

Remediation Plan

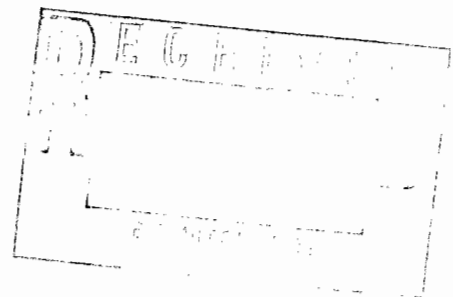
March 2, 2010

Prepared For:

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

Prepared for:

**New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, New York**



IMPACT ENVIRONMENTAL



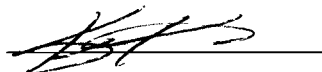
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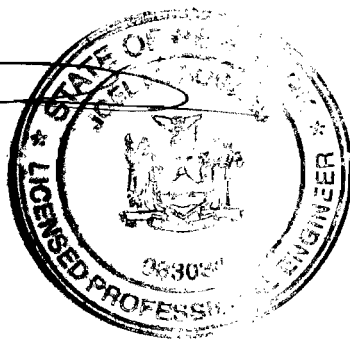

Joel Rogers, P.E.

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1. Introduction

This Remediation Plan (RP) has been developed to outline remedial activities proposed for Melody Cleaners Site (Voluntary Cleanup Program Site Code #347-1, herein referred to as "Site"). This RP was developed based on the Remedial Investigation Report, dated February 25, 2009 and approved by the New York State Department of Environmental Conservation (NYSDEC). This RP provides information regarding Site background, previous investigative activities, and proposed remedial activities.

The proposed remedial activities, which are the continuation of the previous remedial and investigative activities conducted at the Site, were mainly designed to mitigate the groundwater contamination. The proposed remedial activities included: 1) in-situ chemical oxidation (ISCO) on the Site in vicinity of the source area; 2) continuation of the groundwater monitoring program; 3) continuation of the soil vapor extraction (SVE) operation; 4) groundwater modeling to evaluate off-site natural attenuation and to determine the potential down-gradient receptors.

The proposed ISCO will be implemented in a phased approach. A baseline sampling and a pilot test will be conducted prior to the full scale ISCO implementation. Full scale ISCO implementation will be performed in two mobilizations, each will target a specific treatment zone. Subsequent to the Phase I ISCO implementation, an evaluation will be performed to review the efficiency of the ISCO and the necessity of Phase II ISCO implementation.

The methodologies and procedures presented in this RP 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 Description

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 bagel shop (previous TV 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.

Detailed regional and Site geology and hydrogeology conditions can be referenced with in the Remedial Investigation Report, dated February 25, 2009.

3. Previous Investigation Results

Detailed previous investigation results can be reference with Remedial Investigation Report, dated February 25, 2009. The following is a summary of the information that is most relevant to this RP.

3.1. Site Geology

Based on the previous investigation, the subsurface soil in the areas of investigation from grade to 250 ft BEG mainly consists of medium to fine sand with clay particles and seams. Four noticeable clayey sand/clay seams were observed within the investigation depth. The data obtained during the RI are presented on cross-section maps, referenced in **Figure 2**.

3.2. Site Hydrology

The groundwater flow direction at the Site is towards the south. The horizontal hydraulic gradient is approximately 0.0018 ft/ft. The average vertical hydraulic gradient ranges from 0.005 ft/ft to 0.012 ft/ft. The groundwater potentiometric map is referenced with **Figure 3**.

3.3. Site Groundwater Quality

To date, a total of 6 quarterly sampling events plus a baseline investigation have been conducted to profile the existing plume. Review of quarterly sampling results revealed that the extent of the off-site plume has remained stable compared with the baseline investigation. 15 out of 33 wells demonstrated relatively high but stable levels of COC contamination; while the balance of 18 wells had non-detect or a relatively low level of detection.

The most recent sampling results can be referenced with **Figure 4**.

4. Remedial Selection

Based on previous remedial investigation, Impact Environmental has selected the combination of continue SVE Operation/ Institutional control along with On-Site Chemical Oxidation/Long-term Monitoring as the appropriate remedy for addressing the contaminants in soil and groundwater. These alternatives are feasible to implement, cost effective and satisfy the Remedial Action Objectives.

The following remedial actions have been selected:

Soil vapor extraction (SVE) is a remedy selected most frequently to address VOC contamination. Available performance data indicate that it effectively treats soils in place. SVE can be either an in-situ or ex-situ process which physically removes contaminants from unsaturated zone soils by inducing air flow through the soil matrix. The flowing air strips volatile compounds from the soil and carries them to extraction points. The recovered vapors often require further treatment.

Chemical oxidation may be used on-site by injection directly into the groundwater. Commonly used oxidizing agents include: ozone, hydrogen peroxide, permanganate, hypochlorite, chlorine, and chlorine dioxide. Ozone, hydrogen peroxide and permanganate are generally preferred for removing organic compounds because chlorine-based oxidants can produce toxic byproducts. Complete oxidation decomposes hydrocarbons into carbon dioxide and water, although chlorinated organic compounds also yield chloride ions.

Imposition of an institutional control in the form of an environmental easement that would require (a) limiting the use and development of the property to commercial use, which would also permit industrial use; (b) compliance with the approved Site Management Plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.

Development of a Site Management Plan which would include the following institutional and engineering controls: (a) current asphalt cover system to restrict excavation below pavement or buildings. Excavated soil would be tested, properly handled to protect the health and safety of workers and the nearby community, and would be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (c) monitoring for chlorinated volatile organics; (d) identification of any use restrictions on the site; (e) fencing around active remedial systems to control site access; (f) annual sub-slab pressure monitoring to confirm communication of the SVE system to the seven impacted structures; and (g) provisions for the continued proper operation and maintenance of the components of the remedy.

The property owner would provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal would: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that would impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the Site Management Plan unless otherwise approved by the Department.

The operation of the components of the remedy would continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible. Groundwater sampling and groundwater modeling is required to evaluate off-site natural attenuation and to determine the potential down-gradient receptors since the leading edge of the plume was not defined. Installation of supplemental monitoring wells may be required to address any data gaps or evaluate potential impacts to supply well fields.

Supplemental remedial actions may be implemented if off-site groundwater conditions do not improve or are determined to be impacting a public supply well field at levels requiring treatment. Based on the off-site groundwater sampling and modeling, injection of additional chemical oxidants off site and/or well head treatment system to address volatile organic compounds at the Prospect Avenue well field will be required if natural attenuation is not progressing at a sufficient rate or site contaminants are impacting the public supply well field at levels requiring treatment. The need for these activities will be evaluated during the scheduled periodic reviews. The first one will be scheduled one year after the final injection of on-site chemical oxidation.

Since the remedy results in untreated hazardous waste remaining at the site, a long-term monitoring program would be instituted to assess groundwater and soil vapor intrusion. The established groundwater monitoring well network, identified as monitoring wells MLW-1 through MLW-9, MW-1 through MW-4, and SVE-1 through SVE-4, will be sampled to assess the effectiveness of the chemical oxidation remedy. Soil vapor monitoring activities presently being performed will continue at the necessary structures on and off site. These programs will allow the effectiveness of the chemical oxidation and soil vapor extraction remedies to be monitored and will be a component of the long-term management for the site.

Based on the groundwater monitoring results and/or supply well data, installation of a treatment system at the Prospect Avenue well field will be required if site contaminants are determined to be impacting the well field at levels requiring treatment.

A review of Site conditions will be conducted periodically using data obtained from the quarterly sampling program. The Site reviews will include an evaluation of the extent of contamination and an assessment of

contaminant migration and attenuation over time. The long-term groundwater monitoring program will be modified based on the monitoring results.

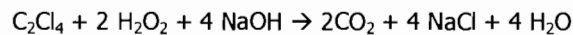
5. In-Situ Chemical Oxidation

This section provides the basis of design and defines the system components, and presents an implementation plan for ISCO on the Site. The basis of design will be the previous remedial investigation as well as the pilot test to be performed at the Site. The system components include the target treatment area and depth, the injection locations, injection method, ISCO reagent specifications and injection methodology. This section also describes the proposed order of events and provides rationale for changes to that plan.

5.1. Basis of Design

The purpose of the selected remedial remedy is to reduce mass of PCE and its breakdown components at the "source area" and to minimize migration to downgradient receptors, thereby reducing risk to human health and the environment. The "source area" is herein defined as the extent of PCE in groundwater greater than 1,000 ppb. The location of the "source area" can be referenced with **Figure 5**.

ISCO injection at the Site will involve injecting RegenOx™ to oxidize PCE to carbon dioxide and water. A molecule of sodium percarbonate ($2\text{Na}_2\text{CO}_3 \cdot 3\text{H}_2\text{O}_2$) dissolved in water yields sodium carbonate and hydrogen peroxide creating an alkaline, oxidative environment. The direct oxidation of tetrachloroethene with sodium percarbonate would theoretically yield water, salt and carbon dioxide as the standard oxidation end products per following equation:



Implementation of the ISCO remedial action will achieve and maintain significant PCE decay trends in groundwater in the treatment zone. The objective of the ISCO implementation is to decrease PCE mass in the "source area", so that monitored natural attenuation (MNA) becomes a feasible remedy for the distal portion of the plume. An additional objective of the ISCO at the Site is to reduce the duration of a future MNA remedy.

5.2. Reagent Specification

RegenOx™ will be used as the ISCO reagent. RegenOx™ is an advanced chemical oxidation technology that destroys contaminants through powerful, yet controlled chemical reactions and not through biological means. This product maximizes in situ performance while using a solid alkaline oxidant that employs a sodium percarbonate complex with a multi-part catalytic formula. RegenOx™ directly oxidizes contaminants while its unique catalytic component generates a range of highly oxidizing free radicals that rapidly and effectively destroy PCE and its breakdown components.

A RegenOx™ application will remove significant amounts of contamination from the subsurface and is typically applied using direct-injection techniques. The application process enables the two part product to be combined, then pressure injected into the zone of contamination and moved out into the aquifer media. Once in the subsurface, RegenOx™ produces a cascade of efficient oxidation reactions via a number of mechanisms including: surface mediated oxidation, direct oxidation and free radical oxidation. These reactions can be propagated in the presence of RegenOx™ for periods of up to 30 days on a single injection. RegenOx™ produces minimal heat and is highly compatible with follow-on enhanced bioremediation applications.

Detailed Reagent specification and the MSDS sheet can be referenced with **Appendix A**.

