July 28, 2015

Mr. Manfred Magloire
Environmental Engineer
New York State department of Environmental Conservation
47-40 21st Street
Long Island City, NY 11101

Re: Remedial Investigation Work Plan
2002-2024 Cropsey Avenue Site
NYSDEC BCP # C224169

Dear Mr. Magliore:

Enclosed please find the final Remedial Investigation Work Plan (RIWP) for the referenced site. The RIWP has been signed and sealed by Daniel Smith a New York licensed professional engineer.

Thank you for your assistance in coordinating project activities. We look forward to working with you and your office on the implementation of the upcoming remedial investigation. If you have any questions or comments, please do not hesitate to contact me at (631) 567-1777 extension 6503.

Sincerely,
Apex Companies, LLC.

Roland Costanzo
New York Division Manager

cc: J. Coghlan / Sive Paget
P. Neglia 2002-2024 Cropsey Avenue Site

cropsey extension 111714.docx

REMEDIAL INVESTIGATION WORK PLAN

2002-2024 Cropsey Avenue Site
Brooklyn, New York
NYSDEC BCP # C224169

Prepared for:

Mr. Peter Neglia
2002 Cropsey Associates, LLC
2611 West 2^{nd} Street
Brooklyn, New York 11223

and

Mr. Manfred Magloire
NYS Department of Environmental Conservation
Division of Environmental Remediation, Region 2
47-40 21^{st} Street
Long Island City, New York 11101

Prepared by:

Apex Companies, LLC
120-D Wilbur Place
Bohemia, New York 11716

Date Submitted:
April 2015

APEX

Remedial Investigation Work Plan
2002-2024 Cropsey Avenue Site
Brooklyn, New York

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CERTIFICATION

I Daniel Smith certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

DANIEL J. SMITH, P.E.

Name

7/28/15

Signature

STATE OF NEW YORK
DANIEL J. SMITH
073173
LICENSED PROFESSIONAL ENGINEER

7/28/15

Date

REMEDIAL INVESTIGATION WORK PLAN:

2002-2024 CROPSEY AVENUE SITE
CROPSEY AVENUE, BROOKLYN NEW YORK

NYSDEC BCP# C224169

EXECUTIVE SUMMARY

Apex Companies LLC. (Apex) has prepared this Remedial Investigation (RI) Work Plan for the 2002-2024 Cropsey Avenue Site (the Site) located at 2002-2024 Cropsey Avenue, Brooklyn, New York. This plan was prepared on behalf of 2002 Cropsey Associates, LLC. The Site occupies Block 6467, Lot 1, and is located along Cropsey Avenue between Bay 25th Street and 20th Avenue. The Site location is shown on **Figure 1**.

Three (3) environmental site characterizations (ESCs) were conducted at the Site between 2004 and 2013. Based on the findings of the ESCs and a June 2, 2014 meeting between the New York State Department of Environmental Conservation (NYSDEC), 2002 Cropsey Associates, LLC, and Apex, a RI will be conducted on three (3) parcels: 2002 – 2024 Cropsey Avenue (Block 6467, Lot 1 – the Site), and two adjacent lots: 8831 and 8841 20th Avenue (Block 6467, Lot 12) and 2036 Cropsey Avenue (Block 6469, Lot 1) located along Cropsey Avenue, 20th Avenue and Bay 25th Street **(Figure 2).**

The investigation activities outlined in this RI Work Plan will provide data to address the following objectives:

- Determine the nature and extent of compounds of concern (COCs) in soil, groundwater, and soil vapor; the RI will be conducted on Site, as well as on adjacent properties and down gradient of the Site;

- Evaluate groundwater quality by installing one (1) water-table monitoring well adjacent to 20th Street. Data collected from the well will be used to supplement data collected during previous investigations and to develop a further understanding of the local groundwater flow regime;

- Assess potential impacts to human health and the environment as a result of the release of COCs at the Site; and

- Collect data sufficient to make decisions regarding remediation of the site, and to perform an alternatives analysis of potential remedial actions.

Previous data collected at the Site indicates that operations at a former dry cleaner (located at 2022 Cropsey Avenue) are likely sources of the volatile organic compound (VOC) releases detected by the ESCs. VOC impacts above standards, criteria and guidance (SCGs) were observed in borings advanced within the dry cleaner and exterior of the site building to the south as illustrated in Figures 6 and 7. These COCs were identified in soil, groundwater, sub-slab soil vapor and indoor air.

To determine the extent of the VOC impacted soil, groundwater, and soil vapor, Apex proposes to complete the following:

- Install eight (8) Membrane Interface Probes (MIPs). MIP data will assist Apex in determining the extent of subsurface contamination and in determining the best locations to install the proposed groundwater monitoring wells. The MIP borings will extend to at least 20 feet below the water table (estimated at 19 to 20 feet below ground surface (bgs) and may be extended deeper if real-time data indicate the possibility of deeper impacts and/or the presence of non-aqueous phase liquids (NAPL);

- Install three (3) soil vapor sampling points (SV-6 to SV-8) to assist Apex in the design of an on-Site sub-slab depressurization system. The installation and operation of the sub-slab depressurization system at the Site will be implemented as an Interim Remedial Measure (IRM);

- Install three (3) soil vapor sampling points (SV-9 to SV-11) at the adjacent properties to evaluate for the absence or presence of VOC impacts;

- Drill three (3) additional soil borings (SB-1, SB-2, SB-3) in the basement slab of the dry cleaner space to horizontally delineate the VOC impacted soils in the suspected source area. Soil samples will be collected and submitted to a laboratory for VOC analysis

- Install one (1) monitoring well hydraulically upgradient of the site, to confirm the site-specific groundwater flow direction. This planned well is also needed to ensure that the groundwater flow direction is consistent over the wider proposed investigation area; and,

- Install six (6) additional downgradient monitoring wells (MW-5 to MW-10) as shown on **Figure 3**, to confirm the hydraulic gradient, to develop a further understanding of the groundwater flow regime and to determine how groundwater influences the nature and extent of contamination and related contaminant transport. The screened interval(s) of these wells will be dependent on the results of the MIP.

- To determine if there are any other contaminants of concern three additional soil borings will be advanced on the site to collect soil samples for SVOC, metals, pesticide /herbicide and PCB analysis. Ground water from MW-2 will also be analyzed for these parameters.

Upon completion of data collection and analysis, a qualitative human health exposure assessment (QHHEA) will be performed and an exposure assessment report will be prepared and included with the RI Report. The QHHEA will be conducted in accordance with NYSDEC DER-10 (NYSDEC, 2010). The purpose of the QHHEA is to determine whether Site conditions pose an unacceptable hazard to potentially exposed receptor populations. To pose an unacceptable hazard to receptor populations, the receptor must be exposed to contaminants at the Site. The QHHEA will evaluate whether complete exposure pathways exist at the Site and identify constituents of potential concern (COPCs) for those receptors and media of concern where a complete exposure pathway exists (NYSDEC, 2010).

Once sufficient information is collected to complete the RI and address the RI objectives, the RI Report will be prepared and submitted to the NYSDEC for review. The RI Report will incorporate the ESC data generated prior to the RI, will be prepared following applicable NYSDEC guidance.

REMEDIAL INVESTIGATION WORK PLAN:

2002-2024 CROPSEY AVENUE SITE
CROPSEY AVENUE, BROOKLYN NEW YORK
NYSDEC BCP# C224169

1.0 INTRODUCTION

Apex Companies LLC. (Apex) prepared this Remedial Investigation (RI) Work Plan for the 2002-2024 Cropsey Avenue Site (the Site) located at 2002-2024 Cropsey Avenue, Brooklyn, New York. The Site is located along Cropsey Avenue between Bay 25th Street and 20th Avenue. The Site location is shown on ***Figure 1***. The responsible party for the Site is known as 2002 Cropsey Associates, LLC.

The RI Work Plan was prepared in accordance with the requirements of NYSDEC Brownfield Cleanup Program (BCP) on behalf of 2002 Cropsey Associates LLC (the Participant). The Participant was accepted in the NYSDEC BCP on August 4, 2014 and a Brownfield Cleanup Agreement (BCA) was executed with the NYSDEC on September 30, 2014.

Environmental Site Characterizations investigations (ESCs) were completed at the Site between 2004 and 2013. Based on the findings of the ESCs and a June 2, 2014 meeting between the NYSDEC 2002 Cropsey Associates, LLC, and Apex, the RI will be conducted on three (3) parcels: 2002 – 2024 Cropsey Avenue (Block 6467, Lot 1: the Site), 8831 and 8841 20th Avenue (Block 6467, Lot 12) and 2036 Cropsey Avenue (Block 6469, Lot 1) located along Cropsey Avenue, 20th Avenue and Bay 25th Street (***Figure 2*)**.

1.1 Objectives

The investigation activities presented in this RI Work Plan will provide data to address the following objectives:

- Determine the nature and extent of compounds of concern (COCs) in soil, groundwater, and soil vapor; the RI will be conducted on Site, as well as on adjacent properties and down gradient of the Site;
- Collect data sufficient to make decisions regarding remediation of the site, and to perform an alternatives analysis of potential remedial actions.

Install one (1) upgradient groundwater monitoring well adjacent to 20th Street. Data collected from the well will be used to develop a further understanding of the groundwater flow regime; and

- Assess potential impacts to human health and the environment as a result of the release of COCs at the Site.

1.2 RI Work Plan Organization

This RI Work Plan was prepared in accordance with NYSDEC, Division of Environmental Remediation, and DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, May 2010).

This RI Work Plan is organized into the following sections:

- Section 2 summarizes the ESCs completed prior to the preparation of this RI Work Plan, the Site description and history, geology, and hydrogeology;
- Section 3 presents a preliminary conceptual site model (CSM);
- Section 4 discusses the applicable New York State standards, criteria, and guidance (SCGs);
- Section 5 discusses the approach and goals of the RI;
- Section 6 presents the proposed RI scope of work and the planned field activities
- Section 7 presents the Project Management Plan and anticipated schedule;
- Section 8 presents the references used to develop the RI Work Plan;
- Appendix A – Merritt Limited Investigation report, completed by others, which presents the results of a limited subsurface investigation completed in February 2012;
- Appendix B – (Previously Provided Under Separate Cover) Apex Limited Phase II report describes all the ESCs performed to date;
- Appendix C – Field Sampling Plan (FSP) describes detailed field procedures and protocols that will be followed during the field activities and provides standard operating procedures (SOPs);
- Appendix D - (Under Separate Cover) Quality Assurance Project Plan (QAPP) presents the analytical methods and procedures that will be used to analyze soil, groundwater, soil vapor, and ambient air samples collected during the field activities;
- Appendix E – Community Air Monitoring Plan (CAMP) presents air monitoring and response efforts to detect and mitigate potential airborne releases of COCs during the field activities;
- Appendix F (Under Separate Cover) – Health and Safety Plan (HASP) presents the site-specific procedures to protect Site workers conducting the RI field activities; and

- Appendix G (Under Separate Cover) – Citizen Participation Plan (CPP) promotes communication among all parties involved with, or affected by, contamination at the Site.
- Appendix H – an inventory of the tenants currently operating at the subject property

2.0 SITE DESCRIPTION AND HISTORY

This section of the RI Work Plan presents the Site setting, a summary of the Site history, current Site conditions, and geologic and hydrogeological conditions in the Site vicinity, and summarizes the ESCs that were completed prior to the preparation of this RI Work Plan. The site location is presented in ***Figure 1*.**

2.1 Site Setting

The Site is located at 2002-2024 Cropsey Avenue in the Borough of Brooklyn, New York City, New York and occupies a parcel that is identified by Tax Map Number: Block 6467, Lot 1. The Site consists of a single-story multi-unit retail building which has a full basement and encompasses approximately 15,000 square feet.

The Site is bounded by Cropsey Avenue to the northeast, 20th Avenue to the northwest, a residential building with subgrade parking to the southwest, and Bay 25th Street to the southeast. Local groundwater flow is expected to be generally from the north and moving towards Gravesend Bay.

The elevation of the Site is approximately 20 feet above mean sea level (msl). Surface topography consists of a gentle downward slope to the south towards Gravesend Bay, which is approximately 1,000 feet from the Site. A narrow undeveloped strip of land extends along the entire south (rear) side of the Site building and is not part of the site property. The layout of the Site and surrounding properties is presented on ***Figure 2***. Currently, the Site is developed with a retail shopping center. Land use and zoning at the Site and the other properties in the area is commercial and residential.

2.2 Site History

This section discusses the historical use of the Site, with emphasis on the former dry cleaner operations. The information reviewed to produce this summary included:

- Sanborn fire insurance maps;
- Aerial photographs; and
- EDR database records.

Based on a review of available historical information, the Site was vacant land prior to the construction of the current structures in 1950. The site buildings configuration and site use have been relatively unchanged since 1950. At least four dry cleaners have operated at the Site: Augies Cleaners (1991 to1996), Michaels Cleaners (1996 to 2005), Ida Cleaners (2005 to 2007) and GLY Cleaners (2007 to current). No information is available regarding tenants at the Site prior to 1991.

2.3 Current Conditions

The Site is currently occupied by a retail shopping center. The majority of the Site is either paved or developed with buildings, with the exception of a strip of vacant/undeveloped land located at the rear of the Site **(*Figure 3*)**.

Current shopping center tenants include a luncheonette and restaurant, a nail salon, convenience / drug store, distributors / traders, and a dry cleaner (not the same as the historic dry cleaner associated with contamination at the site). A list of the tenants and a diagram showing each's location at the shopping center are provided in Appendix H. The current dry cleaner operation, GLY Cleaners, consists of a closed loop hydrocarbon cleaning system. GLY Cleaners also offers tailoring services.

2.4 Geology

This section of the RI Work Plan describes the regional and local geology.

2.4.1 Regional Geology

The unconsolidated geologic deposits underlying Brooklyn consist of clay, silt, sand, and gravel that overlie southward-dipping consolidated bedrock. The crystalline bedrock consists mainly of Precambrian age granite, gneiss, and schist. The overlying unconsolidated sediments were deposited during the Cretaceous and form, in a descending order, the Raritan and Magothy Formations. During the Pleistocene, several episodes of glaciation eroded the Cretaceous deposits (Smolensky, et al, 1989). The oldest Pleistocene deposit is the Jameco Gravel (Jameco aquifer), which overlies the Magothy Formation and Raritan Clay and is present only in western Long Island. The Gardiners Clay overlies the Jameco Gravel, Magothy Formation, and Raritan Clay (a confining unit). The Upper Pleistocene deposits formed when the glacial ice and glacial melt water deposited till and outwash material, forming what is presently known as the Upper Glacial aquifer. The Raritan Formation consists of the Lloyd Sand and the Raritan Clay. The Lloyd aquifer (the hydrogeologic equivalent of the Lloyd Sand) consists of fine to coarse sand, gravel, commonly with a clayey matrix, and lenses and layers of silty and solid clay. The Raritan Clay is regionally continuous and consists of silty and solid clay, and lenses and layers of sand. Because of its low permeability, the Raritan Clay serves as a confining unit for the underlying Lloyd Sand. The Magothy Formation is a deltaic deposit consisting of fine to medium sand, clayey in part, interbedded with lenses and layers of coarse sand, silt, and sandy and solid clay. Gravel is common in the basal zone of the Magothy Formation. The Jameco aquifer (the hydrogeologic equivalent of the Jameco Gravel) is a channel filling consisting of fine to very coarse sand and gravel with few layers of clay and silt (Smolensky, et al, 1989). The Gardiners Clay is a lagoonal/shallow-bay clay consisting of clay, silt, and few layers of sand and gravel (Smolensky, et al, 1989). The Upper Glacial aquifer consists primarily of till and glacial outwash deposits. The till, composed of clay, sand, gravel, and boulders, forms the Harbor Hill and Ronkonkoma terminal moraines. These terminal moraines represent the farthest advance of late-Pleistocene glaciation on Long Island. South of the moraine deposits is a glacial outwash plain, which, in Kings County, extends from the Harbor Hill moraine to Jamaica Bay and New York Bay, and consists of fine to very coarse sand and pebble to boulder sized gravel (Smolensky, et al, 1989).

2.4.2 Local Geology

The Site is located south of the Harbor Hill terminal moraine and the surficial deposits consist of glacial outwash deposits (Upper Glacial aquifer) at the Site. Based on a review of the U.S. Geological Survey publication titled *Hydrologic Framework of Long Island, New York, U.S. Geological Survey Hydrologic Investigations Atlas HA-709* (Smolensky, et al, 1989), bedrock beneath the Site is expected to occur at an approximate elevation of 650 feet below msl. The Lloyd aquifer, which overlies bedrock, has a surface elevation of approximately 500 feet below msl. The Raritan Clay has a surface elevation of approximately 400 feet below msl. The Magothy aquifer has a surface elevation of approximately 250 feet below msl. The Jameco aquifer has a surface elevation of approximately 200 feet below msl. The Gardiners Clay has a surface elevation of approximately 150 feet below msl. The Upper Glacial aquifer corresponds to the saturated upper part of the highly permeable Pleistocene deposits of sand and gravel.

Based on the soil borings installed during the ESCs, fine to coarse sand deposits (glacial outwash deposits [Upper Glacial aquifer]) were encountered. Apex encountered approximately five (5) to seven (7) feet of fill in the upper portion of the soil borings. No confining layers were observed during the ESC drilling activities. Soil borings were advanced to 20 feet bgs.

2.5 Hydrogeology

The principal aquifers underlying the Site are the Upper Glacial aquifer, Jameco aquifer, and Magothy aquifer. The Gardiners Clay hydraulically confines the Magothy and Jameco aquifers in most of Brooklyn; the Jameco aquifer and Magothy aquifer hydrogeologic units are in direct hydraulic connection with each other. Groundwater in the Upper Glacial aquifer occurs under unconfined conditions at and near the Site. Within the project area, the average horizontal hydraulic conductivity of the Upper Glacial aquifer is approximately 270 feet per day (ft/d), with an anisotropy ratio of approximately 10:1 (horizontal to vertical, respectively) (McClymonds and Franke, 1972). The average horizontal hydraulic conductivity of the Jameco aquifer in the project area is approximately 200 to 300 ft/d, with an anisotropy ratio of approximately 10:1 (horizontal to vertical, respectively) (McClymonds and Franke, 1972). The average horizontal hydraulic conductivity of the Magothy aquifer in the project area is approximately 50 ft/d, with an anisotropy ratio of approximately 100:1 (horizontal to vertical, respectively) (McClymonds and Franke, 1972).

The Site is located approximately 1,000 feet northeast of Gravesend Bay. Based on the previous environmental investigations, ground water was encountered at 10 to 20 ft bgs and the shallow groundwater flow direction is inferred to be generally toward the southeast, toward Gravesend Bay. A component of this RI Work Plan is to confirm actual groundwater flow with the installation of an upgradient well and several downgradient wells.

2.6 Previous Investigations

This section of the work plan discusses the previous ESCs performed at the site.

2.6.1 Merritt Limited Investigation

Merritt Environmental Consulting Corp. (Merritt) conducted a limited Subsurface Investigation on February 27, 2012, to evaluate groundwater quality conditions downgradient of the GLY Cleaners facility (included as **Appendix A**). The Merritt report indicated that the groundwater flow direction in the vicinity of the Site was not determined during their investigation, but was believed to be "*from roughly north to south towards Gravesend Bay"* which would place the current GLY Cleaners facility (and location of former dry cleaning operations that were the suspected source of environmental impact) hydraulically upgradient of the adjacent residential properties to the south. Accordingly, it appears as if two of the three borings performed by Merritt were conducted at the side yard of the 8831 and 8841 20th Avenue properties in what was believed by Merritt to be hydraulically down gradient of GLY Cleaners.

The soil/groundwater samples collected by Merritt were field screened; however none of the soil samples were reportedly submitted for laboratory analyses. Tetrachloroethylene (PCE) was detected in all three groundwater samples with the highest concentration recorded at 63,000 micrograms per liter (µg/L). This groundwater sample was collected from the rear of the dry cleaner's space and is assumed to be hydraulically downgradient of the rear of the dry cleaner. The NYSDEC Class GA Groundwater Quality Standard (GWQS) for PCE is 5 µg/L.

Following review of data generated by Merritt, which indicated elevated compound concentrations in the soil borings, NYSDEC Spill No. 11-13648 was assigned to the Site. ***Figure 4*** presents Merritt's sampling locations.

2.6.2 Apex Limited Phase II Environmental Site Assessment

Apex completed a soil vapor intrusion (SVI), soil and groundwater investigation on the Site from July 11, 2012 to July 13, 2012. Apex installed three (3) interior soil borings, six (6) exterior soil borings, three (3) groundwater monitoring wells and five (5) sub slab probes. The complete Apex Limited Phase II ESA is attached as ***Appendix B*** of this RI Work Plan.

SVI Sampling

Soil vapor and indoor air quality (IAQ) samples were collected from five (5) co-located locations within the on- site dry cleaner and at the adjacent residential parking garage closest to the dry cleaner facility (located at 8841 20th Avenue). The adjacent building is a multi-level residential apartment building with a subterranean parking garage. There are no residences in the basement area.

Two locations were sampled in the dry cleaner facility. At each of the locations, a SV and an IAQ sample were collected. As shown on ***Figure 5***, at Location 1, IAQ-1 and SV-1 were collected and at Location 2, IAQ and SV-2 were collected. Similarly, three sets of samples (IAQ and SV) were collected at the adjacent residential parking garage. These samples are identified as IAQ-3/SV-3, IAQ-4/SV-4 and IAQ-5/SV-5. ***Figure 5*** presents the locations of all the sampling points.

The SVI sampling results indicated the presence of elevated PCE and trichloroethene (TCE) concentrations in the soil vapor underlying the dry cleaner and the parking garage. The highest concentrations of PCE and TCE in soil vapor and from samples located beneath the dry cleaner's unit were 420,000 micrograms per cubic meter µg/m^3 and 6,600 µg/m^3. The highest soil vapor concentrations from samples collected beneath the residential structures were detected under the parking garage at 8841 20th Avenue. PCE concentrations of 210,000 µg/m^3 and TCE concentration of 790 µg/m^3 were detected. Elevated levels of PCE and TCE were also noted in the indoor air quality (IAQ) samples collected in the basement of the dry cleaner. The highest concentrations in IAQ samples were 100 µg/m^3 PCE and 18 µg/m^3 TCE. The IAQ samples collected within the parking garage at the residential building did not exhibit elevated levels of PCE or TCE. The maximum concentrations of the parking garage IAQ samples were 4.3 µg/m^3 PCE and 1.1 µg/m^3 TCE. **(*Figure 5*)**

Based on the high concentrations of compounds detected in the sub-slab samples it is very likely that soil vapor contamination extends further to the south and, most likely, further to the east from the source at of the dry cleaner facility. The delineation of the extent of elevated soil vapor concentrations of PCE and TCE is one focus of this RI.

Soil Sampling

- Twelve (12) soil borings were advanced and samples were collected from these borings **(*Figure 6*)**. In general, there was minimal soil contamination detected by Apex during the ESCs, with the exception of one area located beneath the dry cleaner basement. PCE was detected at 14,000 micrograms per kilogram (µg/kg) at a depth of three (3) feet to four (4) feet below grade surface (bgs), which exceeded the NYS Protection of Groundwater (SCO) for PCE of 1.3 ppm. All other VOCs in all other soil sample locations were either: non-detectable above the method reporting limit; detected well below their respective SCOs; or, detected at low concentrations in blank samples as well as the characterization samples.

Groundwater Sampling

Apex collected nine (9) groundwater samples to assess groundwater quality; three (3) from the newly installed monitoring wells (MW-1, MW-2, and MW-3) and six (6) from temporary wells that originated as soil borings. All samples were sent to the NYS ELAP certified laboratory for NYS TCL VOCs and NYS TCL SVOCs analyses. PCE concentrations in groundwater exceeded the Class GA GWQS of 5 µg/L in all nine (9) samples with the highest results detected at MW-1 (2,500 µg/L) and MW-2 (1,400 µg/L). TCE concentrations exceeded the Class GA GWQS of 5 µg/L in three (3) of the nine (9) wells. Cis-1,2-dichlorethene (a PCE degradation product) was also detected above its respective Class GA GWQS of 5 µg/L in the same wells as the PCE and TCE exceedances.

