Remedial Investigation Work Plan

July 16, 2007

Proposed for:

Melody Cleaners Site
East Meadow, New York
Voluntary Cleanup Program Site Code #347-1

Prepared for:

New York State Department of Environmental Conservation
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1. INTRODUCTION

This Remedial Investigation Work Plan documents the tasks scoped for the continued investigation of the hazardous substance release that occurred at the Melody Cleaners Site ("Site") to satisfy the requirements of the New York State Department of Environmental Conservation (NYSDEC) under the Voluntary Cleanup Plan. The specific requirements pertaining to this plan were specified in letters prepared by the NYSDEC, dated February 27, 2006 and May 3, 2006 and meetings conducted on February 22, 2006 and June 6, 2006.

The purpose of the proposed activities presented herein, is to develop a conceptual planning process that will facilitate the characterization of site-specific conditions relating to the nature and extent of contamination emanating from the Site. A phased approach to site characterization will be implemented to meet this objective. Evaluation of the data obtained from these investigations will be used to support future investigative and remedial decisions.

The methodologies and procedures presented in this work plan are based upon the following documents: the New York State Department of Environmental Conservation Draft DER-10, Technical Guidance for Site Investigation and Remediation; the United States Environmental Protection Agency's (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, dated October 1998; the USEPA Compendium of Superfund Field Operations Methods, dated September 1987; and the USEPA Standard Operating Safety Guides, dated June 1992.

2. SITE CHARACTERISTICS AND CONCEPTUAL SITE MODEL

2.1 Site Location and Topography

The site is located at 2050 Hempstead Turnpike, East Meadow, Long Island, New York, and is designated by the Nassau County Tax Assessors Office as Section 50, Block C, Lot 22 (see **Figure 1:** Site Location Map). The site is located within a 74,702 square foot commercial shopping center situated at the southwestern intersection of Hempstead Turnpike and Front Street. The shopping center contains five single-story buildings that are currently utilized by separate tenants including a donut shop, a vacant television repair shop, a laundromat, a dry cleaner and a car wash. The surface area of the site consists of asphalt parking areas and concrete walkways. The site exhibits low topographic relief (one to three percent slopes). The elevation of the site, as presented on the United States Geologic Survey (USGS), Freeport Quadrangle Map, approximates eighty-five (85) ft above mean sea level.

2.2 Regional Geology and Hydrogeology

The geology of Long Island consists of thick deposits of unconsolidated, water bearing sediments resting upon a relatively impermeable, crystalline bedrock surface. The sequence of events that shaped Long Island's geology is not known with certainty, but it probably began with the formation of the original basement rocks in early Paleozoic to Precambrian time more than 400 million years ago. These basement rocks were heated and compressed (metamorphosed) by folding and faulting, producing a rugged, mountainous topography. During the subsequent period ending with the late Cretaceous Epoch 100 million years ago, erosion reduced the land to a nearly planer surface that gently tilted to the southeast.

During the late Cretaceous Epoch (60-100 million years ago), streams brought sediments from the north and the west to the Long Island area on the continental margin, forming a permeable sand layer (Lloyd Sand Member of the Raritan Formation) and overlying clay member (clay member of the Raritan Formation) upon the bedrock surface. After a short period of erosion or non-deposition, thick, permeable beds of river delta clay, sand, and gravel were deposited on the Raritan Formation; these deposits comprise the Magothy Aquifer. Toward the close of the Late Cretaceous period (approximately 60 million years ago), a sand and clay unit (Monmouth Group) of low permeability was deposited in shallow marine waters in the area that now constitutes Long Island's south shore.

A long period of non-deposition, or possibly deposition followed by erosion, occurred after the Cretaceous era. Geologic activities during this time left few sedimentary traces, but streams flowing across Long Island cut deep valleys into the Magothy. It was not until late Pleistocene (Wisconsinian) glaciation- some 20 to 200 thousand years ago- that there were any significant additions to Long Island's geologic record. Valleys were filled and the other deposits were almost completely buried by glacial deposits. Prior to the southward movement of the Pleistocene ice sheets to Long Island, an extensive clay unit (Gardiners Clay) was deposited in shallow marine and brackish waters along the shores of what is now Suffolk County. This unit rested upon the Magothy and Monmouth Group, and acted as a confining layer. The northern portions of the Gardiners were subsequently eroded by advancing ice and glacial meltwaters, and Gardiners Clay beds are now discontinuous in areas of northern and central Long Island.

The Pleistocene glaciation created the hilly Ronkonkoma moraine along Long Island's "spine" and south fork, and the Harbor Hill Moraine along the North shore and the North fork. Erosion of these morainal deposits (as the glacier melted away from Long Island) created extensive outwash plains of sand and gravel in the intermorainal area and south to the Atlantic Ocean. These highly permeable deposits comprise the upper glacial aquifer and represent the majority of Long Island's surficial sediments. Some local confining clay units were also formed from glacial materials in intermorainal lakes and tidal lagoons. Since the end of glaciation, about 12,000 years ago, Holocene beach and marsh deposits have been formed along the marine edge, and within stream corridors and ponds.

2.3 Site Geology and Hydrogeology

Geological data obtained from the previous remedial investigations identified that the soil was consistent with a glacial till outwash and generally included medium sand and gravel within the unsaturated soils. The water table is encountered at approximately 35-ft below grade at the Site.

Lithological data derived from a United States Geological Survey (USGS) study conducted in 1993 in East Meadow, New York (Paul Heisig and Keith Prince, 1993) approximately 0.8 miles northeast of the Site were reviewed to provide further understanding of regional hydrogeology characteristics. According to the USGS study, regional hydraulic gradient in the upper glacial is approximately 0.001 ft/ft. Regional groundwater flow direction is towards the south with a slight eastern component. According to the abovementioned USGS studies, given 1) the hydraulic conductivities of 380 ft/d for the upper glacial aquifer and 100 ft/d for upper part Magothy aquifer; 2) the average hydraulic gradient of 0.0019 ft/ft; and 3) an effective porosity of 0.30,

the estimated groundwater average velocity is 2.41 ft/d in the upper glacial aquifer and 0.63 ft/d in the upper part Magothy aquifer.

Regional maps provided by the United States Geological Service (USGS) regarding the Gardiners Clay in the area of the Site are inconclusive with respect to its horizontal continuity between the Upper Glacial and Magothy aquifers. Although several well completion logs identify the presence of clay in the soil lithology, it appears that these clay lenses are isolated and discontinuous.

The Site is located within Hydrogeologic Zone I, The Deep Flow - Magothy Recharge Area (Nassau-Suffolk 208 Study - Water Management Zones in Nassau and Suffolk). Zone I is characterized by deep groundwater recharge and vertical groundwater flow. Regional groundwater flow direction in the area of the site is toward the south. Limited information has been generated as part of previous remedial investigations concerning the site-specific hydrogeology within the saturated zones. However, published data has been reviewed from well completion logs provided by the NYSDEC and NCDH. A summary of the logs is presented as follows.

Well N-6044 – Car Wash (Formerly On-Site)

Depth Below Grade	Lithology
0′-2′	Fill material
2′-11′	Fine sand and heavy gravel
11′-46′	Sand and gravel
46′-57′	Coarse white sand

Well N-6749 – 1880 Front Street

Depth Below Grade	Lithology
0′-42′	Sand and gravel
42′	Clay

Well N-9336 – East Meadow Public Library

Depth Below Grade	Lithology
0′-21′	Hard pan, rocks
21′-31.5′	Stones, rocks
31.5′-42′	Very coarse sand, heavy gravel
42′-45.5	Very coarse sand, heavy gravel
45.5-49′	Very coarse sand, heavy gravel

Well N-6336 – 1927 Front Street

Depth Below Grade	Lithology
0′-4′	Brown sand
4′-32′	Lt. brown medium-coarse sand
32′-35′	Lt. brown sand and gravel
35′-42′	Solid gray clay
42′-45′	Fine gray brown sand and clay
45′-46′	Lt. brown sand and gravel
46′-52′	Solid brown clay
52′-59′	Hard gray clay

Well completion logs provided by the NYSDEC for the installation of public water supply wells identified the following geological lithology information.

Well N-3456 – 1995 Prospect Avenue

Depth Below Grade	Lithology
0′-40′	Brown sand and gravel
40′-60′	Lt. brown sand and gravel
60′-87′	Fine white sand
87′-110′	Fine white sand and gravel
110′-170′	Sand and gravel with yellow clay
170′-228′	Sand and black clay
228′-242′	Clay
242′-255′	Sand
255′-270′	Muddy sand
270′-329′	Fine white sand
329′-344′	Muddy sand
344′-367′	Sand and clay

2.4 Source Characteristics

The site was developed in the late 1950s. Prior to the availability of municipal sewers, wastewater from site operations was discharged to on-site disposal systems. These on-site disposal systems were comprised of a network of septic tanks and cesspools (underground injection wells) for each of the buildings. Site operations generating processed wastewater included the car wash, the laundromat and the dry cleaning facility. The car wash facility discharged wastewater into three cesspools on the southern side of the car wash building and one cesspool on the northern side of the building. The laundromat facility discharged wastewater into seven cesspools located on the southern side of the laundromat building. According to site

plans, these on-site disposal systems were to have a total capacity of approximately sixteen thousand gallons per day. All of these buildings on-site were connected to the municipal sewer in the 1980s. The septic tanks and cesspools were abandoned in-place.

The dry cleaning facility discharged wastewater into three cesspools via a septic tank located on the southern side of the building. This industrial process water was discharged to the disposal system from interior floor drains. The building was connected to municipal sewer in 1982. The existing cesspools were abandoned in-place.

Three source areas have been identified on the Site from the performance of subsurface investigations. These source areas consist of the three former cesspools associated with the dry cleaning building; seven former cesspools associated with the laundromat building; and residual soil contamination beneath the former perc dry cleaning machines in the dry cleaner building.

The concentrations of tetrachloroethylene within the soil samples secured from within the inverts of the primary, secondary and tertiary cesspools of the former on-site disposal system at the dry cleaning building were 48,515,000 ppb, 2,716 ppb and 34,236 ppb, respectively. This source area was remediated as part of an interim remedial measure work plan from November 27-29, 2000. A total of 492.72 tons of contaminated soil were excavated and removed for proper off-site disposal. The concentrations of tetrachloroethylene within the soil samples secured post excavation from within the primary, secondary and tertiary cesspools were 74 ppb, 29 ppb and non-detect (ND), respectively. These results indicate a significant reduction of the pollution source in the unsaturated soil at the site.

The former cesspools associated with the laundromat at the Site were sampled as part of a supplemental investigation in 2003. The concentrations of tetrachloroethene within the sediment samples secured from the former cesspools ranged from non-detect to 110,000 ppb. The concentrations of trichloroethene within the sediment samples secured from the former cesspools ranged from non-detect to 12,000 ppb. The concentrations of cis-1,2 dichloroethene within the sediment samples secured from the former cesspools ranged from non-detect to 63,000 ppb. This source area was remediated as part of an interim remedial measure work plan on July 20, 2004. A total of 41.11 tons of contaminated soil were excavated and removed for proper off-site disposal. The sample endpoint concentrations of tetrachloroethene secured post excavation from within former cesspools associated with the laundromat ranged from 560 ppb to 9,400 ppb. The sample endpoint concentrations of trichloroethene secured post excavation from within former cesspools associated with the laundromat ranged from non-detect to 350 ppb. The sample

endpoint concentrations of cis-1,2 dichloroethene secured post excavation from within former cesspools associated with the laundromat ranged from non-detect to 980 ppb.

A source of contamination was identified beneath the slab of the dry cleaning building from sampling conducted as part of a supplemental investigation conducted on July 17, 2003. Shallow soil samples collected for analysis from immediately beneath (2-4 ft below grade) the building slab exhibited concentrations of tetrachloroethene ranging from 9,000 to 46,000 ppb; and concentrations of trichloroethene ranging from non-detect to 240 ppb. Deeper soil samples collected from depths of 8-14 ft beneath the building slab failed to exhibit any concentrations of tetrachloroethene or trichloroethene above minimum detection limits. The depth to groundwater at the site is approximately 30-35 ft below grade. Based on this 2003 investigation, it was determined that this source was not contributing to the underlying groundwater contaminant plume. Residual soil contamination from these sources is currently being remediated through the operation of the existing soil vapor extraction system. The SVE system has been in operation since January 2005.

2.5 Nature and Extent of Groundwater Contamination

The groundwater quality at the Site was investigated as part of a due diligence assessment in 1999. These investigations were performed by Fenley & Nicol Environmental and Impact Environmental. The first investigation included the acquisition and analysis of four groundwater samples from the site. The groundwater samples were acquired through the installation of temporary monitoring wells, identified as GP-1, GP-2, GP-3 and GP-4, using a Geoprobe operating system. The temporary monitoring wells were sited on the northern, western, southern and eastern sides of the dry cleaning facility. The laboratory analysis of these groundwater samples detected chlorinated solvents at concentrations significantly above NYSDEC Technical Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Limitations. The chlorinated analytes primarily consisted of tetrachloroethylene (perc or PCE) with concentrations ranging from 82 to 127,700 ppb; trichloroethylene (TCE) with concentrations ranging from non-detect to 640 ppb; and cis-1,2-Dichloroethene (cis DCE) with concentrations ranging from non-detect to 660 ppb. These chemicals are utilized in the dry cleaning and spot removal processes.

The second investigation consisted of the acquisition and analysis of seven additional groundwater samples from the site. Four of the groundwater samples, identified as GP-5, GP-6,

GP-7 and GP-8, were acquired through the installation of temporary monitoring wells using a Geoprobe operating system. The temporary monitoring wells were sited on the southern and eastern sides of the dry cleaning facility. The laboratory analysis of said groundwater samples detected chlorinated solvents at concentrations significantly above NYSDEC TOGS 1.1.1, Ambient Water Quality Standards and Limitations. The chlorinated analytes primarily consisted of tetrachloroethylene (perc or PCE) with concentrations ranging from 147 to 14,100 ppb; trichloroethylene (TCE) with concentrations ranging from 3 to 185 ppb; and cis-1,2-Dichloroethene (cis DCE) with concentrations ranging from non-detect to 101 ppb.

Three of the groundwater samples, identified as MW-1, MW-2 and MW-3, were acquired through the installation of permanent groundwater monitoring wells using a hollow stem auger. Said permanent monitoring wells were installed on the northwestern, southern and eastern sides of the dry cleaning facility. The laboratory analysis of the groundwater samples detected chlorinated solvents at concentrations significantly above NYSDEC TOGS 1.1.1, Ambient Water Quality Standards and Limitations. The chlorinated analytes primarily consisted of tetrachloroethylene (perc or PCE) with concentrations ranging from 52 to 3,420 ppb; trichloroethylene (TCE) with concentrations ranging from 1 to 78 ppb; and cis-1,2-Dichloroethene (cis DCE) with concentrations ranging from non-detect to 127 ppb. In addition, the permanent monitoring wells were gauged and surveyed to determine site-specific groundwater depth and flow direction. Results of these activities indicated that groundwater depth was approximately 35-ft below existing grade and groundwater flow direction was towards the south-southeast.

A subsurface investigation was performed in December 1999 by Impact Environmental on the site. The investigation consisted of the acquisition and analysis of five additional groundwater samples from the site. The groundwater samples, identified as GWP-1, GWP-2, GWP-3, GWP-4 and GWP-5, were acquired through the installation of temporary monitoring wells using a Geoprobe operating system. The wells were sited on the northern and southern border of the site to be representative of groundwater quality hydraulically up-gradient and down-gradient of the site. The laboratory analysis of the up-gradient groundwater samples (GWP-1 and GWP-2) failed to detect any concentrations of target volatile organic analytes. The laboratory analysis of the down-gradient groundwater samples (GWP-3, GWP-4 and GWP-5) detected chlorinated solvents at concentrations significantly above NYSDEC Technical Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Limitations. The chlorinated analytes primarily consisted of tetrachloroethylene (perc or PCE) with concentrations ranging from 8,591 to 89,778 ppb; trichloroethylene (TCE) with concentrations ranging from non-detect to 218 ppb; and cis-1,2-Dichloroethene (cis DCE) with non detectable concentrations.

