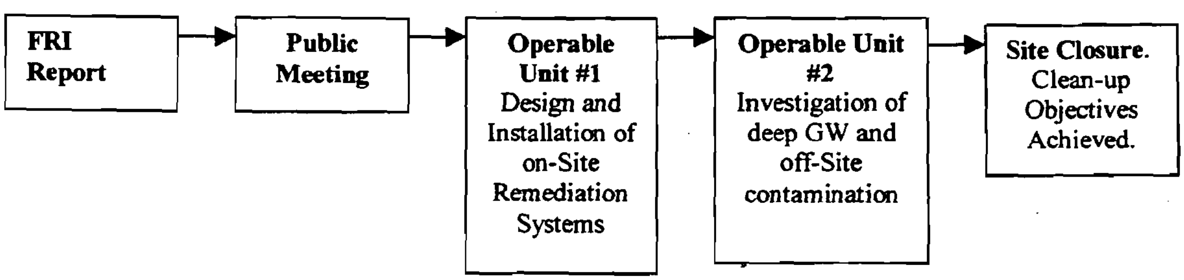
9.0 Schedule

Once the FRI report has been reviewed, a public meeting will be scheduled to address the findings of the FRI report. The design of the soil vapor extraction and shallow pump and treat system will be submitted to the NYSDEC for approval one (1) month following the submission of the FRI report. Once the remedial plans are accepted, construction of the remediation systems will take place under Operable Unit #1.

Based on the comments from the NYSDEC, AEL will propose a work plan for the investigation under Operable Unit #2. Once the work plan is accepted by the NYSDEC, a time frame can be calculated for the work to be accomplished. Based on the findings of Operable Unit #2, additional remedial activities may be required for off-Site contamination, if any.

Once the remedial objectives have been accomplished, AEL will petition the NYSDEC for Site closure and the removal of the Site from the NYSDEC Inactive Hazardous Waste Site registry.

The following chart summarizes the scheduled activities:



10.0 Conclusions

The horizontal and vertical extent of soil and shallow groundwater contamination is delineated at the Site. The compounds detected within soils

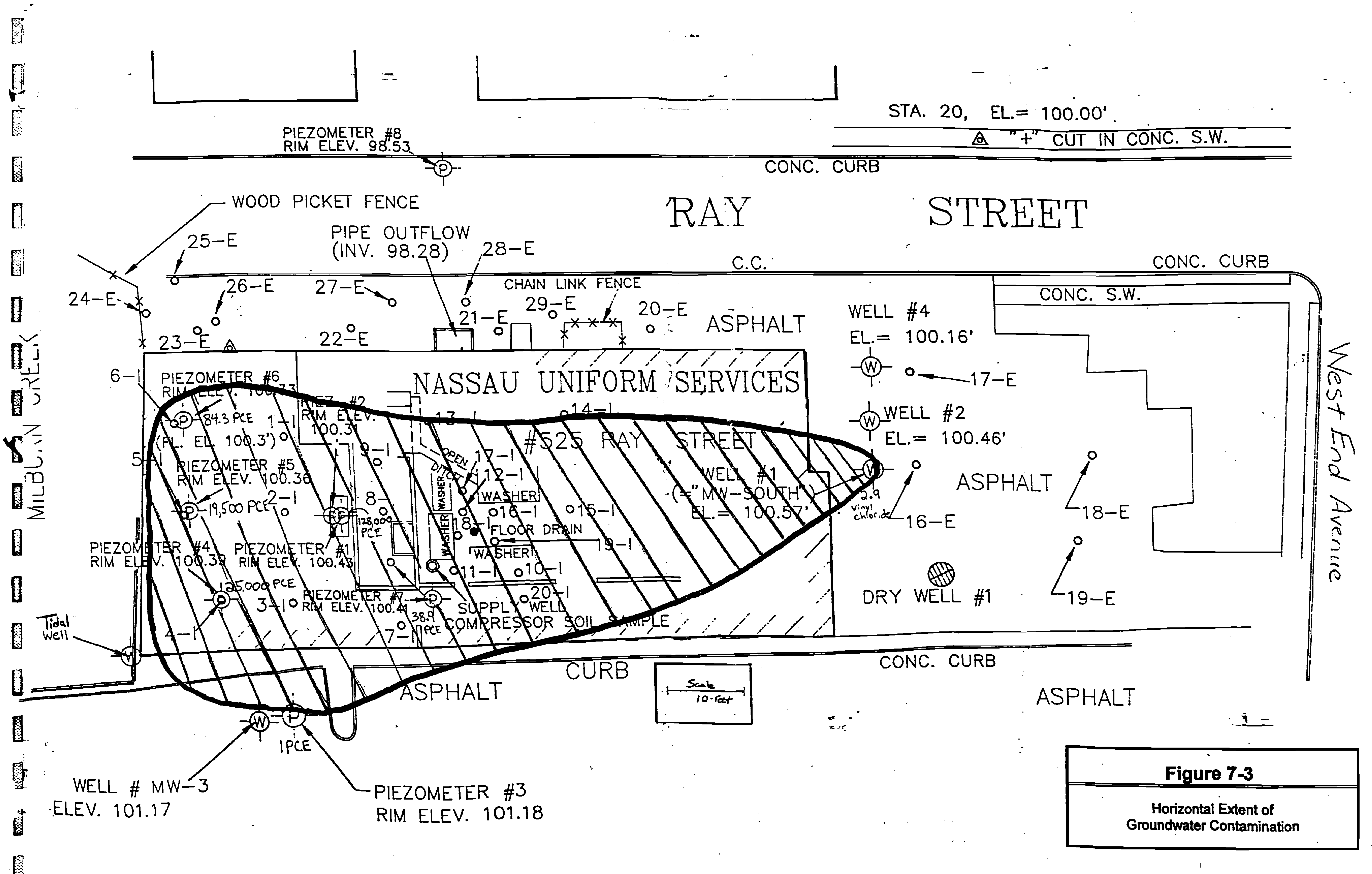


Figure 7-3

Horizontal Extent of Groundwater Contamination

Prepared By: Anson Environmental Ltd.	Cross Sectional Survey
525 Ray Street Freeport, N.Y.	Nassau Uniforms Freeport Site
Scale: 1" = 20'	Date: 10/31/97
Drawn By: J.B.	Job Number: 95100