The highest concentrations of PCE in the groundwater samples were detected near the courtyard area (located behind the rear dry cleaner door) as well as further to the southwest and southeast. PCE concentrations exceeded 1,000 µg/L along the southeast property line indicating probable off-site migration of the groundwater plume to the south and east, consistent with the inferred groundwater flow direction.

The groundwater concentrations in the sample collected from the expected upgradient well (MW-3) contained a PCE concentration of 14 µg/L. All SVOCs compound concentrations were below their respective Class GA GWQS ***(Figure 7).***

3.0 PRELIMINARY CONCEPTUAL SITE MODEL

This section of the RI Work Plan discusses the preliminary Conceptual Site Model (CSM) for the Site.

The purpose of the preliminary CSM is to describe the release(s) of COCs to the environment, and the nature and degree of the release. The releases occurred due to unknown circumstances. The preliminary CSM also serves as the basis for determining additional site characterization needs; therefore, the preliminary CSM is the basis for the scope of work that is presented in this RI Work Plan.

Based upon past investigations, PCE was found to be the primary COC in soil vapor, soil and groundwater at the Site. The likely source of the PCE is the operations of a former dry cleaning tenant at the location currently occupied by GLY Cleaners, an unrelated dry cleaning operation. Dry cleaner operations reportedly have not used PCE since 2003; however, based on Apex's file reviews, PCE was used at the facility prior to 2003. The current dry cleaner tenant began operations in 2007.

Confirmation of the former dry cleaner operations as the primary source of contamination will be evaluated further by the completion of this RI Work Plan. The RI activities will also focus on characterization sampling at the Site and off site, to further delineate the extent of impacts noted during prior investigations and to ensure protection of adjacent residents from possible SVI concerns.

As stated in ***Section 2.6.1***, Merritt conducted a limited Subsurface Investigation on February 27, 2012, to evaluate groundwater quality conditions downgradient of GLY Cleaners. Merritt's report indicated that the groundwater flow direction in the vicinity of the Site was not fully determined during their investigation. Accordingly, it appears as if two (2) of the three (3) borings installed by Merritt (Boring B2 and Boring B3) were conducted on the side yard of 8831 and 8841 20th Avenue (**See Figure 4**) in what was believed at the time by Merritt to be hydraulically downgradient of GLY Cleaners. Following review Merritt's data it is understood that the NYSDEC was contacted and Spill No. 11-13648 was assigned to the Site.

Based solely on the results of the Merritt investigation, it appears that groundwater is impacted on the Site by halogenated VOCs (i.e., 63,000 µg/L PCE in the B3 groundwater sample and 720 µg/L PCE in the B2 groundwater sample – ***Figure 4)***. The suspected source of the halogenated VOCs detected in the groundwater is the former dry cleaning operations at the site. Merritt environmental investigation did not provide sufficient information to confirm the specific source, nature and extent of impacts, nor did it delineate the extent of contamination on the Site. Additional sampling completed by Apex and as detailed in ***Section 2.6.2*** documented the presence of impacts to soil, soil vapor and groundwater. However, the extent of the impacted media was not fully determined during Apex's ESCs and will be completed by the scope of this proposed RI.

4.0 PROJECT OBJECTIVES & STANDARDS, CRITERIA AND GUIDANCE

This section of the RI Work Plan outlines the investigation objectives.

4.1 Remedial Investigation Objectives

In accordance with DER-10, a RI is necessary where data indicate disposal of contaminants at the site has occurred and contamination is potentially present at levels and/or at frequencies sufficient for DER to require a full delineation of the nature and extent of the contamination, to allow a decision by DER regarding any necessary remediation. On this site, the applicable objectives of the RI are:

- Delineation of the areal and vertical extent of contaminants in all media at or emanating from the site;
- Determination of the surface and subsurface characteristics of the site, including topography, geology and hydrogeology, including depth to groundwater;
- Identification of the sources of contamination, migration pathways, and actual or potential receptors of contaminants on or through air, soil, groundwater, utilities, and structures at a contaminated site, without regard to property boundaries;
- Collection and evaluation of data necessary to evaluate the actual and potential threats to public health and the environment; and,
- Collection of data necessary to evaluate any release to an environmental medium and develop remedial alternative(s) to address the release.

It is important to note that some of this information has already been obtained through work completed historically at the site. Historic work will be summarized in the RI Report to be issued upon completion of the activities outlined herein to provide a comprehensive summary of site conditions in one document.

4.2 Remedial Action Objectives (RAOs)

Although the extent, if any, of remediation to be completed has not yet been defined, it is beneficial to establish Remedial Action Objectives (RAOs) at the onset of the RI to ensure that data obtained are directly related to the ultimate goal of remediating the property. In accordance with DER-10, RAOs must consider the following:

- Applicable Standards, Criteria and Guidance (SCGs) considering the current, intended and reasonably anticipated future use of the site and its surroundings;
- All contaminants exceeding applicable SCGs;
- Environmental media impacted by such contaminants;
- Extent of the impact to the environmental media;
- All actual or potential human exposures and/or environmental impacts resulting from the contaminants in environmental media identified above; and,
- Any site-specific cleanup levels developed.

The RAOs identified in ***Sections 4.2.1 through 4.2.3*** are applicable at the site and may be updated following completion of the RI.

4.2.1 Groundwater RAOs

The following RAOs shall apply to groundwater:

- *RAO for Public Health Protection:* (1) Prevent contact with, or inhalation of, volatiles from contaminated groundwater; and,
- *RAO for Environmental Protection:* (1) Restore the groundwater aquifer to pre-disposal / pre-release conditions or applicable regulatory criteria to the extent practicable, and (2) Remove the source of ground or surface water contamination to the extent practicable.

4.2.2 Soil RAOs

The following RAOs shall apply to soil:

- *RAO for Public Health Protection:* (1) Prevent ingestion / direct contact with contaminated soil; and, (2) Prevent inhalation of, or exposure from, contaminants volatilizing from contaminants in soil.
- *RAO for Environmental Protection:* (1) Prevent migration of contaminants that would result in groundwater or surface water contamination.

4.2.3 Soil Vapor RAOs

The following RAOs shall apply to soil vapor:

- *RAO for Public Health Protection:* (1) Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into the building(s) at the site.

4.3 Standards, Criteria and Guidelines

Standards, Criteria and Guidance (SCGs) are defined as "mean standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable, or that are not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with, and with consideration being given to guidance determined, after the exercise of scientific and engineering judgment, to be applicable." SCGs are essentially similar to the CERCLA concept of Applicable or Relevant and Appropriate Requirements (ARARs).

The most common SCGs applicable in New York State and at the Site are the following:

- Soil: SCOs and supplemental SCOs identified in 6 NYCRR 375-6.8 and the Commissioner's Policy on *Soil Cleanup Guidance* (CP- 51);

- Groundwater: Groundwater cleanup guidelines and standards identified in the form of Class GA Groundwater Quality Standards / Guidelines in TOGS 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, June 1998, as amended; and,

- Soil Vapor / Indoor Air Quality: NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, as amended.

In addition to the regulatory SCGs identified above, the follow regulations *may* also apply to the remedy selection and implementation process that will be better defined following completion of the RI:

- New York Codes, Rules and Regulations (NYCRR) Part 175 - Special Licenses and Permits--Definitions and Uniform Procedures;

- NYCRR Part 371 - Identification and Listing of Hazardous Wastes;

- NYCRR Part 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998);

- NYCRR Subpart 374-1 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities;

- NYCRR Part 375 - Environmental Remediation Programs;

- NYCRR Part 376 - Land Disposal Restrictions;

- NYCRR Part 608 - Use and Protection of Waters;

- NYCRR Parts 700-706 - Water Quality Standards;

- NYCRR Part 750 through 758 - Implementation of NPDES Program in NYS (SPDES Regulations);

- Code of Federal Regulations (CFR) Part 1910.120 - Hazardous Waste Operations and Emergency Response; and,

- CFR Part 144 - Underground Injection Control Program

Formal regulations are not the only SCGs that may be applicable. The following regulatory guidance documents *may* be applicable and also will be considered in the final remedy design and implementation:

- United States Environmental Protection Agency (USEPA) Office of Solid Waste and Emergency Response (OSWER) Directive 9355.047FS Presumptive Remedies: Policy and Procedures;

- USEPA OSWER Directive 9355.048FS Presumptive Remedies: Site Characterization and Technology Selection for CERCLA sites with Volatile Organic Compounds in Soils;

- Department of Environmental Remediation (DER)-10 - Technical Guidance for Site Investigation and Remediation;

- DER-10 – Technical Guidance for Site Investigation and Remediation

- DER-15 - Presumptive/Proven Remedial Technologies;

- Technical and Administrative Guidance Memorandum (TAGM) 4013 - Emergency Hazardous Waste Drum Removal/ Surficial Cleanup Procedures;

- TAGM 4059 - Making Changes To Selected Remedies;

- TAGM 3028 - "Contained In" Criteria for Environmental Media: Soil Action Levels;

- TOGS 1.1.1 - Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations;

- TOGS 1.3.8 - New Discharges to Publicly Owned Treatment Works;

- TOGS 2.1.2 - Underground Injection/Recirculation (UIR) at Groundwater Remediation Sites;

- Commissioners Policy (CP) - 43 - Groundwater Monitoring Well Decommissioning Procedures;

- CP-51 - Soil Cleanup Guidance;

- Air Guide 1 - Guidelines for the Control of Toxic Ambient Air Contaminants;

- Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook;
- OSWER Directive 9200.4-17 - Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites; and,
- NYSDOH Environmental Health Manual CSFP-530 - "Individual Water Supplies - Activated Carbon Treatment Systems".

It should be noted that these SCGs are only potentially applicable at this stage of the remedial investigation program and a more detailed applicability review will be completed as part of the future Remedial Design / Remedial Action (RD/RA) process.

5.0 OVERVIEW OF REMEDIAL INVESTIGATION APPROACH

To successfully meet the RI objectives in an effective manner, additional data will be collected. The data collected during the previous investigations (by Merritt and Apex) provided an initial characterization of the existing conditions. The previous investigation data were used to develop the RI scope of work proposed in this RI Work Plan. This approach ensures that the most complete and recent data set is embedded within the decision-making process so that a complete and focused RI is performed and provides a sound technical basis for the field efforts based on the best available data.

The findings of previous investigations at the Site have been discussed in ***Section 2*****,** to fully describe the rationale behind the work to be performed as part of this RI. The investigation planned for the Site will be implemented in two phases. The decision-making process for the RI activities are as follows:

Phase 1

- Soil vapor sampling will be conducted concurrently with the installation of MW-4 and the collection of additional soil samples in the basement of the dry cleaner. Proposed soil vapor samples SV-7 and SV-8 are to be installed to the north and west of the former S-1 location, SV-6 is to be installed in a location to be determined within the western portion of the Site to obtain data to assist Apex in the design of a sub-slab depressurization system for the entire shopping center site as an Interim Remedial Measure (IRM) **(*Figure 3*).**

- SVI sampling will be conducted upon approval of this work plan. The Participant owners the commercial facility and will be provided access to the residential buildings. Sampling will coincide with the heating or cooling season. Three additional hand core sample will be collected from beneath the slab and north, west, and east of the former S-1 location. This is where the highest PCE concentrations in soil were historically detected (***Figure 3*****).**

- MW-4 is being installed first to allow Apex to confirm the site-specific groundwater flow direction. Using the confirmed flow direction the locations of the proposed monitoring well locations MW-5 through MW-10 as well as the proposed Membrane Interface Probe (MIP) locations, will be finalized in coordination with NYSDEC.

- Eight (8) MIP locations are indicated on Figure 3. MIP locations will be finalized once the updated groundwater flow direction data is obtained. The MIP borings will be extended to at least 20 feet below the water table and may be extended deeper if real-time data indicate the possibility of deeper impacts.

Phase 2

- Collected data will be reviewed in coordination with NYSDEC to optimize the locations and depths for any additional monitoring wells. At this time, Apex is contemplating installing and sampling six (6) additional groundwater monitoring wells (MW-5 through MW-10) to determine the extent of the plume in the down gradient direction and to define the lateral extent of the plume. These well locations are subject to change based upon MIP data review, as well as other site data developed during Phase 1. In addition, the need for vertical definition of the plume (i.e., well cluster installation at select locations) will also be made following review of Phase 1.

5.1 RI Supporting Documents

This section of the RI Work Plan describes the proposed RI scope of work. The scope of work includes investigation on three (3) parcels: 2002 – 2024 Cropsey Avenue (Block 6467, Lot 1: the Site), 8831 and 8841 20th Avenue (Block 6467, Lot 12) and 2036 Cropsey Avenue (Block 6469, Lot 1) located along Cropsey Avenue, 20th Avenue and Bay 25th Street.

The following subsections of this RI Work Plan describe, in detail, the rationale for the proposed RI scope of work. Detailed field methodologies and SOPs are provided in ***Appendix C*** of this RI Work Plan (Field Sampling Plan [FSP]). Quality assurance/quality control (QA/QC) procedures and protocols, analyte lists, analytical methods, and sample handling procedures are provided in ***Appendix D*** of this RI Work Plan (Quality Assurance Project Plan [QAPP]). Air monitoring and response efforts to protect the downwind community during the field activities are provided in ***Appendix E*** of this RI Work Plan (Community Air Monitoring Plan [CAMP]). Health and safety procedures are provided in ***Appendix F*** of this RI Work Plan (Health and Safety Plan [HASP]). Community outreach and participation activities are provided in ***Appendix G*** of this RI Work Plan (Citizen Participation Plan [CPP]).

5.2 Utility Clearance / Markouts

Field personnel will mobilize to verify existing Site conditions and label and/or mark the proposed sample or monitoring well locations shown on **Figure 3**. Once the sample locations are marked, New York's Dig Net of New York City & Long Island will be contacted to mark underground utilities in areas where intrusive activities (i.e., drilling, soil sampling, well installation, soil vapor sampling) will occur. The Site property owners, adjacent property owners and/or private vendors will be contacted for assistance with mark out of utilities. Once the utilities are marked, equipment and personnel necessary to accomplish the RI activities will be mobilized to the Site. Given the numerous utilities likely present in this urban setting, a geophysical survey will be performed at subsurface sample locations. The borings will be cleared of utilities to a depth of five feet bgs by soft dig techniques (e.g., hand excavation, air knife).

5.3 Site Geophysical Survey

A geophysical survey will be conducted at each proposed boring location to evaluate the presence of underground utilities. The geophysical survey techniques utilized for this task may include the use of one or more of the following techniques: ground-penetrating radar (GPR), cable avoidance tools, electromagnetics and magnetometry. The actual techniques utilized will be dependent upon the nature of the target of concern.

The area of potential drilling locations (e.g., MIP, monitoring well locations) will be included in the geophysical survey in order to clear them for the presence of sub-surface utilities.[1]

5.4 Soil Vapor Intrusion (SVI) Investigation

Completion of a SVI screening investigation at the areas of concern will be performed in accordance with New York State Department of Health (NYSDOH) "*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*," October 2006 as amended.

5.5 Membrane Interface Probe (MIP) Investigation

The MIP measures soil conductivity and reports this parameter along with the output from VOC detectors. Data are plotted as a function of depth below ground surface. With these data, Apex can identify changes in soil permeability as well as elevated levels of VOCs. The data collected in the field can be immediately downloaded into software that presents a two- or three-dimensional interpretation of soil conductivity and detector response as a function of depth. The results of the MIP investigation will assist Apex in determining the locations of high-concentration source areas of contaminated soil or groundwater during the second phase of the RI.

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[1] In accordance with prevailing regulations, Dig Safe will also be provided with sufficient notification to allow for the mark out of sub-grade utilities.

5.6 Limited Soil Investigation

As a result of the previous environmental investigations an extensive amount of data exists concerning the Site soil conditions. For this reason, the proposed soil investigation is limited to one area which was not previously delineated. The primary area of the focus of the additional soil investigation work to be performed is the basement of current GLY Cleaners property (SB1 – SB3). Additional sampling may be required depending on the MIPs results.. Although soil contamination was detected in other areas of the Site, the level of sampling performed to date is sufficient to delineate the nature and extent of soil impacts in these areas. In addition to the above, a soil sample will be collected from SB-1 and two other locations exterior of the building, one in the vicinity of MW-2 and one in the location of MW4; these samples will be analyzed for SVOCs, metals, pesticides/herbicides, and PCBs to ensure that no other COCs are present.

5.7 Groundwater Investigation

The primary objective of the RI groundwater investigation is to fill the data gaps and clarify the vertical and horizontal extent of contamination beneath the Site as well as and downgradient/off-site properties. This objective will be accomplished by installing additional groundwater monitoring wells off-site. A secondary objective of the proposed groundwater investigation will be to better define up gradient VOC concentrations (both horizontally and vertically) and groundwater flow. In addition, a groundwater sample will be collected from existing MW-2 and proposed MW-6, and analyzed for SVOCs, metals, pesticides/herbicides, and PCBs to ensure that no other COCs are present.

6.0 SCOPE OF WORK

This section of the RIWP provides detailed procedures to be implemented to meet the overall project objectives as outlined in the previous sections.

6.1 Proposed Soil Investigation

6.1.1 Soil Boring Installation

Three (3) soil borings are proposed to address what is expected to be the source area. Proposed soil borings SB-1, SB-2 and SB-3 are to be located in the basement of the dry cleaners unit **(*Figure 3*)**. Information from the new soil boring locations will be reviewed in conjunction with data from previous soil borings installed in this area to define the extent of soil contamination in this area. The soil borings will be installed to a maximum depth of five feet below the basement slab and two (2) soil samples will be collected from the soil boring at two (2) feet bgs and five (5) feet bgs and analyzed for VOCs, SVOCs, metals, pesticides/herbicides, and PCBs in accordance with the QAPP

Prior to beginning field work, underground utilities in the vicinity of the drilling areas will be identified. A qualified environmental professional will be onsite during drilling and sampling operations to prepare a boring log for each soil boring location. The proposed soil sampling will be conducted using a hand auger. The sampling location is in a confined area of the basement which cannot be accessed by mechanical drilling equipment. Prior to advancing the boring, the samplers, rods, and augers will be thoroughly decontaminated. Each item will first be scrubbed with an Alconox and deionized water mixture, then rinsed with deionized water. Additional sampling collected specifications are provided in the QAPP.

6.1.2 Analytical Parameters and Rationale

Soil samples submitted to the laboratory for the analysis of for VOCs, SVOCs, metals, pesticides/herbicides, and PCBs in accordance EPA Methods stated on Table 1. QA/QC sample collection and analysis including the collection of trip blanks, field blanks, duplicates, and matrix spike (MS)/matrix spike duplicate (MSD) samples will be conducted at the Site as per the QAPP.

6.2 Proposed MIP Investigation

The MIP system allows for the detection and measurement of VOCs in the subsurface. More specifically, a heated probe carrying a permeable membrane is advanced at each sample location to the require depth. VOCs from the subsurface cross this membrane and are moved into a gas phase detection unit located at the surface being monitored by the sampling technician. The technology allows a determination of the depth and location of contamination. However, the technology provides only qualitative data. Collection and analysis of samples through other means is required to obtain quantitative results. Apex will collect MIP data from eight (8) locations as presented on ***Figure 3***. The MIP sampling will be contracted to a qualified vendor and oversight will be provided by Apex.

Prior to data collection, a response test will be performed. The response test is conducted to show that the integrity of the MIP sampling equipment is intact and working correctly. The response test is a standardized set of procedures in which the trip time is calibrated to a known compound and entered into the MIP system software. The response test will be completed in accordance with the Geoprobe® Membrane Interface Probe Standard Operating Procedure – Technical Bulletin No. NK3010, dated May 2003, revised August 2006 and issued by Geoprobe® Systems.

Once the response test is complete, the MIP sampling system is calibrated and deemed ready, the system will be placed at a one of the four proposed sampling locations (***Figure 3***). Apex plans to advance the MIP probe to a depth of approximately 20 feet below the water table at each location. Depending on the data logged at each location, the probe may be advanced deeper (e.g. if the data indicates the presence of VOCs) to delineate the extent of the impacts. At each location, the system will log the relative concentration of VOCs with depth and in real time.

As stated, the MIP procedures provide qualitative/semi-qualitative data. If, based on the MIP investigation, further quantitative data is deemed appropriate, Apex may recommend the collection of soil samples for submittal to a laboratory for analysis of VOCs as per ***Section 6.1.1***. Prior to the collection of any soil samples to support the MIP data, NYSDEC will be notified and the proposed locations approved**.**

6.3 Proposed Groundwater Investigation

6.3.1 Groundwater Monitoring Well Installation

Seven (7) permanent monitoring wells will be installed at various locations at the Site. The new wells will be strategically placed to determine the extent of the groundwater plume. In addition to the new wells, three (3) existing monitoring wells will also be used for shallow groundwater monitoring. The existing and proposed monitoring well locations are provided on ***Figure 3*.** The following is a description of each proposed well installation and the rationale behind the proposed approach:

- One (1) new monitoring well (designated MW-4) will be installed upgradient to existing monitoring wells MW-1, MW-2, and MW-3. This well is being installed primarily to allow for confirmation of Site specific groundwater flow direction. This information is critical to fully understanding the dynamics of the aquifer system and the three-dimensional transport of contaminants in the region. This well is also critical to the placement of the remaining wells.

- Three (3) new monitoring wells to be designated MW-5, MW-6, and MW-7 will be installed downgradient of the existing wells. Information from these wells will assist Apex in determining the level of contaminants migrating off-site. These well locations will also help to better define the local groundwater flow direction at the southeastern side of the Site. Location of these wells will be confirmed following the MIP study and determination of groundwater flow direction.

- Three (3) new monitoring wells designated MW- 8, MW -9 and MW 10 will be installed further downgradient of the Site to help delineate the outer boundaries of the suspected contaminant plume and help Apex in determining the level of contaminants migrating off-site to the southeast as a function of depth. Location of these wells will be confirmed following the MIP study and determination of groundwater flow direction.

New wells MW 5 through MW-10 will be installed to a depth below grade to be determined by the MIPs study. The wells will be installed as described Monitoring Well Installation SOP (***Appendix C***)

6.3.2 Groundwater Flow and Hydraulic Characteristics

The groundwater flow patterns and hydraulic characteristics beneath the Site will be evaluated by collecting two (2) comprehensive rounds of water-level measurements from the groundwater monitoring wells. Groundwater levels will be measured to the nearest one-hundredth of a foot from a reference point at the top of the inner casing. The water-level measurements will be converted to groundwater elevations based on the surveyed monitoring well measuring point elevations. The groundwater elevation information will be used to evaluate horizontal groundwater flow beneath the Site, to confirm the hydraulic gradient, and to develop a further understanding of the groundwater flow regime and how it influences contaminant transport.

6.3.3 Groundwater Quality Characterization

To determine the nature and extent of dissolved-phase dry cleaner related and/or non-dry cleaner related chemical constituents in groundwater at the Site, one complete round of groundwater sampling will be conducted. The groundwater sampling will be conducted two weeks after completion of the monitoring well installation and development activities to allow for a period of equilibration. The groundwater sampling event will consist of collecting one groundwater sample from monitoring wells MW-1 through MW-10. The wells will be purged and sampled using low-flow methods as described in the Low-Flow Groundwater Purging and Sampling Procedures for Monitoring Wells SOP (***Appendix C***).

The groundwater samples will be submitted to the laboratory for the analysis of VOCs. Additionally samples collected from MW-2, and MW-6 will be analyzed for SVOCs, metals, pesticides/herbicides, and PCBs. Field parameters including pH, oxidation-reduction potential (ORP), temperature, conductivity, dissolved oxygen, and turbidity will be collected during groundwater sampling using the procedures outlined in the Low-Flow Groundwater Purging and Sampling Procedures for Monitoring Wells SOP (***Appendix C***).

6.4 Proposed Soil Vapor Investigation

6.4.1 Soil Vapor Investigation

The proposed soil vapor RI consists of the advancement of several temporary soil vapor points. The locations of the proposed temporary soil vapor points are shown on ***Figure 3*****.**

The temporary exterior soil vapor points will be advanced to a depth of approximately five (5) feet bgs using hand excavation soft dig techniques. The temporary soil vapor points will be constructed of stainless steel screens and Teflon®-lined tubing. The temporary soil vapor points will be installed and sampled using the procedures described in the Subsurface Soil-Gas Sampling and Analysis Using USEPA Method TO-15 – Single Port, Direct Push, Hollow-Stem and Hand Auger Installation SOP (***Appendix C***).