Impact Environmental conducted Remedial Investigations in July-August 2002 and November 2003. The purpose of these activities was to delineate the nature and extent of groundwater contamination emanating from the Site. The investigations included the collection and analysis of saturated soil samples and groundwater samples from the site and off-site. Two saturated soil sampling probes were installed on the site. Subsurface saturated soil sampling activities failed to identify the presence of any significant concentrations of solvent-related contaminants indicative of dense non-aqueous phase liquid (DNAPL). Based on these findings, it was determined that DNAPL was not present in the groundwater at the Site, and that the groundwater contamination at the Site exists in a dissolved phase. A total of 4 on site and 19 off site groundwater sampling probes were installed for the purposes of collecting groundwater samples for analysis. The groundwater sampling probes were installed at multiple depths to determine the vertical extent of the solvent related dissolved phase plume. The groundwater samples were collected from depths ranging from the water table to 124-ft below existing grade. A total of 80 groundwater samples were collected for analysis from the remedial investigations conducted in 2002 and 2003.

Based on the results of the groundwater laboratory analysis, eighteen off site sampling locations and three on site sampling locations identified concentrations of tetrachloroethene, trichloroethene and cis-1,2 dichloroethene ranging from 3.8 to 5,100 ppb. Of these, thirteen sampling locations off site and three sampling locations on site exhibited concentrations of target analytes exceeding the applicable standards, criteria and guidance's (SCGs) for GA class ambient water quality standards and guidance values under NYSDEC, Technical Operational Guidance Series (TOGS) 1.1.1. The balance of samples failed to exhibit any concentrations of target volatile organic analytes above minimum detection limits. The results of these investigations identified that the solvent related groundwater contaminant plume emanating from the Site is migrating southerly in the direction of groundwater flow. The centerline of the contaminant plume appears to be along groundwater points GP-4 and GP-11. The horizontal extent of the solvent related groundwater contaminant plume within an order of magnitude of the applicable SCG appears to extend to at least Devon Street in the direction of groundwater flow. The vertical extent of the solvent related groundwater contaminant plume extends at groundwater probes GP-4 and GP-11 to at least 124-ft below existing grade. No up-gradient source of contamination was identified from the results of the remedial investigation. Additional investigative activities were deemed necessary to fully define the horizontal and vertical extent of the solvent related groundwater contaminant plume. All historic sampling locations can be referred with **Figure 2 and 3**.

3. REMEDIAL INVESTIGATION PLAN

The work proposed in this plan will be performed in accordance with NYSDEC procedures. The purpose of this work plan is to propose the procedures necessary to further characterize site-specific conditions and the extent of contamination to understand potential contaminant pathways. The information generated as part of this work plan will be used to support informed decisions regarding additional investigative activities and/or remedial alternatives. The site investigation activities will be performed in accordance with the Site Health and Safety Plan included in **Appendix A**.

The objective of this phase of the remedial investigation is to collect data regarding Site-specific hydrogeological properties of the underlying aquifer(s). This data will be evaluated to refine the conceptual site model to enhance the understanding of site specific characteristics that affect contaminant fate and transport. The investigation will be performed to determine the presence, depth and continuity of any significant confining unit(s) or layer(s) within the underlying aquifer(s) at the Site. The investigation will rely on field data to make real time decisions regarding the specifications of the permanent well network installed at the Site. The NYSDEC has indicated that Department staff will work with Impact Environmental to allow for this dynamic work planning to facilitate field decisions.

3.1 Topographic Survey

The proposed soil boring/monitoring well locations will be surveyed using sub-meter accuracy Global Positioning Satellite (GPS) Survey equipment. The GPS surveying techniques are based upon interferometric observations of radio signals from a network of orbiting satellites. These signals are processed to compute station positions by trilateration; the positions of the satellites and computed ranges are used to determine the antenna position. These positions are computed in an Earth-centered Earth-Fixed (ECEF) Cartesian coordinate (x, y, z) system, which can be converted to geodetic curvilinear coordinates (latitude, longitude, and ellipsoidal height). With the additional use of traditional survey techniques, relative elevations can be computed. The GPS survey system to be utilized for this study is the Trimble® R8 and Trimble® 5800 system. Said system includs a dual-frequency, RTK, GPS and WAAS/EGNOS receiver. Horizontal distances were to the nearest 100^{th} of a foot for wells and the nearest 10^{th} of a foot for other features tied into the NYS Plane coordinate system. This data will be used to develop a hydrostratigraphic map of the Site.

A traditional survey of the site also will be performed to collect elevation data for existing/future wells. Survey standards include vertical elevations on wells to the nearest 100^{th} of a foot and ground and surface features to the nearest 10^{th} of a foot. Traditional survey will continue to be used for benchmarks, monitoring wells, and other locations where more exacting survey standards are required.

3.2 Site Characterization

3.2.1 Soil Borings

The installation of 4 soil borings is proposed at locations identified as MLW-1, MLW-2, MLW-3, MLW-6 to obtain site-specific geological data and determine vertical extent of contamination at the centerline of the predicted contaminant plume. These soil borings will be installed prior to the installation of the permanent monitoring wells. The soil boring bordering the water district (MLW-6) will be installed first; followed by each soil boring back toward the Site (i.e. MLW-3, MLW-2 and MLW-1). The collection of subsurface soil samples will be performed utilizing split spoon techniques through a hollow stem auger. Subsurface saturated soil samples will be collected in depth intervals every 10-ft starting from depths of approximately 80-ft (where previous investigations identified the greatest vertical extent of contamination in the aquifer) to a depth extending to a significant confining layer. Split spoon depths may be slightly modified in the field based on visual observation of drill cuttings and/or resistance in drilling that indicate a change in lithology. Additional soil boring locations may be warranted based on an evaluation of field data. The installation of any additional soil borings will be performed in consultation with the NYSDEC. The soil sample collection procedures that will be followed are referenced in Section 4.2 of the QAPP. Each soil boring will be completed as a deep monitoring well as referenced in Section 3.3 and 4.2.6.

The subsurface soil samples collected from the soil borings will be classified in the field in accordance with the modified Burmeister Classification System. The classification of soils in the field will also be used to validate the findings of the natural gamma logging (see Section 3.2.2) and support well construction specifications. In addition, soil samples will be selected for index analysis (grain size) to verify visual classifications.

Based on the field sample classification and observations, saturated soil samples collected from the soil borings may be analyzed by a laboratory. If saturated soil samples are collected for ELAP certified laboratory analysis, they will be preserved in the field with ice, properly transported to

the selected laboratory and analyzed in accordance with USEPA Test Method 8260 for volatile organic analytes. The laboratory analysis results will be reported with NYSDEC Analytical Sampling Protocol (ASP) B deliverables.

3.2.2 Natural Gamma Logging

Natural gamma logging will be conducted on the Site to determine the presence, depth and lateral continuity of any significant confining unit(s) or layer(s) within the underlying aquifer(s) at the Site. Natural gamma logging is the physical measurement of the release of natural gamma radiation from the soil and rocks surrounding a borehole. Natural gamma logging is based on the principle that more intense natural gamma radiation is emitted from clay-rich formations, which are usually higher in naturally radioactive elements, than clay-poor formations. Most natural gamma radiation occurs in clays containing thorium, uranium, or potassium 40. Gamma logs are useful tools for identifying inter-bedded impermeable layers that may be thin and difficult to locate.

Natural gamma measurements will be performed through each soil boring and monitoring well location identified as MLW-1, MLW-2, MLW-3, MLW-4, MLW-5, MLW-6, MLW-7 and MLW-8 through the auger and/or monitoring well casings from the terminating depth. The logging will be performed down and up the casing at an approximate speed of 5-ft per minute. Real time data will be generated from the logging and interpreted in the field to facilitate the placement of the well screens for each multi-level well.

3.2.3 Discrete Water Sampling

The collection of discrete groundwater samples will be performed using a screened auger sampler in conjunction with the permanent monitoring well installation. A total of 6 discrete groundwater sampling locations are proposed to determine vertical extent of contamination at the centerline of the predicted contaminant plume (MLW-1, MLW-2, MLW-3, MLW-6) and the plume boundary wells bordering the water district (MLW-7 and MLW-8). Discrete groundwater samples will be secured from depths of approximately 100-ft below grade (where previous investigations identified the greatest vertical extent of contamination in the aquifer) in intervals every 20-ft to a depth extending to a significant confining unit or layer or where discrete water samples indicate groundwater quality is within delineation criteria. The discrete water sampling depths may be slightly modified in the field based on an evaluation of the soil boring data (i.e. above apparent clay layers). In addition, shallower groundwater samples may be necessary in

closer proximity to the Site due to the vertical migration of the plume. The collection of the discrete groundwater samples will be performed to the terminating depth of these locations prior to the construction of the multi-level wells. The groundwater sampling procedures are referenced in Section 4.2 of the QAPP.

The groundwater samples will be analyzed by an ELAP certified laboratory with an expedited turnaround to facilitate field decisions. The laboratory analysis will consist of United States Environmental Protection Agency (USEPA) Test Method 8260 for total volatile organic analytes. The target analytes that will be analyzed for include tetrachloroethylene (PCE), trichloroethylene (TCE), cis-1,2 dichloroethene (1,2-DCE) and vinyl chloride (VC).

Ten (10) percent of the samples subjected to expedited laboratory analysis will be additionally analyzed by an ELAP certified laboratory reported with NYSDEC Analytical Sampling Protocol (ASP) B deliverables. Said laboratory analysis will consist of United States Environmental Protection Agency (USEPA) Test Method 8260 for total volatile organic analytes.

3.2.4 Identification of Confining Layer

The proposed activities outlined in Sections 3.2 are intended to provide real time data in the field that will facilitate the identification of a confining layer in the underlying aquifer(s). Published data regarding regional geological features indicate that clay layers in the area of East Meadow, New York are generally discontinuous. However, published data available for the water supply wells at the East Meadow Water Supply District (well completion logs referenced in Section 2.3) indicates that a significant clay layer with a thickness of approximately 14-ft exists at a depth of approximately 228-ft below grade. Based on this local geological data, it is anticipated that this clay layer may represent a Site-specific target confining layer. However, there is presently not enough adequate data to make this determination. Therefore, the data collected in the field will be used to collectively identify the presence of a confining layer(s) above the target clay layer at 228-ft below grade. This field data includes classification of saturated soils, discrete water sampling and natural gamma logging. The parameters that will be considered to define the presence of an apparent confining layer include changes in lithology from drill cuttings, increase resistance in drilling, the thickness of the clay observed from split spoons and natural gamma logging results, and continuity of clay layer depths (relative elevation) at each boring location. As

more borings are completed, a more comprehensive understanding of the continuity or discontinuity of any apparent confining layer(s) will be established.

3.2.5 Hydrostratigraphic Mapping

The results of the soil borings, discrete water sampling and natural gamma logging will be utilized for mapping the lateral continuity of any significant confining unit(s) or layer(s) within the underlying aquifer(s) at the Site. The data obtained during the investigation will be presented on two-dimensional contour maps.

3.3 Groundwater Monitoring Wells

A permanent groundwater well network will be installed at the Site for monitoring contaminant fate and transport. The wells will be installed up-gradient of the Site, on the Site and hydraulically down-gradient of the Site relative to the current understanding of the contaminant plume geometry and the results of the site characterization activities referenced in Section 3.2 (soil borings and natural gamma logging). The proposed placement of the wells is presented on **Figure 4.** The placement of 9 wells has been selected based on an evaluation of historic data collected from the Site in consultation with the NYSDEC (2 on-site and 7 off-site). The multi-level wells installed along the centerline will be situated within a radius of approximately 10-ft from previously installed soil boring location. The installation and placement of any additional wells will be implemented in a phased approach based on field and/or certified analytical data collected from the Site in consultation with the NYSDEC. The well construction specifications and installation techniques and methods are referenced in Section 4.2 of the QAPP. The well construction diagram is provided in **Appendix B** of the document.

The off-site wells will be installed in 3 transects that are perpendicular to regional groundwater flow direction and the contaminant plume. The well transect bordering the water district will be installed first; followed by each transect back toward the Site. The centerline well from each transect will be installed first. The field data collected from the centerline well at each transect will in part determine the specifications (well screen depths) of the plume boundary wells. Further, the data collected from wells at each transect will support the placement of the following well transect.

A shallow water table well MW-4 is proposed to be located up-gradient of the Site. Multi-level well MLW-1 is proposed to be located near the source area on the Site. Multi-level wells MLW-2, MLW-3 and MWL-6 are proposed to be located proximal to the predicted center line. Multi-level wells MLW-4, MLW-5, MLW-7 and MLW-8 are proposed to be located proximal to the predicted plume boundary. The installation and placement of 4 additional multi-level wells will be decided on a phased approach based on field and/or certified analytical data collected from the Site in consultation with the NYSDEC. These wells are labeled as MLW-Phased on **Figure 4**.
The proposed up-gradient monitoring (MW-4) well shall have one discrete screen depth that shall straddle the groundwater table. The centerline wells (MLW-1, MLW-2, MLW-3 and MLW-6) and the plume boundary wells bordering the water district (MLW-7 and MLW-8) will be installed with 3 discrete well screen depth intervals; one shallow that shall straddle the groundwater table, one intermediate screen depth and one deep screen depth. The screen depths will be determined by the site characterization activities referenced in Section 3.2. The plume boundary wells (MLW-4, MLW-5) along the second transect will be installed with one shallow that shall straddle the groundwater table and one deep screen depth, which will be determined by the site characterization activities referenced in Section 3.2. The placement of the intermediate well screen depths will be bias toward depths exhibiting the highest concentration of volatile organic compounds as determined by the results of the discrete groundwater sampling; and the deep screen depth shall be placed above a confining layer or if a confining layer is not present, beneath the vertical extent of contamination. Where a confining layer is not identified, the vertical extent of contamination in this case shall be defined based upon two discrete groundwater sampling results that indicate target dry cleaning related volatile organic compounds (those derived from the Site) below NYSDEC ambient groundwater standards and guidance values.

3.3.1 Quarterly Monitoring Well Sampling and Analysis

It is proposed that the new monitoring wells be sampled on a quarterly basis subsequent to installation to monitor fate and transport of the dissolved phase contaminant plume. In addition, the existing on-site shallow monitoring wells, identified as SVE-1 through SVE-4, that are currently utilized as SVE wells and the wells previously installed by Fenley and Nicol, identified as MW-1, MW-2 and MW-3 (recently redeveloped by Impact Environmental) will also be sampled on a quarterly basis as part of the groundwater monitoring program. The baseline sampling event is proposed 2-weeks after the completion of the well installation.

One groundwater sample will be acquired from each screen depth of each multi-level monitoring well. The groundwater samples will be subjected to ELAP certified laboratory analysis. The laboratory analysis will consist of USEPA Test Method 8260 for total volatile organic analytes. The laboratory analytical results will be reported in a Quarterly Monitoring Report to the NYSDEC with Analytical Sampling Protocol (ASP) B deliverables. Additional parameters including dissolved oxygen will be acquired at part of development procedures or laboratory analysis.

3.3.2 Monitoring Well Development and Sampling Procedures

The initial baseline groundwater development and sampling of the previously installed wells on the Site and the proposed wells will be performed using the standard monitoring well purging and sampling procedures referenced in Section 4.2.7 of the QAPP. The subsequent groundwater sampling activities performed for contaminant fate and transport monitoring will be performed using the diffusion bag sampling procedures referenced in Section 4.2.9 of the QAPP.

3.3.3 Groundwater Elevation Survey

The proposed groundwater monitoring wells will be utilized to calculate Site-specific groundwater flow direction. The elevation of groundwater will be gauged at each screen depth from each multi-level monitoring well and recorded. The elevations will be used to graphically define the planimetric surface of the groundwater table. The elevations of the top of the casings will be represented with respect to each other and based on a benchmark elevation. The groundwater elevations will be based as a function of the depth to water at these elevations. Groundwater-table potentiometric contours for each well screen interval will be constructed from the measurement of groundwater elevations and will be presented as a potentiometric gradient map. Based on these contours, the average groundwater flow direction and hydraulic gradient will be reported.

3.3.4 Work Schedule

The anticipated schedule of the remedial investigation proposed under the scope of this work plan provided in **Figure 5**.

4. QUALITY ASSURANCE PROCEDURES PLAN

The quality assurance procedures plan for the Site is intended to establish specific procedures that will be followed during the remedial investigation to ensure the quality and reliability data. The procedures outlined in this plan are specific to the activities proposed within this remedial investigation work plan. Additional quality assurance procedures may be provided in the future relating to activities outside the scope of this plan.

4.1 Organizational Responsibility

The following table provides a list of personnel related to the project that will be involved with the quality assurance procedures plan.