5.3. Baseline Sampling

Prior to the pilot test and the full scale ISCO application, soil and groundwater baseline sampling will be conducted in the source area on the Site. The sampling sequence can be referenced with **Table 1**.

5.3.1. Baseline Soil Sampling

Baseline soil sampling will be conducted utilizing Geoprobe direct-push sampling technique. Soil samples from groundwater interface (approximately 28 ft BEG) will be collected at three locations: upgradient, "source area" and down gradient.

Collected soil samples will be subject to laboratory analysis for VOCs (EPA Method SW8260B) and metals (SW6010/7196). Collected saturated soil samples will also be analyzed for chemical oxidant demand (COD) and 2-week oxidant demand (SOD). COD and SOD results will later be utilized to verify ISCO dosing assumptions.

5.3.2. Baseline Groundwater Sampling

Baseline groundwater sampling will be conducted utilizing both permanent wells and Geoprobe direct-push sampling technique.

For the source area, groundwater samples will be collected via permanent wells. As part of the remedial actions, one additional 2-inch well cluster, identified as MLW-0, will be installed in the source area. The proposed well cluster will consist of two screen depth, with MLW-0 IS at 80 ft BEG and MLW-0 ID at 120 ft BEG. Well installation protocols can be referenced with Section 9.2 of this report. Groundwater sampling collected from MLW-0 and SVE-1 (30 ft BEG) will represent groundwater quality at the source area. Groundwater sampling will be conducted via low flow technique.

For up-gradient sampling, groundwater will be collected via Geoprobe direct-push technique. Groundwater samples will also be collected from 30, 80 and 120 ft BEG. The procedures of groundwater sampling with direct-push techniques can be referenced with Section 9.2 of this report.

For down-gradient sampling, existing monitoring wells SVE-2 (30 ft BEG), MLW-1 IS (80 ft BEG) and MLW-1 ID (160 ft BEG) will be utilized. Groundwater sampling will be conducted via low flow technique.

Note that the injection of oxidant to an aquifer increases the potential for mobilizing certain naturally occurring metals, for example chromium. These constituents will be monitored closely during ISCO implementation.

Collected groundwater samples will be subject for laboratory analysis for VOCs (EPA Method SW8260B) and metals (SW6010/7196). In addition, groundwater samples will be field measured for pH, temperature oxidation-reduction potential (ORP), dissolved oxygen (DO), turbidity, electrical conductivity, and hydrogen peroxide concentrations. Hydrogen peroxide concentrations will be measured in the field using a Hach Peroxide Test Strips (0-100 ppm).

The locations for baseline sampling can be referred with **Figure 6**.

5.4. Pilot Test

Following baseline sampling, a pilot test will be conducted to evaluate the efficiency of ISCO for remediating PCE in groundwater at the Site. The pilot test will include injection of RegenOx™ through a direct push injection rig. A total of 3 injection points, identified as PT-1, PT-2 and PT-3, will be installed. PT-1 will be installed to 30 ft BEG and horizontally 20 ft up-gradient to SVE-2. PT-2 will be installed to 80 ft BEG and 15 ft up-gradient to MLW-1 IS. PT-3 will be installed 30 ft BEG and horizontally 10 ft side-gradient to MW-2. The locations of the pilot test can be referenced with **Figure 7**.

Monitoring wells SVE-2, MLW-1 IS and MW-2 will be utilized as observation wells. Prior to the pilot test, data loggers will be installed in the observation wells. During the pilot test (approximately duration of two weeks), the installed data loggers will collect information including water levels, pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), turbidity, temperature and electric conductivity. At the completion of the pilot test, groundwater samples will be collected from each observation well via low flow technique. Said groundwater samples will be field measured for pH, temperature, DO, salinity, electric conductivity, turbidity, and hydrogen peroxide. Hydrogen peroxide concentration will be measured utilizing a Hach Peroxide Test Strips (0-100 ppm).

The controlled injection flows will range from 3 to 10 gpm at pressures ranging from 100 to 200 psi.

The pilot test will help to estimate the radius of influence of the injection. Radius of influence of the injected reagent will be a function of a number of factors, including the concentration of the oxidant used, the kinetics of the oxidant, temperature and pH of the aquifer, concentration of contaminants, and the composition and total oxidant demand of the groundwater and soil.

Radius of influence will be determined by logging the changes of hydrogen peroxide, pH, DO, Redox and temperature in the monitoring wells in vicinity to the oxidant injection points.

The amount of reagent to be used for the pilot test will be determined by baseline sampling (refer to section 5.8.1). A detailed injection process can be referenced with Section 5.7.

5.5. Target Treatment Area

Generally, the target treatment area will be where dissolved PCE concentration is higher than 1,000 ppb (the "source area"). Target Treatment areas are segregated into two zones, with Zone-1 between Melody Cleaners and the Laundromat and Zone-2 on parking lot to the south of the Laundromat. Both Zone-1 and Zone-2 will be treated in Phase I of the ISCO implementation. If deemed necessary by post injection monitoring, Phase II ISCO implementation will be performed with the same or reduced scale. Refer to Section 5.6 for details. Locations of the target treatment areas can be referenced with **Figure 5**. The treatment depth and spacing could be adjusted based on baseline sampling and pilot test results.

Zone-1 consists of an area of approximately 1,300 square ft and includes 16 injection points with 15 ft interval. The treatment depth at Zone-1 will be from groundwater interface to 80 ft below existing grade (BEG).

Zone-2 consists of an area of approximately 4,500 square ft and includes 28 injection points with 20 ft interval. The treatment depth at Zone-2 will be from groundwater interface to 160 ft BEG. 10 injection points at Zone-2 will be installed to 160 ft BEG and the additional 18 injection points will be installed to 120 ft BEG.

5.6. Phasing of In Situ Chemical Oxidation Implementation

Proposed ISCO implementation will occur in phases. Details of each phase of the ISCO implementation will be designed and modified relying on data collected in the previous phase. The phased approach allows for optimal injection based on site-specific lithology, hydraulic properties, and contaminant distribution.

The baseline sampling and pilot test were discussed in Section 5.3 and Section 5.4. After injection assumptions are confirmed in this initial phase of work, full-scale ISCO can begin. The Phase I ISCO injection will begin in Zone-1, and finished with Zone-2. Injection at Zone-2 will begin with the southernmost locations and move north to minimize pushing PCE down-gradient.

Upon completion of the Phase I ISCO injection, post injection sampling will be conducted (see section 5.9 for details) on quarterly basis for two quarters. Evaluation of the post injection sampling will determine whether a Phase II injection is necessary to meet remedial action objectives. If deemed necessary, a Phase II ISCO injection work plan will be designed and implemented under the auspices of the NYSDEC.

5.7. Injection Rate

The total amount of RegenOx™ to be injected at the Site will be calculated based on the baseline sampling and pilot test results. As a general principle, the injection rate would be greater than 10 lbs per ft per injection point, unless otherwise suggested by the pilot test results.

5.8. Direct-Push Injection Process

Detailed injection procedures for this project can be referenced with Section 9.2 of this report. The procedure applies to both pilot test and full scale test. Manufacturer recommended injection process can be referenced with **Appendix B**.

The injection sequence was predetermined (refer to **Figure 5**). Generally, each injection point will be as far away as possible from the last injection point to prevent "surfacing". Due to the high volumes of liquid being injected, working from the outside of the injection area towards the center will limit expansion of the plume.

For each injection point, a "bottom-up" technique will be applied. Continuous injection will be performed from terminating depth up to the soil-groundwater interface.

5.9. Monitoring and Reporting

Real-time monitoring before, during, and after each phase of chemical injection is necessary to ensure adequate delivery of oxidant prior to demobilization. **Table 1** shows sampling sequence and the analyzing parameters as part the ISCO implementation.

5.9.1 System Monitoring and Reporting

During ISCO implementation, the following information will be measured and recorded:

- Volumes of oxidant solution injected for each injection
- Liquid flow rate of oxidant solution at least hourly during injection
- Mass of Reagent added
- Start and end time of each injection cycle

All these information will be documented in the Remedial Action Report.

5.9.2 Performance Monitoring and Post Injection Sampling

The purpose of performance monitoring and post injection sampling is to assess the long-term effectiveness of the ISCO remedy. The sampling sequence can be referenced with **Table 1**.

Real-time continuous performance monitoring will be conducted throughout the injection period. It will start 3 days in advance and will end one week subsequent to the completion of the injection. Performance monitoring will be conducted by utilizing data logger installed in the designated monitoring wells.

Two rounds of post injection sampling (approximately 1 and 4 months after injection) will be conducted to determine whether concentrations decrease from baseline conditions after treatment.

The results of the post-injection monitoring will be used to determine whether a second ISCO injection is needed to further reduce COC concentrations to target levels. The second round of monitoring may be considered baseline conditions for the subsequent phase of ISCO injection planned. After the Phase 2 injection, a similar sampling schedule will be used to conduct post-remediation sampling. At least two rounds of sampling will be completed after ISCO implementation to ensure that post-treatment conditions are adequately monitored.

During each of the proposed post-injection monitoring events, groundwater will be collected from selected wells in the sampling network. Low flow technique will be utilized for the sampling. Samples will be field monitored for temperature, conductivity, turbidity, pH, ORP, DO, and hydrogen peroxide concentration. Hydrogen peroxide concentrations will be measured using a colorimeter. Groundwater samples will be submitted for laboratory analysis of VOCs via EPA Method SW8260. Select wells will also be monitored for metals (SW6010/7196).

5.10. Contingency Plan for Elevated Dissolved Metals

The contingency plan would be implemented if the exceedance of dissolved chromium or other metals is confirmed in the downgradient monitoring wells. A comprehensive evaluation will be used to determine when an exceedance has occurred and when contingency measures should be implemented.

The first phase of the contingency plan is increased monitoring, which would include increasing the monitoring frequency at existing monitoring wells and/ or installing additional monitoring wells. Dissolved metals are subject to biotic and abiotic transformation and might be addressed using MNA. Additional monitoring wells might also be installed if it is determined that the existing wells cannot adequately monitor the effect of ISCO on groundwater outside the transition zone. Increased monitoring might be performed alone or in combination with groundwater modeling to determine the fate and transport of contaminants that exceed baseline conditions. As a final step, an Enhanced In-Situ Bioremediation (EISB) system might be installed to reduce any oxidants or dissolved metals that were mobilized during ISCO treatment.