Completion of a SVI screening investigation will be performed in accordance with NYSDOH "*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*," October 2006 as amended. Specifically, Apex proposes:

- Completion of a SVI screening investigation at the southern end of the property located at 8841 20th Avenue (initial sampling locations SV-3/IAQ3, SV-4/IAQ4, and SV-5/IAQ5 - collected in July 2012) and additionally at the property located at 8831 20th Avenue in accordance with NYSDOH Guidance. Specifically, Apex proposes the installation of SV-9 at the property located at 8831 20th Avenue and SV-10 at the southern end of the building located at 8841 20th Avenue; each boring will have a co-located indoor air quality sample collected from within the basement of the structure. If possible, Apex will use one (1) upwind sample for the Site SVI investigations and the length of collection time is eight (8) hours. The four (4) vapor samples will be analyzed by VOCs by EPA Method TO-15.

- Completion of a SVI screening investigation at 2036 Cropsey Avenue in accordance with NYSDOH Guidance. Specifically, Apex proposes installation of one (1) interior sub-slab vapor sample SV-11, and one (1) co-located indoor air quality sample from within the basement of the structure. If possible, Apex will use one (1) upwind sample for the Site SVI investigations. The two (2) vapor samples will be analyzed by VOCs by EPA Method TO-15.

- Completion of a SVI screening investigation (update of previous work completed) at the Site at 2002 to 2024 Cropsey Avenue in accordance with NYSDOH Guidance. Specifically, Apex proposes installation of one (1) interior sub-slab vapor sample SV-6 and (1) co-located indoor air quality samples from within the basement of the structure. Apex proposes installation of two (2) exterior soil vapor samples along the building's outer perimeter. Sample SV-7 will be located along Cropsey Avenue and sample SV-8 will be located on the Bay 20th St. side of the Site. Figure 3 presents the proposed SVI locations. If possible, Apex will use one upwind sample. The vapor samples will be analyzed by VOCs by EPA Method TO-15. This data will be utilized to assist Apex in the design of a sub-slab depressurization system for the entire shopping center site as an Interim Remedial Measure (IRM).

6.5 Laboratory Parameters and Methods

All soil, groundwater, and air samples will be analyzed by a NYSDOH-approved laboratory. The methods listed below include the analyses expected to be performed. The general analytical requirements are summarized in ***Table 1***.

Based upon the results of historic investigations and the former operations at the property currently occupied by GLY site operations, the analytical suite will include VOCs, SVOCs, metals, pesticides/herbicides, and PCBs.

6.6 Management of Investigation-Derived Waste

Investigation-derived waste (IDW) will be containerized in 55 gallon steel drums and staged on site for appropriate characterization and disposal following the procedures outlined in the Investigation-Derived Waste Handling and Storage SOP (***Appendix C***). PPE and spent disposable sampling materials will be segregated and placed in DOT-approved 55-gallon steel drums. Decontamination water and monitoring well purge water will be stored in DOT-approved 55-gallon steel drums. Waste storage containers will be appropriately labeled with the contents, generator, location, and date and properly secured at the site for subsequent off-site transportation and disposal by the contractor.

One representative sample will be collected from the solid IDW (i.e., drill cuttings) and one representative sample will be collected from the liquid IDW (i.e., development water/monitoring well purge water) generated by the field activities. The samples will be submitted to the laboratory for analysis of the parameters required by the off-site disposal facility. Apex will use the analytical results from the waste characterization samples to profile the IDW for disposal as part of a "contained-in" request.

6.7 Data Analysis and Management

Samples will be analyzed in accordance with the analytical methods listed in the QAPP (***Appendix D***). The chemistry data will be transferred from the laboratory and maintained in a database format. The laboratory will provide Electronic Data Deliverables (EDDs), which will be uploaded directly into the database.

The laboratory will produce NYSDEC ASP Category B deliverable packages and will produce Contract Laboratory Program (CLP)-type data packages that will contain all information needed for formal validation of the data. Data validation will be performed on the data in accordance with analytical method performance criteria, laboratory control limits, NYSDEC ASP Revision 2005 requirements, the USEPA's National Functional Guidelines, and USEPA Region 2 SOPs for data validation. These procedures are specific with regard to evaluation of holding time, surrogate and spike recoveries, and precision of duplicate measurements, instrument performance, blank contamination, compound identification, and compound quantification. Data will be qualified as necessary in accordance with the SOPs. Additional information is provided in the QAPP (***Appendix D)***. Following completion of the above validation, data usability summary reports (DUSRs) will be prepared in accordance with DER-10 and appended to the RI Report. All data generated during the RI will be submitted to NYSDEC in the appropriate Electronic Data Deliverable format.

6.8 Remedial Investigation Deliverables

Following full evaluation and analysis of the field and analytical data, a determination will be made as to the validity of the CSM. If it is determined that additional characterization is necessary, those investigative activities will be detailed in a letter submitted to the NYSDEC, as described in ***Section 5.1***. The comprehensive RI Report will be submitted following completion of the RI and a full evaluation of the RI data; the submittal of the RI Report and subsequent approval by the NYSDEC will conclude the RI process.

6.9 Sampling and Analysis Plan

The sampling analysis plan (SAP) is the umbrella document that consists of ***Appendices C and D***. The SAP includes the following elements:

- The FSP (***Appendix C***) defines field sampling and data collection methods and procedures consistent with NYSDEC DER-10 (NYSDEC, 2010).
- The QAPP (***Appendix D***) describes the QA/QC protocols necessary to achieve the data quality objectives.

- The CAMP (***Appendix E***) describes air monitoring and response efforts to provide a measure of protection for the downwind community during performance of the RI consistent with NYSDEC DER-10 (NYSDEC, 2010).
- The HASP (***Appendix F***) presents the site-specific procedures to protect Site workers conducting the RI field activities.
- The CPP (***Appendix G***) was developed in accordance with NYSDEC DER-23 Citizen Participation Handbook for Remedial Programs (NYSDEC, 2010).

6.10 Evaluation of Data Gaps and Refining RI Objectives

During the course of the data collection and evaluation tasks described in previous sections, remaining or new data gaps may be identified. If clear and pertinent data gaps are identified, they will be addressed with the NYSDEC with the goal of limiting the interruption in the field work.

6.11 Human Health Exposure Assessment

Upon completion of data collection and analysis, a qualitative human health exposure assessment (QHHEA) will be performed and an exposure assessment report will be prepared and included with the RI Report. The QHHEA will be conducted in accordance with NYSDEC DER-10 (NYSDEC, 2010). The purpose of the QHHEA is to determine whether Site conditions pose an unacceptable hazard to potentially exposed receptor populations. To pose an unacceptable hazard to receptor populations, the receptor must be exposed to contaminants at the Site. The QHHEA will evaluate whether complete exposure pathways exist at the Site and identify constituents of potential concern (COPCs) for those receptors and media of concern where a complete exposure pathway exists (NYSDEC, 2010).

6.12 Remedial Investigation Report

Once sufficient information is collected to complete the RI and address the objectives of this RI Work Plan, the RI Report will be prepared and submitted to the NYSDEC for review. The RI Report will incorporate the ESC data generated prior to the RI and will be prepared following applicable NYSDEC guidance, and be consistent with the requirements set forth in the NYSDEC BCP.

7.0 PROJECT MANAGEMENT PLAN

For project responsibilities and communication see the organization chart in the QAPP (***Appendix D***). Subcontractors used for specialty services, such as drilling, laboratory analysis, and surveying will be subcontractors that Apex has relied on for similar tasks performed previously. Any subcontractor utilized will meet the requirements of the NYSDEC.

7.1 Project Schedule

The actual project duration will depend on whether additional investigation efforts are required, as described in ***Section 5.1*** of this RI Work Plan.

The NYSDEC will be provided with five (5) days advance notice of the commencement of field work. In general, the sequence of field activities and related rationale for the RI are as follows:

- Conduct pre-field planning including field verification of sampling locations and utility mark-outs;
- Perform RI field work. The RI data will provide information on whether further characterization of COCs is needed;
- If necessary based on the data collected in item 2, prepare a letter detailing additional activities that may be required; and,
- Prepare and issue RI Report.

8.0 REFERENCES

- McClymonds, N.E. and Franke, O.L. 1972. Water-Transmitting Properties of Aquifers on Long Island, New York. United States Geological Survey Professional Paper 627-E.

- New York State Department of Environmental Conservation. 2010. DER-10 Technical Guidance for Site Investigation and Remediation. May 2010.

- New York State Department of Environmental Conservation. 2010. DER-23 Citizen Participation Handbook for Remedial Programs. January 2010.

- New York State Department of Health. 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006.

- Smolensky, D.A., Buxton, H.T., and Shernoff, P.K. 1989. Hydrologic Framework of Long Island, New York. U.S. Geological Survey Hydrologic Investigations Atlas HA-709.

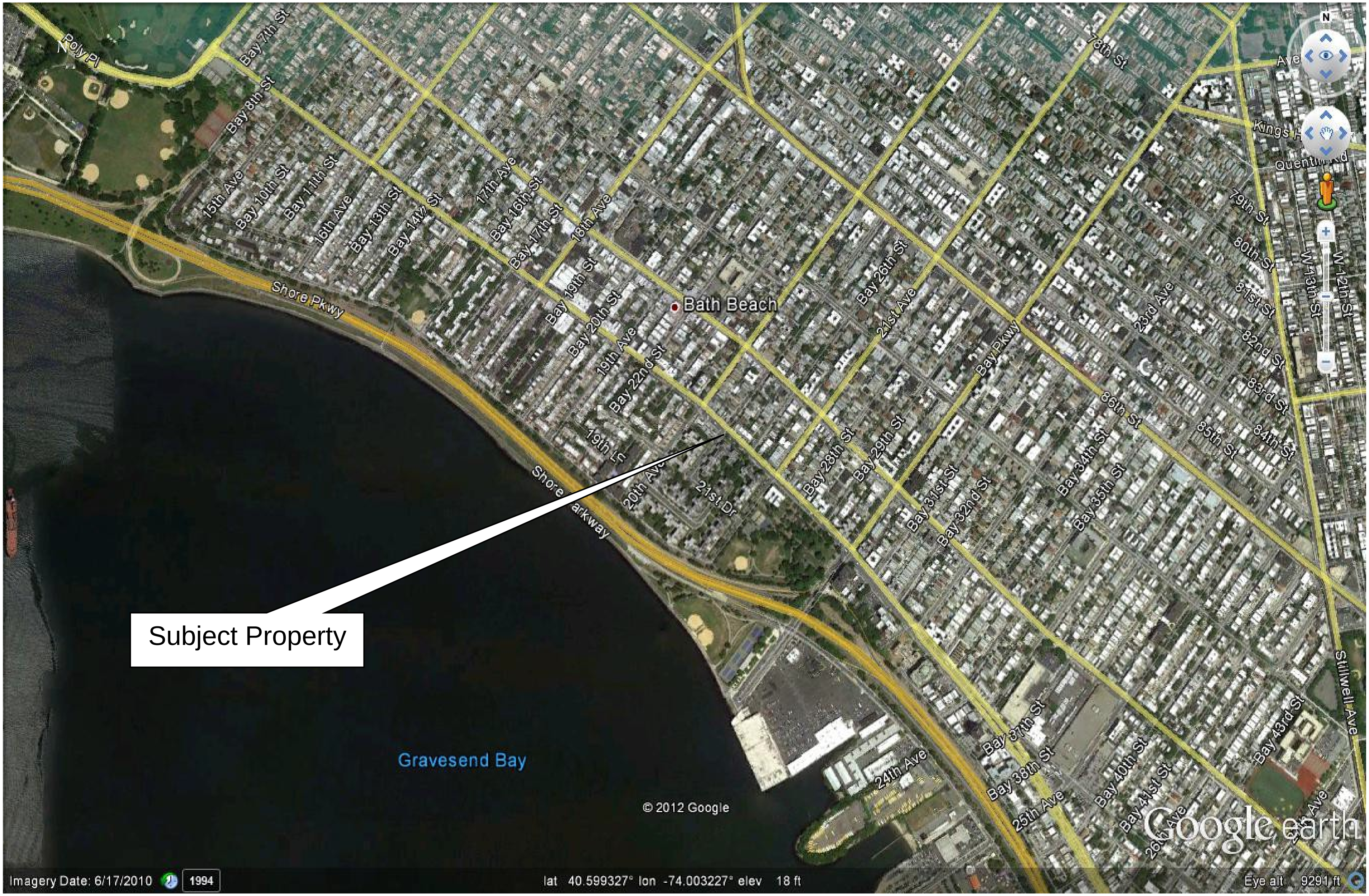
TABLES

Table 1
Analytical Summary

Summary of Sample Containers, Analytical Methods, Preservation, and Holding Times

Parameter	Method	Sample Container	Preservation	Holding Time
Soil				
VOCs	8260C	1 x 2-oz glass jar with Teflon®-lined septa	Cool 4° C	14 Days
SVOCs	8270D	250 ml wide mouth glass container with PTFE lined lid	Cool 4° C	14 Days
PCBs	8082A	250 ml wide mouth glass container with PTFE lined lid	Cool 4° C	14 Days
Metals	6010C	1 x 16 oz. glass container	Cool 4° C	180 Days
Pesticides/Herbicides	8081B/8151A	250 ml wide mouth glass container with PTFE lined lid	Cool 4° C	14 Days
Water				
VOCs	8260C	3 x 40-mL glass vial with Teflon®-lined septa	Cool 4° C, HCL to pH <2	14 Days
SVOCs	8270D	4 x 1- L amber glass container with PTFE lined lid	Cool 4° C	7 Days
PCBs	8082A	4 x 1- L amber glass container with PTFE lined lid	Cool 4° C	7 Days
Metals	6010C	1 x 1-L plastic or glass container	HNO_3, to pH,2, Cool 4° C	180 Days
Pesticides/Herbicides	8081B/8151A	4 x 1- L amber glass container with PTFE lined lid	Cool 4° C	7 Days
Air				
TO-15 VOCs Expanded	TO-15	One (1) 6-L SUMMA® Canister	---	30 Days

FIGURES



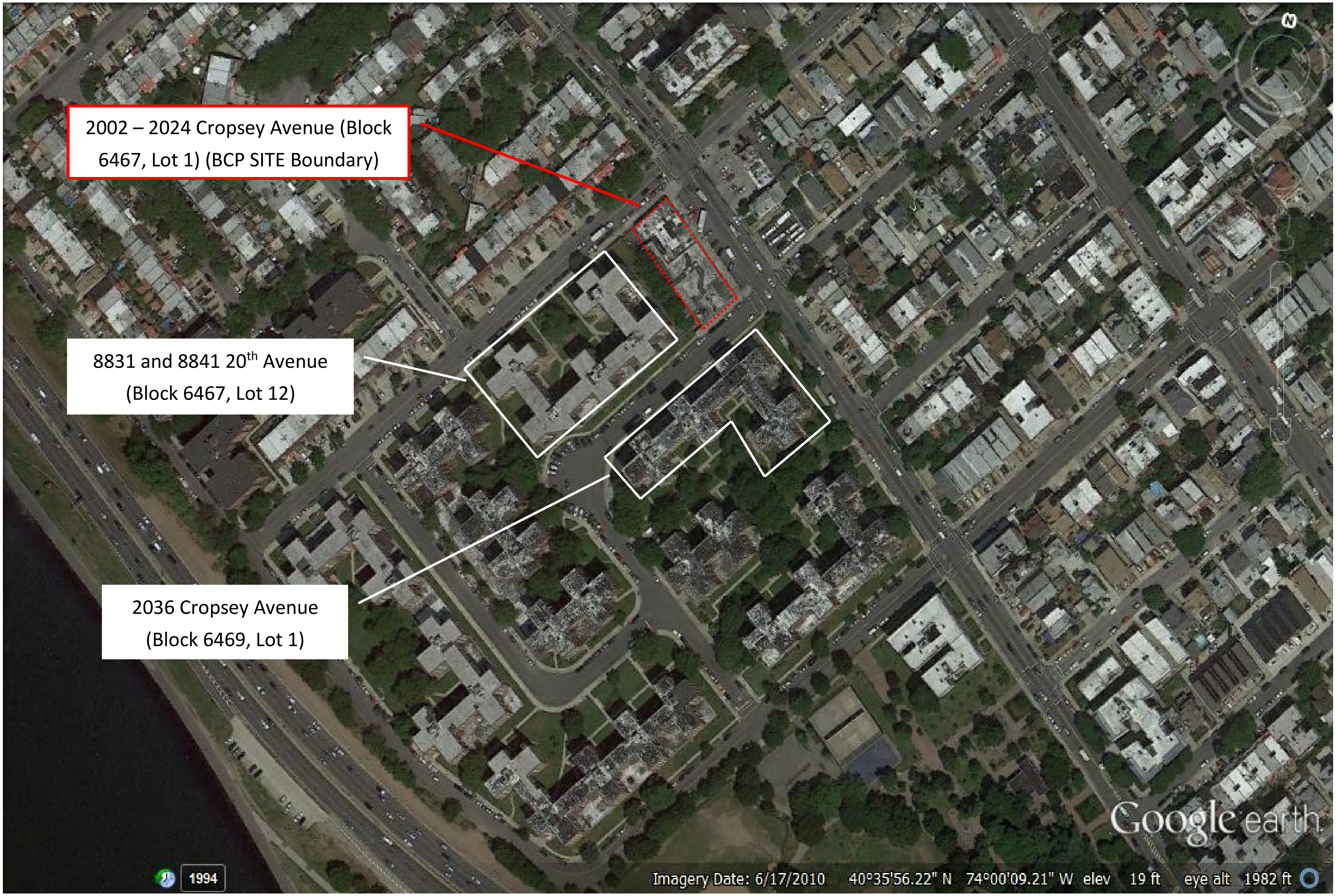
APEX

Site Location Map

2002-2022 Cropsey Avenue, Brooklyn, NY

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 1

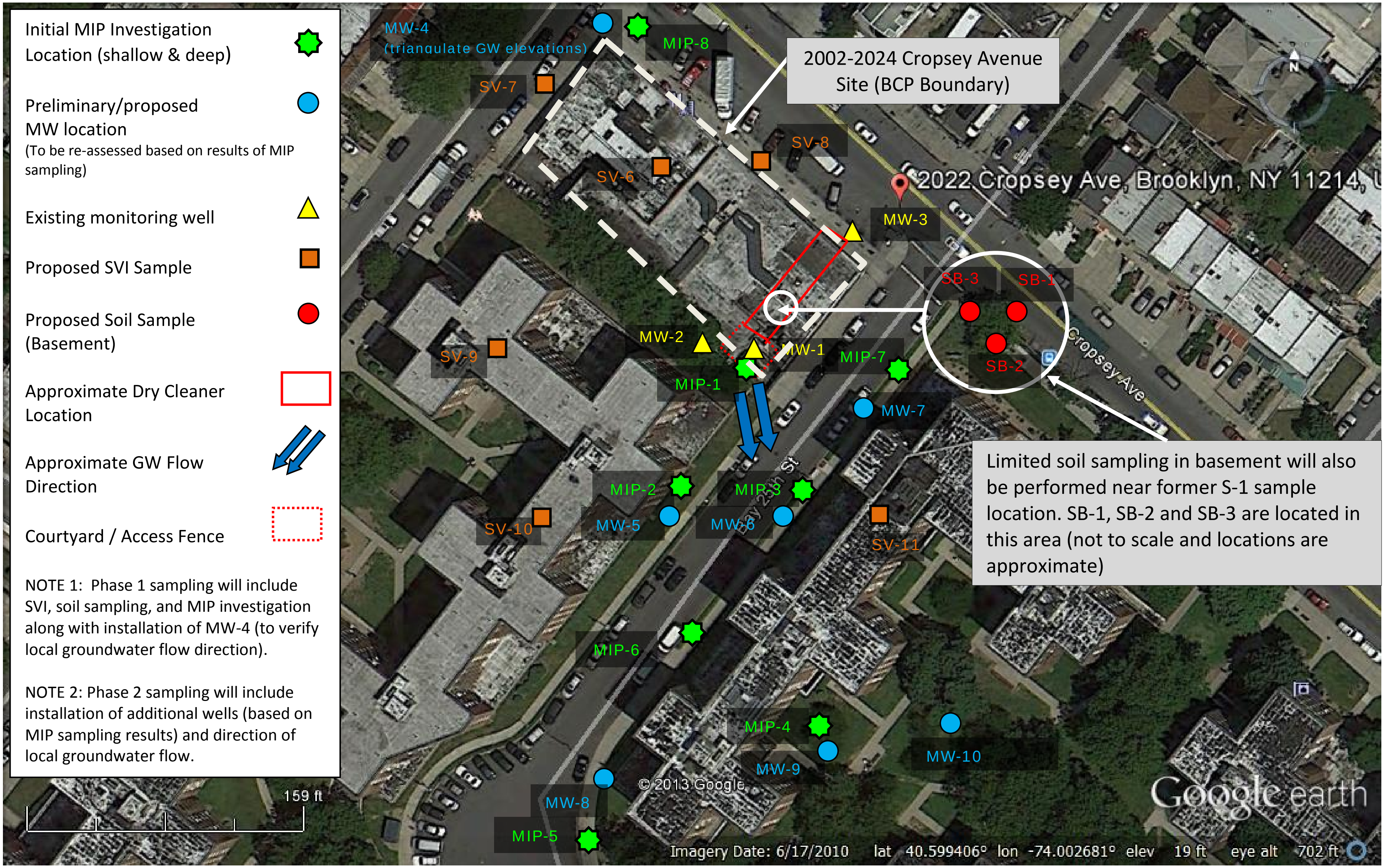


APEX

Site Plan (with adjacent investigation areas)