Title	Name
Project Manager, Impact Environmental	Richard Parrish
Quality Assurance Officer, Impact Environmental	Kevin Kleaka
Field Operations Leader, Impact Environmental	Hal Benjamin
Project Manager, NYSDEC	Brian Jankauskas

4.1.1 Project Manager

The Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project.
Specific duties will include:

- Coordinating the activities of subcontractors, to include informing them of the required PPE and insuring their signature acknowledging this Site Safety Plan;
- Selecting a Site Health and Safety Officer and field personnel for the work to be undertaken on site;
- Ensuring that the tasks assigned are being completed as planned and on schedule;
- Providing authority and resources to ensure that the Site Health and Safety Officer is able to implement and manage safety procedures;
- Preparing reports and recommendations about the project to clients and affected personnel;
- Ensuring that persons allowed to enter the site (i.e., EPA, contractors, state officials, visitors are made aware of the potential hazards associated with the substances known or suspected to be on site, and are knowledgeable as to the on-site copy of the specific site safety plan;

- Ensuring that the Site Health and Safety Officer is aware of the provisions of this site safety plan and is instructing all personnel on site about the safety practices and emergency procedures defined in the plan;
- Ensuring that the Site Health and Safety Officer is making an effort to monitor site safety, and has designated a Field Operations Leader to assist with the responsibility when necessary.

4.1.2 Quality Assurance Officer

The Quality Assurance Officer (QAO) is an employee of the same consulting firm generating the work plan and acts in conjunction with the project manager to develop a site-specific quality assurance plan.

The QAO will assist the project manager in the development of the sampling and analytical portion of the Quality Assurance Project Plan. The QAO or his/her designee shall conduct periodic field and sampling audits, interface with the analytical laboratory to make requests and resolve problems, interface with the data validator and develop a project-specific data usability report.

4.1.3 Field Operations Leader

The Field Operations Leader will be responsible for field operations and safety. Specific duties will include, but are not limited to:

- Managing field operations;
- Executing the work plan and schedule;
- Enforcing safety procedures;
- Coordinating with the Site Health and Safety Officer in determining protection levels;
- Enforcing site control;
- Documenting field activities, including sample collection;
- Serving as liaison with public officials where there is no Public Affairs official designated.

4.2 Field Procedures

The sampling that will be conducted on the site will consist of soil and groundwater sampling. The activities associated with the remedial investigation will be performed by or under the auspices of a Quality Assurance Officer. The sample staff (samplers) will possess a minimum of a BA Degree in the Earth, Space or Biological Sciences or a BS Degree in Engineering. Samplers will have a minimum of one (1) year experience in environmental/geological fieldwork. Additionally, all samplers will have received mandatory forty-hour Occupational Safety and Health Administration (OSHA) training on working with potentially hazardous materials and appropriate Hazard Communication Program and "Right-To-Know" training.

4.2.1 Decontamination Procedures

Prior to arrival on the Site and between boring/ well locations, all sampling tools relating to auger or drilling equipment will be decontaminated using the following methods: 1) remove all adherent soil material with stiff bristle brush; 2) wash with a laboratory grade glassware detergent or Alconox; 3) steam clean interior and exterior of the screened auger sampler and all associated augers; 4) allow to air dry. Decontamination waste water will be contained, tested and passed through a granular activated carbon treatment system (if possible) and tested prior to disposal. A decontamination pad will be constructed on the Site for this purpose.

4.2.2 Soil Boring Installation

Hollow stem auger drilling is the method that will be employed to install the soil borings at the Site. 4.25" augers will be used to drill. Split spoon sampling will be used to collect representative soil samples. A 2-ft. split spoon sampler will be used to collect the soil samples. The following techniques will be used for the split spoon sampling upon advancement of the augers to the desired depth: 1) Assemble the sampler by aligning both sides of barrel and then screwing the drive shoe on the bottom and the head piece on top; 2) place the sampler in a perpendicular position on the sample material; 3) using a well ring, drive the tube. Do not drive past the bottom of the head piece or compression of the sample will result; 4) record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled; 5) withdraw the sampler, and open by unscrewing the bit and head and splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally; 6) without disturbing the core, transfer it to appropriate labeled sample

container(s) and seal tightly; and 7) decontaminate the sampler for use prior to the collection of the following split spoon sample.

Due to site conditions, the split spoon sampling will be performed in the saturated soils. To prevent heaving or running sands, a pressurized water passage tube will be used to flush heaves to obtain the desired depth prior to sampling with the split spoon. Field measurements will be secured for each split spoon sample prior to collection to ensure accurate sample depths. The water used with the passage tube will be tested at prior to use for injection.

4.2.3 Sample Characterization

A visual inspection of the soil samples collected for the hydrogeological study will be conducted to classify the sample media and identify changes in lithology. In addition, inspection of drill cuttings (from the augers) will be performed during drilling activities to facilitate identifying changes in lithology. Color classifications will be made in accordance with the Munsell Classification System. Gradation classifications will be made in accordance with the modified Burmeister Soil Classification System.

4.2.4 Field Headspace Analysis

Headspace analysis will be performed on each of the acquired soil samples utilizing a portable photo ionization detection meter to measure what, if any, volatile hydrocarbon concentrations were present in isolated portions of the secured samples. Calibration of the PID will be conducted prior to sampling using a span gas of known concentration. Headspace analysis will be conducted by partially filling a wide-mouth glass container with sample aliquot and sealing the top with aluminum foil, thereby creating a void. This void is referred to as the sample headspace. To facilitate the detection of any hydrocarbons contained within the headspace, the container will be agitated for a period of thirty (30) seconds. The probe of the vapor analyzer will then be injected through the foil into the headspace to measure the hydrocarbon concentrations present. A Photovac Micro-Tip, photo ionization detection meter (PID) will be the organic vapor analyzer selected for the headspace analysis. A PID utilizes the principle of photo ionization for detection and measurement of hydrocarbon compounds. A PID does not respond to all compounds similarly; rather, each compound has its own response factor relative to its calibration. For this investigation, the PID will be calibrated to isobutylene for the compounds of concern. Hydrocarbon relative response factors for a PID calibrated to isobutylene are published by the manufacturer.

4.2.5 Screened Auger Discrete Water Sampling Procedure

The Screened Auger Tool (SAT) is a five foot length of laser-slotted hollow stem auger, available in 2 to 12 inch ID, constructed of carbon steel through which samples of ground water may be obtained.

A. Tool Description

1. The SAT is a length of laser slotted hollow stem auger which will allow the passing of groundwater into the auger for sampling (Figure I).

2. The slots are bevel cut to a slot size of 10 slot (0.01 inches) which allows for quick cleaning and helps eliminate the passage of fine soil particles.

3. The SAT will be equipped with a knock out plug at the cutting head to prevent the entrance of soil and eliminates the need for a center bit and rod while advancing. The knock out plug will not affect hole advancement and will be dislodged at the terminating depth of each bore hole.

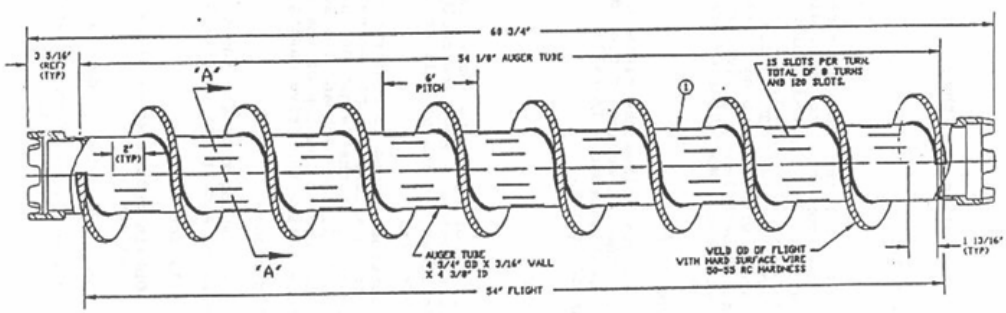

FIGURE I
SCREENED AUGER TOOL

B. Applications

1. Field screening tool for the collection of ground water samples to aid in the placement of monitor wells.

2. Use of the SAT can provide a quick assessment of ground water conditions at a potentially contaminated site during auger advancement.

C. Capabilities

1. Obtain samples from unconfined aquifers.

2. Capable of obtaining ground water samples and allows for continued auger advancement immediately after collection.

3. Capable of collecting samples for obtaining a vertical profile of contamination in an aquifer.

D. Installation

1. The SAT is used in the same manner as conventional auger drilling techniques. It is designed to be used in well sorted, unconsolidated, fine to coarse sands.

2. Since a center bit and drill rod are not used with the SAT, a plug constructed of Teflon® or polypropylene will be used in the bottom of the screened auger section when drilling. This plug prevents soils from entering the auger during drilling, development and sampling. When at the final target depth, the plug is knocked out and left in the ground for well installation.

3. Always accurately measure the depth of the SAT and auger stick-up to determine depth of sample zone.

B. Sampling Procedures

1. Development

The SAT must be developed by one of the standard methods used for well development prior to sampling. If an air lift development technique is used, the air outlet must be at a minimum of 2-ft above the screened auger. Operations must be continuous and not pulsed. The air lift pipe shall not be placed within the screened auger and only the double pipe method shall be used. Therefore this development technique cannot be used for sampling at water table locations.

The well should be developed until the ground water is clear and sediment free. This clears the screen and removes all sediment in the auger.

2. Purging

After development, three to five volumes of the standing water must be purged from the SAT utilizing a submersible or centrifugal pump. This removes water agitated in the formation by the development process.

3. Sampling

Groundwater samples are collected through the center of the auger using a 4 inch submersible pump in conjunction with a packer. If drilling and sampling with the SAT below the water table, a packer made of neoprene or equivalent will be installed within the augers above the screened auger (lead auger) to form a seal. This will prevent cross contamination of samples from formation water at different depths. The packer is inflated and well purging occurs prior to sampling. The sampling is performed using low-flow groundwater sampling procedures.

4.2.6 Monitoring Well Construction Procedures

The proposed groundwater wells and multi-level (cluster) groundwater wells will be installed using hollow stem augers (HSA). If HSA drilling is not capable to reach the required drilling depths, alternate drilling methods will be considered. The water table and multi-level groundwater wells will be installed using 4.25 inch augers. The shallow and intermediate well casing will be constructed using either 1 or 2-inch diameter, PVC Schedule 40. The deep well casing will be constructed using either 2 or 2.5-inch diameter, PVC Schedule 80. The screen construction used for the proposed wells will be 10 slot (0.01 inch). The screen length of the water table well will be 15-ft straddling the water table (7.5-ft below and 7.5-ft above). The screen length of the intermediate and deep wells will be 10-ft.

The deep wells at the centerline multi-level well locations (MLW-6, MLW-3, MLW-2 and MLW-1) will be set in the borehole used for the soil borings (immediately following the completion of the soil borings). The target depth for the deep wells closet to the water district is anticipated to be approximately 230-ft below grade (depth of confining layer identified at the water district). The shallow and intermediate wells for these multi-level wells will be installed in a separate borehole immediately following the discrete water sampling. If necessary, the shallow wells will be installed in single borehole. The sand pack materials will consist of Morie # 1 sand with a thickness ranging from 2-ft below to 5-ft above the screen with 1-ft thick layer of finer grain sand placed above each sand pack. The finer grain sand is intended to prevent settlement of the bentonite slurry and/or infiltration of the bentonite slurry into sand pack. A bentonite slurry seal with thicknesses ranging from 5-10 ft will be installed using a tremie pipe above the fine grain sand pack. A bentonite cement/bentonite grout will be installed between well screen construction depths using a ratio of approximately 94 lbs of cement, 3 to 5 lbs of bentonite and 6.5 gallons of clean water. In addition, a 15-ft layer of ¼" bentonite balls (non-coated) will be installed at the base of each clustered shallow well. The construction details for the deep, intermediate and shallow wells are provided in **Appendix B:** Multi-Level Well Construction Diagrams. These diagrams depict the thicknesses of sand packs, fine grain sand and bentonite slurry seals for the proposed groundwater wells and multi-level groundwater wells.

Additional bentonite slurry seals may be installed, if required. This determination will be made in the field in consultation with the NYSDEC. Field measurements will be collected after the placement of each sand pack and bentonite slurry seal to avoid bridging and verify accurate placement (confirm no settlement). The wells will be completed to grade with a locking manhole cover.

4.2.7 Standard Monitoring Well Purging and Sampling Procedures

A field log protocol will be conducted to record sampling data including; date, time, location, sample identification code, depth to water, method of well purging, and sampling technique. The monitoring wells will be purged by evacuating a minimum of three (3) static well volumes utilizing an air lift system with submersible pump. A static well volume is defined as Static well volume = height of water column x (well radius)^2 x π x 7.48 (where 7.48 is the conversion factor for cubic feet to gallons). Field measurements will be secured from each monitoring well during the purging process to provide data regarding physical groundwater characteristics. The development water will be field analyzed for pH, specific conductivity and temperature. Results of the field measurements will be utilized to establish steady state conditions within the groundwater aquifer. One water sample will be acquired from each of the monitoring wells utilizing a dedicated disposable bailer to prevent cross-contamination. The samples will be transferred with minimal disturbance into the appropriate vessels and stored in a cooler with ice for preservation. The development wastewater will be containerized for subsequent disposal. The purging and sampling equipment will be decontaminated before use and prior to use subsequent to each location. The decontamination procedures include the following methods: 1) remove all adherent soil material with brush; 2) wash with a laboratory grade glassware detergent or Alconox; 3) rinse using clean water; 4) allow to air dry. Where possible, sampling apparatus will be dedicated or disposable. The development waste water from the initial well development tested prior to disposal to the municipal sewer system. If necessary, the development waste waster will be passed through a granular activated carbon system.

4.2.8 Multi-Level Well Purging Procedures

A field log protocol will be conducted to record sampling data including; date, time, location, sample identification code, depth to water and method of well purging technique. The monitoring wells will be purged by evacuating a minimum of three (3) static well volumes utilizing 3/8 inch polyethylene tubing with a check valve system and peristaltic pump. A static well volume is defined as Static well volume = height of water column x (well radius)^2 x π x 7.48 (where 7.48 is the conversion factor for cubic feet to gallons). Field measurements will be secured from each monitoring well during the purging process to provide data regarding physical groundwater characteristics. The development water will be field analyzed for pH, specific conductivity and temperature. Results of the field measurements will be utilized to establish steady state conditions within the groundwater aquifer. The development wastewater will be containerized for subsequent disposal. Where possible, purging apparatus (i.e. tubing) will be dedicated or

disposable. Where necessary, purging equipment will be decontaminated before use and prior to each subsequent use (i.e. check valve). The decontamination procedures include the following methods: 1) remove all adherent soil material with brush; 2) wash with a laboratory grade glassware detergent or Alconox; 3) rinse using clean water; 4) allow to air dry. Decontamination waste water will be containerized for subsequent disposal.

4.2.9 Diffusion Bag Sampling Procedures

Diffusion samplers are used to obtain groundwater samples at a discrete depth for a variety of volatile organic analyses. They are generally constructed of a low density polyethylene tube filled with organic free water. Low density polyethylene is permeable to many volatile organic compounds. A weighted tube is lowered into a well or open borehole to a target depth. If left long enough (generally 48 hours at a minimum), dissolved chemicals diffuse through the tube wall into the organic free water until equilibrium is achieved. Depending upon groundwater flow velocities and any purging activities performed during the deployment, the bag can be retrieved at 48 hours or left for several weeks. Upon being brought to the surface, the tube is opened and the water poured into 40 ml vials for subsequent preservation and analysis. New diffusion bags will be left in place in each well after each sampling event for the following sampling event. The technique does not produce investigation derived wastes.

4.2.10 Sealing of Confining Layer

It is not anticipated that a significant confining layer will be penetrated during the installation of the soil borings and/or monitoring well installations. However, if a confining layer is breached, the bore hole will be backfilled from the bottom-up with cement/bentonite grout. The bentonite cement/bentonite grout will consist approximately 94 lbs of cement, 3 to 5 lbs of bentonite and 6.5 gallons of clean water.

4.2.11 Investigative Derived Wastes

Any waste material generated as part of the remedial investigation activities (i.e. drill cuttings, development water, decontamination water) will be properly containerized, tested and disposed of in accordance with NYSDEC regulations. The development waste water from the initial well development tested prior to disposal to the municipal sewer system. If necessary, the development waste waster will be passed through a granular activated carbon system.