6. Continuation of Long Term Groundwater Monitoring

Groundwater monitoring program will be continued subsequent to the ISCO implementation. The sampling frequency might be modified based on the results of ISCO implementation. Groundwater samples will be submitted for laboratory analysis of VOCs via EPA Method SW8260. In addition, select wells will also be monitored for metals (SW6010/7196).

7. Continuation of Soil Vapor Extraction Operation

The existing SVE system will continue to operate. It will prevent or minimize risk of vapor intrusion. It will provide long-term protection of human health as well as the environment.

8. Health and Safety Plan

A Health and Safety Plan (HASP) will be submitted subsequent to the approval of this RP by the NYSDEC. The HASP will cover Impact Environmental personnel during on-Site activities, and will be provided to Site contractors (if any) as an environmental resource to supplement the HASPs covering their own worker. A worker safety program will be in effect during ISCO implementation.

The site-wide health and safety plan includes precautions for ISCO implementation activities and will be reviewed by field personnel before injection activities begin. The HASP will include relevant materials safety data sheets for chemicals brought onsite. The HASP will detail how the chemicals will be properly stored and utilized so that the workers and the public are protected during the remedial activities. The HASP will also include a community air monitoring program (CAMP) to describe in detail the ambient air monitoring activities during the ISCO implementation.

Frequent communication between the field staff and on-site workers and residents, both before and during ISCO implementation, will be coordinated to minimize health and safety risks by securing the ISCO staging and implementation area from pedestrian traffic. Coordination and communication with site operators are also necessary to minimize interruption of implementation activities.

9. 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 activities to ensure the quality and reliability data. The procedures outlined in this plan are specific to the activities proposed within this RP. Additional quality assurance procedures may be provided in the future relating to activities outside the scope of this plan.

9.1. 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
Health and Safety Officer, Impact Environmental	Wenqing Fang
Project Manager, NYSDEC	Brian Jankauskas

9.1.1. 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.

9.1.2. 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.

9.1.3. 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.

9.1.4. Site Health and Safety Officer

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

- ◆ Monitoring the compliance of environmental remediation activities personnel (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 endanger themselves, co-workers, or the public, and reporting the same to the Project Manager;
- ◆ Reporting any accidents or violations of the HASP 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-related personnel have signed the personnel agreement and acknowledgments form contained in this HASP;
- ◆ 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 HASP.

9.2. 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.

9.2.1. Decontamination Procedures

Prior to arrival on the Site and between injection points/sampling points, all injection/sampling tools relating to 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; and 3) 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.

9.2.2. Soil Boring Installation

Subsurface probes will be installed using a *Geoprobe* hydraulically powered probing tool. Mechanized, vehicle mounted probe systems apply both static force and hydraulically powered percussion hammers for tool placement (static down forces up to 3,000 pounds combined with percussion hammers of eight horsepower continuous output). Recovery of large sample volumes will be facilitated with a probe-driven sampler. The probe-driven sampler consists of a hollow probe, which opens via a remote control mechanism at the selected sampling depth in the soil profile to allow soil to enter as it was advanced. Discrete media samples will be secured at the desired depths and contained within a non-reactive transparent plastic sleeve that lined the hollow probe. The plastic sleeves will be removed for subsequent inspection and sample aliquot acquisition.

9.2.3. 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. 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.

9.2.4. 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.

9.2.5. Monitoring Well Construction Procedures

The proposed groundwater well cluster will be installed using hollow stem augers (HSA). The water table and multi-level groundwater wells will be installed using 4.25 inch augers. 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 will be 10-ft.

The wells will be installed in separate bore holes. Sand pack will be installed at the screening levels. 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 upon bentonite slurry seal to the grade. The grout will mixed using a ratio of approximately 94 lbs of cement, 3 to 5 lbs of bentonite and 6.5 gallons of clean water.

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.

9.2.6. Temporary Well Point Sampling

The groundwater sampling system that will be used is the Screen Point 15 that is designed to accurately collect grab samples of groundwater. The Screen Point 15 uses a screen with a standard slot size of 0.004 inches that is sealed inside a 1.5-inch ID alloy steel sheath as it is driven to depth. The screen is sealed inside the sheath with Neoprene O-rings, which prevents infiltration of formation fluids until the desired depth is attained. When the screen has been driven to the depth of interest in the formation, extension rods are used to hold the screen in position as the driving rods are retracted approximately 4 feet. The 4-foot long sampler sheath forms a seal above the screen as it is retracted. A total of 41.5 inches of slotted screen is placed into contact with the formation. The Screen Point 15 groundwater sampler has a total boring diameter of 1.5 inches and the outside diameter of the screen is 1.0 inch. This provides for a maximum of 0.25 inches between the screen and the natural formation as the sampler sheath is retracted. These conditions approach the ideal for natural formation development that can be conducted when lower turbidity samples are required.

Each groundwater sample will be collected from the sampler utilizing 3/8-inch in diameter disposable tubing equipped with a bottom check valve. The tubing is extended from the surface down to the sampler. The tubing is oscillated in a controlled manner to avoid excessive turbulence that would result in a loss of volatile analytes from the sample. The collection will continue until the check valve has trapped an adequate volume to expunge three bore hole volumes, to develop the temporary well, before the groundwater sample is collected for analysis. The tubing is then removed and the water is poured into appropriate sample vessels for subsequent laboratory analysis.

If field measurement of turbidity is greater than 50 NTU, then a filtered sample, in addition to the unfiltered sample, will also be collected for metal analysis.

9.2.7. Low Flow Sampling Procedures

A Grundfos® pump will be utilized for low-flow sampling. Prior to purging, static water levels will be measured utilizing a conventional water level meter. Upon completion of the measurement, the water level meter will be lowered to 0.3 ft below water table. The pump will be started at its lowest speed setting and slowly increased until discharge occurs. The pump speed will then be adjusted until there is little or no

water level drawdown (less than 0.3 feet). Flow rates will be maintained at <500ml/min. Alarm signals from water level meter will be monitored to make sure the maximum drawdown level is not exceeded.

During well purging, a QED M20 Flow Cell will be utilized to monitor field parameters, including temperature, specific conductance, pH, DO and Redox. Purging will be considered complete and sampling may begin when all of the above indicator field parameters have stabilized. Stabilization is considered to be achieved when three consecutive readings, taken at three (3) to five (5) minute intervals, are within the following limits:

DO ($\pm 10\%$),
Specific conductance ($\pm 3\%$),
pH (± 0.1 units),
Redox (± 10 millivolts),
Turbidity ($\pm 10\%$)

Parameters and depth to groundwater will be documented on the purge logs in the filed for each interval that field measurements are recorded. A field log protocol will be conducted to record sampling data including: date, time, location, sample identification code, depth to water, well specifications, purging method, purging rate, and sampling techniques. All purging readings through the flow-cell will be automatically stored in the instrument and later downloaded. All field data will be submitted to the NYSDEC along with the final report.

The flow-through cell will be disconnected prior to water sampling for laboratory analyses. VOC samples will be collected first and directly into pre-preserved sample containers. All sample containers will be filled by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence. During purging and sampling, the tubing will remain filled with water so as to minimize possible changes in water chemistry upon contact with the atmosphere. Samples will be labeled and placed into a cooler with ice or refrigerant for delivery to the laboratory. The development wastewater will be containerized for subsequent disposal.

If field measurement of turbidity is greater than 50 NTU, then a filtered sample, in addition to the unfiltered sample, will also be collected for metal analysis.

9.2.8. Direct-Push ISCO Implementation Procedure

Prior to the injection, all injection points will be pre-mark with code and associated treatment depth. 1.5-inch O.D./0.625-inch I.D drive rods will be used for the injection. Drive rod assembly will be pushed with an expendable tip to the desired maximum depth. After the drive rods have been pushed to the desired depth,

the rod assembly will be filled with RegenOx solution (to prevent heaving sands). The rod assembly will then be withdrawn three to six inches for the expendable tip to drop from the drive rods.

The RegenOx™ percent of the oxidizer in solution will be approximately 5%. Under no circumstance will the concentration of the solution be greater than 8% (to prevent excessive reaction which may increase the difficulty of injection). Appropriate quantity of RegenOx™ Oxidizer for five vertical foot (length of one rod) will be measured and be placed into a 55 gallon drum or mixing tank. To make a roughly 5% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), 22 gallons of water will be used.

Pre-measured quantity of RegenOx™ Oxidizer (Part A) will be poured into the pre-measured volume of water to make the desired target % oxidant in solution. Water and oxidant will be mixed with a power drill to ensure that the Oxidizer has dissolved in the water.

Applicable quantity of the pre-mixed RegenOx™ Activator (Part B) will be poured into the oxidant:water solution. Oxidant and Activator will be mixed using a power drill for at least 5 minutes until a homogenous mixture is formed. After mixing the RegenOx™ mixture will be injected into the subsurface as soon as possible.

An appropriately sized pressure gauge will be placed between the pump outlet and the delivery sub-assembly in order to monitor application pump pressure and detect changes in aquifer backpressures during application. After confirming that all of the connections are secure, RegenOx™ will be pumped through the delivery system to displace the water/fluid in the rods.

For each injection point, RegenOx™ solution will be evenly distributed from terminating depth up to the capillary fringe. A continuous injection will be performed. Drive rods will be slowly withdrawn during the injection. For each length of the rod, the pre-determined volume of RegenOx™ will be pumped into the aquifer. Injection volume will be closed monitored to make sure the solution is evenly distributed.

Any indications of aquifer refusal will be carefully monitored. Indications include a spike in pressure or RegenOx™ "surfacing" around the injection rods or previously installed injection points. Injection process will be continued until treatment of the entire target depth has been achieved. The procedure will extend to the top of the capillary fringe/smear zone.

A bentonite seal will be placed on top of the treatment depth, above the RegenOx™ material through the entire vadose zone. Prior to emplacing the borehole seal, clean sand will be placed into the hole to the top of the RegenOx™ treatment zone. Granular bentonite will be placed immediately above the treatment zone, followed by a cement/bentonite grout to roughly 0.5 feet below ground surface. Quick-set concrete will then be used as a surface seal.

9.2.9. Derived Wastes

Any waste material generated as part of the remedial 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 will be tested prior to disposal to the municipal sewer system. If necessary, the development waste water will be passed through a granular activated carbon system.

9.2.10. Permits

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

9.3. QA/QC Procedures

9.3.1. Standards, Criteria and Guidances

The Standards, Criteria and Guidances (SCGs) that will be applied for comparison of contaminant levels for the remedial activities consist of the NYSDEC 6 NYCRR Part 375; 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 6 NYCRR Part 375, Environmental Remediation Programs	Soil Cleanup Objectives
Indoor Air	NYSDOH, Guidance for Evaluating Soil Vapor Intrusion in New York State	Decision Matrix 2, EPA Databases

9.3.2. 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**.