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 2

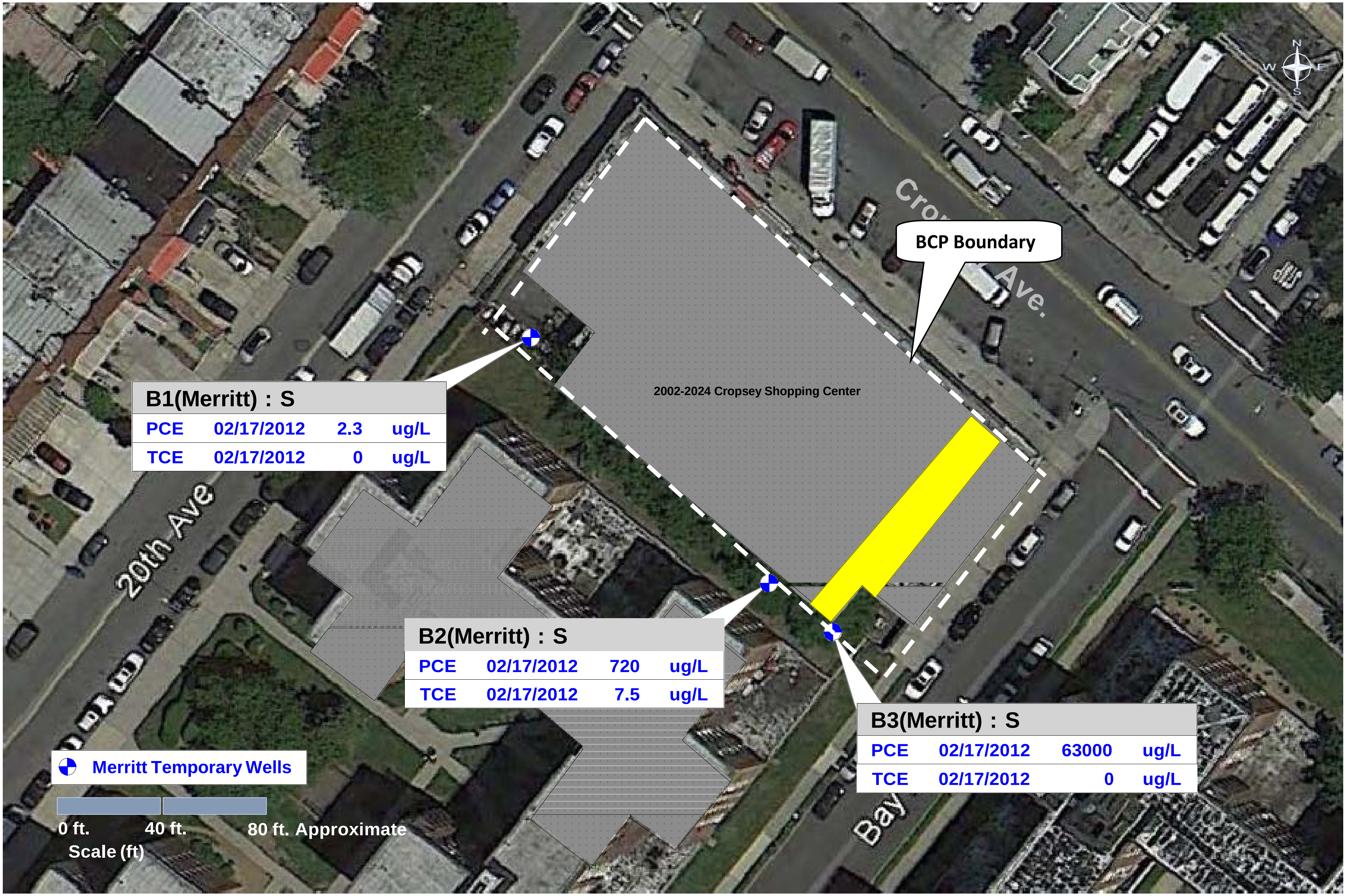


APEX

Proposed Sampling and Well Locations

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 3

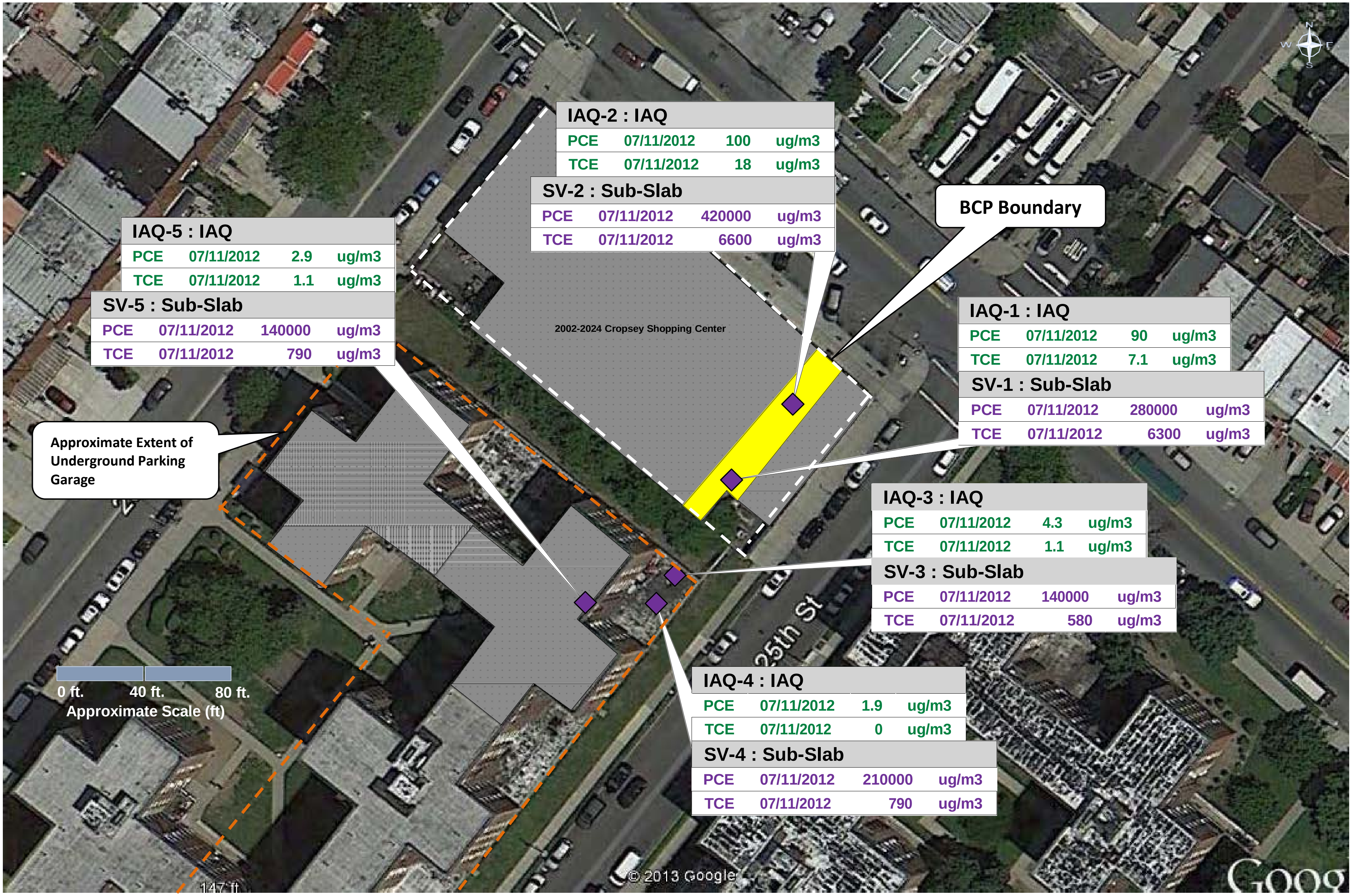


APEX

Merritt Groundwater investigation Data Summary 2012

Client: 2002 Cropsey Associates, LLC**Project No.:** 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 4

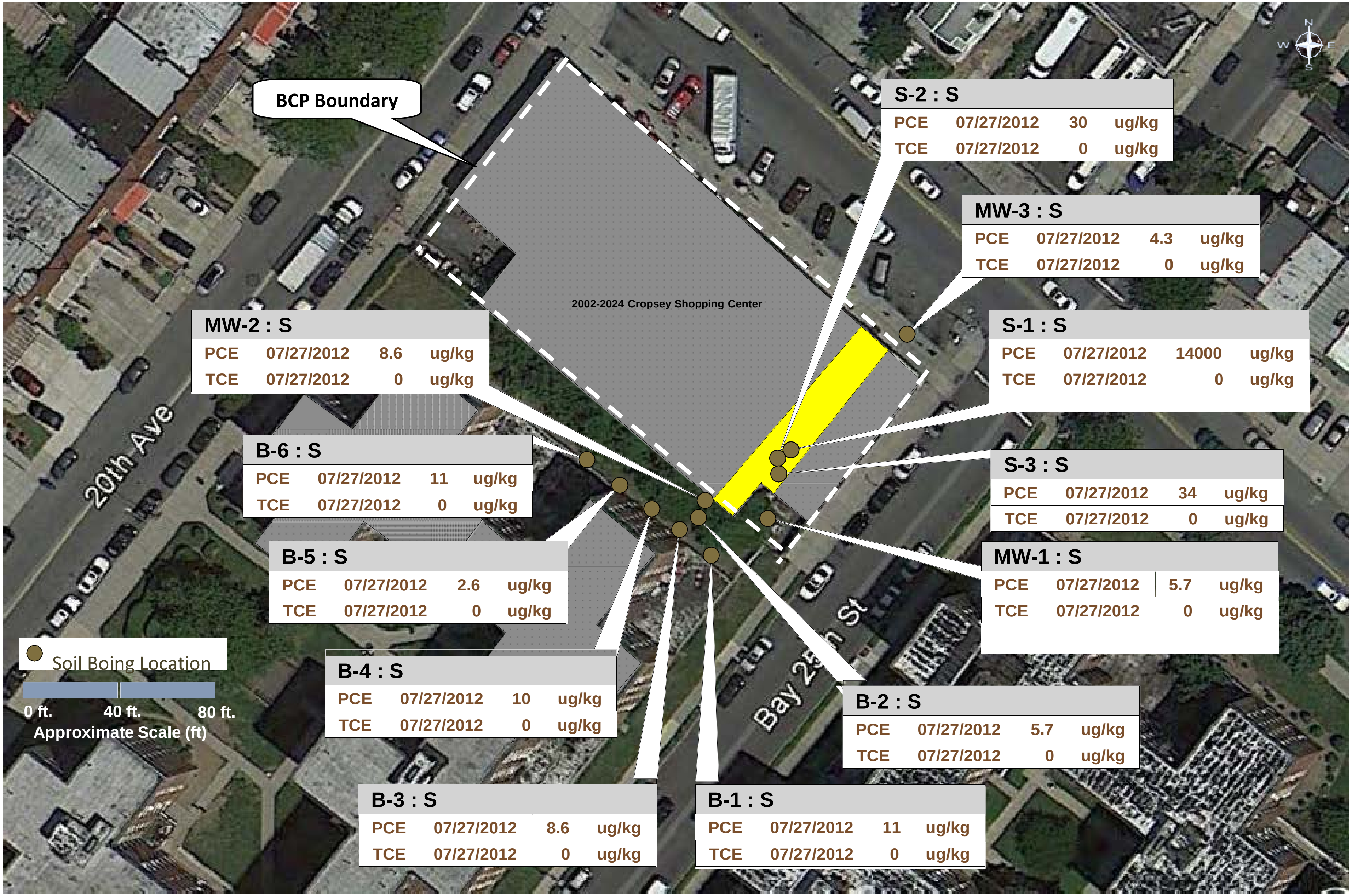


APEX

Apex Sub Slab Vapor and IAQ Summary
2002-2024 Cropsey Ave. and Adjacent Properties

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 5

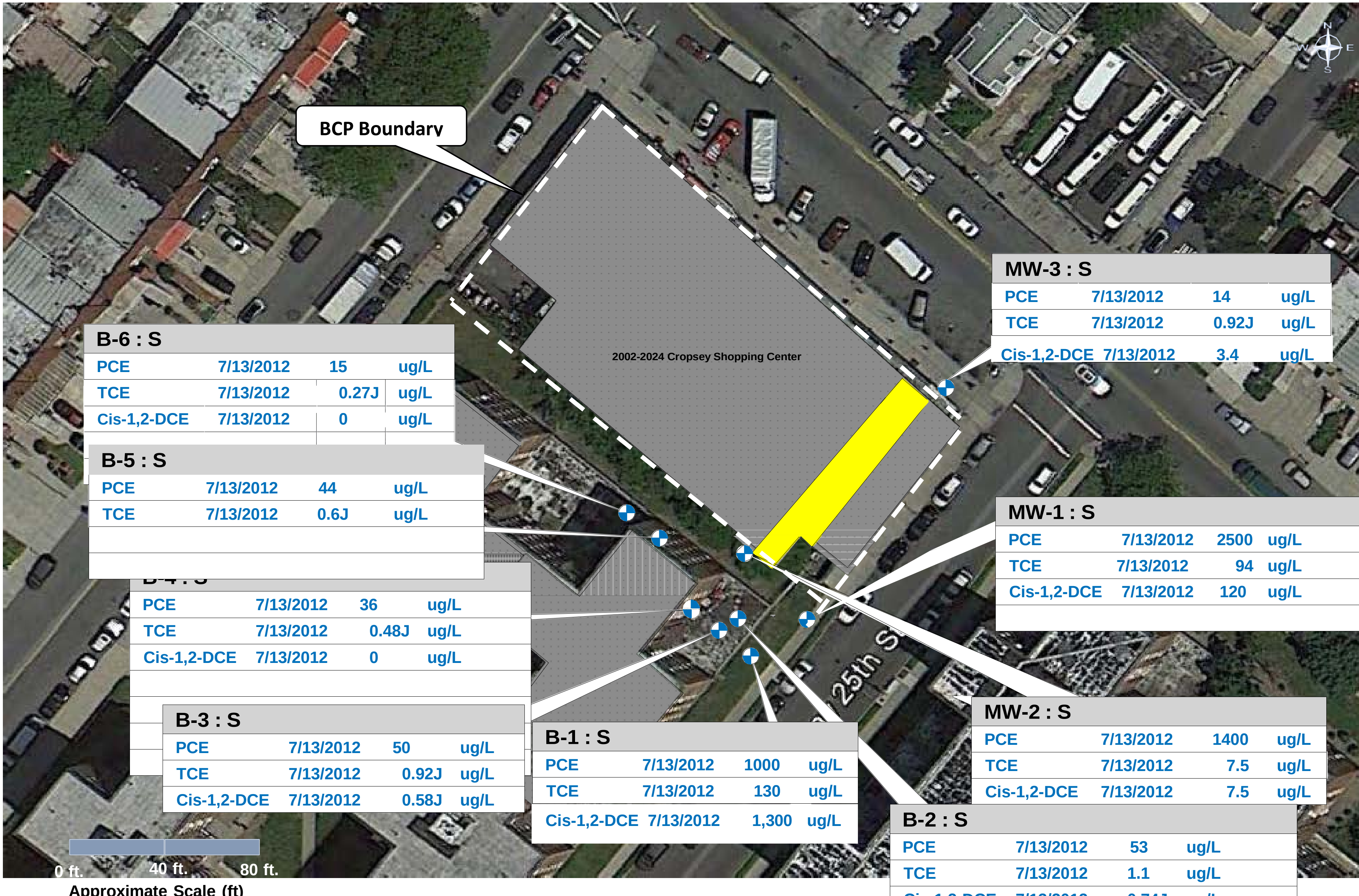


APEX

Apex Soil Sampling Data Summary 2012

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 6



MW-3 : S

PCE	7/13/2012	14	ug/L
TCE	7/13/2012	0.92J	ug/L
Cis-1,2-DCE	7/13/2012	3.4	ug/L

B-6 : S

PCE	7/13/2012	15	ug/L
TCE	7/13/2012	0.27J	ug/L
Cis-1,2-DCE	7/13/2012	0	ug/L

B-5 : S

PCE	7/13/2012	44	ug/L
TCE	7/13/2012	0.6J	ug/L

MW-1 : S

PCE	7/13/2012	2500	ug/L
TCE	7/13/2012	94	ug/L
Cis-1,2-DCE	7/13/2012	120	ug/L

B-4 : S

PCE	7/13/2012	36	ug/L
TCE	7/13/2012	0.48J	ug/L
Cis-1,2-DCE	7/13/2012	0	ug/L

MW-2 : S

PCE	7/13/2012	1400	ug/L
TCE	7/13/2012	7.5	ug/L
Cis-1,2-DCE	7/13/2012	7.5	ug/L

B-3 : S

PCE	7/13/2012	50	ug/L
TCE	7/13/2012	0.92J	ug/L
Cis-1,2-DCE	7/13/2012	0.58J	ug/L

B-1 : S

PCE	7/13/2012	1000	ug/L
TCE	7/13/2012	130	ug/L
Cis-1,2-DCE	7/13/2012	1,300	ug/L

B-2 : S

PCE	7/13/2012	53	ug/L
TCE	7/13/2012	1.1	ug/L
Cis-1,2-DCE	7/13/2012	0.74J	ug/L

APEX

Apex Groundwater Sampling Data Summary 2012

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

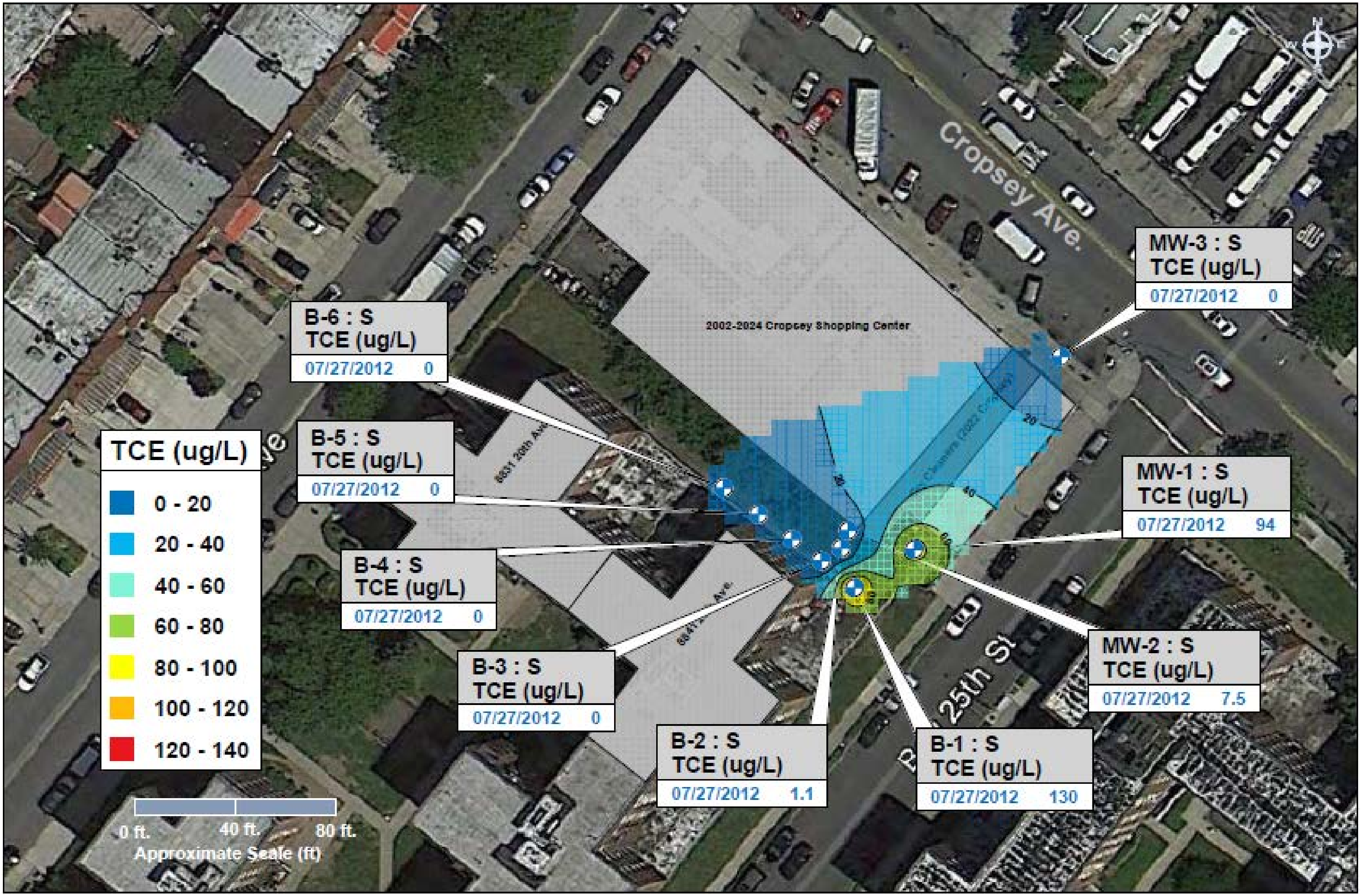
FIG. 7

APEX

Apex PCE in Groundwater Sampling Data Summary 2012

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 8

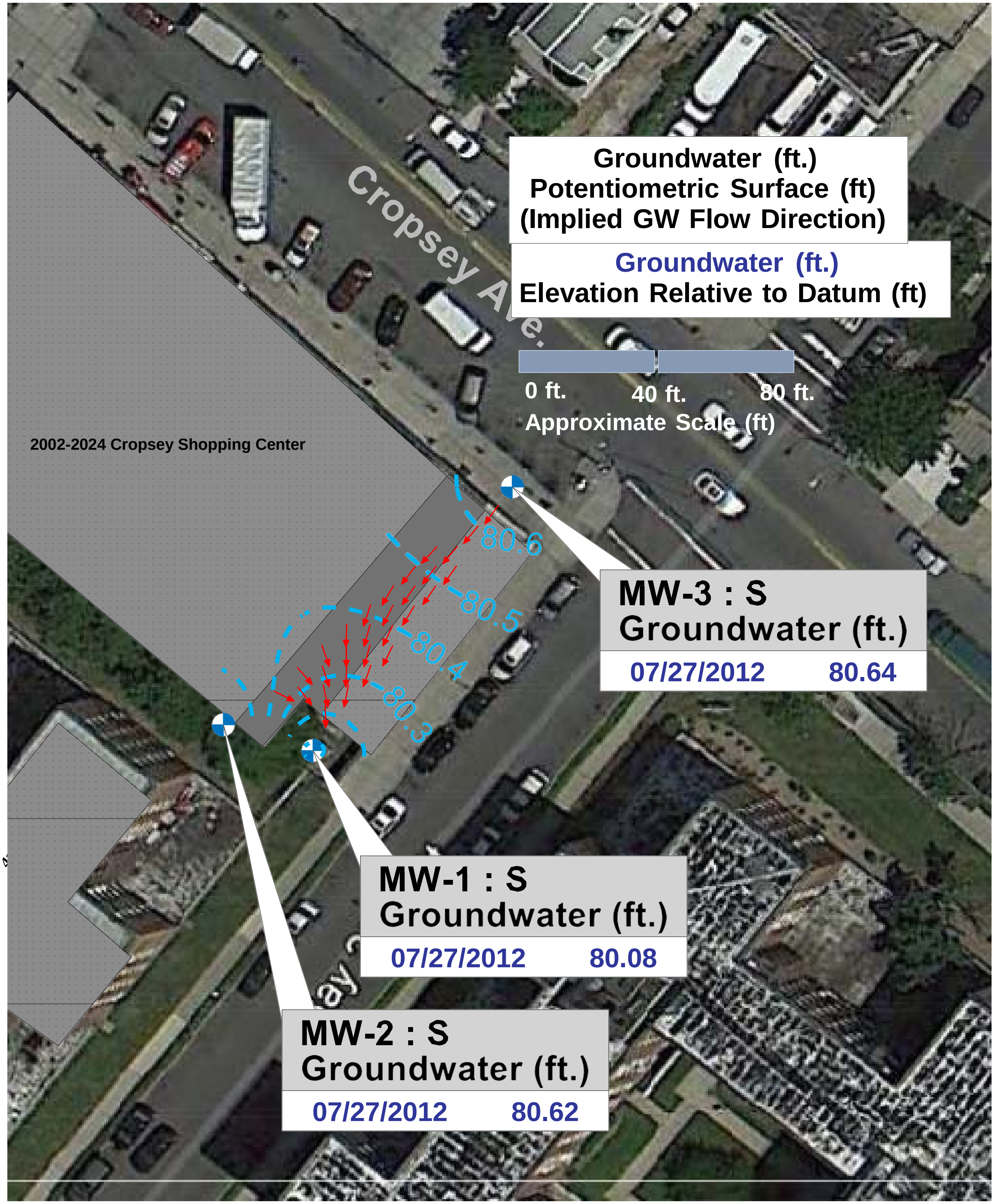


APEX

Apex TCE in Groundwater Sampling Data Summary 2012

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: Remedial Investigation Work Plan
Date: January 2014

FIG. 9



APEX	***Implied Groundwater Flow Direction***	**Client:** 2002 Cropsey Associates, LLC **Project No.:** 85265.001 **Project:** Remedial Investigation Work Plan **Date:** January 2014	FIG. 10

APPENDIX A

Merritt Limited Investigation

MERRITT
Environmental
Consulting Corp.

77 Arkay Drive, Suite D, Hauppauge, NY 11788
(631) 617-6200, Fax. 631-617-6201

February 27, 2012
Project No. M5920
NYCB application 15-119263-5

Ms. Beatrisa Formina
New York Community Bank
1 Jericho Plaza
Jericho, NY 11753

Re: 2002-2024 Cropsey Avenue
Brooklyn, New York

Dear Ms. Formina:

Merritt Environmental Consulting Corp. (MECC) has completed a subsurface investigation at 2002 to 2024 Cropsey Avenue, Brooklyn, New York (the "Site). The Site contains a single-story multi-unit retail building at the south side of Cropsey Avenue. A dry cleaner is present at the eastern section of the structure. The principal focus of this study was to determine if dry cleaning operations had released perchloroethylene (PCE) to the environment at actionable concentrations. The results of the study identified high concentrations of PCE in groundwater at the Site. These concentrations greatly exceed applicable regulatory limits and warrant a recommendation for regulatory reporting and corrective action.