4.2.12 Permits

Any applicable local or county permits for access to right of way properties for drilling will be acquired prior to drilling activities.

4.3 QA/QC Procedures

4.3.1 Standards, Criteria and Guidances

The Standards, Criteria and Guidances (SCGs) that will be applied for comparison of contaminant levels for the remedial investigation consist of the NYSDEC, Technical and Administrative Guidance Memorandum (TAGM) #4046, Determination of Soil Cleanup Objectives, the NYSDEC, Technical Operational Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards and Limitations and NYSDOH, Guidance for Evaluating Soil Vapor Intrusion in New York State. The sample media and corresponding SCGs to be used for this investigation will be as follows.

Media	Applicable SCGs	Classification
Liquid	NYSDEC Technical Operational Guidance Series (TOGS) 1.1.1.	Ambient Water Quality Standards and Guidance Values-Class GA
Saturated Soil	NYSDEC 6 NYCRR Part 375, Environmental Remediation Programs	Soil Cleanup Objectives to protect groundwater quality
Unsaturated Soil	NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4046, Determination of Soil Cleanup Objectives	Soil Cleanup Objectives
Indoor Air	NYSDOH, Guidance for Evaluating Soil Vapor Intrusion in New York State	Decision Matrix 2, EPA Databases

4.3.2 Data Validation

Data validation is the process used to determine if the available data satisfies the project Data Quality Objectives (DQOs). The frequency and scope of the data validation process may vary, but should always be consistent with project DQOs. Data validation and review will be conducted by the Quality Assurance Officer and presented within a NYSDEC Department of Environmental Remediation (DER) Data Usability Summary Report (DUSR). The DUSR will determine whether or not the data, as presented, meets the site/project specific criteria for data quality and data use. The data packages will be evaluated by a third party according to the DER DUSR Guidelines, Revised 9/97. A resume of the third party is provided in **Appendix C**.

4.3.3 Analytical Deliverables

The laboratory analytical results will be reported in a Quarterly Monitoring Report to the NYSDEC with Analytical Sampling Protocol (ASP) B deliverables (with the exception of the groundwater

samples used for screening as referenced in 3.2.3). In addition, the deliverables will be provided by the laboratory in accordance with EPA Region 2 in electronic data deliverable format.

4.3.4 Sample Frequency and Preservation

The following table summarizes the proposed sample matrix, frequency, USEPA Test Methods, QA/QC deliverables and preservatives for the proposed plan. The appropriate quantity of field blanks, trip blanks will be analyzed as part of the proposed plan.

Sample Matrix	Test Method	Parameters	Container	Preservation	Holding Times
Soil-Gas (air)-Analysis	TO-15	ELAP-ASP A	6-L Summa	Summa-NA	15 days
Indoor Air-Analysis	TO-15	ELAP-ASP A	6-L Summa	Summa-NA	15 days
Solid (soil)- Analysis	8260	ELAP-ASP B	2 or 4oz glass jar	Ice	7 days
Liquid (gw) - Analysis	8260 w/ low MDL	ELAP-ASP B	40 mil glass voa	HCL/Ice	7 days

4.3.5 Field Blanks

A field blank is a sample of analyte-free water transferred, at the project site, into an appropriate container for the purpose of distinguishing ambient air contamination from in-situ sample contamination. Field blanks are used to indicate potential cross contamination from sampling equipment as quality control of decontamination procedures. With regards to field sampling, one field blank will be collected for every work day. The procedure for obtaining a field blank sample are as follows:

- Collect two sets of sample vessels. One vessel shall contain analyte free water and the other is empty.
- Run the analyte free water through the decontaminated sampling equipment into the empty vessel. Analye the water of this collecting vessel for target analytes.

4.3.6 Trip Blanks

A trip blank is used to identify the presence of volatile compound contamination attributable to transfer across a sample container septum during shipping and storage of samples. A trip blank is a sample of analyte-free matrix that is transported from the laboratory to the sampling site with the sample containers. The trip blank is stored on-site with the sample containers and field samples and then transported back to the laboratory with the samples for analysis. The trip blank is received and processed as a sample by the laboratory. One trip blank shall be submitted per cooler from laboratory personnel. The holding time for the trip blank in the field shall be 7 days.

4.3.7 Duplicate Samples

Duplicate samples will be collected to verify QA/QC data accuracy at the selected laboratory. One duplicate sample will be analyzed for every twenty samples submitted to the laboratory.

4.3.8 Sample Transfer

Samples shall be containerized and immediately transferred within a cooler with minimal disturbance. Chain-of-custody forms will be completed at the time of sample collection and will accompany the samples inside a cooler for transfer from sample team to mobile laboratory representatives.

4.3.9 Sample Containers and Analytical Requirements

All sample vessels will be "level A" certified decontaminated containers supplied by a New York State Certified Commercial Laboratory. Samples analyzed for hydrocarbons will be placed in containers with Teflon lined caps. All samples will be preserved by cooling them to a temperature of approximately four degrees Celsius. If glass bottles are used, extra glass bottles will be obtained from the laboratory to allow for accidental breakage that may occur. Necessary preservatives will be placed in the sample bottles by the laboratory. The sample bottles will be handled carefully so that preservatives and glassware are not inadvertently spilled. All liquid samples will be put into 40-ml glass vials with Teflon liners.

4.3.10 Chain-of-Custody Protocol

The primary objective of the sample custody procedures is to create an accurate written record that can be used to trace the possession and handling of all samples from the moment of their collection, through analysis, until their final disposition. Sample custody for samples collected during the investigation will be maintained by the field personnel collecting the samples. Field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are transferred to the laboratory.

4.4 Record Keeping and Documentation Procedures

4.4.1 Sampling Documentation

The sample team or individual performing a particular activity shall be required to keep a weatherproof Site field notebook. The Site field notebook will be used on-site to record notes pertaining to the field sampling plan. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during projects and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings. In a legal proceeding, notes, if referred to, are subject to cross-examination and are admissible as evidence. The field notebook entries should be factual, detailed, and objective. All entries are to be signed and dated. All members of the field investigation team are to use this notebook, which shall be kept as a permanent record. The field notebook shall be filled out at the location of sample collection immediately after sampling. It shall contain sample descriptions including: sample number, sample collection time, sample location, sample description, sampling method used, daily weather conditions, field measurements, name of sampler, and other site-specific observations. The field notebook shall contain any deviations from the protocol contained herein, visitor's names, community contacts made during sampling, and geologic and other site-specific information that may be noteworthy.

4.4.2 Sample Tracking System

In order to provide for proper identification in the field, and proper tracking in the laboratory, all samples must be labeled clear and in a consistent fashion using the procedures and protocols described below and with the following subsections. Sample labels will be waterproof and have a pre-assigned, unique number that is indelible. Field personnel must maintain a field notebook. This notebook must be water resistant with sequentially numbered pages. Field activities shall be sequentially recorded at a later time. The notebook, along with the chain of custody form, must contain sufficient information to allow reconstruction of the sample collection and handling procedure at a later time. Each sample shall have a corresponding notebook entry that includes:

- Sample ID number
- Well location and number
- Date and time
- Analysis for which sample was collected
- Additional comments as necessary
- Sampler's name

Each sample must have a corresponding notebook entry on a chain-of-custody form. The manifest entry for sampling at any one location is to be completed before sampling is initiated by the same sampling team at any other location. In cases where the samples leave the immediate control of the sampling team, the samples must be sealed.

4.4.3 Sample Identification System

Each sample collected shall be designated by an alphanumeric code that shall identify the type of sampling location, the specific location, the matrix sampled, and a specific sample designation. Site specific procedures are described below.

Sample identifications shall contain a sequential code consisting of three segments. The first segment shall designate the project number. The second segment shall identify the location type. Location types shall be identified by a two-letter code. For example, MLW will be used for multi-level well. The third segment shall identify the specific sample location. The specific sampling location shall be identified using a three-digit number.

5. REFERENCES

1. Characteristics of a Groundwater Plume Derived from Artificial Recharge with Reclaimed Wastewater at East Meadow, Long Island, New York. USGS Water-Resources Investigation Report 91-4118. Paul Heisig and Keith Prince, 1993

2. Estimation of Hydraulic Characteristics of the Upper Glacial and Magothy Aquifers at East Meadow, New York, By Use of Aquifer Test. USGS Water-Resources Investigation Report 87-41-22. Keith Prince and Brian Schneider, 1989

APPENDICES

APPENDIX A

HEALTH AND SAFTEY PLAN

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Appendices

Appendix I: Materials Safety Data Sheets (MSDS)
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Appendix V: Safety Meeting Sheet
Appendix VI: Vapor Monitoring Sheet

A.1. INTRODUCTION

This Health and Safety Plan (HASP) describes the procedures to be followed in order to reduce employee exposure to potential health and safety hazards that may be present at the project site. The emergency response procedures necessary to respond to such hazards are also described within this HASP. All activities performed under this HASP comply with Occupational Safety and Health Administration (OSHA) Regulations 29 CFR Parts 1910, 1925 and 1926 as amended.

A.1.1 Purpose

This Health and Safety Plan is required according to OSHA 29 CFR 1910.120. The purpose of this HASP is to provide the community, contractor's field personnel, subcontractors, and other visitors with an understanding of the potential chemical and physical hazards that exist or may arise while the tasks of this project are being performed.

The primary objective is to ensure the well being of all field personnel and the community surrounding this site. In order to accomplish this, project staff and approved subcontractors shall acknowledge and adhere to the policies and procedures established herein.

The contractor's personnel have the authority to stop work performed by our sub-contractors at this site if said work is not performed in accordance with the requirements of this HASP.

A.1.2 Contaminants of Concern

According to the limited subsurface investigation performed as part of the Phase II Environmental Site Assessments, the following organic chemical analytes are present or have the potential to be present at the Site.

- Vinyl Chloride
- Cis-1,2-dichloroethylene
- Trichloroethylene
- Tetracholoroethylene

A.2. KEY PERSONNEL / IDENTIFICATION OF HEALTH & SAFETY PERSONNEL

A.2.1 Key Personnel

A list of the pertinent personnel authorized to be present on site is as follows.

Title	Name	Telephone Number
Project Manager	Richard Parrish	(631) 269-8800
Field Operations Leader	Hal Benjamin	(631) 269-8800
Site Health and Safety Officer	John Herbig	(631) 269-8800
Quality Assurance Officer	Kevin Kleaka	(631) 269-8800
Site Contact	Nick Caparelli	(516) 357-8959
State Agency Contact (NYSDEC)	Brian Jankauskas	(518) 402-9620

A.2.2 Organizational Responsibility

A.2.2.1 Project Manager

The Project Manager will be responsible for implementing the project and obtaining any necessary personnel or resources for the completion of the project.

Specific duties will include:

- Coordinating the activities of all subcontractors, to include informing them of the required PPE and insuring their signature acknowledging this Site Safety Plan;
- Selecting a Site Health and Safety Officer and field personnel for the work to be undertaken on site;
- Ensuring that the tasks assigned are being completed as planned and on schedule;
- Providing authority and resources to ensure that the Site Health and Safety Officer is able to implement and manage safety procedures;
- Preparing reports and recommendations about the project to clients and affected personnel;
- Ensuring that all persons allowed to enter the site (i.e., EPA, contractors, state officials, visitors are made aware of the potential hazards associated with the substances known or suspected to be on site, and are knowledgeable as to the on-site copy of the specific site safety plan;
- Ensuring that the Site Health and Safety Officer is aware of all of the provisions of this site safety plan and is instructing all personnel on site about the safety practices and emergency procedures defined in the plan;
- Ensuring that the Site Health and Safety Officer is making an effort to monitor site safety, and has designated a Field Operations Leader to assist with the responsibility when necessary.

- Ensuring that the Site Health and Safety Officer is making an effort to monitor site safety, and has designated a Field Operations Leader to assist with the responsibility when necessary.

A.2.2.2 Field Operations Leader

The Field Operations Leader will be responsible for field operations and safety. Specific duties will include, but are not limited to:

- Managing field operations;
- Executing the work plan and schedule;
- Enforcing safety procedures;
- Coordinating with the Site Health and Safety Officer in determining protection levels;
- Enforcing site control;
- Documenting field activities, including sample collection;
- Serving as liaison with public officials where there is no Public Affairs official designated.

In the event that the Project Manager and the Site Health and Safety Officer are not on site, the Project Field Manger will assume all responsibility of the Site Health and Safety Officer.

A.2.2.3 Site Health and Safety Officer

The Site Health and Safety Officer shall be responsible for the implementation of the site safety plan on site. Specific duties will include:

- Monitoring the compliance of field personnel for the routine and proper use of the PPE that has been designated for each task;
- Routinely inspecting PPE and clothing to ensure that it is in good condition and is being stored and maintained properly;
- Stopping work on the site or changing work assignments or procedures if any operation threatens the health and safety of workers or the public;
- Monitoring personnel who enter and exit the site and all controlled access points.
- Reporting any signs of fatigue, work-related stress, or chemical exposures to the Project Manager;
- Dismissing field personnel from the site if their actions or negligence endangers themselves, co-workers, or the public, and reporting the same to the Project Manager;
- Reporting any accidents or violations of the site safety plan to the Project Manager and documenting the same for the project in the records;
- Knowing emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire and police departments;

- Ensuring that all project-relating personnel have signed the personnel agreement and acknowledgments form contained in this site safety plan;
- Coordinate upgrading and downgrading PPE as necessary due to changes in exposure levels, monitoring results, weather, and other site conditions;
- Perform air monitoring with approved instruments in accordance with requirements stated in this Site Safety Plan.

A.2.2.4 Quality Assurance Officer

The Quality Assurance Officer (QAO) is an employee of the same consulting firm generating the work plan and acts in conjunction with the project manager to develop a site-specific quality assurance plan. The QAO must not have another position on the project, such as a project or task manager, that involves project productivity or profitability as job-performance criteria.

The QAO will assist the project manager in the development of the sampling and analytical portion of the Quality Assurance Project Plan. The QAO or his/her designee shall conduct periodic field and sampling audits, interface with the analytical laboratory to make requests and resolve problems, interface with the data validator and develop a project-specific data usability report.

A.2.2.5 Field Personnel

All field personnel shall be responsible for acting in compliance with all safety procedures outlined in the Site Safety Plan. Any hazardous work situations or procedures should be reported to the Site Safety Officer so that corrective steps can be taken.

A.3. TASK / OPERATION HEALTH AND SAFETY RISK ANALYSIS

The field tasks covered by the HASP may include well installation, development, gauging, and bailing; soil & groundwater handling/sampling; and confined space (excavation) entry and job task hazards. The following hazards may be encountered:

A.3.1 Oxygen Deficiency

Oxygen deficiency may result from the displacement of oxygen by another gas, or the consumption of oxygen by a chemical reaction.

A.3.1.1 Organic Vapors

The inhalation of volatile organic vapors during all operations can pose a potential health hazard. Hazard reduction procedures include monitoring the ambient air with a flame ionization detector (FID) and the use of appropriate Personal Protective Equipment (PPE). Workers should stand upwind of the source of contamination whenever possible.

A.3.2 Explosion and Fire

The following are possible fire and explosion hazards that may be encountered on the job site and fire preventive measures to take.

A.3.2.1 Flammable Vapors

The presence of flammable vapors can pose a potential fire and health hazard. Hazard reduction procedures include monitoring the ambient air with an oxygen/LEL meter (combustible gas indicator). If the LEL reading exceeds 20%, leave the site immediately and contact the fire department.

A.3.2.2 High Oxygen Levels

Atmospheres that contain a level of oxygen greater than 23% pose an extreme fire hazard (the usual ambient oxygen level is approximately 20.5%). This hazard can be compounded by the fact that vapors associated with this site are highly flammable. All personnel encountering atmospheres that contain a level of oxygen greater than 23% must evacuate the site immediately and must notify the Fire Department. If the oxygen level is less than 19.5%, do not enter the space without level B PPE.

A.3.2.3 Fire Prevention

- During equipment operation, periodic vapor concentration measurements should be taken with an explosimeter or combustimeter. If at any time the vapor concentrations exceed 20% of the LEL, then the Site Safety Officer or designated field worker should immediately shut down all operations.
- Only approved safety cans will be used to transport and store flammable liquids.
- All gasoline and diesel-driven engines requiring refueling must be shut down and allowed to cool prior to filling.
- Smoking is not allowed during any operations within the work area in which petroleum products or solvents in free-floating, dissolved, or vapor forms, or other flammable liquids may be present.
- No open flame or spark is allowed in any area containing petroleum products or other flammable liquids.