9.3.3. Analytical Deliverables

The laboratory analytical results will be reported 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.

9.3.4. 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, and duplicates 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, 6010/7199	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
Liquid (gw) - Analysis	6010/7199	ELAP-ASP B	1-L amber jar	HCL/Ice	7 days

9.3.5. 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.
Analyze the water of this collecting vessel for target analytes.

9.3.6. 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.

9.3.7. 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.

9.3.8. 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.

9.3.9. 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. Specific sampling containers can be referenced with Section 9.3.4.

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.

9.3.10. 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.

9.4. Record Keeping and Documentation Procedures

9.4.1. *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.

9.4.2. *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.

9.4.3. Sample Identification System

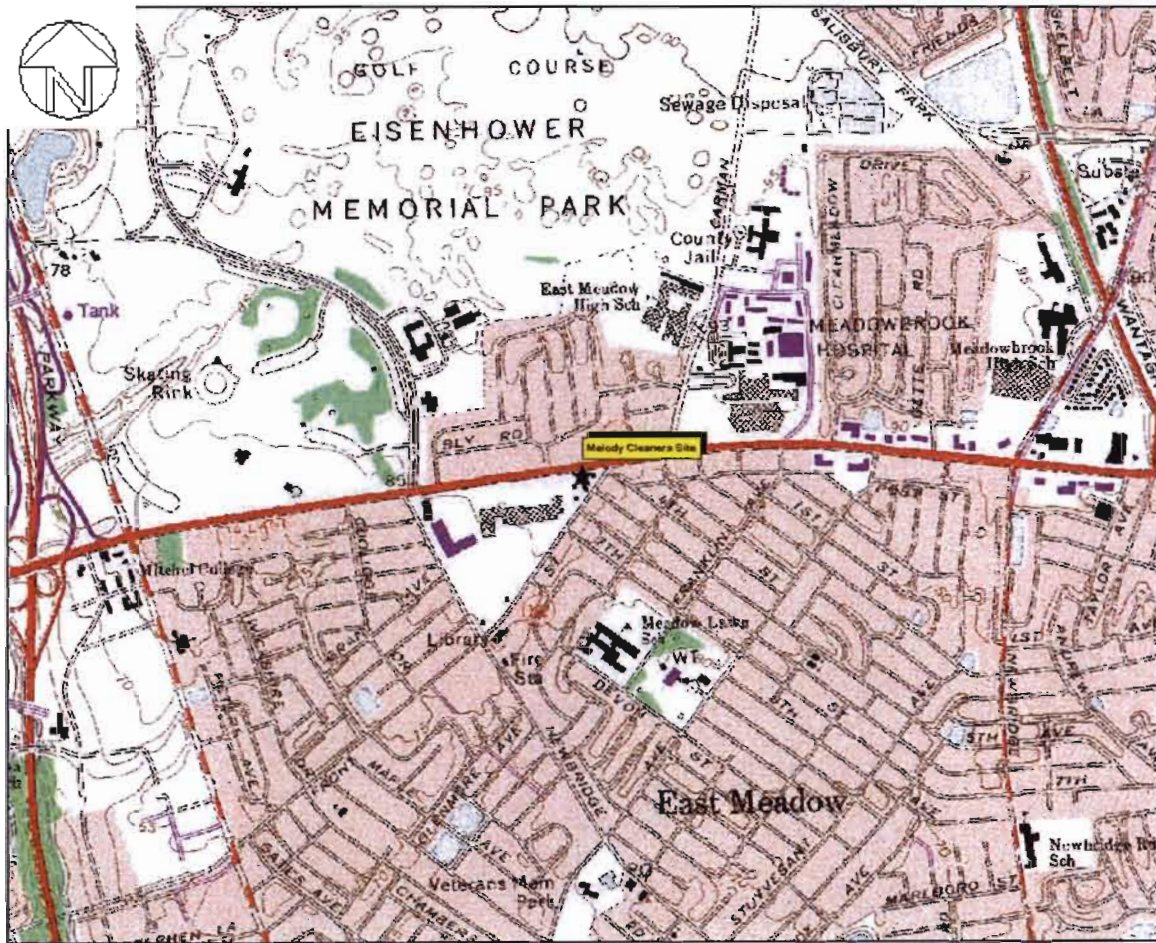
Each sample collected shall be designated by an alphanumeric code that shall identify the type of sampling location, the specific location, the matrix sampled, and a specific sample designation. Site specific procedures are described below.

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.

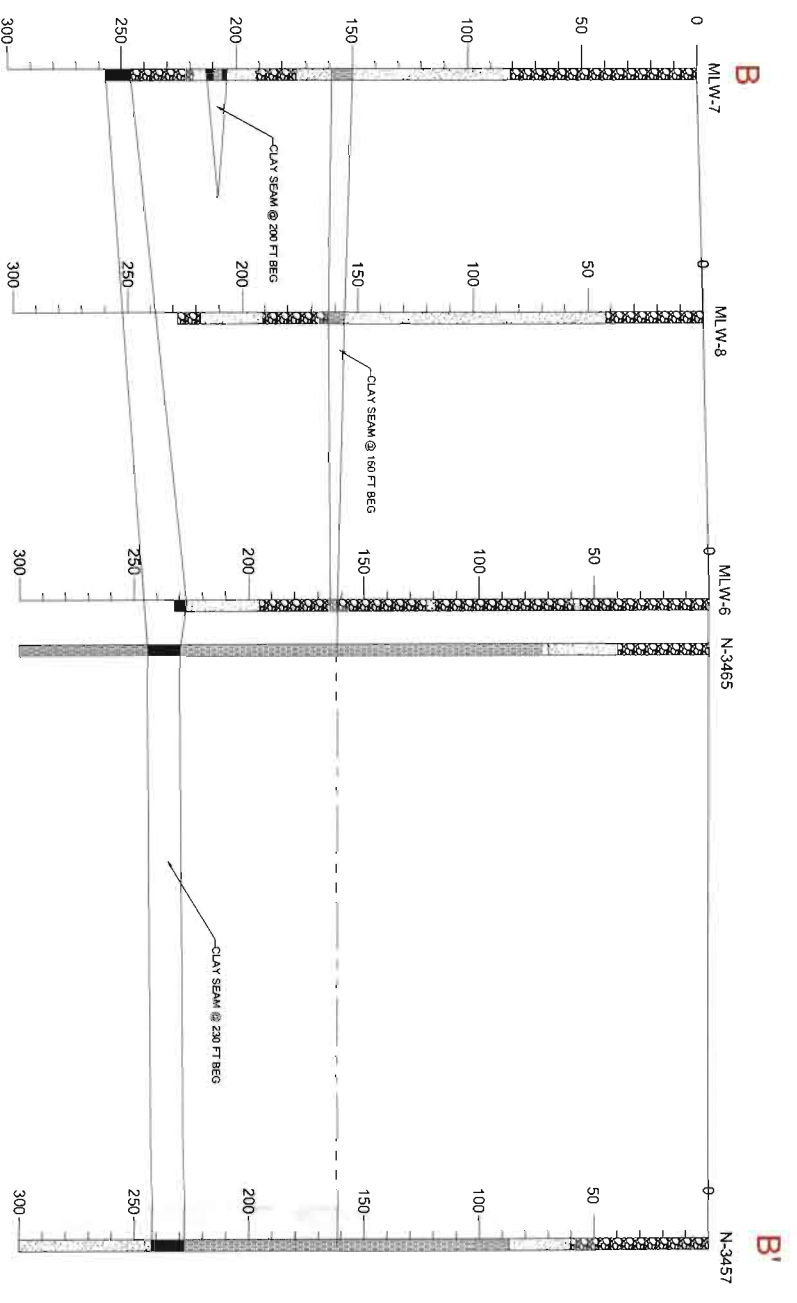
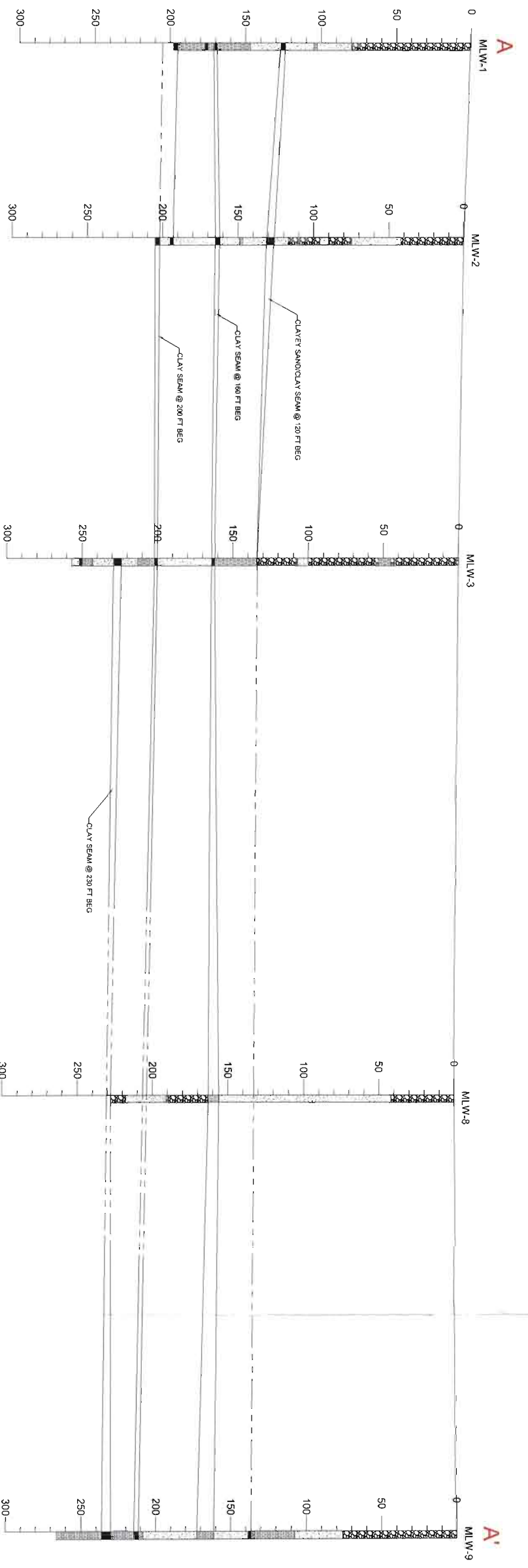
Figures