Background

The Site consists of a single-story multi-unit retail building at the south side of Cropsey Avenue. The building contains a full basement and extends from Bay 25th Street to the east to 20th Avenue to the west. The footprint of the Site building is approximately 15,000 square feet. Specifically, the on-site dry cleaner is known as "GLY Cleaners," 2022 Cropsey Avenue and occupies a space at the eastern section of the building. The basement of the dry cleaner contains a hot water boiler for operation of cleaning equipment and motorized clothing racks for customer garment storage. The basement floor consists of poured concrete with no observed cracking or other penetrations. A concrete-lined pit is present near the rear (south side) of the dry cleaner basement exit door. No penetrations were observed in this pit. The rear exit door leads to exterior steps. A drain is present at the base of these steps and appears to be connected to the municipal sewer system but MECC was unable to confirm this connection. A small paved exterior storage area is located at the top of the steps.

The elevation of the Site is approximately 20 feet above mean sea level (msl). Surface topography consists of a gentle downward slope to the south towards Gravesend Bay, which is approximately 1,000 feet from the Site. A narrow undeveloped strip of land extends along the entire south (rear) side of the Site building and lies between the Site and a south-adjoining apartment building. This strip of land is situated at an assumed hydraulic downgradient position relative to the Site building. Local groundwater flow is expected to be from roughly north to south towards Gravesend Bay.

Scope of Work Completed

MECC retained a drilling contractor to install three soil borings at the strip of land in a line that parallels the long axis of the Site building (long axis is oriented east-west). All field activities were completed on February 17, 2012. Mr. Frank Galdun, Project Geologist with MECC, directed the driller and conducted all field sampling/logging activities. All soil borings were drilled to the water table, which is between 18 feet and 19 feet below ground surface (bgs) at the Site. Subsurface soil encountered in the soil borings consists of uniform coarse sand.

The principal intent of this study was to determine if the on-site dry cleaner had adversely affected the environmental integrity of the Site. Of secondary concern is a gasoline station located north of the Site across Crpsey Avenue. Soil Boring B1 was drilled in a line that was assumed to be hydraulically down-gradient of the gasoline station (this boring was drilled at the west side of the Site). The remaining two borings (B2 and B3) were drilled proximal to the south side of the on-site dry cleaner at the east side of the Site.

All driller sampling tubes and rods were subjected to a water/alconox wash between soil boring locations to reduce the potential for cross contamination. All penetrations made by the drilling activities were filled and then patched with like surfacing material.

Soil Quality Field Screening Results

Soil samples were continuously subjected to field screening techniques as the borings were drilled. Field screening consisted of using a portable photoionization detector (PID) for evidence of volatile organic vapors, and assessing each soil sample for physical evidence of contamination. Field screening was conducted until the water table was encountered. No evidence of soil contamination was encountered at any of the borings. However, elevated PID readings were recorded at the soil/groundwater interface. In Soil Boring B3, PID readings exceeded 150 parts per million (ppm) in soil at the water table. This device response is considered evidence of or high levels of contamination in groundwater.

Groundwater Sample Laboratory Analysis

One groundwater sample was collected for laboratory analysis from each of the three borings. The samples were analyzed at Hampton Clarke-Veritech a New York State Department of Health-Certified environmental laboratory (NYSDOH Cert. No. 10982). All samples were analyzed under EPA Method 8260 – Volatile Organic Compounds (VOCs). The following table summarizes the laboratory report:

TABLE 1: LABORATORY REPORT SUMMARY (EPA METHOD 8260) DETECTED COMPOUNDS ONLY

EPA Method 8260 VOCs	B1GW	B2GW	B3GW	NYSDEC TOGS Standards
Trichloroethene	ND	7.5	ND	5.0
Perchloroethylene	2.3	720	63000	5.0

NOTES
All results are expressed in micrograms per liter (ug/l), also can be expressed as parts per billion (ppm).

Any result in bold exceeds New York State Department of Health Maximum Contaminant Level for drinking water, and the guidance values or standard listed in the NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1) or "TOGS" ***Water Quality Standards and Guidance Values.***

ND: Parameter non-detected, below method detection limits.

Laboratory analysis of these samples show PCE concentrations in groundwater as high as 63,000 parts per billion (ppb). The regulatory limit for PCE in groundwater is 5 ppb. The sample containing this highest reported concentration was obtained from a boring drilled directly south of the dry cleaner tenant space (Soil Boring B3). A second boring (B2) was drilled approximately 30 feet west of the dry cleaner and the laboratory reported a PCE concentration of 720 ppb. The groundwater extracted from B3 also exhibited a distinct solvent odor.

Conclusions/Recommendations

Based on the laboratory results and field observations, MECC has found evidence of a significant impact of PCE contamination in groundwater at the Site. The source of this condition does appear to be emanating from the on-site dry cleaner operation. The lateral extent of the contamination is unknown but, based upon the high PCE concentration detected in B3, the potential does exist for plume of impact to be present down-gradient of the Site.

The conditions discovered at the Site need to be reported to the New York State Department of Environmental Conservation by the site owner as soon as possible. In addition, investigatory tasks need to be initiated in the near future to gain an understanding of the extent of the contamination and to determine if PCE releases are currently occurring at the dry cleaner. The potential for soil vapor intrusion exists and any near-term study needs to incorporate appropriate investigation of this issue.

No evidence of gasoline contamination was identified in groundwater at the Site. MECC concludes that current and historical operation of a gasoline station north of the Site has not adversely impacted the environmental integrity of the Site.

Limitations of the FSSI

The scope of the FSSI is intended to aid in evaluating whether additional investigation would be prudent. The tasks that comprise this FSSI are not exhaustive or definitive. MECC has made no independent investigation of the accuracy of these secondary sources and has assumed them to be accurate and complete. MECC does not warrant the accuracy or completeness of information provided by secondary sources (MECC has no reason to believe that the secondary sources provided or acquired during this study contain intentionally false or misleading information). MECC does not warrant that all contamination that may exist under the Site has been discovered, that the Site is suitable for any particular purpose or that the Site is clean or free of liability.

If you have any questions concerning this report, please feel free to call our office.

Sincerely,

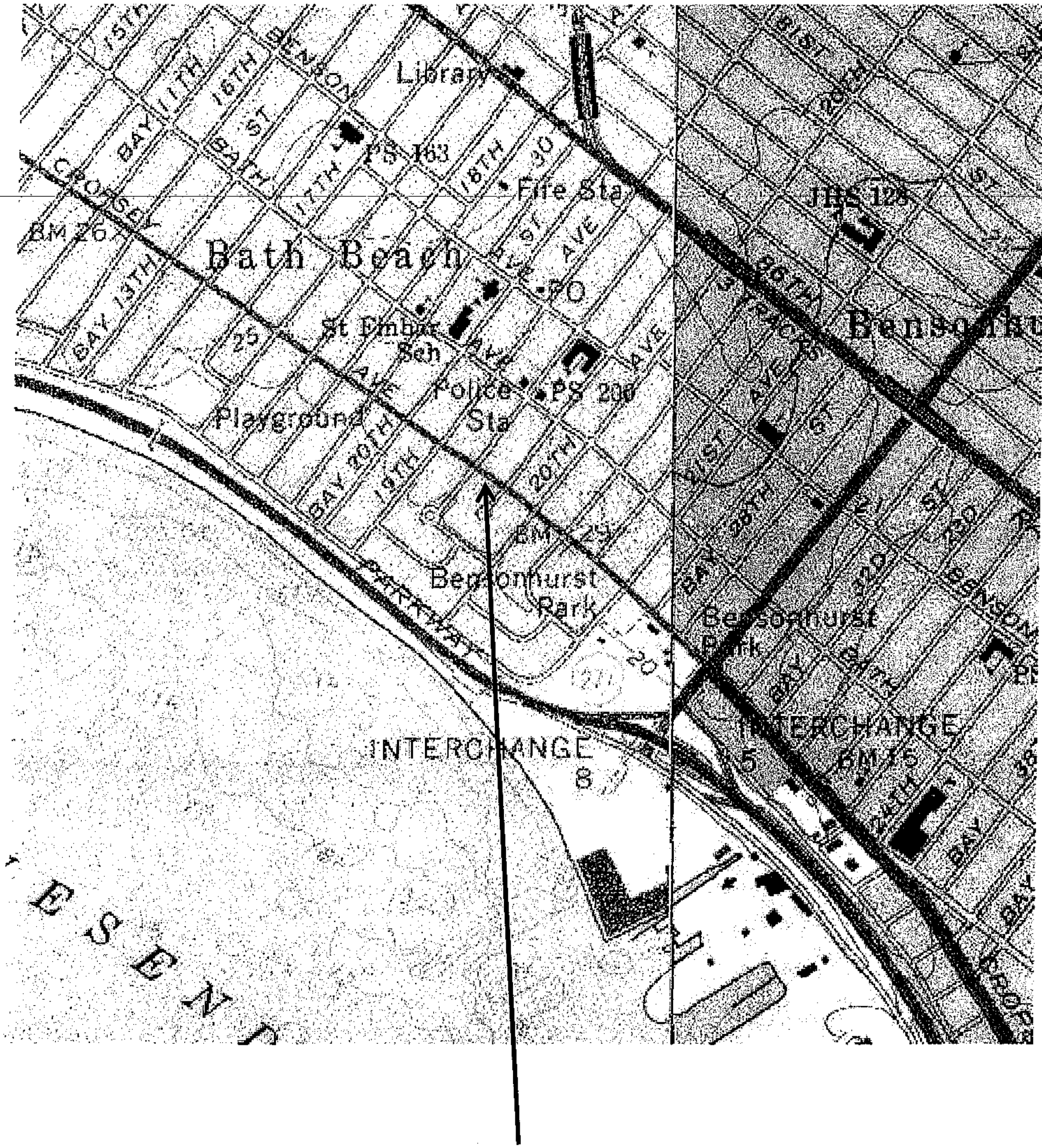
Charles G. Merritt

Charles G. Merritt
President/LEED AP

Frank Galdun
Project Geologist

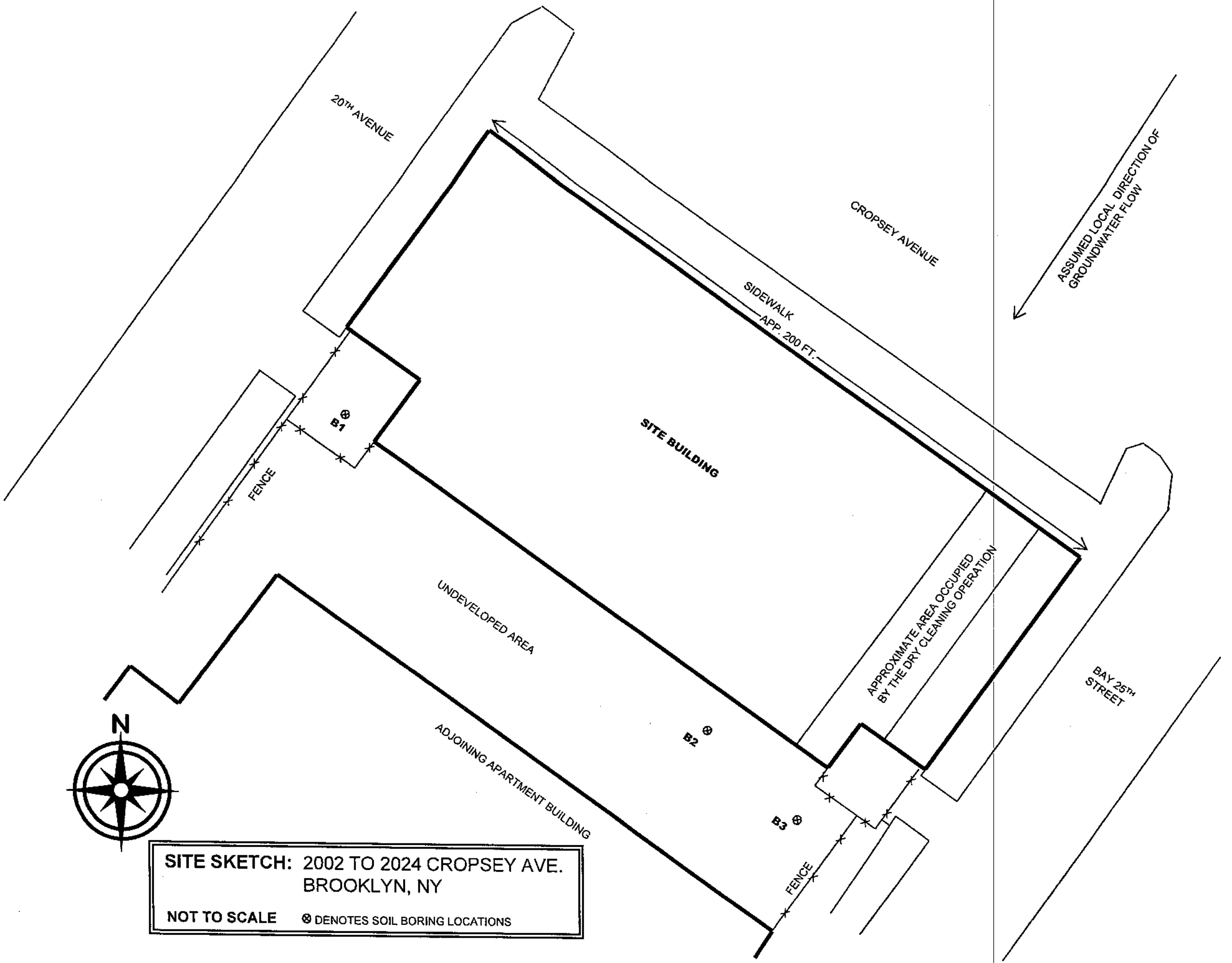
Attachments:

Attachment 1: Site location map and Site Plan
Attachment 2: Laboratory Report of Analysis
Attachment 3: Site Photographs
Attachment 4: Soil Boring Logs



SITE

FIGURE 1: SITE LOCATION MAP **Contour Interval: 5'**	**Site Address:** **2002 to 2024 Cropsey Ave.** **Brooklyn, NY**
USGS 7.5" Quadrangle Map titled *The Narrows, NY,* dated 1995	


20TH AVENUE
CROPSEY AVENUE
ASSUMED LOCAL DIRECTION OF GROUNDWATER FLOW
SIDEWALK
APP. 200 FT.
SITE BUILDING
B1
FENCE
UNDEVELOPED AREA
APPROXIMATE AREA OCCUPIED BY THE DRY CLEANING OPERATION
BAY 25TH STREET
B2
B3
FENCE
ADJOINING APARTMENT BUILDING
N
SITE SKETCH: 2002 TO 2024 CROPSEY AVE.
BROOKLYN, NY
NOT TO SCALE
⊗ DENOTES SOIL BORING LOCATIONS

HCV Report Of Analysis
DRAFT

Client: GFE LLC **HCV Project #:** 2021718

Project: 2022 Cropsey Ave

Sample ID: B1GW **Collection Date:** 2/17/2012
Lab#: AC64287-001 **Receipt Date:** 2/17/2012
Matrix: Aqueous

Volatile Organics (TAGM 4046) 8260

Analyte	DF	Units	RL	DRAFT Result
1,1,1-Trichloroethane	1	ug/l	1.0	ND
1,1,2,2-Tetrachloroethane	1	ug/l	1.0	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	1	ug/l	1.0	ND
1,1-Dichloroethane	1	ug/l	1.0	ND
1,1-Dichloroethene	1	ug/l	1.0	ND
1,2,3-Trichloropropane	1	ug/l	1.0	ND
1,2,4-Trichlorobenzene	1	ug/l	1.0	ND
1,2-Dichlorobenzene	1	ug/l	1.0	ND
1,2-Dichloroethane	1	ug/l	0.50	ND
1,3-Dichlorobenzene	1	ug/l	1.0	ND
1,3-Dichloropropane	1	ug/l	1.0	ND
1,4-Dichlorobenzene	1	ug/l	1.0	ND
2-Butanone	1	ug/l	1.0	ND
4-Methyl-2-pentanone	1	ug/l	1.0	ND
Acetone	1	ug/l	10	ND
Benzene	1	ug/l	0.50	ND
Carbon disulfide	1	ug/l	1.0	ND
Carbon tetrachloride	1	ug/l	1.0	ND
Chlorobenzene	1	ug/l	1.0	ND
Chloroethane	1	ug/l	1.0	ND
Chloroform	1	ug/l	1.0	ND
Dibromochloromethane	1	ug/l	1.0	ND
Ethylbenzene	1	ug/l	1.0	ND
m&p-Xylenes	1	ug/l	1.0	ND
Methylene chloride	1	ug/l	1.0	ND
o-Xylene	1	ug/l	1.0	ND
Tetrachloroethene	**1**	**ug/l**	**1.0**	**2.3**
Toluene	1	ug/l	1.0	ND
Trans-1,2-dichloroethene	1	ug/l	1.0	ND
Trichloroethene	1	ug/l	1.0	ND
Vinyl chloride	1	ug/l	1.0	ND
Xylenes (Total)	1	ug/l	1.0	ND

Sample ID: B2GW **Collection Date:** 2/17/2012
Lab#: AC64287-002 **Receipt Date:** 2/17/2012
Matrix: Aqueous

Volatile Organics (TAGM 4046) 8260

Analyte	DF	Units	RL	DRAFT Result
1,1,1-Trichloroethane	5	ug/l	5.0	ND
1,1,2,2-Tetrachloroethane	5	ug/l	5.0	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	5	ug/l	5.0	ND
1,1-Dichloroethane	5	ug/l	5.0	ND
1,1-Dichloroethene	5	ug/l	5.0	ND
1,2,3-Trichloropropane	5	ug/l	5.0	ND
1,2,4-Trichlorobenzene	5	ug/l	5.0	ND
1,2-Dichlorobenzene	5	ug/l	5.0	ND
1,2-Dichloroethane	5	ug/l	2.5	ND
1,3-Dichlorobenzene	5	ug/l	5.0	ND
1,3-Dichloropropane	5	ug/l	5.0	ND
1,4-Dichlorobenzene	5	ug/l	5.0	ND

Sample ID:	B2GW	Collection Date:	2/17/2012
Lab#:	AC64287-002	Receipt Date:	2/17/2012
Matrix:	Aqueous		

2-Butanone	5	ug/l	5.0	ND
4-Methyl-2-pentanone	5	ug/l	5.0	ND
Acetone	5	ug/l	50	ND
Benzene	5	ug/l	2.5	ND
Carbon disulfide	5	ug/l	5.0	ND
Carbon tetrachloride	5	ug/l	5.0	ND
Chlorobenzene	5	ug/l	5.0	ND
Chloroethane	5	ug/l	5.0	ND
Chloroform	5	ug/l	5.0	ND
Dibromochloromethane	5	ug/l	5.0	ND
Ethylbenzene	5	ug/l	5.0	ND
m&p-Xylenes	5	ug/l	5.0	ND
Methylene chloride	5	ug/l	5.0	ND
o-Xylene	5	ug/l	5.0	ND
Tetrachloroethene	**5**	**ug/l**	**5.0**	**720**
Toluene	5	ug/l	5.0	ND
Trans-1,2-dichloroethene	5	ug/l	5.0	ND
Trichloroethene	**5**	**ug/l**	**5.0**	**7.5**
Vinyl chloride	5	ug/l	5.0	ND
Xylenes (Total)	5	ug/l	5.0	ND

Sample ID:	B3GW	Collection Date:	2/17/2012
Lab#:	AC64287-003	Receipt Date:	2/17/2012
Matrix:	Aqueous		

Volatile Organics (TAGM 4046) 8260 DRAFT

Analyte	DF	Units	RL	Result
1,1,1-Trichloroethane	500	ug/l	500	ND
1,1,2,2-Tetrachloroethane	500	ug/l	500	ND
1,1,2-Trichloro-1,2,2-trifluoroethane	500	ug/l	500	ND
1,1-Dichloroethane	500	ug/l	500	ND
1,1-Dichloroethene	500	ug/l	500	ND
1,2,3-Trichloropropane	500	ug/l	500	ND
1,2,4-Trichlorobenzene	500	ug/l	500	ND
1,2-Dichlorobenzene	500	ug/l	500	ND
1,2-Dichloroethane	500	ug/l	250	ND
1,3-Dichlorobenzene	500	ug/l	500	ND
1,3-Dichloropropane	500	ug/l	500	ND
1,4-Dichlorobenzene	500	ug/l	500	ND
2-Butanone	500	ug/l	500	ND
4-Methyl-2-pentanone	500	ug/l	500	ND
Acetone	500	ug/l	5000	ND
Benzene	500	ug/l	250	ND
Carbon disulfide	500	ug/l	500	ND
Carbon tetrachloride	500	ug/l	500	ND
Chlorobenzene	500	ug/l	500	ND
Chloroethane	500	ug/l	500	ND
Chloroform	500	ug/l	500	ND
Dibromochloromethane	500	ug/l	500	ND
Ethylbenzene	500	ug/l	500	ND
m&p-Xylenes	500	ug/l	500	ND
Methylene chloride	500	ug/l	500	ND
o-Xylene	500	ug/l	500	ND
Tetrachloroethene	**500**	**ug/l**	**500**	**63000**
Toluene	500	ug/l	500	ND
Trans-1,2-dichloroethene	500	ug/l	500	ND
Trichloroethene	500	ug/l	500	ND
Vinyl chloride	500	ug/l	500	ND
Xylenes (Total)	500	ug/l	500	ND

Veritech/Division of Hampton-Clarke
175 Route 46 West, Fairfield, New Jersey 07004
2 Madison Road, Fairfield, New Jersey 07004
Ph: 800-426-9992 | 973-244-9770 Fax: 973-244-9787 | 973-439-1458

HC-V HamptonClarke·Veritech

CHAIN OF CUSTODY RECORD

Project # (Lab Use Only): 2021718

Page 1 of 1

NELAC/NJ #07071 & 07069 | CT #PH-0671 | NY #11408 & 11939 | PA #68-00463 & 68-04409 | WV #353 | KY #90124

Customer Information

1a) Customer: GFE
Address: 58 Nokomis Ave, Lake Hiawatha, NJ
1b) Email/Cell/Fax/Ph: frankg4@optonline
1c) Send Invoice to:
1d) Send Report to: Frank Galdun

Project Information

2a) Project: 2022 Cropsey Ave
2b) Project Mgr: Frank Galdun
2c) Project Location (City/State): Brooklyn NY
2d) Quote/PO # (If Applicable):

3) Reporting Requirements (Please Circle)

Turnaround	Report Type	Electronic Deliv.
24 Hours (100%)	Data Summary	Hazsite/CSV
48 Hours (75%)	Waste	EQuIS 4-File
72 Hours (50%)	Red - NJ / NY / PA	EQuIS EZ
4 Days (35%; TPH)	CLP	Excel - NJCC
1 Week (25%; EPH)	Full / Category B	Excel - NY TAGM
10 Days (10%)	Category A	Excel - PA Act 2
2 Weeks	Other:	PDF
Other:		Other:

Expedited TAT Not Always Available (Please Check with Lab)

FOR LAB USE ONLY

Batch #: AC64287

Matrix Codes
DW - Drinking Water; S - Soil; A - Air
GW - Ground Water; SL - Sludge; OT - Other
WW - Waste Water; OL - Oil

Check If Contingent ===>

7) Analysis Request

HIGH LEVELS POSSIBLE IN B3GW

Lab Sample #	4) Customer Sample ID	5) Matrix	6) Sample Date	6) Sample Time	Composite (C)	Grab (G)	EPA 8260 NYSDEC-TAGM	EPH Cat 1	EPH Cat 2 Screen/Total	EPH Cat 2 Fractionation	None	MeOH	En Core	NaOH	HCl	H2SO4	HNO3	Other:	9a) Methanol Bottle Numbers (If Applicable) / 9b) Comments
-001	B1GW	GW	2/17/12			X	X								3				
-002	B2GW	↓	↓	↓		X	X								3				
-003	B3GW	↓	↓	↓		X	X								3				

(# of Bottles: columns None through Other)

10) Relinquished by:	Accepted by:	Date	Time
[signature]	[signature]	2/17/12	~~150~~ 1430

Comments, Notes, Special Requirements, HAZARDS

Note: Check if low-level groundwater methods required to meet current standards in NJ or PA:
- BN or BNA (8270C SIM)
- VOC (8260B SIM or 8011)
- Metals (ICP-MS 200.8 or 6020)

Note: Check if applicable:
- Project-Specific Reporting Limits
- High Contaminant Concentrations

Cooler Temperature: 3.7

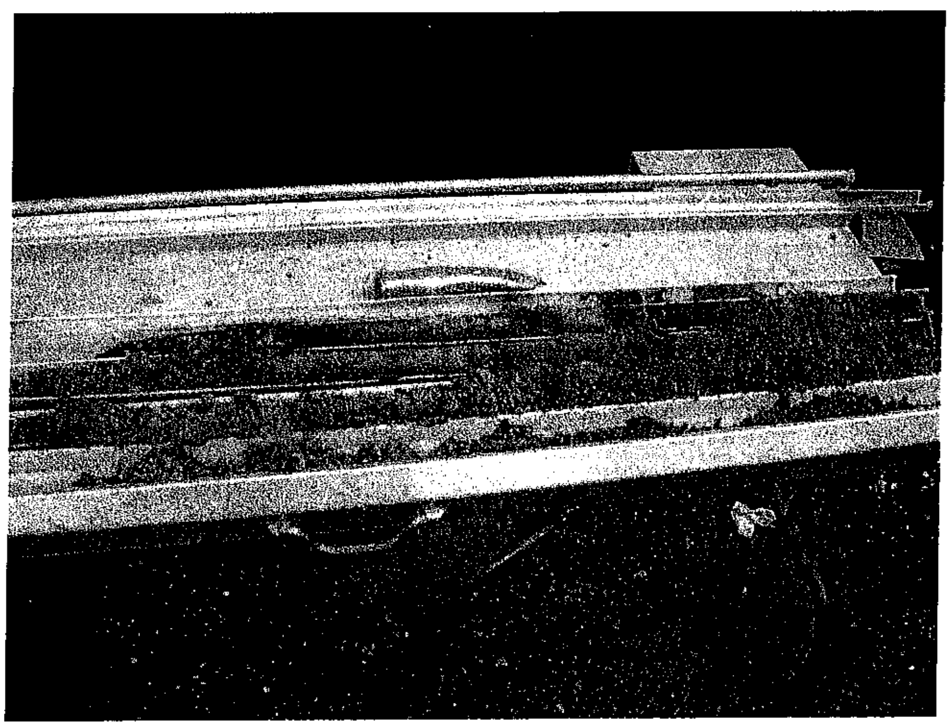
11) Sampler (print name): Frank Galdun Date: 2/17/12

Please circle required parameter list (refer to HC-V summary): i) NJ 2008 SRS; ii) Current TCL; iii) HC-V 2010 Merged; iv) PA; v) NY; vi) Project-Specific

Please note NUMBERED items. If not completed your analytical work may be delayed.