A.3.3 Operational Safety Hazards

A.3.3.1 Heavy Machinery / Equipment

All site employees must remain aware of those site activities that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn frequently during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physical injury to themselves or others.

A.3.3.2 Vehicular Traffic

All employees will be required to wear a fluorescent safety vest at all times while on site. In addition, supplemental traffic safety equipment use can be exercised when warranted by specific task. Supplemental equipment can be items such as cones, flags, barricades, and/or caution tape.

A.3.4 Noise Hazards

Requirements set forth in the OSHA Hearing Conservation Regulation (OSHA 1910.95) shall be adhered to during work on-site. Hearing protection shall be provided to the employees where sound pressure levels exceed 85 dB. Hearing protection shall be worn where sound pressure levels in areas and/or on equipment exceeds 90 dB. Typical drilling operations have been monitored with a

sound level meter and indicate that hearing protection is required for all personnel while engaged in this action.

A.3.5 Well Installation, Development, Gauging and Bailing Hazards

Skin and eye contact with contaminated groundwater and/or soil may occur during these tasks. Nitrile gloves and approved safety glasses must be worn.

A.3.6 Soil & Groundwater Sampling Hazards

Skin and eye contact with contaminated groundwater and/or soil may occur during these tasks. Nitrile gloves and approved safety glasses must be worn.

A.3.7 Sample Preservation Hazards

When hydrochloric acid is used, skin and eye contact can occur. This hazard can be reduced with the use of Nitrile gloves and safety glasses. Safety goggles should be worn if there is a potential for a splash hazard.

A.3.8 Equipment Cleaning Hazards

Skin and eye contact with methanol, "Alconox", or other cleaning substances can occur while decontaminating equipment. This hazard can be reduced with the use of Nitrile gloves and safety glasses.

A.3.9 Heat Exposure Hazards

Since climatic changes cannot be avoided, work schedules will be adjusted to provide time intervals for intake of juices, juice products, and water in an area free from contamination and in quantities appropriate for fluid replacement to prevent heat stress conditions from occurring.

A.3.9.1 Types of Heat Stress

Heat stress may occur even in moderate temperature areas and may present any or all of the following:

Heat Rash

Result of continuous exposure to heat, humid air, and chafing clothes. Heat rash is uncomfortable and decreases the ability to tolerate heat.

Heat Cramps

Result of the inadequate replacement of body electrolytes lost through perspiration. Signs include severe spasms and pain in the extremities and abdomen.

Heat Exhaustion

Result of increased stress on the vital organs of the body in the effort to meet the body's cooling demands. Signs include shallow breathing; pale, cool, moist skin; profuse sweating; and dizziness.

Heat Stroke

Result of overworked cooling system. Heat stroke is the most serious form of heat stress. Body surfaces must be cooled and medical help must be obtained immediately to prevent severe injury and/or death. Signs include red, hot, dry skin, absence of perspiration, nausea, dizziness and confusion, strong, rapid pulse, coma, and death.

A.3.9.2 Heat Stress Prevention

A. Replace body fluids (water and electrolytes) lost through perspiration. Solutions may include a 0.1% salt and water solution or commercial mixes such as "Gatorade". Employees must be encouraged to drink more than the amount required in order to satisfy thirst.
B. Use cooling devices to aid the natural body ventilation. Cooling occurs through evaporation of perspiration and limited body contact with heat-absorbing protective clothing. Utilize fans and air conditioners to assist in evaporation. Long, cotton underwear is suggested to absorb perspiration and limit any contact with heat-absorbing protective clothing (i.e., coated Tyvek suits).
C. Conduct non-emergency response activities in the early morning or evening during very hot weather.
D. Provide shelter against heat and direct sunlight to protect personnel. Take breaks in shaded areas.
E. Rotate workers utilizing protective clothing during hot weather.
F. Establish a work regime that will provide adequate rest periods, with personnel working in shifts.

A.3.10 Cold Exposure Hazards

Work schedules will be adjusted to provide sufficient rest periods in a heated area for warming up during operations conducted in cold weather. Also, thermal protective clothing such as wind and/or moisture resistant outerwear is recommended to be worn.

If work is performed continuously in the cold at or below -7 °C (20 °F), including wind chill factor, heated warming shelters (tents, cabins, company vehicles, rest rooms, etc.) shall be made available nearby and the worker should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria, are indications for immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing.

Dehydration, or the loss of body fluids, occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect (Adapted from TLV's and Biological Exposure Indices 1988-1989, ACGIH).

A.4. PERSONNEL TRAINING

A.4.1 Pre-assignment and Annual Refresher Training

All personnel assigned to the project site should have completed an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course, health and safety training course, and a current eight-hour refresher course (as required annually after initial 40-hour training completion). Personnel assigned to the site should also have a minimum of three days of field experience under direct supervision of a trained, experienced person.

A.4.2 Site Supervisors Training

On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations have received an additional eight hours of supervisory training. These training requirements comply with the OSHA Hazardous Waste Operations and Emergency Response Regulation, 29 CFR 1910.120.

The project Quality Assurance Officer (QAO) must have a minimum of a bachelor's degree in chemistry or natural science with a minimum of 20 hours in chemistry. The QAO must be proficient in analytical methodology, data interpretation and validation, the development of sampling plans, quality control procedures, and auditing techniques. Because on-site work may be necessary, verification or completion of the 40-hour OSHA safety training course and 8-hour refresher is required.

A.4.3 On-Site Training Program

The site safety supervisor will conduct an on-site training and safety meeting (see Appendix V) for all personnel and observers who will be involved in the various project operations before they are permitted to participate in any site activities. Training meetings will be provided routinely for any new project personnel. This program will cover specific health and safety equipment and protocols and potential problems inherent to each project operation. No one will be allowed to work on the project site in restricted areas (e.g., waste excavation / handling / processing) unless he/she has attended a project training meeting.

The HASP will be reviewed during the meeting. Copies of the HASP will be distributed to all attending and will be kept available for reference in the field office for the project duration.

A.5. PERSONAL PROTECTIVE EQUIPMENT TO BE USED

The purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biological hazards that may be encountered on-site when engineering and other controls are not feasible or cannot provide adequate protection. Careful selection and use of adequate PPE should protect the health of all on-site workers. No single combination of PPE is capable of protecting against all hazards. Therefore, PPE should be used in conjunction with, not in place of, other protective methods, such as engineering controls and safe work practices.

The following is a breakdown of the types of protective clothing and equipment to be used during the site activities. Personal protective equipment is in conformance with EPA criteria for Level B, C, and D protection.

A.5.1 Levels of Protection

Site Specific chemicals of Concern are tetrachloroethene, Trichloroethene, cis 1,2 Dichloroethane, and Vinyl Chloride. These chemicals are of moderate to low hazard. Therefore, modified level D personal protective equipment will be required at all times when on site.

The Site Safety Officer will determine whether or not a level of protection can be upgraded or downgraded. Changes in the level of protection will be recorded in the dedicated site logbook along with the rationale for the changes.

A.5.1.1 Level D Personal Protective Equipment

All initial site access and activities will be done in Level D attire. Level D protection is sufficient under conditions where no contaminants are present or those activities that do not pose a potential threat of unexpected inhalation of or contact with hazardous levels of any substances. Typical Level D activities may include sediment, logging and groundwater sampling, as well as surficial site surveys.

Level C protection equipment should be readily available at all times. Consistent with OSHA training, prior to donning Level C, oxygen percent must be continuously monitored.

• Hard hat
• Safety glasses
• Steel toe and shank boots
• Fluorescent vest
• Splash goggles
• Hearing protection (as appropriate)

A.5.1.2 Modified Level D Personal Protective Equipment

• Hard hat
• Safety glasses
• Steel toe and shank boots
• Fluorescent vest
• Nitrile "N-Dex" inner gloves
• Latex outer boots (chemical resistant)
• Splash goggles
• Polyethylene coated Tyvek suit
• Hearing protection (as appropriate)

A.5.1.3 Level C Personal Protective Equipment

Level C protection, as described in this plan, will be available at a minimum for those activities that involve surface and subsurface soil (strata disturbance such as well installation, and all subsurface media sampling activities such as split-spoon sampling and borings).

• Buddy system required at all times
• Full-face respirator with NIOSH approved OV/AG/HEPA combination cartridges (MSA GMC-H)
• Saranex coated Tyvek Suit
• Inner Nitrile "N-Dex" gloves
• Outer Nitrile (NBR) gloves
• Steel toe and shank boots
• Outer boots (chemical resistant)
• Hard hat
• Hearing protection (as appropriate)

A.5.1.4 Level B Personal Protective Equipment

Some activities may require Level B protection. In atmospheres potentially containing toluene and xylenes, the protective ensemble should include chemical resistant clothing since the two compounds have skin absorption potential.

Regional Health and Safety representatives must be on site upon start-up of any project requiring level B protection. This should be understood to include subcontractors conducting Level B activity.

- Buddy system required at all times
- Supplied air respirator or SCBA
- Saranex coated Tyvek Suit
- Inner Nitrile "N-Dex" gloves
- Outer Nitrile (NBR) gloves
- Steel toe and shank boots
- Outer boots (chemical resistant)
- Hard hat
- Hearing protection (as appropriate)

A.5.2 Personal Use Factors and Equipment Limitations

Prohibitive or precautionary measures should be taken as necessary to prevent workers from jeopardizing safety during equipment use.

All respiratory protective equipment used will be approved by NIOSH/MSHA. Respirator cartridges will be changed once per day at a minimum. This can be accomplished at the end of the workday during respirator decontamination. If odor breakthrough is detected while wearing the respirator or if breathing becomes difficult, change cartridges immediately.

When utilizing protective garments such as Tyvek suits, gloves, and booties, all seams between protective items will be sealed with duct tape.

Contact with contaminated surfaces, or surfaces suspected of being contaminated, should be avoided. This includes walking through, kneeling in, or placing equipment in puddles, mud, discolored surfaces, or on drums and other containers.

Eating, smoking, drinking, and/or the application of cosmetics in the immediate work area is prohibited. Ingestion of contaminants or absorption of contaminants into the skin may occur.

The use of contact lenses on the job site is strongly advised against. Contact lenses may trap contaminants and/or particulate between the lens and eye, causing irritation. However, when glasses are not available, contact lenses are preferred over faulty vision. When contact lenses are worn, safety glasses and/or goggles must be worn at all times while on the job site. Wearing contact lenses with a respirator in a contaminated atmosphere is prohibited under 29 CFR §1910.134(e)(5)(iii).

A.6. MEDICAL SURVEILLANCE REQUIREMENTS

A.6.1 Baseline or Preassignment Monitoring

A baseline physical examination should be conducted on all employees before they are permitted to engage in sampling, cleanup, and remedial action work. A complete medical survey should be completed on each employee upon start of employment. Yearly re-examination should be performed to update information on employee health status. Additional re-evaluation will be considered in the event of a chemical overexposure. These medical surveillance requirements shall comply with OSHA regulations as defined in 29 CFR 1910.120.

A.6.2 Periodic Monitoring

A.6.2.1 Heat Stress Monitoring

Heat stress may occur even in moderate temperatures and may present heat rash, heat cramps, heat exhaustion, and/or heat stroke.

Monitoring procedures should be implemented to prevent heat stress arising from environmental conditions, use of PPE, and/or intensity of workload.

For temperatures above 70 °F, the following regime shall be followed for workers wearing permeable coveralls:

Adjusted Temperature	Normal Ensemble	Impermeable Ensemble
90 °F or above	After 45 min. of work	After 15 min. of work
87.5 to 90 °F	After 60 min. of work	After 30 min. of work
82.5 to 87.5 °F	After 90 min. of work	After 60 min. of work
77.5 to 82.5 °F	After 120 min. of work	After 90 min. of work
72.5 to 77.5 °F	After 150 min. of work	After 120 min. of work

Workers wearing semi-permeable or impermeable encapsulating protective clothing should be monitored for heart rate and temperature when the temperature in the work area is above 70 °F. In order to monitor the worker, measure:

A. Heart rate - Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third.

B. Oral temperature - Use a clinical thermometer or similar device to measure the oral temperature at the end of the work period (before drinking). If oral temperature exceeds 99.6 °F, shorten the next work cycle by one-third.

Do not permit a worker to wear a semi-permeable or impermeable garment if the core body temperature exceeds 100.6 °F.

Workers shall not be required to continue working if they feel any of the symptoms of heat stress. Rest periods should be a minimum of 15 minutes. Length of rest period should be extended as appropriate or as recommended by the Site Safety Officer or alternate.

A.7. COMMUNITY AIR MONITORING AND SAMPLING PROGRAM

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) at the downwind perimeter of the designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) at the perimeter of the exclusion zone or work area will be necessary. Continuous monitoring will be performed for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

A.7.1 VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 25 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 10 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 25ppm over background but less than 50 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 10 ppm over background for the 15-minute average.

- If the organic vapor level is above 50 ppm at the perimeter of the work area, activities must be shutdown.

All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded. All air monitoring results should be logged in the Site Safety Log.

A.8. DETECTION EQUIPMENT

During the investigation of the project site, the site workers will use a photoionization detector (PID) to monitor levels of organic vapor in the air and verify that they are within the safety guidelines established by the preliminary assessment of the risks associated with site investigations. The measured readings will be recorded in a vapor-monitoring sheet (See Appendix VI). The following information will be recorded in the field notebook:

- Instrument type
- Control settings
- Reading locations
- Atmospheric conditions

A.9. SITE CONTROL MEASURES

A.9.1 Buddy System

Site personnel will employ the buddy system when working under certain circumstances, such as enclosed spacing. Under the buddy system, each site worker is responsible for monitoring the well being of another worker. No one will work alone when the buddy system is implemented. At no time will fewer than two employees be present at the site if activities are underway.

A.9.2 Site Communications Plan

Mobile telephone and/or two-way radios will be used to communicate between the work parties on the site. The following standard hand signals will be used in case of failure of radio communication:

Hands on top of head = Need assistance
Thumbs up = OK, I am alright, I understand
Thumbs down = No, Negative

Personnel in the Contaminated Zone should remain in constant radio communication or within sight of the project team leader. Any failure of radio communication will require the team leader to evaluate whether personnel should leave the zone.

A.9.3 Work Zone Definition

Work and support areas shall be established based on ambient air data and proposed work sites. They shall be established in order to contain contamination within the smallest areas possible and shall ensure that each employee has the proper PPE for the area or zone in which work is to be performed.

A.9.3.1 Exclusion Zone (EZ)

It is within this zone that the work activities are performed. No one shall enter this zone unless the appropriate PPE is donned.

A.9.3.2 Contaminant Reduction Zone (CRZ)

It is within this zone that the decontamination process is undertaken. Personnel and their equipment must be adequately decontaminated before leaving this zone for the support zone. This zone will be set up between the EZ and a well-ventilated open area.

A.9.3.3 Support Zone (SZ)

The support zone is considered to be uncontaminated; as such, protective clothing and equipment are not required but should be available for use in emergencies. All equipment and materials are stored and maintained within this zone. Protective clothing is put on in the SZ before entering the CRZ. The SZ will be established in a safe environment.

A.9.4 Nearest Medical Assistance

Hospital:	516-572-0123	Nassau County Medical Center

Directions to Nearest Hospital From Project Site:

Make right onto the Hempstead Turnpike (Rt. 24) heading east for approximately 1/5 of a mile. Turn left onto Carman Ave. he Nassau County Medical Center is on the right side of Carmen (the northeast corner of Carmen and Hempstead Turnpike).

A.9.5 Safe Work Practices

A.9.5.1 Safety Practices / Standing Orders

The following are important safety precautions that will be enforced during work activities.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.
2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.
3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garments are removed.
4. No excessive facial hair that interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit testing shall be performed prior to respirator use to ensure the wearer obtains a proper seal.
5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles; kneel on the ground; lean, sit, or place equipment on drums, containers, vehicles, or the ground.

6. Medicine and alcohol can potentate the effect from exposure to certain compounds. Prescribed drugs and alcoholic beverages should not be consumed by personnel involved in the project.
7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.
8. Work areas for various operational activities should be established.
9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.
10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use.
11. Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.
12. All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.
13. Noise mufflers or earplugs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the Site Safety Officer. Disposable, form-fitting plugs are preferred.
14. Cartridges for air-purifying respirators in use will be changed daily at a minimum.