Melody Cleaners Site
East Meadow, New York

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

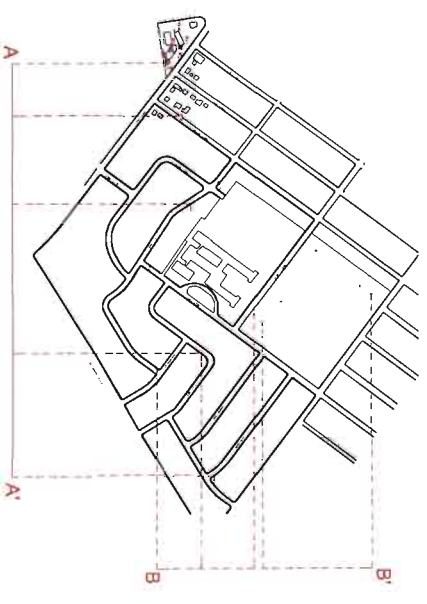


LEGEND

- Gravel and coarse sand
- Medium to fine sand
- Clayey sand and silt
- Clay

Notes:

1. Soil cross section was constructed based on soil sampling results and natural gamma logging results. Note that the result of natural gamma logging might be dampened due to casing material.
2. The delineation of less permeable layers was based on the detection of clay and/or clayey sand/silt material from natural gamma logging results and/or field observations.
3. Surface elevation was determined by survey results.
4. N-3465 and N-3457 were municipal wells. Well logs from these wells provided supplemental information for subsurface soil condition.
5. Soil cross section shown here has a vertical magnification factor of 3.0



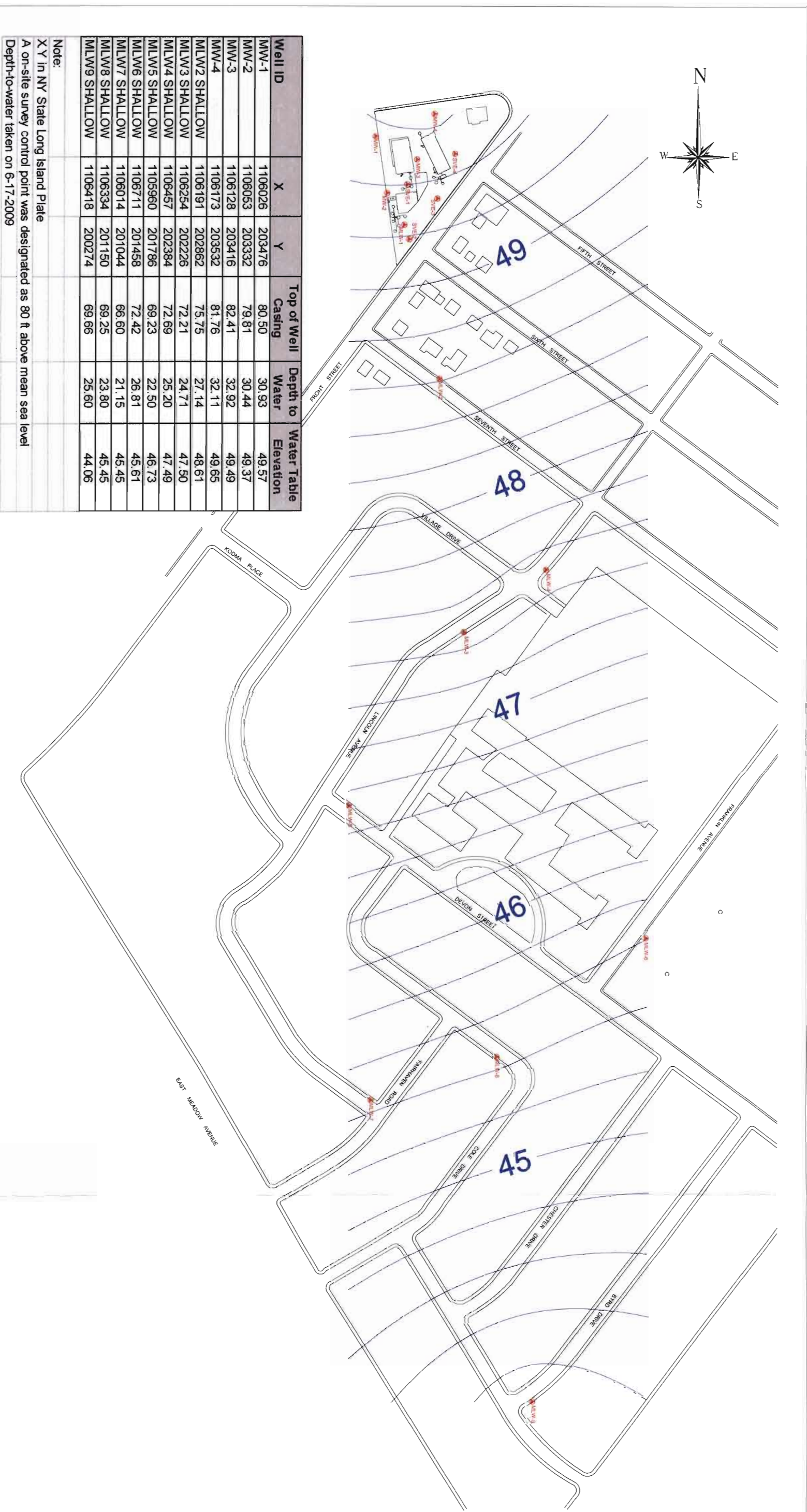
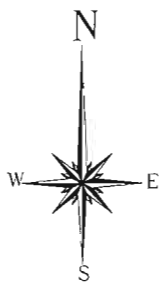
TITLE:
Soil Matrix Cross Section Map

Melody Cleaners Site, East Meadow, New York

DRAWN BY:	WF	PROJECT #	04-455
CHECKED BY:	KK	FIGURE #	02
DATE:	7-31-2008		
SCALE:	1" = 250'		

IMPACT ENVIRONMENTAL
 170 KEYLAND COURT
 BOHEMIA, NEW YORK 11716
 TEL (631) 269-8800 FAX (631) 269-1599
 1580 BROADWAY, SUITE 1024
 NEW YORK, NEW YORK 10036
 TEL (212) 201-7905 FAX (212) 201-7906





Well ID	X	Y	Top of Well Casing	Depth to Water	Water Table Elevation
MW-1	1106026	203476	80.50	30.93	49.57
MW-2	1106053	203332	79.81	30.44	49.37
MW-3	1106128	203416	82.41	32.92	49.49
MW-4	1106173	203532	81.76	32.11	49.65
MLW2 SHALLOW	1106191	202862	75.75	27.14	48.61
MLW3 SHALLOW	1106254	202226	72.21	24.71	47.50
MLW4 SHALLOW	1106457	202384	72.69	25.20	47.49
MLW5 SHALLOW	1105960	201786	69.23	22.50	46.73
MLW6 SHALLOW	1106711	201458	72.42	26.81	45.61
MLW7 SHALLOW	1106014	201044	66.60	21.15	45.45
MLW8 SHALLOW	1106334	201150	69.25	23.80	45.45
MLW9 SHALLOW	1106418	200274	69.66	25.60	44.06

Note:
 X, Y in NY State Long Island Plate
 A on-site survey control point was designated as 80 ft above mean sea level
 Depth-to-water taken on 6-17-2009

Legend
 Monitoring Well

- Note:
1. X, Y in NY State Long Island Plate
 2. A on-site survey control point was designated as 80 ft above mean sea level based on the site approximate elevation
 3. Depth-to-water taken on March 24, 2004 with SVE system off

TITLE: Groundwater Potentiometric Map		PROJECT # 04-455	
PROJECT # 04-455		FIGURE # 3	
Scale in Feet 		IMPACT ENVIRONMENTAL 170 KEVLAND COURT BOHEMIA, NEW YORK 11716 TEL: (531) 269-8800 FAX: (531) 269-1599 1560 BROADWAY, SUITE 1024 NEW YORK, NEW YORK 10036 TEL: (212) 201-7905 FAX: (212) 201-7908	
DRAWN BY: WF	CHECKED BY: KK	DATE: 6-17-09	SCALE: 1" = 250'
Melody Cleaners Site East Meadow, New York			

Date	2/26/2008	4/8/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	ND	ND	ND	ND	ND	ND
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	2/26/2008	4/8/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	4.6	2.5	ND	ND	ND	ND
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	2/26/2008	4/8/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	790	300	470	760	1,200	120
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	0.93J	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	2/26/2008	4/8/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	1.4	ND	ND	ND	ND	ND
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	11/19/2007	4/8/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	31	ND	ND	ND	ND	ND
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	2/26/2008	4/8/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	1.7	ND	ND	1.8	ND	ND
TOE	ND	ND	ND	3.5	ND	ND
DOE	ND	ND	ND	3.2	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	2/26/2008	4/1/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	2.2	ND	0.77J	ND	ND	ND
TOE	8.2	ND	ND	ND	ND	ND
DOE	ND	ND	1.2	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	10/27/2007	4/1/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	ND	ND	ND	ND	ND	ND
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	10/30/2007	4/8/2008	7/28/2008	11/1/2008	3/24/2009	6/30/2009
FCE	4.3	1.6	4.6	1.7	2.5	1.2
TOE	1	0.63	ND	ND	ND	ND
DOE	3.3	ND	2.2	1.7	ND	1.2
VC	ND	ND	ND	ND	ND	ND

Date	2/28/2008	4/8/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	ND	ND	4.6	0.74J	ND	ND
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	2/28/2008	4/2/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	3.8	ND	1.9	1.9	2.8	1
TOE	ND	ND	ND	ND	ND	ND
DOE	ND	ND	ND	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	2/28/2008	4/2/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	3.3	1.9	1.2	1.3	1.1	7.2
TOE	10	16	8.6	7.2	8.7	5.3
DOE	19	40	22	1.9	1.8	1.2
VC	ND	ND	ND	ND	ND	ND

Date	10/17/2007	4/1/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	1.1	4.2	8.2	ND	1.7	3
TOE	ND	ND	1.1	ND	1.5	1.5
DOE	ND	ND	1.3	0.64J	1.5	4.5
VC	ND	ND	ND	ND	ND	ND

Date	3/10/2008	4/1/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	2	1.3	3.9	ND	0.87	ND
TOE	ND	ND	0.69J	ND	ND	ND
DOE	ND	ND	1.1	ND	ND	ND
VC	ND	ND	ND	ND	ND	ND