A fee of $5/sample will be assessed for storage should sample not be activated for any analysis.

Photograph 1: View of the Site building looking southwest from Cropsey Avenue. The apartment building south of the Site is visible at background.



Photograph 2: View of typical soil type encountered in the borings.

Photograph 3: View of installation of Soil Boring B2. Photographer facing east. The Site building is visible at left.

Photograph 4: View of installation of Soil Boring B3. Photographer facing east.

MERRITT ENVIRONMENTAL CONSULTING CORP. **77 Arkay Dr., Suite D** **Hauppauge, NY 11788** **631.617.3200**	Project Number: 2468	Boring No. **B1** Boring location: West corner of building (see site plan)
Driller: Laurel Geologist: Frank Galdun	Location: 2002-2024 Cropsey Ave. Brooklyn, NY	
Groundwater Observations: Wet at app. 19'	Geoprobe with 5-foot casing sampler Type: Track-mounted Size I.D. 2" Hammer wt. N/A Hammer Fall: N/A	Date Start : 2/17/12 Date Complete : 2//17/12 Surface Elev. : N/A Groundwater Elev.: N/A

Depth feet	Sample #	Sample Type	Blows per 6 " 0-6	Blows per 6 " 6-12	Blows per 6 " 12-18	density moisture	PID	Field Identification of soil Remarks
0'-5'	N/A	N/A	N/A	N/A	N/A	Dry	0.0	70% recovery. Med-coarse sand Dry, no odor.
5'-10'						Dry	0.0	70% recovery. Coarse sand some pebbles Dry, no odor.
10'-15'						Dry	0.0	75% recovery. Coarse sand some pebbles. Dry, no odor.
15'-20'						Wet	0.0	75% recovery. Wet at 19'. Coarse sand some pebbles. No odor
								Boring extended to 23 feet for groundwater sampling

ground surface to ______ft. used__________ casing then________casing to _________ft

A= auger ss: split spoon sampler mc: macrocore HSA: hollow stem auger HA: Hand Auger

Trace: 0-10% Little: 10-20% some: 20-10%

C= coarse M=medium F=fine

MERRITT ENVIRONMENTAL CONSULTING CORP. 77 Arkay Dr., Suite D Hauppauge, NY 11788 631.617.3200	[redacted] Project Number: 2468	Boring No. **B2** Boring location: Center-east section of strip of land (see site plan)
Driller: Laurel Geologist: Frank Galdun	Location: 2002-2024 Cropsey Ave. Brooklyn, NY	
Groundwater Observations: Wet at app. 19'	Geoprobe with 5-foot casing sampler Type: Track-mounted Size I.D. 2" Hammer wt. N/A Hammer Fall: N/A	Date Start : 2/17/12 Date Complete : 2//17/12 Surface Elev. : N/A Groundwater Elev.: N/A

Depth feet	Sample		Blows per 6 "			density moisture	PID	Field Identification of soil Remarks
	#	Type	0-6	6-12	12-18			
0'-5'	N/A	N/A	N/A	N/A	N/A	Dry	0.0	60% recovery. Med-coarse sand. Dry, no odor.
5'-10'						Dry	0.0	70% recovery. Coarse sand some pebbles Dry, no odor.
10'-15'						Dry	0.0	70% recovery. Coarse sand some pebbles. Dry, no odor.
15'-20'						Wet	5.0	70% recovery. Wet at 19'. Coarse sand some pebbles. No odor.
								Boring extended to 25 feet for groundwater sampling

ground surface to ______ft. used__________ casing then________casing to _________ft

A= auger ss: split spoon sampler mc: macrocore HSA: hollow stem auger HA: Hand Auger

Trace: 0-10% Little: 10-20% some: 20-10%

C= coarse M=medium F=fine

MERRITT ENVIRONMENTAL CONSULTING CORP. **77 Arkay Dr., Suite D** **Hauppauge, NY 11788** **631.617.3200**	Project Number: 2468	Boring No. **B3**
		Boring location: East section of strip of land (see site plan)2
Driller: Laurel Geologist: Frank Galdun	Location: 2002-2024 Cropsey Ave. Brooklyn, NY	
Groundwater Observations: Wet at app. 19'	Geoprobe with 5-foot casing sampler Type: Track-mounted Size I.D. 2" Hammer wt. N/A Hammer Fall: N/A	Date Start : 2/17/12 Date Complete : 2//17/12 Surface Elev. : N/A Groundwater Elev.: N/A

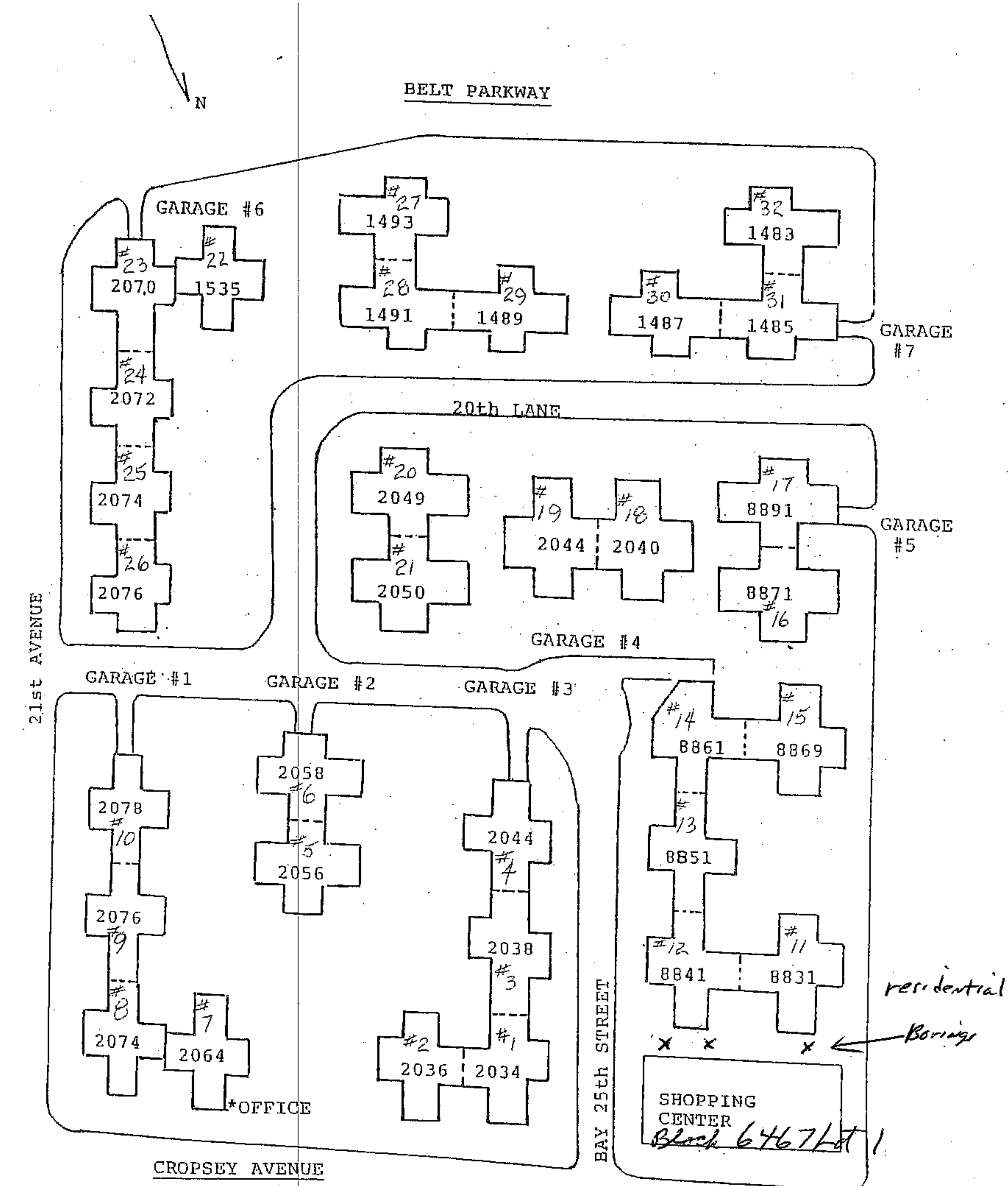
Depth feet	Sample		Blows per 6 "			density moisture	PID	Field Identification of soil Remarks
	#	Type	0-6	6-12	12-18			
0'-5'	N/A	N/A	N/A	N/A	N/A	Dry	0.0	50% recovery. Med-coarse sand. Dry, no odor.
5'-10'						Dry	0.0	70% recovery. Coarse sand some pebbles. Dry, no odor.
10'-15'						Dry	3.0	75% recovery. Coarse sand some pebbles. Dry, no odor.
15'-20'						Wet	Greater Than 150	70% recovery. Wet at 19'. Coarse sand some pebbles. Distinct solvent odor at water table
								Boring extended to 25 feet for groundwater sampling

ground surface to ______ft. used__________ casing then________casing to _________ft

A= auger ss: split spoon sampler mc: macrocore HSA: hollow stem auger HA: Hand Auger

Trace: 0-10% Little: 10-20% some: 20-10%

C= coarse M=medium F=fine



SHORE HAVEN APARTMENTS

1 - 2034 CROPSEY AVENUE
2 - 2036 CROPSEY AVENUE
3 - 2038 CROPSEY AVENUE
4 - 2044 CROPSEY AVENUE
5 - 2056 CROPSEY AVENUE
6 - 2058 CROPSEY AVENUE
7 - 2064 CROPSEY AVENUE
8 - 2074 CROPSEY AVENUE
9 - 2076 CROPSEY AVENUE
10 - 2078 CROPSEY AVENUE

Block 6469 Lot 1

11 - 8831 20TH AVENUE
12 - 8841 20TH AVENUE
13 - 8851 20TH AVENUE
14 - 8861 20TH AVENUE
15 - 8869 20TH AVENUE
16 - 8871 20TH AVENUE
17 - 8891 20TH AVENUE
18 - 2040 21ST DRIVE
19 - 2044 21ST DRIVE
20 - 2049 20TH LANE
21 - 2050 21ST DRIVE

Block ~~[illegible]~~ Lot 12 6467

22 - 1535 SHORE PKWY
23 - 2070 20TH LANE
24 - 2072 20TH LANE
25 - 2074 20TH LANE
26 - 2076 20TH LANE
27 - 1493 SHORE PKWY
28 - 1491 SHORE PKWY
29 - 1489 SHORE PKWY
30 - 1487 SHORE PKWY
31 - 1485 SHORE PKWY
32 - 1483 SHORE PKWY
11214

Block 6489 Lot 1

APPENDIX B

Apex Phase II ESA

(Provided Previously Under Separate Cover)

APPENDIX C

Field Sampling Plan

Field Sampling Plan
2002-2024 Cropsey Avenue Site
Brooklyn, New York

NYSDEC BCP # C224169

Prepared for:

Mr. Peter Neglia c/o Apartment Management
2002 Cropsey Associates, LLC
2611 West 2nd Street
Brooklyn, NY 11223

Prepared by:

Apex Companies, LLC
120-D Wilbur Place
Bohemia, New York 11716

Date Submitted:

November 2014

APEX

FIELD SAMPLING PLAN

2002-2024 CROPSEY AVENUE SITE

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FIELD SAMPLING PLAN

2002-2024 CROPSEY AVENUE SITE
CROPSEY AVENUE, BROOKLYN NEW YORK

NYSDEC BCP# C224169

1.0 INTRODUCTION

Apex has prepared this Field Sampling Plan (FSP) as a component of the Remedial Investigation (RI) Work Plan for the 2002-2024 Cropsey Avenue Site (the Site), Cropsey Avenue, Brooklyn, New York. The FSP describes the methods and procedures to be used for environmental sample collection during implementation of the RI field activities.

The FSP should be used in conjunction with the RI Work Plan, the Quality Assurance Project Plan (QAPP), the Community Air Monitoring Plan (CAMP), and the Health and Safety Plan (HASP). The RI Work Plan presents the Site background and defines the field sampling program. The QAPP presents the quality assurance/quality control (QA/QC) procedures to be used during implementation of the RI Work Plan, as well as a description of the general field and laboratory procedures. The CAMP provides procedures to protect the downwind communities from potential airborne releases of constituents of concern during RI activities. The QAPP, CAMP, and HASP are provided as Appendices C, D, and E, of the RI Work Plan, respectively.

1.1 Plan Organization

This FSP contains the following sections:

- Section 2: Site Description;
- Section 3: "Remedial Investigation Activities" summarizes the type of sampling to be performed in accordance with the FSP;
- Section 4: "Pre-Field Preparation and Equipment" describes preparation and equipment needed prior to mobilization to the field;
- Section 5: "Remedial Investigation Field Activities" describes the sampling and data collection associated with the following RI activities:
  - Membrane Interface Probe Investigation;
  - Drilling of soil borings and collection of soil sample;
  - Drilling and installation of monitoring wells;

- o Collection of hydraulic (water-level and fluid-level) measurements from monitoring wells;
- o Collection of groundwater samples from monitoring wells;
- o Drilling of temporary soil vapor points and collection of soil vapor samples;
- o Collection of ambient air quality samples;

- Section 6: Investigation-Derived Waste (IDW) Sampling;
- Section 7: Sample Collection, Labeling, Handling, and Analysis;
- Section 8: Field Decontamination Procedures; and
- Section 9: Waste Management and Disposal.

2.0 SITE DESCRIPTION

The Site is located at 2022 Cropsey Avenue in the Borough of Brooklyn, New York City, New York and occupies a portion of a parcel that is identified by Tax Map Number: Block 6467, Lot 1. As shown on Figure 1 of the RI. The Site consists of a single-story multi-unit retail building which has a full basement and is approximately 15,000 square feet.

The Site is bounded by Cropsey Avenue to the northeast, 20th Avenue to the northeast, a residential parcel to the southwest, and Bay 25th Street to the southeast. Local groundwater flow is expected to be from roughly north to south towards Gravesend Bay. The elevation of the Site is approximately 20 feet above mean sea level (msl). Surface topography consists of a gentle downward slope to the south towards Gravesend Bay, which is approximately 1,000 feet from the Site. A narrow undeveloped strip of land extends along the entire south (rear) side of the Site building. The layout of the Site and surrounding properties is presented on Figure 2 of the RI. Currently, the Site is developed with a shopping center. Land use and zoning at the Site and the other properties in the area is commercial and residential.

3.0 REMEDIAL INVESTIGATION ACTIVITIES

The primary objectives of the proposed RI activities are listed in Section 1.1 of the RI Work Plan. Sample collection efforts include obtaining qualitative data from installation of membrane interface probes (MIPs), collection of a discrete soil sample from a soil borings groundwater samples from permanent monitoring wells, soil vapor samples from temporary soil vapor points, ambient air quality samples, and IDW solid and liquid media samples for to determine waste characterization parameters.

4.0 PRE-FIELD PREPARATION AND EQUIPMENT

Pre-field preparation will be performed prior to mobilization to the field to conduct the activities described in the RI Work Plan and this FSP. The field project team (scientists, technicians, and engineers) will be responsible for obtaining, operating, and maintaining the required equipment, for procuring and maintaining sample containers or canisters pertinent to the collection of environmental samples, and collecting the samples as specified herein. The equipment and materials required to perform the RI field activities are listed in the standard operating procedures (SOPs) provided in Attachments 1-8 of this FSP.

In general, pre-cleaned environmental sample containers (bottles) or canisters (SUMMA® canisters) will be provided by the analytical laboratory in accordance with procedures and requirements set forth in the QAPP (Appendix C of the RI Work Plan). The sample containers or canisters will be inventoried and inspected prior to sampling to verify that the required containers or canisters are present and in good condition.

5.0 REMEDIAL INVESTIGATION FIELD ACTIVITIES

The following sections describe the field activities and methods associated with the RI activities.

5.1 Sample Locations

The locations of the proposed MIP locations, soil borings, monitoring wells, and temporary soil vapor points are shown on Figure 3 of the RI Work Plan.

Underground and aboveground utilities will be identified prior to any drilling or subsurface sampling. Utilities will be located by contacting responsible agencies by phone (New York's Dig Net of New York City & Long Island) so that their underground utilities can be marked at the Site. Utilities will be located and identified following the procedures outlined in the Utility Location Policy and Procedure (see HASP). Other potential on site hazards such as traffic and building hazards will be identified during a Site reconnaissance visit. The work will be planned, in conjunction with Site occupants, to minimize impacts and promote safe conditions for workers, Site occupants, and visitors.

5.1.1 MIP Investigation

This section describes the MIP Investigation.

The Membrane Interface Probe (MIP) provides real-time detection of VOCs or non-aqueous phase liquid (NAPL) in the vadose and saturated zones. The MIP fits onto conventional direct push technology (DPT) equipment and is inserted into the target investigation zone in a manner similar to a standard DPT sampling device. The tool tip has a membrane that is permeable to VOCs and a built-in heating element that causes VOCs near the MIP to volatilize from soil or groundwater. The volatilized VOCs pass through the membrane, where a carrier gas transports the VOCs through sealed tubing to one or more truck-mounted detectors (e.g., a Flame Ionization Detector [FID], Electron Capture Detector [ECD], or Photoionization Detector [PID]). The detectors measure total VOCs in the carrier gas and provide this information in real-time as an instrument response. The detectors do not provide a quantitative concentration of VOCs in the groundwater or soil. However, the response level from the detector corresponds to the amount of VOCs present in the carrier gas, which is proportional to the amount of VOCs in the soil or groundwater at the MIP location. A greater response from the detector indicates greater VOC concentrations in the subsurface.

The MIP also measures soil conductivity and reports this parameter along with the output from the VOC detectors. Data are plotted as a function of depth below ground surface. With these data, Apex can identify changes in soil permeability as well as elevated levels of VOCs. The data collected in the field can be immediately downloaded into software that presents a two- or three-dimensional interpretation of soil conductivity and detector response as a function of depth. The results of the MIP investigation will assist Apex in determining the locations of high-concentration source areas of contaminated soil or groundwater during the second phase of the RI. The MIP will be installed at each location using the procedures described in the GEOPROBE® MIP SOP (Attachment 8 of this FSP). The MIP system will be operated by a trained and qualified contractor and the work will be overseen by Apex.

5.1.2 Soil Vapor, SVI and Sub Slab Installations

Completion of a Soil Vapor Intrusion (SVI) screening investigation at the following Areas of Concern (AOCs) will be performed in accordance with New York State Department of Health (NYSDOH) "*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*," October 2006 as amended. Specifically:

- Apex will complete a Soil Vapor Intrusion (SVI) screening investigation at an adjacent property identified as 8831 and 8841 20th Ave. in accordance with NYSDOH Guidance. Specifically, Apex proposes installation of two (2) interior sub-slab vapor samples SV-4 and SV-5;

- Completion of a Soil Vapor Intrusion (SVI) screening investigation at the down gradient Subject Property at 2036 Cropsey Avenue in accordance with NYSDOH Guidance. Specifically, Apex proposes installation of one (1) interior sub-slab vapor sample SV-6;

- Completion of a Soil Vapor Intrusion (SVI) screening investigation at the Site at 2002 to 2024 Cropsey Avenue in accordance with NYSDOH Guidance. Specifically, Apex proposes installation of one (1) interior sub-slab vapor sample SV-1; and

- Apex proposes installation of two (2) exterior soil vapor samples along the buildings outer perimeter. Sample SV-2 will be located along Cropsey Avenue and sample SV-3 will be located on the Bay 20th St. side of the Site. See Figure 3 of the RI.

5.1.3 Soil Borings

This section describes the methods to drill soil borings and collect soil samples. The soil borings will be drilled using hand drilling methods (see RI Work Plan for details).

Soil samples will be collected following the procedures described in the Soil Drilling and Sample Collection SOP (Attachment 1 of this FSP) and as described in the RI Work Plan and Section 6.1 of this FSP. Soil samples will be analyzed for the compounds/analytes specified in the RI Work Plan and the QAPP (Appendix C of the RI Work Plan).

The drilling and sampling of soil borings will include the following activities:

- Determine location of the soil boring and avoid aboveground and underground utilities per the HASP;
- The approximate location will be measured and shown on a location sketch;
- Drilling will commence and soil sample will be collected as specified in the RI Work Plan; and
- Soil samples will be collected for the specified analyses (see RI Work Plan and QAPP for details).

5.1.4 Drilling and Installation of Monitoring Wells

This section describes the methods to drill, install, and develop monitoring wells. The monitoring wells will be drilled using hollow-stem auger methods.

Based on available information on the local geology and prior well installations at the site, bedrock is expected to be present at a depth greater than 100 feet below ground surface; thus, bedrock is not expected to be encountered at the Site. After completion of drilling and well installation, the monitoring wells will be developed to establish hydraulic connection between the well and the formation. The monitoring wells will be installed at each location using the procedures described in the Monitoring Well Installation SOP (Attachment 2 of this FSP)

The drilling and geological logging methods to be completed in connection with monitoring well installation are as follows:

- The MW-4 through MW-10 (groundwater monitoring wells) will be drilled using hollow-stem auger methods. Soil borings will be completed to a depth as discussed in the RI Work Plan. No soil cores will be collected;

- The designated field geologist will log borehole geology (using the Unified Soil Classification System [ASTM D2488]) and monitoring well specifications in the field book and/or field forms; and

- Soil cuttings will be placed in drums supplied by the drilling subcontractor. Decontamination water will be placed in drums supplied by the drilling subcontractor. Soil cuttings and decontamination water will be containerized at the end of each work day. The open-top drums used to contain IDW will be covered when not in use.