A.10. DECONTAMINATION PLAN

A.10.1 General

Personnel involved in work activities at the site may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Site personnel may come in contact with vapors, gases, mists, or particulates in the air, or other site media while performing site duties. Use of monitoring instruments and site equipment can also result in exposure and transmittal of hazardous substances.

In general, decontamination involves scrubbing with a detergent water solution followed by clean water rinses. All disposable items shall be disposed of in a dry container. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in detergent and water and scrubbed with a brush. In addition to being contaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized or replaced before they can be used again if they become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator masks.

The Site Safety Officer will be responsible for the proper maintenance, decontamination, and sanitizing of all respirator equipment.

The decontamination zone layout and procedures should match the prescribed levels of personal protection.

The following procedures have been established to provide site personnel with minimum guidelines for proper decontamination. Personnel leaving the point of operations designated as the EZ must follow these minimum procedures. The decontamination process shall take place at a reasonable distance away from any area of potential contamination.

A.10.2 Minimum Decontamination Procedure

Personnel leaving the point of operations should wash outer gloves and boots. At a minimum, the outer boots shall be removed first and stored in an appropriate area or disposed of properly. Outer boots must be properly washed where gross contamination is evident. Personnel shall then remove and dispose of the Tyvek suits. Personnel should remove the Tyvek suits so that the inner clothing

does not come in contact with any contaminated surfaces. After Tyvek removal, personnel shall remove and discard outer Nitrile gloves. Personnel shall then remove the respirator, where applicable. Respirators shall be disinfected between uses with towelettes or other sanitary methods. Potable water, at a minimum, will be present so that site personnel can thoroughly wash hands and face after leaving the point of operations.

Portable wash stations shall be utilized for easy and efficient access. The wash station shall consist of a potable water supply, hand soap, and clean towels. Portable sprayer units filled with Alconox solution and potable water should also be available to wash and rinse off grossly contaminated boots, gloves, and equipment. The Site Safety Officer will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the Site Safety Officer's observations.

A.10.3 Standard Decontamination Procedure

The following decontamination procedures should be implemented during site operations for the appropriate level of protection.

A.10.3.1 Level B

Segregated equipment drop	Deposit equipment (tools, sampling devices, notes, monitoring instruments, radios, etc.) used on the site onto plastic drop cloths.
Boot covers and glove wash	Outer boots and outer gloves should be scrubbed with a decontamination solution of detergent and water or replaced.
Rinse off boot covers and gloves	Decontamination solution should be rinsed off boot covers and gloves using generous amounts of water. Repeat as many times as necessary.
Tape removal	Remove tape from around boots and gloves and place into container with plastic liner.
Boot cover removal	Remove disposable boot covers and place into container with plastic liner.
Outer glove removal	Remove outer gloves and deposit in container with plastic liner.
Suit / safety boot wash	Completely wash splash suit, SCBA, gloves, and safety boots. Care should be exercised that no water is allowed into the SCBA regulator. It is suggested that the SCBA regulator be wrapped in plastic.
Suit / safety boot rinse	Thoroughly rinse off all decontamination solution from protective clothing.
Tank or canister changes	This is the last step in the decontamination procedure for those workers wishing to change air tanks and return to the EZ. The worker's air tank or

	cartridge is exchanged, new outer glove and boot covers are donned, and joints taped.
Removal of safety boots	Remove safety boots and deposit in container with a plastic liner.
SCBA backpack removal	Without removing the face piece, the SCBA backpack should be removed and placed on a table. The face piece should then be disconnected from the remaining SCBA unit and then proceed to the next station.
Splash suit removal	With care, remove the splash suit. The exterior of the splash suit should not come in contact with any inner layers of clothing.
Inner glove wash	The inner gloves should be washed with a mild decontamination solution (detergent / water).
Inner glove rinse	Generously rinse the inner gloves with water.
Face piece removal	Without touching the face with gloves, remove the face piece. The face piece should be deposited into a container that has a plastic liner.
Inner glove removal	Remove the inner glove and deposit into a container that has a plastic liner.
Field wash	Wash hands and face thoroughly. If highly toxic, skin corrosive, or skin absorbent materials are known or suspected to be present, a shower should be taken.

A.10.3.2 Level C and Level D

The decontamination procedure for Level C and Level D personal protection will employ applicable steps detailed in the Level B decontamination process.

A.10.4 Sampling Equipment and Sample Container Decontamination

All non-disposable sampling equipment will be decontaminated with an Alconox / water solution followed by a clean water rinse. As an added precaution against cross-contamination, all non-disposable sampling equipment will be rinsed with distilled water. All disposable sampling equipment will be properly disposed of in dry containers.

Before leaving the site, all sample containers will be thoroughly decontaminated using a detergent and water solution followed by a clean water rinse. The decontamination procedure should include a complete scrubbing of the container's surface to remove possible contamination. Care must be exercised to prevent damage to sample container identification labels.

A.11. EMERGENCY RESPONSE / CONTINGENCY PLAN

A.11.1 Pre-Emergency Planning

In order to properly prepare for emergencies, personal protective equipment (PPE) will be worn by site workers, and first aid equipment will be kept at the site. Material Safety Data Sheets (MSDS) will be maintained for all contaminants that workers may be exposed to (see Appendix I).

A.11.2 Contact Information

In the event of an accident or emergency situation, emergency procedures will be executed. Said procedures can and will be executed by the first person to observe an accident or emergency situation. The Project Field Manager will be notified about the situation immediately after emergency procedures are implemented.

A.11.2.1 Emergency Contacts

Emergency:	911	
Ambulance:	516-572-6655	Nassau County Medical Center
Hospital:	516-572-0123	Nassau County Medical Center
State Police:	516-756-3300	New York State Police Department
Fire Department:	516-542-0576	East Meadow Fire Dept.
Chemtrec:	800-424-9300	
Poison Control Center:	800-336-6997	
National Response Center:	800-424-8802	
US EPA (24-hour hotline):	800-424-9346	
Directions to Nearest Hospital From Project Site: Make right onto the Hempstead Turnpike (Rt. 24) heading east for approximately 1/5 of a mile. Turn left onto Carman Ave. he Nassau County Medical Center is on the right side of Carmen (the northeast corner of Carmen and Hempstead Turnpike).		

A.11.2.2 Utility Emergencies / Initiating Subsurface Investigation Work

Impact Environmental Consulting, Inc. ("Impact") representatives are responsible for contacting appropriate agencies prior to conducting on-site activities when applicable.

Gas Company:	718-643-4050	Brooklyn Union Gas
Telephone Company:	516-661-6000	Bell Atlantic
Electric Company:	516-222-7700	Marketspan

A.11.3 Contingency / Evacuation Plan

It may be possible that a site emergency could necessitate the evacuation of all personnel from the site. If such a situation develops, an audible alarm shall be given for site evacuation (consisting of an air horn). Personnel shall evacuate the site in a calm and controlled fashion and regroup at a predetermined location. The route of evacuation will be dependent on wind direction, severity, type of incident, etc.

The site must not be re-entered until back-up help, monitoring equipment, and/or personal protective equipment are on hand and the appropriate regulatory agencies have been notified.

A.11.4 Emergency Medical Treatment Procedures

All injuries, no matter how slight, will be reported to the site safety supervisor immediately. The safety supervisor will complete an accident report for all incidents (Appendix II).

Some injuries, such as severe lacerations or burns, may require immediate treatment. Unless required due to immediate danger, seriously injured persons should not be moved without direction from attending medical personnel.

A.11.4.1 Standard Procedures for Injury

1. Notify the Site Safety Officer, Project Manager, and the Regional Safety Director of all accidents, incidents, and near emergency situations.
2. If the injury is minor, trained personnel should proceed to administer appropriate first aid.
3. Telephone for ambulance/medical assistance if necessary. Whenever possible, notify the receiving hospital of the nature of physical injury or chemical overexposure. If no phone is available, transport the person to the nearest hospital.

4. When transporting an injured person to a hospital, bring this Health and Safety Plan with the attached MSDS to assist medical personnel with diagnosis and treatment.

A.11.4.2 Chemical Overexposure

In all cases of chemical overexposure, follow standard procedures as outlined below for poison management, first aid, and, if applicable, cardiopulmonary resuscitation. Different routes of exposure and their respective first aid/poison management procedures are outlined below.

Ingestion	Do not induce vomiting unless prompted by a health professional. Transport person to nearest hospital immediately.
Inhalation / Confined Space	Do not enter a confined space to rescue someone who has been overcome unless properly equipped and a standby person present.
Inhalation / Other	Move the person from the contaminated environment. Initiate CPR if necessary. Call or have someone call for medical assistance. Refer to MSDS for additional specific information. If necessary, transport the victim to the nearest hospital as soon as possible.
Skin Contact / Non-Caustic Contaminant (Petroleum, Gasoline, etc.)	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin using soap, if available. Transport person to a medical facility if necessary.
Skin Contact / Corrosive Contaminant (Acids, Hydrogen Peroxide, etc.)	Wash off skin with a large amount of water immediately. Remove any affected clothing and rewash skin with water. Transport person to a medical facility if necessary.
Eyes	Hold eyelids open and rinse the eyes immediately with large amounts of water for 15 minutes. Never permit the eyes to be rubbed. Transport person to a medical facility as soon as possible.

A.11.5 First Aid for Injuries Incurred During Field Work

A first aid kit and an emergency eyewash will be available on-site. Field crews, when performing field operations, will carry portable first aid kits that include emergency eye wash stations.

A.11.5.1 First Aid Equipment List

The first aid kit(s) kept at the site will consist of a weatherproof container with individually sealed packages for each type of item.

The kit will include at least the following items:

- Gauze roller bandages, 1-inch and 2-inch
- Gauze compress bandages, 4-inch
- Gauze pads, 2-inch
- Adhesive tape, 1-inch
- Bandage, 1-inch
- Butterfly bandages
- Triangular bandages, 40-inch
- Ampules of ammonia inhalants
- Antiseptic applicators or swabs
- Burn dressing and sterilized towels
- Surgical scissors
- Eye dressing
- Portable emergency eye wash
- Emergency oxygen supply
- Alcohol
- Hydrogen peroxide
- Clinical grade thermometer
- Tourniquet

A.11.5.2 Other Emergency Equipment

One portable fire extinguisher with a rating (ratio) of 20-pound A/B/C and one portable fire extinguisher with a rating of 2A will be conspicuously and centrally located between the restricted and non-restricted zones. In addition, similar extinguishers of the same size and class will be located in the site office trailer so that maximum travel distance to the nearest unit shall not exceed 50 feet. Portable extinguishers will be properly tagged with inspection dates and maintained in accordance with standard maintenance procedures for portable fire extinguishers. Field personnel will be trained in fire extinguisher use before field operations begin.

An emergency at any part of the site, such as fire or chemical release, might require that some appropriately trained site workers direct traffic on or near the site.

The following safety equipment to be used for traffic should be kept readily available on site in the field office:

- reflective/fluorescent vests
- flares
- traffic cones (and flags, or the equivalent, as needed)
- hazard tape (barricades as needed)
- working flashlights

A.11.6 Record of Injuries Incurred On-Site

A.11.6.1 Occupational Injuries and Illnesses Form (OSHA 200)

All occupational injuries and illnesses that are required to be recorded under the Occupational Safety and Health Act will be registered on OSHA Form 200 (see Appendix III). The site safety supervisor will record occupational injuries and illnesses within 48 hours of occurrence, as required by statute.

A.11.6.2 Employer's First Report of Injury

The site safety supervisor for all accidents involving work injury at the site will complete this form (Appendix IV). Follow-up procedures will include investigation of each accident or near miss by the safety supervisor to assure that no similar accidents occur in the future.

A.12. CONFINED SPACE ENTRY PROCEDURES

Excavation pits, storage tanks, soil trenches, subsurface vaults, basements, and sheds are examples of confined spaces. Confined spaces can be identified as an area having one of the following characteristics:

- Limited access and egress
- Unfavorable for natural ventilation
- Not designed for continuous human occupancy

Organic and/or combustible vapors may be trapped in confined spaces, resulting in lack of oxygen (anoxia) and/or overexposure to vapors. When site work takes place in a confined space, the air must be monitored for oxygen level, flammable vapors, and toxic vapors. The following air monitoring procedures must be followed before entering a confined space.

A.12.1 Oxygen Level

Monitor for percent oxygen with an oxygen/LEL meter (e.g., CGI) to ensure an oxygen level between 19.5 and 23%. Because of the high vapor density of the contaminants associated with this site, there is a high probability that vapors in the enclosed spaces or vaults will replace any oxygen that is present, even if the space is open to the air. Therefore, oxygen level monitoring will be done at the top, middle, and bottom of the enclosed space to determine if there is a minimum acceptable oxygen level of 19.5% prior to entry. The oxygen/LEL meter is factory-set to sound an alarm at levels less than 19.5% oxygen. **If oxygen is less than 19.5% or greater than 23%, do not enter the space.**

A.12.2 Explosive Vapors

Monitor the percentage of the Lower Explosive Limit (LEL) with an oxygen/LEL meter to determine whether vapor concentrations within the confined space are within the flammable range. If LEL readings exceed 10%, personnel should exercise extreme caution, use non-sparking tools, and utilize ventilation engineering controls to reduce LEL levels. The oxygen/LEL meter is factory set to sound an alarm at levels greater than 20% LEL. If LEL readings exceed 20%, **personnel <u>MUST</u> leave the site immediately and contact the project manager.**

A.12.3 Toxic Vapors

Monitor for toxic vapors with a FID (e.g., Photovac OVA) to determine whether toxic vapors within the confined space exceed the action levels. PID readings will be taken at the top, middle, and bottom of a vault, shed, or other confined space to determine vapor levels.

A.12.4 Summary

Do not enter the confined space unless:

- The oxygen concentration is between 19.5 and 23%;
- The LEL is less than 20%; and
- FID readings are less than 250 ppm (a respirator must be worn if the readings exceed 5 ppm)

All monitoring equipment must be calibrated and maintained in accordance with manufacturer's recommendations.

APPENDIX A
Accident Report Form

Employee Accident Report

EMPLOYEE

Name_____SS#_____Emp ID#_____

Home Address_____
Street city zip code phone

Sex: M F Birth Date_____ Age:_____ Employment Status: Full time _____Part time _____%_____

Job Title _____Time in Present Position _____ Yrs _____Months

Department _____Work Address_____
building/room # phone

Supervisor_____
name building/room # phone

Accident Date_____ Time _____am/pm Location_____

What were you doing and using (tools, chemicals, equipment, etc.) when the accident occurred? Describe what happened.

_____

_____

_____

Was this part of your normal job duty? _____ Yes _____No

Parts of body affected or injured_____

Witnesses:_____/_____

name phone name phone

Report prepared by (if different from the injured employee)_____
name phone

I understand that it is my right to apply for Workers' Compensation benefits and that I have two years from the date of this accident to do so. For more information regarding workers' compensation, call the New York State Department of Labor. I also authorize release of medical information regarding this accident to the Prime Contractors claim administrators.

EMPLOYEE SIGNATURE:_____DATE:_____

SUPERVISOR/CHARGE PERSON

This accident was reported to me on _____at_____ Cost Center/Dept # _____
(date) (time)

IS FURTHER INVESTIGATION REQUIRED? ___Yes ___No _____
Supervisor/Charge Person Signature Date

HEALTH CARE PROVIDER

Treated by:_____
print name signature

Address_____
name of facility street city state zip code phone

Hospitalized overnight as inpatient? _____yes _____no (if emergency room only mark no)

Diagnosis/Assessment_____

Parts of body affected_____

Reaggravation of previous work injury? _____ yes _____no Date of initial injury_____

APPENDIX B

OSHA 200 Form

OMB DISCLOSURE STATEMENT

Public reporting burden for this collection of information is estimated to vary from 4 to 30 (time in minutes) per response with an average of 15 (time in minutes) per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments regarding this estimate or any other aspect of this information collection, including suggestions for reducing this burden, please send them to the OSHA Office of Statistics, Room N-3644, 200 Constitution Avenue, N.W. Washington, D.C. 20210

Instructions for OSHA No. 200

I. Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment, a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment to which they refer, it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health and Human Services, or States accorded jurisdiction under the Act. Access to the log is also provided to employees, former employees and their representatives.