Date	11/19/2007	4/1/2008	7/28/2008	12/1/2008	3/24/2009	6/30/2009
FCE	830	910	230	2,700	2,000	2,000
TOE	0.87	ND	1.3	ND	1.4	ND
DOE	ND	ND	1.5	0.67J	ND	0.72J
VC	ND	ND	ND	ND	ND	ND

Legend
Monitoring Well
All units are in ppb

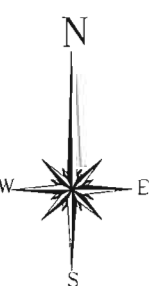
TITLE:
Analytical Summary Map

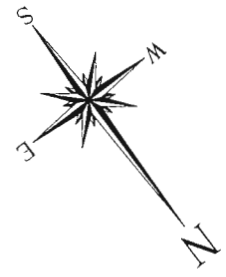
PROJECT # 04-455
FIGURE # 4

IMPACT ENVIRONMENTAL
170 KEYLAND COURT
BOHEMIA, NEW YORK 11716
TEL (631) 289-8800 FAX (631) 289-1599
1560 BROADWAY, SUITE 1024
NEW YORK, NEW YORK 10036
TEL (212) 201-7905 FAX (212) 201-7906

Scale in Feet
0 40 80 200
SCALE: 1" = 250'

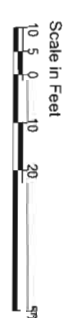
IMPACT ENVIRONMENTAL





Legend

- Injection Point to 80 ft BEG
- Injection Point to 120 ft BEG
- Injection Point to 160 ft BEG

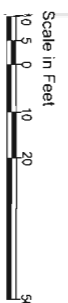
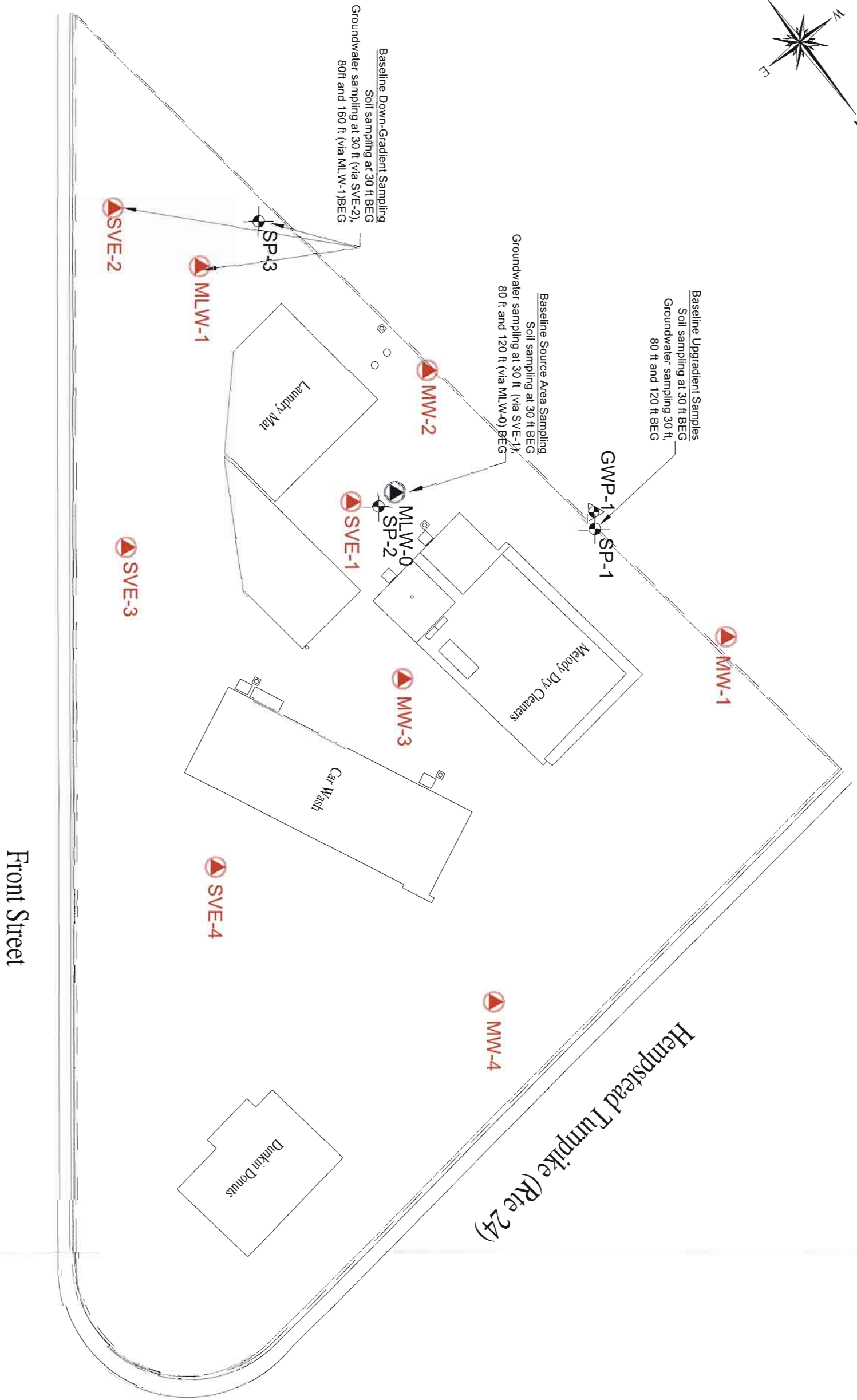
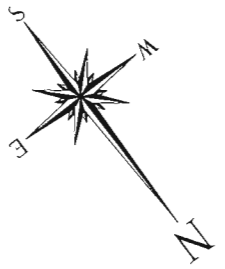


IMPACT ENVIRONMENTAL
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 NEW YORK, NEW YORK 10036
 TEL (212) 201-7905 FAX (212) 201-7906

TITLE:
ISCO Implementation Plan
*Melody Cleaners Site
 East Meadow, New York*

DRAWN BY: WF
 CHECKED BY: KK
 DATE: 10-21-2009
 SCALE: 1" = 40'

PROJECT #	04-455
Figure #	05



IMPACT ENVIRONMENTAL
170 KEYLAND COURT
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TEL (631) 269-8800 FAX (631) 269-1599

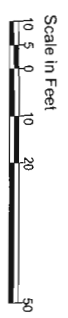
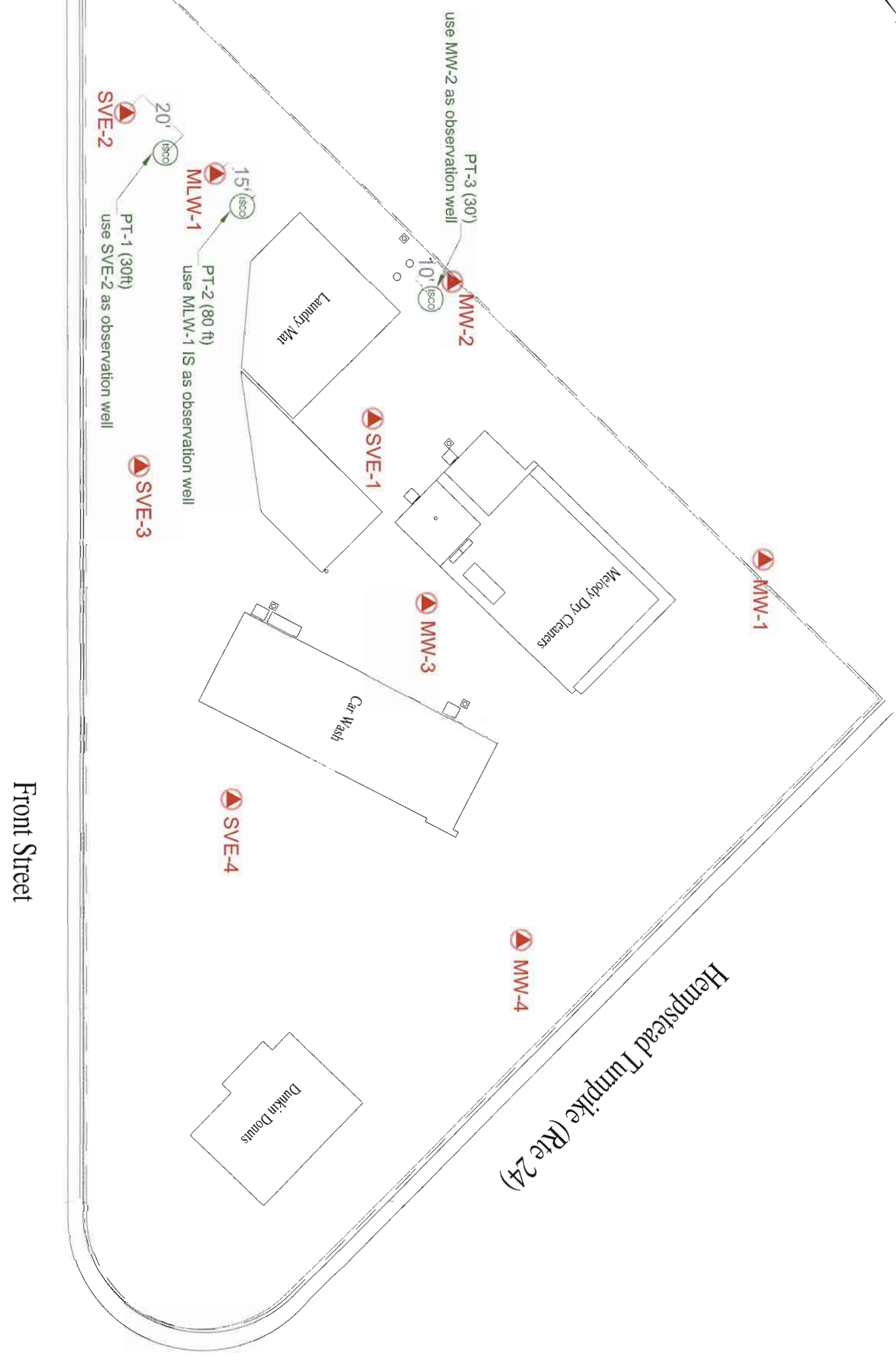
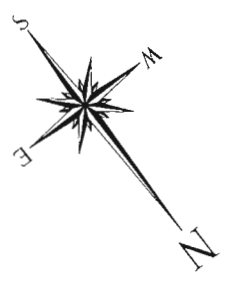
1560 BROADWAY, SUITE 1024
NEW YORK, NEW YORK 10036
TEL (212) 201-7905 FAX (212) 201-7906