5.1.4.1 Monitoring Well Specifications

The monitoring wells will be installed according to the following specifications:

- 2-inch diameter threaded, flush-joint Schedule 40 polyvinyl chloride (PVC) casing and 10-foot long, 20 slot (0.020-inch) screens will be installed;

- The annular space around the screens will be backfilled with a Morie #2 (or equivalent) sand pack to a height of 1 to 2 feet above the top of the screen;

- A 2-foot thick bentonite seal (pellets or slurry depending on depth of seal) will be placed above the sand pack. The bentonite seal must be allowed to hydrate before placing grout above the seal;

- The remainder of the annular space will be filled with a cement/bentonite grout to approximately 2 ft. bls. The grout will be placed from the bottom up using a tremie pipe. The grout will consist of a cement mixture of one 94-pound bag of Portland cement, approximately 5 pounds of granular bentonite, and approximately 7 gallons of water. The grout will be allowed to set for a minimum of 48 hours before wells are developed if the grout is placed below the water table;

- Each monitoring well will be completed with an 8-inch diameter water-tight flush-mount protective casing. A 2-foot by 2-foot cement pad will be installed around the flush-mount protective casing. The well casing will extend to within approximately 2 to 4 inches below land surface and will include a locking cap;

- The north side of the top of the PVC well casing will be marked and the elevation surveyed to the nearest 0.01 foot; and

- The measuring point on wells will be the marked location on the innermost PVC casing.

The following characteristics of each newly installed monitoring well will be recorded in the field log book and/or on a Well Construction Log:

- Date/time of construction;

- Drilling method;

- Approximate well location;

- Borehole diameter and well casing diameter;
- Well depth;
- Casing materials;
- Screen materials and design;
- Casing and screen joint type;
- Screen slot size/length;
- Filter pack material/size;
- Filter pack placement method;
- Sealant materials;
- Sealant placement method;
- Surface seal design/construction;
- Well development procedure;
- Type of protective well cap; and
- Detailed drawing of well (including dimensions);

The on-site geologist shall specify the monitoring well design to the drilling contractor before installation. An alternate monitoring well construction method may be used if the water table is within approximately 4 feet of land surface. If these conditions are encountered, the thickness of the sand pack and bentonite seal would be reduced as necessary and the depth of the protective casing would be modified as necessary.

5.1.4.2 Monitoring Well Development

A minimum of 48 hours after installation, or the day after installation if the grout is located above the water table, the monitoring wells will be developed by surging and pumping using the procedures outlined in the Monitoring Well Development SOP (Attachment 3 of this FSP). The development water will be containerized in drums provided by the drilling subcontractor. The wells will be developed until the turbidity is reduced to 50 nephelometric turbidity units (NTUs) or less or until the pH and conductivity measurements have stabilized. Following development, the monitoring wells will be allowed to equilibrate for a minimum of two weeks before groundwater sampling is conducted. Monitoring well development will be overseen by a qualified person and the duration, method of development, and approximate volume of water removed will be recorded in the field book.

5.1.4.3 Hydraulic Measurements in Monitoring Wells

Hydraulic (i.e., water-level and fluid-level) measurements will be collected using the procedures described in the Water-Level and NAPL Thickness Measurement Procedures SOP (Attachment 4 of this FSP). The measurements will be made in as short a timeframe as practical to minimize temporal fluctuations in hydraulic conditions.

5.1.4.4 Monitoring Well Groundwater Sample Collection

Groundwater sampling will be conducted using the procedures described in the Low-Flow Groundwater Purging and Sampling Procedures for Monitoring Wells SOP (Attachment 5 of this FSP). Groundwater samples will be analyzed for the compounds/analytes specified in the RI Work Plan and the QAPP (Appendix C of the RI Work Plan).

5.1.4.5 Temporary Soil Vapor Points

The temporary soil vapor points will be installed and sampled using the procedures described in the Subsurface Soil-Gas Sampling and Analysis Using USEPA Method TO-15 – Single Port, Direct Push, Hollow-Stem and Hand Auger Installation SOP (Attachment 6 of this FSP). The temporary soil vapor point boreholes will be advanced to a depth of approximately 5 feet below ground surface using hand excavation soft dig techniques. The temporary soil vapor point samples are intended to serve as screening-level samples that will be collected from a temporary point; therefore, temporal repeat sampling of temporary soil vapor point sample intervals will not be performed. Soil vapor samples will be analyzed for the compounds specified in the RI Work Plan and the QAPP (Appendix C of the RI Work Plan).

5.1.4.6 Ambient Air Quality Sample Collection

Ambient air quality sampling will be conducted using the procedures described in the Ambient Air Sampling and Analysis Using USEPA Method TO-15 SOP (Attachment 7 of this FSP). Ambient air quality samples will be analyzed for the compounds specified in the RI Work Plan and the QAPP (Appendix C of the RI Work Plan).

6.0 SAMPLE COLLECTION, LABELING, HANDLING, AND ANALYSIS

Samples (including QA/QC samples specified in the QAPP) will be properly labeled and identified, and the applicable sampling log and Chain-of-Custody Form will be completed. The QAPP provides additional details regarding Field Records and QA/QC samples, frequency and protocols, sample labeling, and sample custody. Sample containers and SUMMA® canisters will be checked for proper identification/labeling and compared to the Chain-of-Custody Form for accuracy prior to packaging any sample for shipment. The Chain-of-Custody Form will be placed in a sealed plastic bag and taped to the underside of the cooler lid (soil and groundwater samples) or placed in the canister shipping box (air samples).

The soil and groundwater samples will be wrapped with a cushioning material to preclude sample container breakage during shipment and placed in a cooler.

Sufficient amounts of bagged ice will be placed in the cooler to keep the samples at 4 degrees Celsius until arrival at the laboratory. The cooler will be sealed with packaging tape and custody seals will be placed in such a manner that any opening of the cooler prior to arrival at the laboratory can be visually detected.

The canister (air samples) shipping box will be sealed with packaging tape and custody seals will be placed in such a manner that any opening of the box prior to arrival at the laboratory can be visually detected.

Samples will be delivered by overnight carrier or laboratory courier to the analytical laboratory following sample custody requirements specified in the QAPP. The laboratory will be prepared to receive the samples and perform preliminary extractions or analyses within the analytical method recommended holding times.

6.1 Soil Samples

Soil sampling to be conducted as part of the RI includes the collection of soil samples from hand soil borings (see RI Work Plan for details). Soil samples will be collected using the procedures described in the Soil Drilling and Sample Collection SOP (Attachment 7 of this FSP) and as described in this FSP and the RI Work Plan. Soil samples will be collected from the appropriate two-foot interval using a decontaminated stainless steel spoon or trowel. The VOC sample will be immediately transferred directly into an ENCORE sampler.

The soil cores will be screened for organic vapors using the jar headspace method and a PID. In addition, a geologist will be on site during the drilling operations to describe each sample and will include:

- Depth;
- Sample recovery;
- Soil type and sorting;
- Color (natural color, discoloring due to impacts should be described as staining);
- Moisture content (dry, moist, wet);
- Texture;
- Grain size and shape;

- Relative density;
- Consistency;
- Representativeness; and
- Miscellaneous observation (obvious odors – e.g., faint odor, moderate odor, strong odor, etc.).

6.2 Groundwater Samples

Groundwater samples will be collected directly into the laboratory-supplied sample bottles. The flow of water from the sampling equipment will be adjusted to ensure slow, laminar flow so that no entrained air bubbles are present in VOC samples.

Special care will be taken in filling and capping volatile organic analysis (VOA) vials so that headspace/air bubbles are not present in the groundwater samples. In addition, overflowing bottles will be avoided to prevent the loss of floating substances or preservatives that may have already been added to the bottle. All sample bottle caps will be secured snugly, but not over-tightened.

The groundwater samples will be described in the Water Sampling Log or Low-Flow Groundwater Sampling Log.

6.3 Soil Vapor and Ambient Air Quality Samples

Soil vapor samples and ambient air quality samples will be collected directly into the laboratory-supplied SUMMA® canisters. Sample time duration will be monitored during sampling and the SUMMA® canister valve will be closed when the vacuum is 5 inches of Hg.

7.0 FIELD DECONTAMINATION PROCEDURES

Decontamination procedures for non-dedicated field equipment are presented in detail in this section and include decontamination procedures associated with non-dedicated sampling equipment and down hole drilling tools and equipment. In general, after decontamination is completed, items will be stored in a manner to preserve their decontaminated condition prior to use.

7.1 Drilling Equipment Decontamination

A decontamination pad will be constructed, lined with plastic sheeting, and will contain a sump for water collection. The sump will be lined with plastic and be of sufficient volume to accommodate the decontamination water generation needs. Drilling equipment including the rear-end of the drilling rig (if necessary), augers, bits, drill rods, tools, and tremie pipe will be cleaned on the decontamination pad with a high-pressure hot water "steam cleaner" unit and scrubbed with a wire brush, as needed, to remove foreign material (e.g., soil, etc.). The equipment will be decontaminated prior to the start of drilling activities, between each borehole, and prior to leaving the Site.

Tools, drill rods, and augers will be placed on sawhorses, decontaminated pallets, or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided. Decontamination water will be containerized in DOT-approved 55- gallon open-top steel drums. Open-top drums will remain closed when not in use.

Following decontamination of Site equipment, the decontamination pad will be decommissioned. The decommissioning will be completed by:

- Transferring the bulk of the remaining liquids and solids into the drums or tanks to be provided by the drilling subcontractor.
- Rolling the sheeting used in the decontamination pad onto itself to prevent discharge of the remaining materials to the ground surface. Once rolled up, the polyethylene sheeting will be placed in the drums used for disposal of personal protective equipment (PPE) and disposable equipment.

7.2 Sampling Equipment Decontamination

Soil sampling and groundwater sampling equipment requiring decontamination includes, but is not limited to, split-spoon samplers, core barrels, stainless steel spoons/trowels/bowls, interface meters, and non-dedicated pumps/appurtenances.

Water quality probes and water-level indicators will be decontaminated by rinsing with distilled water. Decontamination may be conducted at the sampling location as long as liquids are contained in pails or buckets. The equipment will be decontaminated before and between each use and prior to demobilization. At no time will washed equipment be placed directly on the ground. Decontaminated equipment will either be used immediately or wrapped in plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location. Decontamination fluids will be containerized prior to off-site transportation and disposal.

8.0 INVESTIGATION-DERIVED WASTE SAMPLING

In general, IDW will be containerized in DOT-approved 55-gallon steel drums. Solid and liquid samples will be collected to support IDW characterization for disposal purposes. Solid IDW samples will be collected from the 55-gallon drums by opening the drums, collecting a number of grab samples using a stainless steel spoon/trowel, compositing the grab samples in a stainless steel bowl (except samples collected for VOC analysis), and transferring the sample into the sample containers. The VOC sample will be immediately transferred directly into an ENCORE sampler. Liquid/water IDW samples will be collected from the 55-gallon drums by opening the drum, collecting a grab sample using a bailer, and decanting the sample directly into the sample containers. IDW samples will be analyzed by the laboratory for the parameters specified by the receiving/disposal facility.

9.0 WASTE MANAGEMENT AND DISPOSAL

Solid and liquid IDW generated during field activities including, but not limited to, drill cuttings, monitoring well purge water, and decontamination water will be managed and disposed as outlined in this section. IDW will be containerized in appropriate waste containers and staged on site prior to off-site disposal. If the property owners do not permit the IDW to be stored on site, then the IDW will be picked up on a daily basis and transported to a treatment, storage, and disposal facility (TSDF) for temporary storage until the waste has been characterized and profiled for acceptance at the off-site disposal facility. Soil cuttings, PPE, and spent disposable sampling materials will be segregated by waste type and placed in Department of Transportation (DOT)-approved 55-gallon steel drums. Decontamination water and development water will be stored in DOT- approved 55-gallon steel drums. Storage vessels will be appropriately labeled with the contents, generator, location, and date for later off- site transportation and disposal.

Attachment 1

Soil Drilling and Sample Collection

Standard Operating Procedures

SCOPE AND APPLICATION

Overburden drilling is commonly performed using the hollow-stem auger drilling method. Other drilling methods suitable for overburden drilling, which are sometimes necessary due to site-specific geologic conditions, include: drive-and-wash, spun casing, Rotasonic, dual-rotary (Barber Rig), and fluid/mud rotary.

Direct-push techniques (e.g., Geoprobe or cone penetrometer) may also be used. The drilling method to be used at a given site will be selected based on site-specific consideration of anticipated drilling depths, site or regional geologic knowledge, types of sampling to be conducted, required sample quality and volume, and cost.

No oils or grease will be used on equipment introduced into the boring (e.g., drill rod, casing, or sampling tools).

PERSONNEL QUALIFICATIONS

The Project Manager (a qualified geologist, environmental scientist, or engineer) will identify the appropriate soil boring locations, depth and soil sample intervals in a written plan.

Personnel responsible for overseeing drilling operations must have at least 16 hours of prior training overseeing drilling activities with an experienced geologist, environmental scientist, or engineer with at least 2 years of prior experience.

Equipment List

The following materials will be available during soil boring and sampling activities, as required:

- Site Plan with proposed soil boring/well locations;
- Work Plan and site Health and Safety Plan (HASP);
- personal protective equipment (PPE), as required by the HASP;
- drilling equipment required by the American Society for Testing and Materials (ASTM) D 1586, when performing split-spoon sampling;
- disposable plastic liners, when drilling with direct-push equipment;
- appropriate soil sampling equipment (e.g., stainless steel spatulas, knife);
- equipment cleaning materials;
- appropriate sample containers and labels;

- chain-of-custody forms;
- insulated coolers with ice, when collecting samples requiring preservation by chilling;
- photoionization detector (PID) or flame ionization detector (FID); and
- field notebook and/or personal digital assistant (PDA).

Precautions

Prior to beginning field work, underground utilities in the vicinity of the drilling areas will be identified by one of the following three actions (lines of evidence):

- Contact the State One Call;
- Obtain a detailed site utility plan drawn to scale, preferably an “as-built” plan; and
- Conduct a detailed visual site inspection.

In the event that one or more of the above lines of evidence cannot be conducted, or if the accuracy of utility location is questionable, a minimum of one additional line of evidence will be utilized as appropriate or suitable to the conditions. Examples of additional lines of evidence include but are not limited to:

- Private utility locating service;
- Research of state, county or municipal utility records and maps including computer drawn maps or geographical information systems (GIS);
- Contact with the utility provider to obtain their utility location records;
- Hand auguring or digging;
- Hydro-knife;
- Air-knife Radio Frequency Detector (RFD);
- Ground Penetrating Radar (GPR);
- Any other method that may give ample evidence of the presence or location of subgrade utilities;
- Overhead power lines also present risks and the following safe clearance must be maintained from them.

Power Line Voltage Phase to Phase (kV)	Minimum Safe Clearance (feet)
50 or below	10
Above 50 to 200	15
Above 200 to 350	20
Above 350 to 500	25
Above 500 to 750	35
Above 750 to 1,000	35

ANSI Standard B30.5-1994, 5-3.4.5

Avoid using drilling fluids or materials that could impact groundwater or soil quality, or could be incompatible with the subsurface conditions.

Water used for drilling and sampling of soil or bedrock, decontamination of drilling/sampling equipment, or grouting boreholes upon completion will be of a quality acceptable for project objectives. Testing of water supply should be considered.

Specifications of materials used for backfilling borehole will be obtained, reviewed and approved to meet project quality objectives.

HEALTH AND SAFETY CONSIDERATIONS

Field activities associated with overburden drilling and soil sampling will be performed in accordance with a site-specific HASP, a copy of which will be present on site during such activities.

DRILLING PROCEDURES

The drilling contractor will be responsible for obtaining accurate and representative samples; informing the supervising geologist of changes in drilling pressure; and keeping a separate general log of soils encountered, including blow counts (i.e., the number of blows from a soil sampling drive weight [140 pounds] required to drive the split-barrel sampler in 6-inch increments).

Records will also be kept of occurrences of premature refusal due to boulders or construction materials that may have been used as fill. Where a boring cannot be advanced to the desired depth, the boring will be abandoned and an additional boring will be advanced at an adjacent location to obtain the required sample. Where it is desirable to avoid leaving vertical connections between depth intervals, the borehole will be sealed using cement and/or bentonite.

Multiple refusals may lead to a decision by the supervising geologist to abandon that sampling location.

Soil Sampling Procedures

Samples of subsurface materials encountered while drilling soil borings will be collected using one of the following methods:

- 2-inch split-barrel (split-spoon) sampler, if using the ASTM D 1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils; and
- Plastic internal soil sample sleeves if using direct-push drilling.

Soil samples are typically field screened with an FID or PID at sites where volatile organic compounds are present in the subsurface. Field screening is performed using one of the following methods:

- Upon opening the sampler, the soil is split open and the PID or FID probe is placed in the opening and covered with a gloved hand. Such readings should be obtained at several locations along the length of the sample; and
- A portion of the collected sample is placed in a jar, which is covered with aluminum foil, sealed, and allowed to warm to room temperature. After warming, the cover is removed, the foil is pieced with the FID or PID probe, and a reading is obtained.
- Samples selected for laboratory analysis will be handled, packed, and shipped in accordance with the procedures outlined in the Work Plan or Chain-of-Custody, Handling, Packing, and Shipping SOP.

A geologist will be onsite during drilling and sampling operations to describe each soil sample on the soil boring log, including:

- percent recovery;
- structure and degree of sample disturbance;
- soil type;
- color;
- moisture condition;
- density;
- grain-size;

- consistency; and
- other observations, particularly relating to the presence of waste materials.

Particular care will be taken to fully describe any sheens observed, oil saturation, staining, discoloration, evidence of chemical impacts, or unnatural materials.

Waste Management

Water generated during cleaning procedures will be collected and contained onsite in appropriate containers for future analysis and appropriate disposal.

PPE (such as gloves, disposable clothing, and other disposable equipment) resulting from personnel cleaning procedures and soil sampling/handling activities will be placed in plastic bags. These bags will be transferred into appropriately labeled 55- gallon drums or a covered roll-off box for appropriate disposal.

Soil materials will be placed in sealed 55-gallon steel drums or covered roll-off boxes and stored in a secured area. Once full, the material will be analyzed to determine the appropriate disposal method.

Data Recording and Management

The supervising geologist or scientist will be responsible for documenting drilling events using a bound field notebook and/or PDA to record all relevant information in a clear and concise format. The record of drilling events will include:

- start and finish dates of drilling;
- name and location of project;
- project number, client, and site location;
- sample number and depths;
- blow counts and recovery;
- depth to water;
- type of drilling method;
- drilling equipment specifications, including the diameter of drilling tools;
- documentation of any elevated organic vapor readings;
- names of drillers, inspectors, or other people onsite; and

- weather conditions.

Quality Assurance

Equipment will be cleaned prior to use onsite, between each drilling location, and prior to leaving the site. Drilling equipment and associated tools, including augers, drill rods, sampling equipment, wrenches, and other equipment or tools that may have come in contact with soils and/or waste materials will be cleaned with high-pressure steam-cleaning equipment using a potable water source. The drilling equipment will be cleaned in an area designated by the supervising engineer or geologist that is located outside of the work zone. More elaborate cleaning procedures may be required for reusable soil samplers (split-spoons) when soil samples are obtained for laboratory analysis of chemical constituents.

References

American Society of Testing and Materials (ASTM) D 1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils

Attachment 2

Monitoring Well Installation

Procedure

MONITORING WELL INSTALLATION

Scope and Application

The procedures set out herein are designed to produce standard groundwater monitoring wells suitable for: (1) groundwater sampling, (2) water level measurement, (3) bulk hydraulic conductivity testing of formations adjacent to the open interval of the well.

Monitoring well boreholes in unconsolidated (overburden) materials are typically drilled using the hollow-stem auger drilling method. Other drilling methods that are also suitable for installing overburden monitoring wells, and are sometimes necessary due to site-specific geologic conditions, include: drive-and-wash, spun casing, Rotasonic, dual-rotary (Barber Rig), and fluid/mud rotary with core barrel or roller bit.

Direct-push techniques (e.g., Geoprobe or cone penetrometer) and driven well points may also be used in some cases within the overburden. Monitoring wells within consolidated materials such as bedrock are commonly drilled using water-rotary (coring or tri-cone roller bit), air rotary or Rotasonic methods. The drilling method to be used at a given site will be selected based on site-specific consideration of anticipated drilling/well depths, site or regional geologic knowledge, type of monitoring to be conducted using the installed well, and cost.

No oils or grease will be used on equipment introduced into the boring (e.g., drill rod, casing, or sampling tools). No polyvinyl chloride (PVC) glue/cement will be used in constructing or retrofitting monitoring wells that will be used for water-quality monitoring. No coated bentonite pellets will be used in the well drilling or construction process. Specifications of materials to be installed in the well will be obtained prior to mobilizing onsite, including:

- well casing;
- bentonite;
- sand; and
- grout.

Well materials will be inspected and, if needed, cleaned prior to installation.

Personnel Qualifications

Monitoring well installation activities will be performed by persons who have been trained in proper well installation procedures under the guidance of an experienced field geologist, engineer, or technician. Where field sampling is performed for soil or bedrock characterization, field personnel will have undergone in-field training in soil or bedrock description methods, as described in the appropriate SOP(s) for those activities.

Equipment List

The following materials will be available during soil boring and monitoring well installation activities, as required:

- Site Plan with proposed soil boring/well locations;
- Work Plan or Field Sampling Plan (FSP), and site Health and Safety Plan (HASP);
- personal protective equipment (PPE), as required by the HASP;
- traffic cones, delineators, caution tape, and/or fencing as appropriate for securing the work area, if such are not provided by drillers;
- appropriate soil sampling equipment (e.g., stainless steel spatulas, knife);
- soil and/or bedrock logging equipment as specified in the appropriate SOPs;
- appropriate sample containers and labels;
- drum labels as required for investigation derived waste handling;
- chain-of-custody forms;
- insulated coolers with ice, when collecting samples requiring preservation by chilling;
- photoionization detector (PID) or flame ionization detector (FID);
- ziplock style bags;
- water level or oil/water interface meter;
- locks and keys for securing the well after installation;
- decontamination equipment (bucket, distilled or deionized water, cleansers appropriate for removing expected chemicals of concern, paper towels); and
- field notebook.

Prior to mobilizing to the site, personnel will contact the drilling subcontractor to confirm that appropriate sampling and well installation equipment will be provided. Specifications of the sampling and well installation equipment are expected to vary by project, and so communication with the driller will be necessary to ensure that the materials provided will meet the project objectives. Equipment typically provided by the driller could include:

- drilling equipment required by the American Society of Testing and Materials (ASTM) D 1586, when performing split-spoon sampling;
- disposable plastic liners, when drilling with direct-push equipment;
- drums for investigation derived waste;
- drilling and sampling equipment decontamination materials;
- decontamination pad materials, if required; and
- well construction materials.

Precautions

Prior to beginning field work, underground utilities in the vicinity of the drilling areas will be delineated by the drilling contractor and an independent underground utility locator service.

Some regulatory agencies require a minimum annular space between the well or permanent casing and the borehole wall. When specified, the minimum clearance is typically 2 inches on all sides (e.g., a 2-inch diameter well requires a 6-inch diameter borehole). In addition, some regulatory agencies have specific requirements regarding grout mixtures. Determine whether the oversight agency has any such requirements prior to finalizing the drilling and well installation plan.

Avoid using drilling fluids or materials that could impact groundwater or soil quality, or could be incompatible with the subsurface conditions.

Similarly, consider the material compatibility between the well materials and the surrounding environment. For example, PVC well materials are not preferred when DNAPL is present. In addition, some groundwater conditions leach metals from stainless steel.

Water used for drilling and sampling of soil or bedrock, decontamination of drilling/sampling equipment, or grouting boreholes upon completion will be of a quality acceptable for project objectives. Testing of water supply should be considered.

Specifications of materials used for backfilling bore hole will be obtained, reviewed and approved to meet project quality objectives. Bentonite is not recommended where DNAPLs are likely to be present. In these situations, neat cement grout is preferred.

No coated bentonite pellets will be used in monitoring well construction, as the coating could impact the water quality in the completed well.

Monitoring wells may be installed with Schedule 40 polyvinyl chloride (PVC) to a maximum depth of 200 feet below ground surface (bgs). PVC monitoring wells between 200 and 400 feet total depth will be constructed using Schedule 80 PVC. Monitoring wells deeper than 400 feet will be constructed using steel.

Health and Safety Considerations

Field activities associated with monitoring well installation will be performed in accordance with the site-specific HASP, a copy of which will be present on site during such activities.