II. Changes in Extent of or Outcome of Injury or Illness

If, during the 5-year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 13, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost workdays away from work, the check in column 6 should be lined out and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost wordays, returned to work, and then died of the illness, any entries in columns 9 through 12 would be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example, an injury which is later determined not to be work related, or which was initially thought to involve medical treatement but later was determined to have involved only first aid.

III. Posting Requirements

A copy of the totals and information following the total line of the last page for the year, must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than February 1 and must remain in place until March 1. Even though there were no injuries or illnessed during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the annual summary totals shall certify that the totals are true and complete by signing at the bottom of the form.

IV. Instructions for Completing Log and Summary of Occupational injuries and illnesses

Column A - CASE OR FILE NUMBER. Self Expanatory

Column B - DATE OF INJURY OR ONSET OF ILLNESS

For occupational injuries, enter the date of the work accident which resulted in the injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

Columns C through F - Self Explanatory

Columns 1 and 8 - INJURY OR ILLNESS-RELATED DEATHS - Self Explanatory

Columns 2 and 9 - INJURIES OR ILLNESSES WITH LOST WORKDAYS - Self Explanatory

Any injury which involves days away from work, or days of restricted work activitiy, or both, must be recorded since it always involves one or more of the criteria for recordability.

Columns 3 and 10 - INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK - Self Explanatory

Columns 4 and 11 - LOST WORKDAYS -- DAYS AWAY FROM WORK.

Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work. NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Estimates of lost workdays shall be based on prior work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 - LOST WORKDAYS -- DAYS OF RESTRICTED WORK ACTIVITY.

Enter the number of workdays (consecutive or not) on which because of injury or illness:

(1) the employee was assigned to another job on a temporary basis, or

(2) the employee worked at a permanent job less than full time, or

(3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Columns 6 and 13 - INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS - Self Explanatory

Columns 7a through 7g - TYPE OF ILLNESS. Enter a check in only *one* column for each illness.

TERMINATION OR PERMANENT TRANSFER - Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

V. Totals

Add number of entries in columns 1 and 8.

Add number of checks in columns 2, 3, 6, 7, 9, 10 and 13.

Add number of days in columns 4, 5, 11 and 12.

Yearly totals for each column (1-13) are required for posting. Running or page totals may be generated at the discretion of the employer.

In an employee's loss of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include this figure in the annual totals. No further entries are to be made with respect to such cases in the next year's log.

VI. Definitions

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc. which results from a work accident or from an exposure involving a single incident in the work environment. NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals, are considered to be injuries.

OCCUPATIONAL ILLNESS of an amployee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For porposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a. Occupational Skin Diseases or Disorders. Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflamation, etc.

7b. Dust Diseases of the Lungs (Pneumaconioses). Examples: Silicosis, asbestosis and other asbestos-related diseases, coal worker's pneumaconioses, byssinosis, siderosis, and other pneumaconioses.

7c. Respiratory Conditions Due to Toxic Agents. Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung; etc.

7d. Poisoning (Systemic Effects of Toxic Materials). Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins; etc.

7e. Disorders Due to Physical Agents (Other than Toxic Materials). Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat, freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn); etc.

7f. Disorders Associated with Repeated Trauma. Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis. Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses. Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, resturant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physicial location, such as construction activities operated from the same physical locations as a lumber yard, each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed, such as agriculture; construction; transportation; communications and electric, gas, and sanitary services, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is comprised of the physical location, equipment, materials processed or used, and the kinds of operations performed in the course of an employee's work, wether on or off the employer's premisis.

APPENDIX C

Safety Meeting Sheet

DATE	EMPLOYEE NAME	SAFETY OFFICER/SUPERVISOR	ACKNOLEDGEMENT THAT YOU HAVE READ AND UNDERSTSAND THE HASP SUPPLEMENT – TARGET SAFETY TOPIC FOR CONSTRUCTION PERSONNEL

APPENDIX D

Vapor Monitoring Sheet

Air Quality Chart Data						MAP
Event #	1	2	3	4	5	
Date/Time						
Location						
Tester						
Weather						
Instrument						
Calibration						
Ambient/Unit						
Reading/Unit						

NOTES FOR EVENTS:	

Ionization Detector Response

Photoionization Detector (PID)	
Concentrations (in ppm)	**Level of PPE Required**
0.0 to 5.0	Level D
5.0 to 250.0	Level C
250.0 to 750.0	Level B
Above 750.0	Immediately withdraw from the area

Combustible Gas Response

Combustible Gas Indicator (CGI)	
Results (% of LEL)	**Procedure**
0.0 to 20.0	Continue with normal activity
Above 20.0	Immediately withdraw from the area

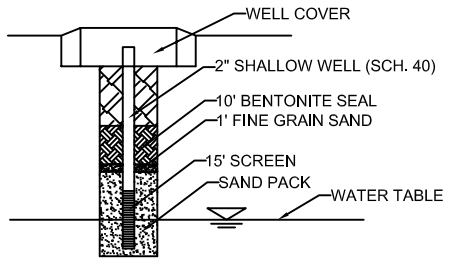
Oxygen Detector Response

Combustible Gas Indicator (CGI)	
Results (% Oxygen)	**Procedure**
0.0 to 19.5	Level B PPE is required
19.5 to 23.0	Continue with normal activity
Above 23.0	Immediately withdraw from the area

APPENDIX B

MULTI-LEVEL WELL CONSTRUCTION DIAGRAMS

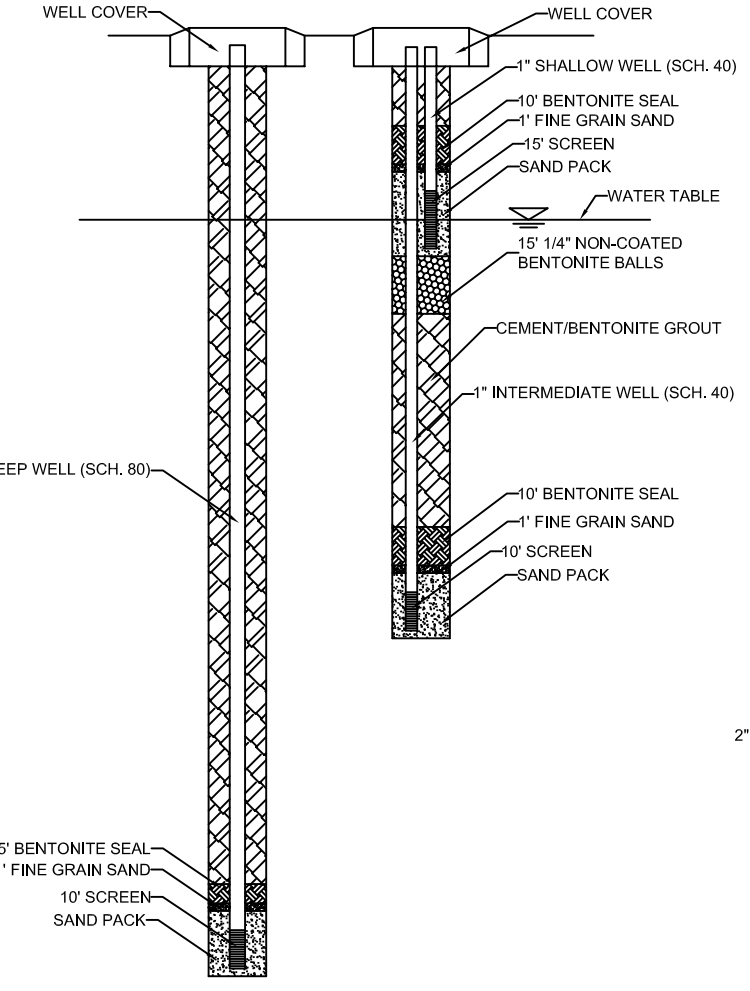
Shallow Well



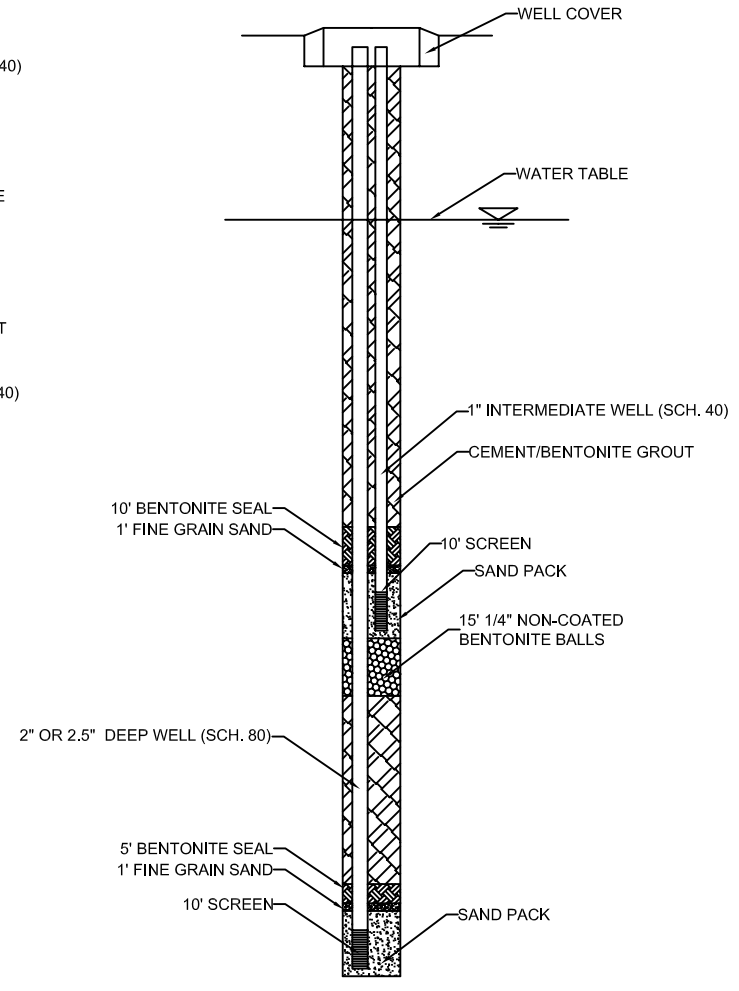
Legend

- BENTONITE SLURRY / SEAL
- FINE GRAIN SAND
- SAND PACK (#1 MORIE SAND)
- CEMENT/BENTONITE GROUT
- 1/4" NON-COATED BENTONITE BALLS

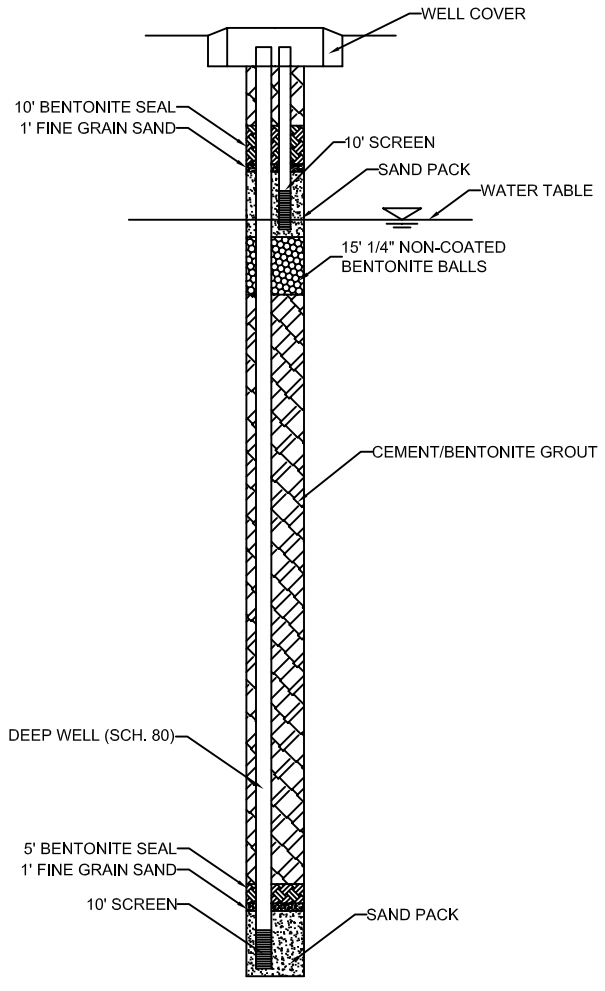
Deep & Intermediate/Shallow Cluster



Deep/Intermediate Cluster



Deep/Shallow Cluster



NOTE:

1. THE WATER TABLE IS APPROXIMATELY 30 FT BELOW EXISTING GRADE (BEG). THE SCREEN OF THE SHALLOW WELL WILL BE SET FROM 7.5 FT ABOVE WATER TABLE TO 7.5 FT BELOW.

2. THE FINAL DEPTH OF INTERMEDIATE WELL AND DEEP WELL WILL BE DECIDED BY FIELD INVESTIGATION.

3. PLACEMENT OF ANY ADDITIONAL BENTONITE SLURRY SEALS, IF REQUIRED, WILL BE DECIDED BY FIELD INVESTIGATION.

4. FOR THE SHALLOW WELL, INTERMEDIATE WELL AND DEEP WELL, SAND PACK WILL BE FROM 5 FEET ABOVE TO 2 FEET BELOW THE WELL SCREEN.

5. CEMENT/BENTONITE/WATER RATIO WILL BE 94 LBS, 3 TO 5 LBS, AND 6.5 GALLONS, RESPECTIVELY.

6. WELL SCREENS WILL HAVE SLOT SIZE OF 10 SLOT (0.01 INCH).

PROJECT # 04-455

PLATE #

TITLE: MULTI-LEVEL WELL CONSTRUCTION DIAGRAMS

Melody Cleaner Site
East Meadow, New York

DRAWN BY:	WF
CHECKED BY:	KK
DATE:	6/20/2007
SCALE:	N.T.S.

IMPACT ENVIRONMENTAL

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800 FAX (631) 269-1599

1560 BROADWAY, SUITE 1024
NEW YORK, NEW YORK 10036
TEL (212) 201-7905 FAX (212) 201-7906

APPENDIX C

THIRD PARTY DATA VALIDATION

RESUME

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

SHARON HOULIHAN

for Successfully Completing

ORGANIC DATA VALIDATION - 35 Hour Course

Dr. John Samuelian
Instructor

Date June 1993

Assistant Dean
Professional Development Center

President

The Professional
Development Center

SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Sharon J. Houlahan
3368 Lorelei Drive
Yorktown Heights, New York 10598-2110
(914)245-0649

OBJECTIVE

A position in a scientific field offering professional growth and advancement.

EDUCATION

B.A., 1983, Drew University, Madison, New Jersey. Zoology major, Psychology minor. Courses in mathematics and organic chemistry. Dean's List, academic assistant, officer in Tri-Beta, member of Psi Chi and full scholarship recipient.

SCIENTIFIC EQUIPMENT & TECHNIQUES

Experienced on a Hewlett-Packard 5995/96 GC/MS, as well as a MSD. Familiar with "Aquarian" and ChemStation software. Capable of MS Data interpretation. Trained in ion source cleaning and routine maintenance of instruments as well as Tekmar and Archon auto-sampler. Familiar with spectral interpretation of organic priority and tentatively identified compounds. Knowledge of CLP, NYDEC, ASP and NJDES protocol, QA/QC requirements and reporting procedure. Hold EPA Region II Data Validation Certification.

EXPERIENCE

Januaary 1998 to Present

JMS Environmental Services, Inc. 41 Kenosia Ave, Danbury, CT

Laboratory Manager - Responsible for oveall activity of the laboratory, including primary organic chemist. Responsible for day to day operations including NELAC and ELAP criteria.

October 1996 to December 1997

YORK LABORATORIES, INC., 1 Research Drive, Stamford CT

Senior Chemist/Acting QAO - Duties include training and acquisition of data for the organics department (GC and GC/MS). Also, preparing all client reports (including A and B type deliverables), creating control limits used in reporting and quality. Worked intensely on the LIMS (Labworks) system. Helped to develop forms used in deliverables in EXCEL. Responsible for revision of SOPs and developing training criteria.

July 1994 to May 1996

EA ENGINEERING, 3 Washington Center, Newburgh, NY

Certified Data Validator - Responsible for organic and inorganic data validation for Region I, II and III, as well as "special" validation for non-CLP analyses (i.e. Vinyl chloride, Pentachlorophenol, Total Petroleum Hydrocarbons, Thiodiglycol, Chemical Agent Degradation Products etc.) and specific validation (i.e. USACE) following QAPjP guidelines.