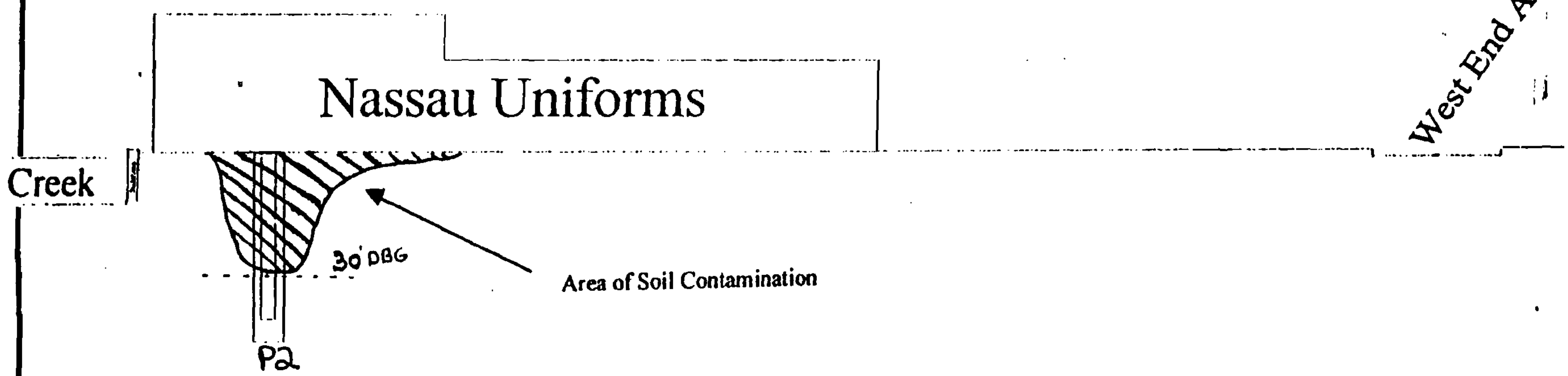


Figure 7-2
Vertical Extent of Soil Contamination

Extent of Soil and Groundwater Contamination

Refer to Figures 7-1 and 7-2 for the horizontal and vertical extent of soil contamination that has been identified during Phase One and Two investigations. The following soil samples have been identified as being contaminated:

1. 3-I	7. 18-I
2. 8-I	8. 19-I
3. 9-I	9. 21-E
4. Compressor Room	10. 22-E
5. 11-I	11. 23-E
6. 12-I	12. P2 (2-4)
7. 16-I	15. P2 (6-8)
8. 17-I	16. P2 (24-26)

The following groundwater samples have been identified as being contaminated during the most recent sampling event (Phase Two):

1. MW-1	5. P5
2. P1	6. P6
3. P3	7. P7
4. P4	

Refer to Figures 7-3 and 7-4 for the horizontal and vertical extent of groundwater contamination identified during Phase Two sampling. Based on the groundwater data interpretation, the approximate size of contaminated groundwater measures an area of 40-feet in width by 95-feet in length and 20-feet in depth. Therefore, remedial action will be required to reduce the concentration and migration of contaminants.

8.0 Recommended Remedial Action Objectives

The recommended remedial action objectives will be accomplished in two (2) operable units, designated Operable Unit #1 and Operable Unit #2. Operable unit #1 will include the remediation of on-Site soil and shallow groundwater. Soil vapor extraction and pump and treat technology will address on-Site soils and shallow groundwater remediation. No feasibility study will be required for these remediation techniques, since they are proven remedial techniques.

In addition to soil vapor extraction, soils near the garbage container area (23-E to 26-E) will be excavated in order to remove metals contamination.

and groundwater on-Site are at concentration levels above the NYSDEC TAGM guidance values and drinking water standards. Therefore, remedial action is required to reduce the concentration levels of these compounds.

It is important to note the decrease in contaminant concentrations between groundwater sampling events. The concentrations in shallow groundwater wells decreased along with deep wells MW-3 and P2. Both MW-3 and P2 were contaminated during Phase One and are clean during Phase Two sampling. Tidal fluctuation may be the main mechanism attributed to the decrease in concentrations. Therefore, further investigation will be required to determine if on-Site contamination has affected the canal associated with Milburn Creek and the property to the south and southeast. During the interim, a design plan will be submitted to the NYSDEC for the construction of a remediation system. The remediation system will address contaminated soils and groundwater on-Site.

Operable Unit #1 and Operable Unit #2 have been designated to the tasks of on-Site remediation and further off-Site investigations, respectively. Based on the results of the off-site investigation and the monitoring of remedial progress, site closure can be achieved. Site closure would include the removal of the Site from the NYSDEC Inactive Hazardous Waste Site registry.

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