TITLE:
Baseline Sampling Plan

*Melody Cleaners Site
East Meadow, New York*

DRAWN BY:	WF
CHECKED BY:	KK
DATE:	10-21-2009
SCALE:	1" = 40'

PROJECT #	04-455
Figure #	06



 <p>IMPACT ENVIRONMENTAL 170 KEYLAND COURT BOHEMIA, NEW YORK 11716 TEL (631) 269-8800 FAX (631) 269-1599</p> <p>1560 BROADWAY, SUITE 1024 NEW YORK, NEW YORK 10036 TEL (212) 201-7905 FAX (212) 201-7906</p>	TITLE:	PROJECT #	04-455
	Pilot Test Plan	Figure #	07
Melody Cleaners Site East Meadow, New York	DRAWN BY: WF		
	CHECKED BY: KK		
	DATE: 10-21-2009		
	SCALE: 1" = 40'		

Tables

Melody Cleaners Site
East Meadow, New York

Table 1: Sampling Sequence
Melody Cleaners Site
East Meadow, New York

Sampling Sequence	Area	Matrix	Well ID / Boring ID	Sampling Depth (ft)	Sampling Technique	Field Measurement	Analyzing Parameters
Baseline Sampling	Up Gradient	Groundwater	GWP-1	30	direct push, standard	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				80	direct push, standard	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				120	direct push, standard	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
Baseline Sampling	Source Area	Soil	SP-1	30	direct push, standard	NA	8260, metals, SOD, COD
				30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				80	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				120	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				30	direct push, standard	NA	8260, metals, SOD, COD
				30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
Pilot Testing	Down Gradient	Groundwater	SVE-2	30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				80	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				160	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				30	direct push, standard	NA	8260, metals, SOD, COD
				80	data logger	water level, pH, temp, DO, redox, turbidity	NA
				30	data logger	water level, pH, temp, DO, redox, turbidity	NA
Performance Monitoring	Zone-1	Groundwater	SVE-2	30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				80	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				30	data logger	water level, pH, temp, DO, redox, turbidity	NA
				80	data logger	water level, pH, temp, DO, redox, turbidity	NA
				120	data logger	water level, pH, temp, DO, redox, turbidity	NA
Post Injection Sampling	Zone-1	Groundwater	SVE-2	30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				80	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				120	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				30	data logger	water level, pH, temp, DO, redox, turbidity	NA
				80	data logger	water level, pH, temp, DO, redox, turbidity	NA
				160	data logger	water level, pH, temp, DO, redox, turbidity	NA
Performance Monitoring	Zone-2	Groundwater	MLW-1 IS	30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				80	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				160	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				30	data logger	water level, pH, temp, DO, redox, turbidity	NA
				80	data logger	water level, pH, temp, DO, redox, turbidity	NA
				120	data logger	water level, pH, temp, DO, redox, turbidity	NA
Performance Monitoring	Zone-2	Groundwater	MLW-1 IS	30	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				80	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				160	low flow	pH, temp, DO, redox, salinity, EC, turbidity, H2	8260, metals
				30	data logger	water level, pH, temp, DO, redox, turbidity	NA
				80	data logger	water level, pH, temp, DO, redox, turbidity	NA
				160	data logger	water level, pH, temp, DO, redox, turbidity	NA

APPENDICES

Appendix A

RegenOx™ Specifications

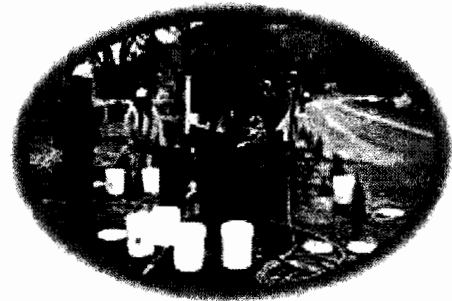
RegenOx™

CHEMICAL OXIDATION REDEFINED...

RegenOx™ is an advanced in situ chemical oxidation technology designed to treat organic contaminants including high concentration source areas in the saturated and vadose zones*

PRODUCT FEATURES:

- Rapid and sustained oxidation of target compounds
- Easily applied with readily available equipment
- Destroys a broad range of contaminants
- More efficient than other solid oxidants
- Enhances subsequent bioremediation
- Avoids detrimental impacts to groundwater aquifers



RegenOx product application

HOW IT WORKS:

RegenOx maximizes in situ performance using a solid alkaline oxidant that employs a sodium percarbonate complex with a multi-part catalytic formula. The product is delivered as two parts that are combined and injected into the subsurface using common drilling or direct-push equipment. Once in the subsurface, the combined product produces an effective oxidation reaction comparable to that of Fenton's Reagent without a violent exothermic reaction. RegenOx safely, effectively and rapidly destroys a wide range of contaminants in both soil and groundwater (Table 1).

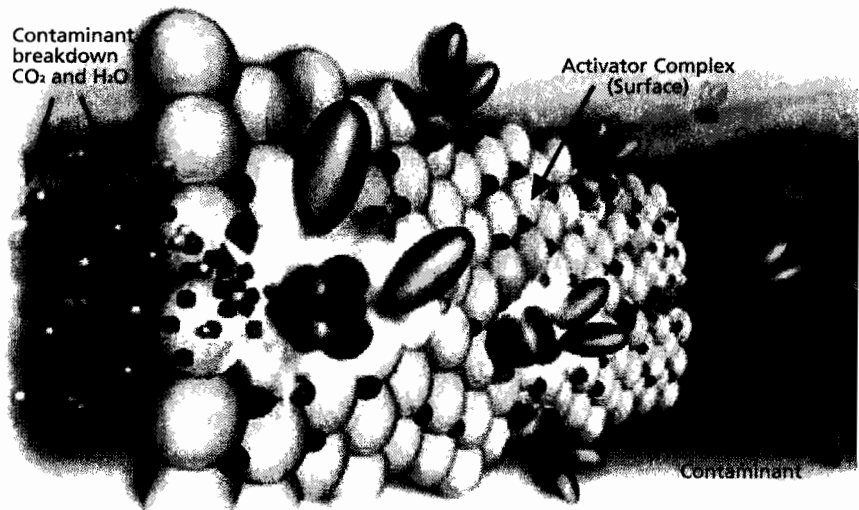
ACHIEVES RAPID OXIDATION VIA A NUMBER OF MECHANISMS

RegenOx directly oxidizes contaminants while its unique catalytic complex generates a suite of highly charged, oxidative free radicals that are responsible for the rapid destruction of contaminants. The mechanisms by which RegenOx operates are:

- Surface-Mediated Oxidation: (see Figure 1 and description below)
- Direct Oxidation: $C_2Cl_4 + 2 Na_2CO_3 + 3 H_2O_2 + 2 H_2O \leftrightarrow 2CO_2 + 4 NaCl + 4 H_2O + 2 H_2CO_3$
- Free Radical Oxidation:
 - Peroxyhydroxyl Radical ($HO_2\bullet$)
 - Hydroxyl Radical ($OH\bullet$)
 - Superoxide Radical ($O_2\bullet^-$)

Figure 1. Surface-Mediated Oxidation is responsible for the majority of RegenOx contaminant destruction. This process takes place in two stages. First, the RegenOx activator complex coats the subsurface. Second, the oxidizer complex and contaminant react with the activator complex surface destroying the contaminant.

Figure 1. RegenOx™ Surface-Mediated Oxidation



* Patent applied for



From Mass Reduction to Bioremediation:

RegenOx™ is an effective and rapid contaminant mass reduction technology. A single injection will remove significant amounts of target contaminants from the subsurface. Strategies employing multiple Regenox injections coupled with follow-on accelerated bioremediation can be used to treat highly contaminated sites to regulatory closure. In fact, RegenOx was designed specifically to allow for a seamless transition to low-cost accelerated bioremediation using any of Regenesis controlled release compounds.

Significant Longevity:

RegenOx has been shown to destroy contaminants for periods of up to one month.

Product Application Made Safe and Easy:

RegenOx produces minimal heat and as with all oxidants proper health and safety procedures must be followed. The necessary safety guidance accompanies all shipments of RegenOx and additional resources are available on request. Through the use of readily available, highly mobile, direct-push equipment and an array of pumps, RegenOx has been designed to be as easy to install as other Regenesis products like ORC® and HRC®.

Effective on a Wide Range of Contaminants:

RegenOx has been rigorously tested in both the laboratory and the field on petroleum hydrocarbons (aliphatics and aromatics), gasoline oxygenates (e.g., MTBE and TAME), polyaromatic hydrocarbons (e.g., naphthalene and phenanthrene) and chlorinated hydrocarbons (e.g., PCE, TCE, TCA).

Oxidant Effectiveness vs. Contaminant Type:

Table 1

Contaminant	RegenOx™	Fenton's Reagent	Permanganate	Persulfate	Activated Persulfate	Ozone
Petroleum Hydrocarbons	A	A	B	B	B	A
Benzene	A	A	D	B	B	A
MTBE	A	B	B	C	B	B
Phenols	A	A	B	C	B	A
Chlorinated Ethenes (PCE, TCE, DCE, VC)	A	A	A	B	A	A
Chlorinated Ethanes (TCA, DCA)	A	B	C	D	C	B
Polycyclic Aromatic Hydrocarbons (PAHs)	A	A	B	B	A	A
Polychlorinated Biphenyls (PCBs)	B	C	D	D	D	B
Explosives (RDX, HMX)	A	A	A	A	A	A

Based on laboratory kinetic data, thermodynamic calculations, and literature reports.

Oxidant Effectiveness Key:

- A = Short half life, low free energy (most energetically favored), most complete
- B = Intermediate half life, low free energy, intermediate degree of completion
- C = Intermediate half life, intermediate free energy, low degree of completion
- D = Long half life, high free energy (least favored), very low degree of completion



Advanced Technologies for Groundwater Resources

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Appendix B

Manufacturer Recommended Direct-Push ISCO Implementation Process



CHEMICAL OXIDATION REDEFINED

RegenOx™ *In Situ* Chemical Oxidation Application Instructions

Using Direct-Push Injection (Step-by-Step Procedures)

RegenOx™ is the new generation of chemical oxidation. RegenOx™ is a proprietary (patent-applied-for) *in situ* chemical oxidation process using a solid oxidant complex (sodium percarbonate/catalytic formulation) and an activator complex (a composition of ferrous salt embedded in a micro-scale catalyst gel). RegenOx™ with its catalytic system has very high activity, capable of treating a very broad range of soil and groundwater contaminants including both petroleum hydrocarbons and chlorinated solvents.