July 1992 to September 1993

PACE, INC., Robinson Lane, Wappinger Falls, NY
(Facility no longer in operation)

Organic Reporting Supervisor - Responsible for scheduling of staff, review of CLP Non-CLP data deliverables and data validation. Also, assist Organics Manager and provide technical support. Other duties include software review, LIMS support, QA/QC documentation and staff training.

March 1990 to May 1992

AUTOMATED COMPLIANCE SYSTEMS, INC., 245 Rte. 22 West, Bridgewater, NJ

Manager, Data Organization/Capture - Responsible for creating and maintaining UNIX based in-house data systems utilizing SQL Plus and ASCII formatted files. Accountable for correctness of data recieved from laboratories. Also, primary in-in-house trainer on Defender Systems. Other duties include client contact billings, in-house QC and dproduction reports.

May 1988 to February 1990

TRACE TECHNOLOGIES, INC., 10 Radel Avenue, Bridgewater, NJ

Laboratory Manager - Responsible for overall lab operations, as well as sole operator of GC/MS instrumentation. Also, responsible for QA/QC requirements, data reporting, client contact, hiring personnel and creating SOPS from all lab areas.

November 1987 to May 1988

ROY F. WESTON, Weston Way, Westchester, PA

GC/MS Senior Analyst - Responsible for the ESAT Region II program. Duties luded supervising 5 people in sample preparation, data acquisition, interpretation and of organics using CLP protocol. Also, responsible for instrument maintenance, ordering supplies and standard preparation.

January 1984 to October 1987

ENVIRONMENTAL TREATMENT AND TECHNOLOGIES CORPORATION,

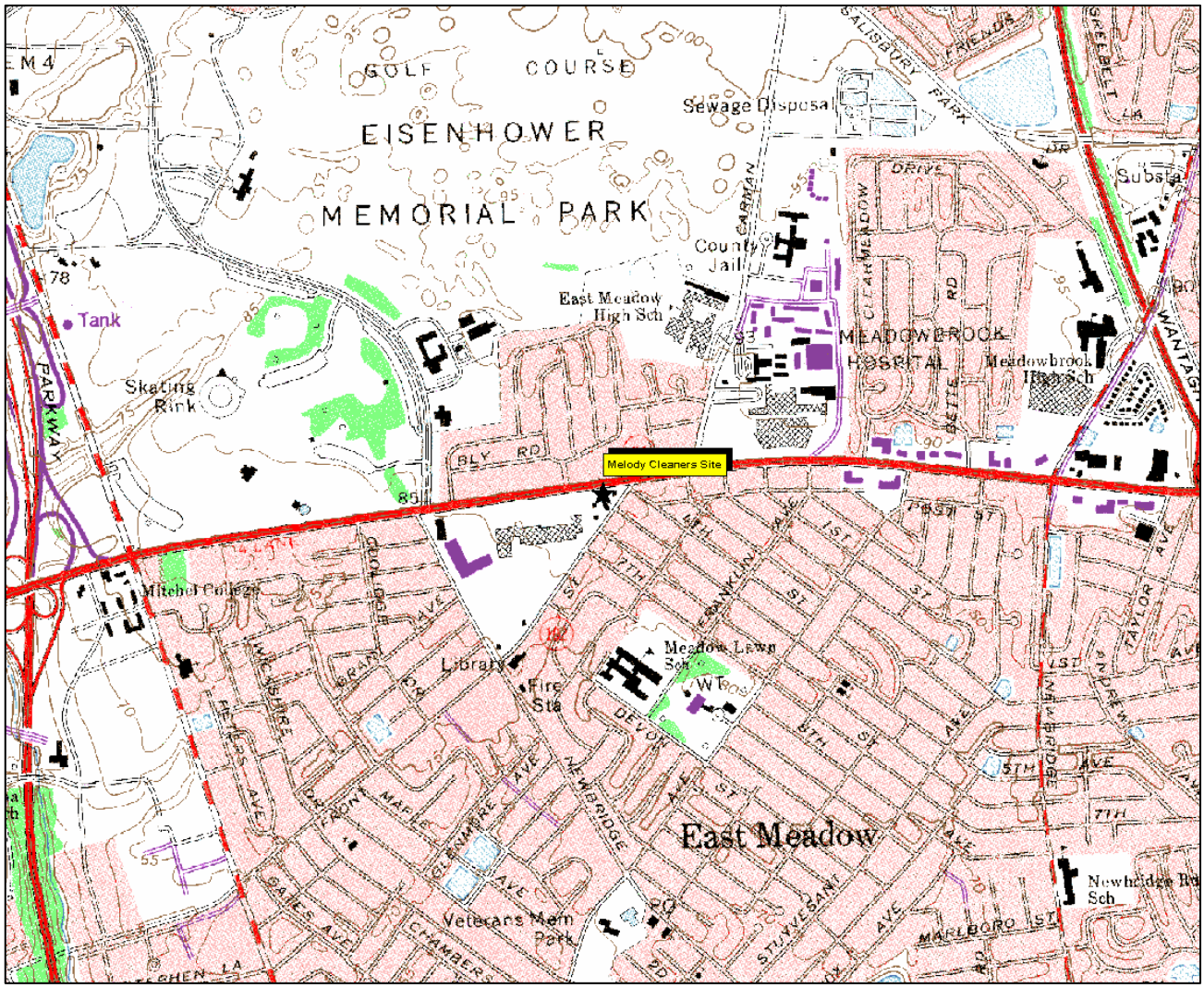
(Formerly ETC, currently Pace, Inc.), 284 Raritan Center Parkway, Edison, NJ
GC/MS Analyst - Responsible for the analyses of volatiles and extractables using EPA and CLP protocol. Duties included: data interpretation, reporting (CLP report packages), QA/QC verification, inventory, general repairs and instrument maintenance (including HP auto-samplers and Tekmar units) and procedural verification.

REFERENCES

References are available upon request.

FIGURES

Figure 1: Site Location Map
East Meadow, New York



Scale 1:24000
CONTOUR INTERVAL 10 FEET
DASHED LINES REPRESENT 5 – FOOT CONTOURS
DATUM IS MEAN SEA LEVEL
DEPTH CURVES AND SOUNDINGS IN FEET – DATUM IS MEAN LOW WAT

Legend

Scale: 1" = 40'

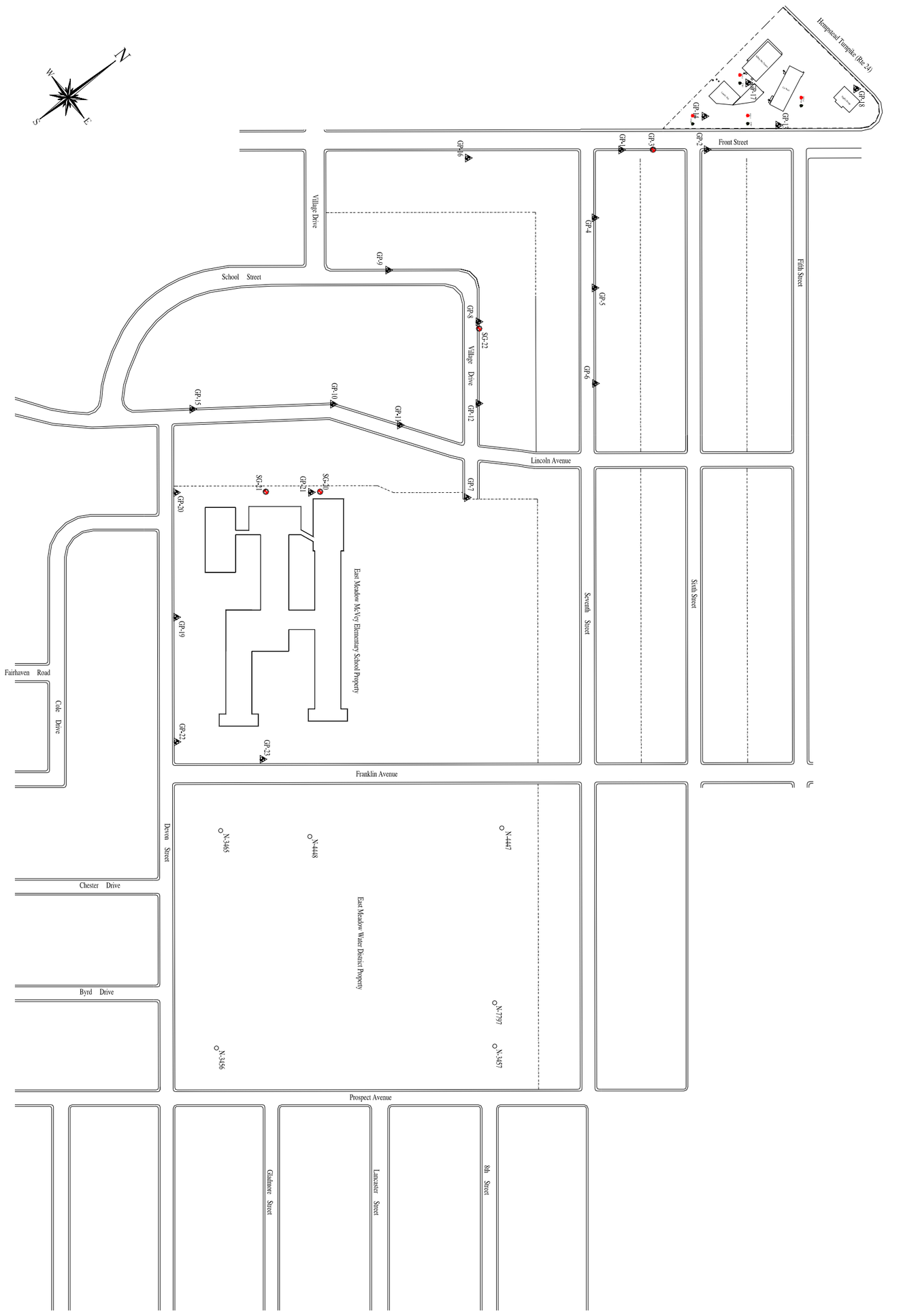
- Monitoring Well
- Groundwater Probe
- Soil Probe
- SVE Well

04-455

Figure 2: Historical On-Site Sampling Locations

East Meadow, New York

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
631.269.9800 TELEPHONE
631.269.1599 FACSIMILE



Scale in Feet

100 50 0 100 200 500

IMPACT ENVIRONMENTAL
170 Keyland Court
Bohemia, New York 11716
631.269.8800 telephone
631.269.1599 facsimile

04-455

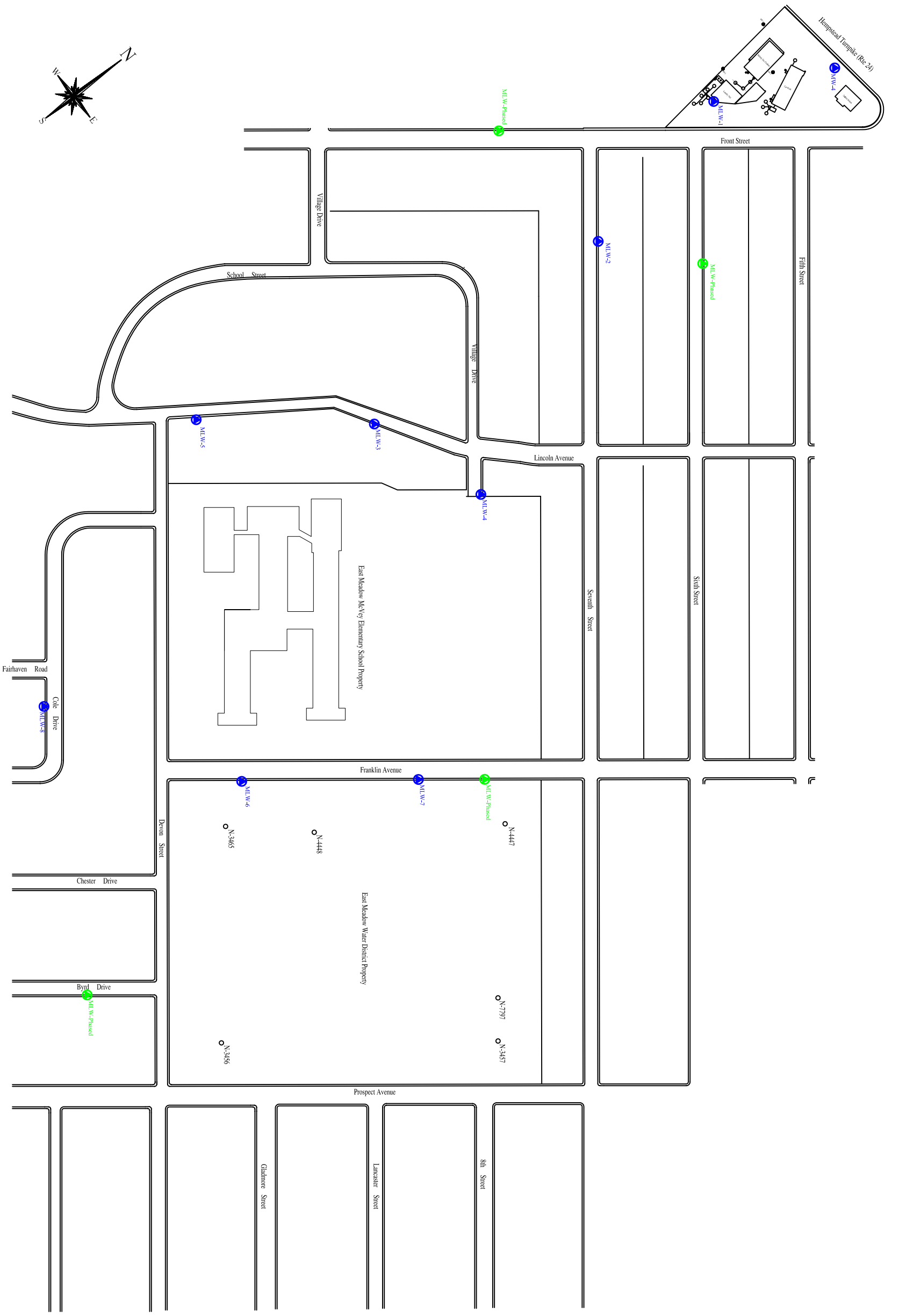
Figure 3: Historical Off-Site Sampling Locations

East Meadow, New York

Legend

Scale: 1" = 240'

- Groundwater Probe Node
- Soil Gas Probe



IMPACT ENVIRONMENTAL

170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 269-8800 FAX (631) 269-1599

1560 BROADWAY, SUITE 1024
NEW YORK, NEW YORK 10036
TEL (212) 201-7905 FAX (212) 201-7906

04-455

Figure 4: Monitoring Well Plan

East Meadow, New York

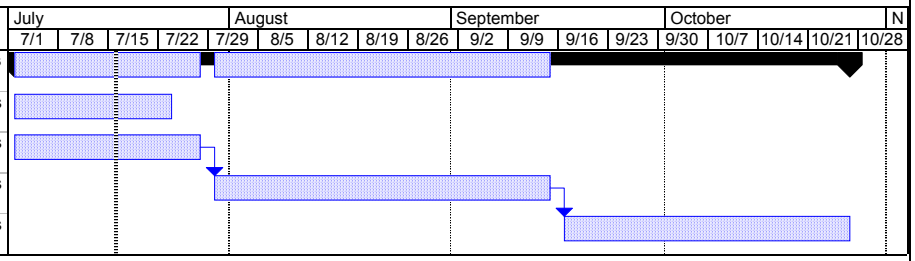
Legend

Scale: 1" = 240'

- Monitoring Well (Multi-level / Cluster)
- Monitoring Wells Phased

Melody Cleaners Site
Voluntary Cleanup Program Site Code 347-1

ID	Task Name	Start	Finish	Duration
1	**Remedial Investigation**	**Mon 7/2/07**	**Fri 10/26/07**	**85 days**
2	Topographic Survey	Mon 7/2/07	Mon 7/23/07	16 days
3	Permits Acquisition	Mon 7/2/07	Fri 7/27/07	20 days
4	Soil Borings, Gamma Logging, Water Sampling, Well Construction	Mon 7/30/07	Fri 9/14/07	35 days
5	Generation of Well Construction Logs	Mon 9/17/07	Fri 10/26/07	30 days



Project: Melody Cleaners Site
Date: Mon 7/16/07

Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
External Milestone
Deadline