Instructions

- 1) Prior to the installation of RegenOx™, any surface or overhead impediments should be identified as well as the location of all underground structures. Underground structures include but are not limited to utility lines; tanks; distribution piping; sewers; drains; and landscape irrigation systems. The planned installation locations should be adjusted to account for all impediments and obstacles. These considerations should be part of the SSHP or HASP.
- 2) Pre-mark the installation locations, noting any points that may have different vertical application requirements or total depth.
- 3) Set up the direct push unit over each point and follow the manufacturer standard operating procedures (SOP) for the direct push equipment. Care should be taken to assure that probe holes remain in the vertical.
- 4) For most applications, RegenesiS suggests using 1.5-inch O.D./0.625-inch I.D drive rods. However, some applications may require the use of 2.125-inch O.D./1.5-inch I.D. or larger drive rods.
- 5) Advance drive rods through the surface pavement, as necessary, following SOP.
- 6) Push the drive rod assembly with an expendable tip to the desired maximum depth. RegenesiS suggests pre-counting the number of drive rods needed to reach depth prior to starting injection activities.
- 7) After the drive rods have been pushed to the desired depth, the rod assembly should be withdrawn three to six inches. Then the expendable tip can be dropped from the drive rods, following SOP. If an injection tool was used instead of an expendable tip, the application of material can take place without any preliminary withdrawal of the rods.



REGENESIS

- 8) In some cases, introduction of a large column of air prior to RegenOx™ application may be problematic because the air can block water flow to the treatment area. This is particularly the case in deep injections (>50 ft) with large diameter rods (>1.5-inch O.D.). To prevent the injection of air into the aquifer during RegenOx™ application, as well as to prevent problems associated with heaving sands, fill the drive rods with water, or the RegenOx™ mixture prior dropping the expendable tip or exposing the injection tool.
- 9) The RegenOx™ percent of the oxidizer in solution should range between 3% to 5%. Although solutions up to 8% may be used, this will likely increase the difficulty of injection due to reactivity. Solutions with greater than 8% oxidizer in solution will result in excess reaction and flocculation prior to injection and are not typically recommended

Measure the appropriate quantity of RegenOx™ Oxidizer for one to four vertical foot of injection into a 55 gallon drum or mixing tank. The volume of water per injection location can be calculated from the following formula:

$$\frac{\text{RegenOx Oxidizer lbs/foot}}{(8.34 \text{ lbs/gal water})(\% \text{ RegenOx_Oxidizer solids})} [1 - (\% \text{ RegenOx_Oxidizer solids})]$$

Tighter formations (clays and silts), and even some fine sand formations will likely require higher oxidant percentages since less volume can be injected per location. The following are guides to various RegenOx™ mixing ratios based on the above equation.

- to make a roughly 3% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 38 gallons of water.
 - to make a roughly 4% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 28 gallons of water.
 - to make a roughly 5% oxidant solution for every 10 lbs of oxidant and 10 lbs of activator (20 lbs total RegenOx™), use 22 gallons of water.
- 10) Pour the pre-measured quantity of RegenOx™ Oxidizer into the pre-measured volume of water to make the desired target % oxidant in solution. NOTE: always pour the Oxidizer into water, do not pour water into the Oxidizer. Mix the water and oxidant with a power drill and paint stirrer or other mechanical mixing device to ensure that the Oxidizer has dissolved in the water.



REGENESIS

- 11) Pour the applicable quantity of the pre-mixed RegenOx™ Activator into the oxidant:water solution. Mix the Oxidant and Activator using a power drill paint stirrer or other mechanical mixing device for at least 5 minutes until a homogenous mixture is formed. After mixing the RegenOx™ mixture should be injected into the subsurface as soon as possible.
- 12) Do not mix more RegenOx™ material than will be used over roughly 1 to 4 feet of injection so as to minimize potential above ground reaction/flocculation prior to injection.

Transfer the contents of the mixing tank to the pump using gravity feed or appropriate transfer pump. (See Section 9.2: Pump Selection) For some types of pumps, it may be desirable to perform a volume check prior to injecting RegenOx™

- 13) Connect the delivery hose to the pump outlet and the delivery sub-assembly. Circulate RegenOx™ through the hose and the delivery sub-assembly to displace air in the hose. NOTE: an appropriately sized pressure gauge should be placed between the pump outlet and the delivery sub-assembly in order to monitor application pump pressure and detect changes in aquifer backpressures during application.
- 14) Connect the sub-assembly to the drive rod. After confirming that all of the connections are secure, pump the RegenOx™ through the delivery system to displace the water/fluid in the rods.
- 15) Slowly withdraw the drive rods. Commonly RegenOx™ injection progress at 1-foot intervals. However, continuous injection while slowly withdrawing single lengths of drive rod (3 or 4 feet) is an acceptable option. The pre-determined volume of RegenOx™ should be pumped into the aquifer across the desired treatment interval.
- 16) Remove one section of the drive rod. The drive rod may contain some residual RegenOx™. Place the RegenOx™-filled rod in a clean, empty bucket and allow the RegenOx to drain. Eventually, the RegenOx™ should be returned to the RegenOx™ pump hopper for reuse.
- 17) Monitor for any indications of aquifer refusal. This is typically indicated by a spike in pressure as indicated or (in the case of shallow applications) RegenOx™ “surfacing” around the injection rods or previously installed injection points. At times backpressure caused by reaction off-gassing will impede the pumps delivery volume. This can be corrected by bleeding the pressure off using a pressure relief/bypass valve (placed inline between the pump discharge and the delivery sub-assembly) and then resume pumping. If aquifer acceptance appears to be low, as indicated by high back pressure, allow sufficient time for the aquifer to equilibrate prior to removing the drive rod.



REGENESIS

- 18) Repeat steps 13 through 23 until treatment of the entire contaminated vertical zone has been achieved. It is recommended that the procedure extend to the top of the capillary fringe/smear zone, or to the top of the targeted treatment interval.
- 19) Install an appropriate seal, such as bentonite, above the RegenOx™ material through the entire vadose zone. Prior to emplacing the borehole seal, we recommend placing clean sand in the hole to the top of the RegenOx™ treatment zone (especially important in holes that stay open). Bentonite chips or granular bentonite should be placed immediately above the treatment zone, followed by a cement/bentonite grout to roughly 0.5 feet below ground surface. Quick-set concrete should then be used as a surface seal.
- 20) Remove and clean the drive rods as necessary.
- 21) Finish the borehole at the surface as appropriate (concrete or asphalt cap, as needed). We recommend a quick set concrete to provide a good surface seal with minimal set up time.
- 22) A proper borehole and surface seal assures that the RegenOx™ remains properly placed and prevents contaminant migration from the subsurface. Each borehole should be sealed immediately following RegenOx™ application to minimize RegenOx™ surfacing during the injection process. If RegenOx™ continues to “surface” up the direct push borehole, an appropriately sized (oversized) disposable drive tip or wood plug/stake can be used to plug the hole until the aquifer pressures equilibrates and the RegenOx™ stops surfacing. If wells are used for RegenOx™ injection the RegenOx™ injection wells and all nearby groundwater monitoring wells should be tightly capped to reduce potential for surfacing through nearby wells.
- 23) Periodically compare the pre- and post-injection volumes of RegenOx™ in the holding tank or pump hopper using the pre-marked volume levels. Volume level may not be present on all tanks or pump hoppers. In this case, volume level markings can be temporarily added using known amounts of water and a carpenter’s grease pencil (Kiel crayon).
- 24) Move to the next probe point, repeating steps 8 through 29. We recommend that the next RegenOx™ injection point be as far a distance as possible within the treatment zone from the previous RegenOx™ injection point. This will further minimize RegenOx™ surfacing and short circuiting up an adjacent borehole. When possible, due to the high volumes of liquid being injected, working from the outside of the injection area towards the center will limit expansion of the plume.



Pump Selection

Regenesis has evaluated a number of pumps and many are capable of delivering RegenOx™ to the subsurface at a sufficient pressure and volumetric rate. However, even though a number of the evaluated pumps may be capable of delivering the RegenOx™ to the subsurface based on adequate pressures and delivery rates, each pump has its own set of practical issues that may make it more or less difficult to manage in a field setting.

In general, Regenesis strongly recommends using a pump with a pressure rating of 200 pounds per square inch (psi) in sandy soil settings, and 800 psi in silt, clay or weathered bedrock settings. Any pump under consideration should have a minimum delivery rate of 5 gallons per minute (gpm). A lower gpm rated pump may be used; however, they are not recommended due to the amount of time required to inject the volume of liquids typically associated with a RegenOx™ injection (i.e. 1,000 lbs of RegenOx™ [500 lbs Oxidant/500 lbs Activator] require roughly 1,100 gallons of water to make a 5% Oxidant solution).

Quite often diaphragm pumps are used for the delivery of chemical oxidants. Generally, these pumps operate pressures from 50-150 psi. Some of these pumps do not have the pressure head necessary to overcome the back pressure encountered in silt and clay lenses. In these cases the chemical oxidant thus ends up being delivered to the surrounding sands (the path of least resistance) and is not delivered to soil with residual adsorbed contamination. The use of a positive displacement pump such as a piston pump or a progressing cavity pump is may be superior because these pumps have the pressure necessary to overcome the resistance of low permeability soils. NOTE: be aware that application at pressures that are too high may over-consolidate the soil and minimize the direct contact of the oxidant. The key is to inject at a rate and pressure that maximizes the radius of influence without causing preferential flow. This can be achieved by injecting at the minimum pressure necessary to overcome the particular pressures associated with your site soil conditions.

Whether direct injection or wells are used, it is best to start by injecting RegenOx™ outside the contaminated area and spiral laterally inwards toward the source. Similarly, RegenOx™ should be applied starting vertically at the bottom elevation of contamination, through the layer of contamination, and a couple of feet above the layer of contamination. The reagents can be pushed out from the well bore with some water.

Pump Cleaning

For best results, flush all moving parts and hoses with clean water at the end of the day; flush the injection system with a mixture of water and biodegradable cleaner such as Simple Green.

For more information or technical assistance please call Regenesis at 949-366-8000

Appendix C

Third Party Data Validator 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

January 1998 to Present JMS Environmental Services, Inc. 41 Kenosia Ave, Danbury, CT
Laboratory Manager - Responsible for overall 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 received from laboratories. Also, primary 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.