Procedures

The procedures for installing groundwater monitoring wells are presented below:

- Locate boring/well location, establish work zone, and set up sampling equipment decontamination area.

- Advance boring to desired depth.

- Collect soil and/or bedrock samples at appropriate interval as specified in the Work Plan and/or FSP. Collect, document, and store samples for laboratory analysis as specified in the Work Plan and/or FSP. Decontaminate equipment between samples in accordance with the Work Plan and/or FSP. A common sampling method that produces high-quality soil samples with relatively little soil disturbance is the ASTM D 1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils. Split-spoon samples are obtained during drilling using hollow-stem auger, drive-and-wash, spun casing, and fluid/mud rotary. Rotasonic drilling produces large-diameter soil cores that tend to be more disturbed than split-spoon samples due to the vibratory action of the drill casing. Dual-rotary removes cuttings by compressed air and allows only a general assessment of geology.

- Describe each soil or bedrock sample as outlined in the appropriate SOP.

- Record descriptions in the field notebook and/or personal digital assistant (PDA). It should be noted that PDA logs must be electronically backed up and transferred to a location accessible to other project team members as soon as feasible to retain and protect the field data. During soil boring advancement, document all drilling events in field notebook, including blow counts (number of blows required to advance split-spoon sampler in 6-inch increments) and work stoppages. Blow counts will not be available if Rotasonic, dual-rotary, or direct-push methods are used. When drilling in bedrock, the rate of penetration (minutes per foot) is recorded.

- pressure-injection grouting using an inflatable packer installed temporarily into the base of the casing, such that grout is injected out the bottom of the casing until it is observed at ground surface outside the casing; displacement-method grouting (also known as the Halliburton method), which entails filling the casing with grout and displacing the grout out the bottom of the casing by pushing a drillable plug, typically made of wood to the bottom of the casing, following by tremie grouting the remainder of the annulus outside the casing; or tremie grouting the annulus surrounding the casing using a tremie pipe installed to the base of the borehole. In all three cases, the casing is grouted to the ground surface, and the grout is allowed to set prior to drilling deeper through the casing. Site-specific criteria and work plans should be created for the completion of non-standard monitoring wells, including telescopic wells.

- Upon completing the borehole to the desired depth, if a screened well construction is desired, install the monitoring well by lowering the screen and casing assembly with sump through the augers or casing. Monitoring wells typically will be constructed of 2-inch-diameter, flush-threaded PVC or stainless steel slotted well screen and blank riser casing. Smaller diameters may be used if wells are installed using direct-push methodology or if multiple wells are to be installed in a single borehole. The screen length will be specified in the Work Plan or FSP based on regulatory requirements and specific monitoring objectives.

- Monitoring well screens are usually 5 to 10 feet long, but may be up to 25 feet long in very low permeability, thick geologic formations. The screen length will depend on the purpose for the well and the objectives of the groundwater investigation. Typically, the slot size will be 0.010 inch and the sand pack will be 20-40, Morie No. 0, or equivalent. In very fine-grained formations where sample turbidity needs to be minimized, it may be preferred to use a 0.006-inch slot size and 30-65, Morie No. 00, or equivalent sand pack. Alternatively, where monitoring wells are installed in coarse-grained deposits and higher well yield is required, a 0.020-inch slot size and 10-20, Morie No. 1, or equivalent sand pack may be preferred. To the extent practicable, the slot size and sand pack gradation may be predetermined in the Work Plan or FSP based on site-specific grain-size analysis or other geologic considerations or monitoring objectives. A blank sump may be attached below the well screen if the well is being installed for DNAPL recovery/monitoring purposes. If so, the annular space around the sump will be backfilled with neat cement grout to the bottom of the well screen prior to placing the sand pack around the screen. A blank riser will extend from the top of the screen to approximately 2.5 feet above grade or, if necessary, just below grade where conditions warrant a flush- mounted monitoring well. For wells greater than 50 feet deep, centralizers may be desired to assist in centralizing the monitoring well in the borehole during construction.

- When the monitoring well assembly has been set in place and the grout has been placed around the sump (if any), place a washed silica sand pack in the annular space from the bottom of the boring to a height of 1 to 2 feet above the top of the well screen. The sand pack is placed and drilling equipment extracted in increments until the top of the sand pack is at the appropriate depth. The sand pack will be consistent with the screen slot size and the soil particle size in the screened interval, as specified in the Work Plan or FSP.

- A hydrated bentonite seal (a minimum of 2 feet thick) will then be placed in the annular space above the sand pack. If non-hydrated bentonite is used, the bentonite should be permitted to hydrate in place for a minimum of 30 minutes before proceeding. No coated bentonite pellets will be used in monitoring well drilling or construction. Potable water may be added to hydrate the bentonite if the seal is above the water table. Monitor the placement of the sand pack and bentonite with a weighted tape measure. During the extraction of the augers or casing, a cement/bentonite or neat cement grout will be placed in the annular space from the bentonite seal to a depth approximately 2 feet bgs.

- Place a locking, steel protective casing (extended at least 1.5 feet below grade and 2 feet above grade) over the riser casing and secure with a neat cement seal. Alternatively, for flush-mount completions, place a steel curb box with a bolt-down lid over the riser casing and secure with a neat cement seal. In either case, the cement seal will extend approximately 1.5 to 2.0 feet below grade and laterally at least 1 foot in all directions from the protective casing, and should slope gently away to promote drainage away from the well. Monitoring wells will be labeled with the appropriate designation on both the inner and outer well casings or inside of the curb box lid.

- When an above-grade completion is used, the PVC riser will be sealed using an expandable locking plug and the top of the well will be vented by drilling a small-diameter (1/8 inch) hole near the top of the well casing or through the locking plug, or by cutting a vertical slot in the top of the well casing. When a flush-mount installation is used, the PVC riser will be sealed using an unvented, expandable locking plug. During well installation, record construction details and actual measurements relayed by the drilling contractor and tabulate materials used (e.g., screen and riser footages; bags of bentonite, cement, and sand) in the field notebook.

Direct-Push Method

The direct-push drilling method may also be used to complete soil borings and install monitoring wells. Examples of this technique include the Diedrich ESP vibratory probe system, GeoProbe®, or AMS Power Probe® dual-tube system. Environmental probe systems typically use a hydraulically operated percussion hammer. Depending on the equipment used, the hammer delivers 140- to 350-foot pounds of energy with each blow. The hammer provides the force needed to penetrate very stiff/medium dense soil formations. The hammer simultaneously advances an outer steel casing that contains a dual-tube liner for sampling soil. The outside diameter (OD) of the outer casing ranges from 1.75 to 2.4 inches and the OD of the inner sampling tube ranges from 1.1 to 1.8 inches. The outer casing isolates shallow layers and permits the unit to continue to probe at depth. The double-rod system provides a borehole that may be tremie-grouted from the bottom up. Alternatively, the inside diameter (ID) of the steel casing provides clearance for the installation of small-diameter (e.g., 0.75- to 1-inch ID) micro-wells. The procedures for installing monitoring wells in soil using the direct- push method are described below.

- Locate boring/well location, establish work zone, and set up sample equipment decontamination area.
- Advance soil boring to designated depth, collecting samples at intervals specified in the Work Plan. Samples will be collected using dedicated, disposable, plastic liners. Describe samples in accordance with the procedures outlined in Step 3 above. Collect samples for laboratory analysis as specified in the Work Plan and/or FSP.
- Upon advancing the borehole to the desired depth, install the micro-well through the inner drill casing. The micro-well will consist of approximately 1-inch ID PVC or stainless steel slotted screen and blank riser. The sand pack, bentonite seal, and cement/bentonite grout will be installed as described, where applicable, in Step 7 and 8 above. Install protective steel casing or flush-mount, as appropriate, as described in Step 9 above.
- During well installation, record construction details and tabulate materials used.

Waste Management

Investigation-derived wastes (IDW), including soil cuttings and excess drilling fluids (if used), decontamination liquids, and disposable materials (well material packages, PPE, etc.), will be placed in clearly labeled, appropriate containers, or managed as otherwise specified in the Work Plan, FSP, and/or IDW management SOP.

Data Recording and Management

Drilling activities will be documented in a field notebook. Pertinent information will include personnel present on site, times of arrival and departure, significant weather conditions, timing of well installation activities, soil descriptions, well construction specifications (screen and riser material and diameter, sump length, screen length and slot size, riser length, sand pack type), and quantities of materials used. In addition, the locations of newly-installed wells will be documented photographically or in a site sketch. If appropriate, a measuring wheel or engineer’s tape will be used to determine approximate distances between important site features. The well or piezometer location, ground surface elevation, and inner and outer casing elevations will be surveyed using the method specified in the site Work Plan.

Generally, a local baseline control will be set up. This local baseline control can then be tied into the appropriate vertical and horizontal datum, such as the National Geodetic Vertical Datum of 1929 or 1988 and the State Plane Coordinate System. At a minimum, the elevation of the top of the inner casing used for water-level measurements should be measured to the nearest 0.01

foot. Elevations will be established in relation to the National Geodetic Vertical Datum of 1929. A permanent mark will be placed on top of the inner casing to mark the point for water-level measurements.

Quality Assurance

All drilling equipment and associated tools (including augers, drill rods, sampling equipment, wrenches, and any other equipment or tools) that may have come in contact with soil will be cleaned in accordance with the procedures outlined in the appropriate SOP. Well materials will also be cleaned prior to well installation.

References

American Society of Testing and Materials (ASTM) D 1586 - Standard Test Method for Penetration Test and Split-Barrel Sampling of Soil

Attachment 3

Monitoring Well Development Procedures

SCOPE AND APPLICATION

Monitoring wells (or piezometers, well points, or micro-wells) will be developed to clear them of fine-grained sediment to enhance the hydraulic connection between the well and the surrounding geologic formation. Development will be accomplished by evacuating well water by either pumping or bailing. Prior to pumping or bailing, the screened interval will be gently surged using a surge block, bailer, or inertia pump with optional surge block fitting as appropriate. Accumulated sediment in the bottom of the well (if present) will be removed by bailing with a bottom-loading bailer or via pumping using a submersible or inertia pump with optional surge-block fitting. Wells will also be gently brushed with a weighted brush to assist in removing loose debris, silt or flock attached to the inside of the well riser and/or screen prior to development. Pumping methods will be selected based on site-specific geologic conditions, anticipated well yield, water table depth, and groundwater monitoring objectives, and may include one or more of the following:

- submersible pump;
- inertial pump (Waterra™ pump or equivalent);
- bladder pump;
- peristaltic pump; and
- centrifugal pump.

When developing a well using the pumping method, the pump (or, with inertial pumps, the tubing) is lowered to the screened portion of the well. During purging, the pump or tubing is moved up and down the screened interval until the well yields relatively clear water.

Submersible pumps have a motor-driven impeller that pushes the groundwater through discharge tubing to the ground surface. Inertial pumps have a check valve at the bottom of stiff tubing which, when operated up and down, lifts water to the ground surface.

Bladder pumps have a bottom check valve and a flexible internal bladder that fills from below and is then compressed using pressurized air to force water out the top of the bladder through the discharge tubing to the ground surface. These three types of pumps have a wide range of applicability in terms of well depth and water depth. Centrifugal and peristaltic pumps use atmospheric pressure to lift water from the well, and therefore can only be practically used where the depth to water is less than 25 feet.

Personnel Qualifications

Monitoring well development activities will be performed by persons who have been trained in proper well development procedures under the guidance of an experienced field geologist, engineer, or technician.

Equipment List

Materials for monitoring well development using a pump include the following:

- health and safety equipment, as required by the site Health and Safety Plan (HASP);
- cleaning equipment;
- photoionization detector (PID) to measure headspace vapors;
- pump;
- polyethylene pump discharge tubing;
- plastic sheeting;
- power source (generator or battery);
- field notebook and/or personal digital assistant (PDA);
- graduated pails;
- appropriate containers;
- monitoring well keys; and
- water level indicator.

Materials for monitoring well development using a bailer include the following:

- personal protective equipment (PPE) as required by the HASP;
- cleaning equipment;
- PID to measure headspace vapors;
- bottom-loading bailer, sand bailer;
- polypropylene or nylon rope;
- plastic sheeting;

- graduated pails;
- appropriate containers;
- keys to wells;
- field notebook and/or PDA; and
- water level indicator weighted brush for well brushing.

Precautions

Where surging is performed to assist in removing fine-grained material from the sand pack, surging must be performed in a gentle manner. Excessive suction could promote fine-grained sediment entry into the outside of the sand pack from the formation.

Avoid using development fluids or materials that could impact groundwater or soil quality, or could be incompatible with the subsurface conditions.

In some cases it may be necessary to add potable water to a well to allow surging and development, especially for new monitoring wells installed in low permeability formations. Before adding potable water to a well, the Project Manager (PM) must be notified and the PM shall make the decision regarding the appropriateness and applicability of adding potable water to a well during well development procedures. If potable water is to be added to a well as part of development, the potable water source should be sampled and analyzed for constituents of concern, and the results evaluated by the PM prior to adding the potable water to the well. If potable water is added to a well for development purposes, at the end of development the well will be purged dry to remove the potable water, or if the well no longer goes dry then the well will be purged to remove at least three times the volume of potable water that was added.

Health and Safety Considerations

Field activities associated with monitoring well development will be performed in accordance with a site-specific HASP, a copy of which will be present on site during such activities.

Procedure

The procedures for monitoring well development are described below. (Note: Steps 7, 8, and 10 can be performed at the same time using an inertial pump with a surge-block fitting.)

1. Don appropriate PPE (as required by the HASP).

2. Place plastic sheeting around the well.

3. Clean all equipment entering each monitoring well, except for new, disposable materials that have not been previously used. Open the well cover while standing upwind of the well, remove well cap. Insert PID probe approximately 4 to 6 inches into the casing or the well headspace and cover with gloved hand. Record the PID reading in the field notebook. If the well headspace reading is less than 5 PID units, proceed; if the headspace reading is greater than 5 PID units, screen the air within the breathing zone. If the PID reading in the breathing zone is below 5 PID units, proceed. If the PID reading is above 5 PID units, move upwind from well for 5 minutes to allow the volatiles to dissipate. Repeat the breathing zone test. If the reading is still above 5 PID units, don the appropriate respiratory protection in accordance with the requirements of the HASP. Record all PID readings.

4. Obtain an initial measurement of the depth to water and the total well depth from the reference point at the top of the well casing. Record these measurements in the field log book.

5. Prior to redeveloping older wells that may contain solid particulate debris along the inside of the well casing and screen, gently lower and raise a weighted brush along the entire length of the well screen and riser to free and assist in removing loose debris, silt or flock. Perform a minimum of 4 “passes” along the screened and cased intervals of the well below the static water level in the well. Allow the resulting suspended material to settle for a minimum of one day prior to continuing with redevelopment activities.

6. Lower a surge block or bailer into the screened portion of the well. Gently raise and lower the surge block or bailer within the screened interval of the well to force water in and out of the screen slots and sand pack. Continue surging for 15 to 30 minutes.

7. Lower a bottom-loading bailer, submersible pump, or inertia pump tubing with check valve to the bottom of the well and gently bounce the bailer, pump, pump tubing on the bottom of the well to collect/remove accumulated sediment, if any. Remove and empty the bailer, if used. Repeat until the bailed/pumped water is free of excessive sediment and the bottom of the well feels solid. Alternatively, measurement of the well depth with a water level indicator can be used to verify that sediment and/or silt has been removed to the extent practicable, based on a comparison with the well installation log or previous measurement of total well depth.

8. After surging the well and removing excess accumulated sediment from the bottom of the well, re-measure the depth-to-water and the total well depth from the reference point at the top of the well casing. Record these measurements in the field log book.

9. Remove formation water by pumping or bailing. Where pumping is used, measure and record the pre-pumping water level. Operate the pump at a relatively constant rate. Measure the pumping rate using a calibrated container and stop watch, and record the pumping rate in the field log book. Measure and record the water level in the well at least once every 5 minutes during pumping. Note any relevant observations in terms of water color, visual level of turbidity, sheen, odors, etc. Pump or bail until termination criteria specified in the Site Characterization (SC) Work Plan are reached. Record the total volume of water purged from the well.

10. If the well goes dry, stop pumping or bailing and allow well to recover. Resume pumping or bailing when sufficient water has recharged the well.

11. Contain all water in appropriate containers.

12. When complete, secure the lid back on the well.

13. Place disposable materials in plastic bags for appropriate disposal and decontaminate reusable, downhole pump components and/or bailer.

Waste Management

Materials generated during monitoring well installation and development will be placed in appropriate labeled containers and disposed of as described in the Work Plan or FSP.

Data Recording and Management

Well development activities will be documented in a proper field notebook and/or PDA. Pertinent information will include personnel present on site; times of arrival and departure; significant weather conditions; timing of well development activities; development method(s); observations of purge water color, turbidity, odor, sheen, etc.; purge rate; and water levels before and during pumping.

Quality Assurance

All reused, non-disposable, downhole well development equipment will be cleaned in accordance with the procedures outlined in the Field Equipment Cleaning-Decontamination SOP.

Attachment 4

Water-Level and NAPL Thickness

Measurement Procedures

SCOPE AND APPLICATION

Monitoring well water levels and thickness of non-aqueous phase liquids (NAPLs) will be determined, as appropriate, to develop groundwater elevation contour maps and to assess the presence or absence of NAPL in wells. This SOP applies to light and/or dense NAPLs (LNAPLs and DNAPLs, respectively). In addition, because this SOP describes water-level measurement from surveyed measurement points, this SOP can be followed, to obtain surface water level measurements from surveyed measurement points.

Fluid levels will be measured using an electric water-level probe and/or NAPL-water interface probe from established reference points. Reference points are surveyed, and are established at the highest point at the top of well riser, and will be based on mean sea level, or local/onsite datum. The Operating and Maintenance (O&M) Instruction Manual for the electric water level probe and/or and interface probe should be reviewed prior to commencing work for safe and accurate operation.

Personnel Qualifications

Individuals conducting fluid level measurements will have been trained in the proper use of the instruments, including their use for measuring fluid levels and the bottom depth of wells. In addition, field sampling personnel will have current health and safety training including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and CPR, as needed. In addition, field sampling personnel will be versed in the relevant SOPs and possess the required skills and experience necessary to successfully complete the desired field work. Field personnel will also be compliant with client-specific training requirements, such as (but not limited to) LPS or other behavior-based training, and short-service employee restrictions.

Equipment List

The following materials, as required, shall be available during fluid level measurements:

- photoionization detector (PID);
- appropriate health and safety equipment, as specified in the site Health and Safety Plan (HASP);
- laboratory-type soap (Alconox or equivalent), methanol/hexane rinse, potable water, distilled water, and/or other equipment that may be needed for decontamination purposes;
- electronic NAPL-water interface probe;
- electronic water-level meter;

- 6-foot engineer's rule;
- portable containers;
- plastic sheeting;
- field logbook and/or personal digital assistant (PDA);
- indelible ink pen; and
- digital camera (optional, if allowed by site policy).

Precautions

Electronic water-level probes and NAPL-water interface probes can sometimes produce false-positive readings. For example, if the inside surface of the well has condensation above the water level, then an electronic water-level probe may produce a signal by contacting the side of the well rather than the true water level in the well. In addition, NAPL-water interface probes can sometimes indicate false positive signals when contacting a sediment layer on the bottom of a well. In contrast, a NAPL-water interface probe may produce a false-negative (no signal) if a floating layer of non-aqueous phase liquid (NAPL) is too thin, such as a film or sheen.

To produce reliable data, the electronic water level probe and/or interface probe should be raised and lowered several times at the approximate depth where the instrument produces a tone indicating a fluid interface to verify consistent, repeatable results. In addition, a bottom-loading bailer should periodically be used to check for the presence of NAPLs rather than relying solely on the NAPL-water interface probe.

The graduated tape or cable with depth markings is designed to indicate the depth of the electronic sensor that detects the fluid interface, but not the depth of the bottom of the instrument. When using these devices to measure the total well depth, the additional length of the instrument below the electronic sensor must be added to the apparent well depth reading, as observed on the tape or cable of the instrument, to obtain the true total depth of the well. If the depth markings on the tape or cable are worn or otherwise difficult to read, extra care must be taken in obtaining the depth readings.

Health and Safety Considerations

The HASP will be followed, as appropriate, to ensure the safety of field personnel. Access to wells may expose field personnel to hazardous materials such as contaminated groundwater or NAPL. Other potential hazards include stinging insects that may inhabit well heads, other biologic hazards, and potentially the use of sharp cutting tools (scissors, knife). Appropriate personal protective equipment (PPE) will be worn during these activities. Field personnel will thoroughly review client-specific health and safety requirements, which may preclude the use of fixed/folding-blade knives.

Procedure Calibration Procedures

If there is any uncertainty regarding the accuracy of the tape or cable associated with the electronic water-level probe or NAPL-water interface probe, it should be checked versus a standard length prior to use to assess if the tape or cable above the meter has been correctly calibrated by the manufacturer, and to identify evidence of tape or cable stretching, etc.

Measure the lengths between markers on the cable with a 6-foot engineer's rule or a fiberglass engineer's tape. The tape or cable associated with the electronic water-level probe or NAPL-water interface probe should be checked for the length corresponding to the deepest total well depth to be monitored during the data collection event.

If the length designations on the tape or cable associated with the electronic water-level probe or NAPL-water interface probe are found to be incorrect, the probe will not be used until it is repaired by the manufacturer.

Record verification of this calibration process in field logbook or PDA.

Measurement Procedures

The detailed procedure for obtaining fluid level depth measurements is as follows. Field notes on logs will be treated as secured documentation and indelible ink will be used. As a general rule, the order of measuring should proceed from the least to most contaminated monitoring wells, based on available data .Identify site and well number in field logbook using indelible ink, along with date, time, personnel, and weather conditions.

1. Field personnel will avoid activities that may introduce contamination into monitoring wells. Activities such as dispensing gasoline into vehicles or generators should be accomplished well in advance of obtaining field measurements.

2. Don PPE as required by the HASP.

3. Clean the NAPL/water interface probe and cable in accordance with the appropriate cleaning procedures. Down-hole instrumentation should be cleaned prior to obtaining readings at the first monitoring well and upon completion of readings at each well.

4. Clean the NAPL/water level interface probe and cable with a soapy (Alconox) water rinse followed by a solvent rinse (if appropriate based on site-specific constituents of

concern) an analyte-free water rinse Contain rinse water in a portable container that will be transferred to an on-site container.

5. Put clean plastic sheeting on the ground next to the well.

6. Unlock and open the well cover while standing upwind from the well. Place the well cap on the plastic sheeting.

7. Locate a measuring reference point on the well casing. If one is not found, initiate a reference point at the highest discernable point on the inner casing (or outer if an inner casing is not present) by notching with a hacksaw, or using an indelible marker. All down-hole measurements will be taken from the reference point established at each well on the inner casing (on the outer only if an inner casing is not present).

8. Measure to the nearest hundredth of a foot and record the height of the inner and outer casings (from reference point, as appropriate) to ground level.

9. Record the inside diameter of the well casing in the field log.

10. If an electronic water level probe is used to measure the water level, lower the probe until it emits a signal (tone and or light) indicating the top of the water surface. Gently raise and lower the instrument through this interface to confirm its depth. Measure and record the depth of the water surface, and the total well depth, to the nearest hundredth of a foot from the reference point at the top of the well. Lower the probe to the bottom of the well to obtain a total depth measurement.

11. If a NAPL/water interface probe is being used to measure the depth and thickness of NAPL, lower the instrument until it emits a signal (tone and or light) indicating whether LNAPL is present. Continue to lower the NAPL/water level interface probe until it indicates the top of water. Lower the probe to the bottom of the well to obtain a total depth measurement. Note also of the depth indicating the bottom of water and top of DNAPL layer, if any, based on the signal emitted by the interface probe. At each fluid interface, gently raise and lower the instrument through each the interface to confirm its depth. Measure to the nearest hundredth of a foot and record the depth of each fluid interface, and the total well depth, from the reference point.

12. Clean the NAPL/water interface probe and cable in accordance with the appropriate cleaning procedures.

13. If using a bailer to confirm the presence/absence of NAPL, the bailer should either have been previously dedicated to the well, or be a new previously unused bailer. Compare the depth of the well to previous records, and note any discrepancy

14. Lock the well when all activities are completed.

Waste Management

Decontamination fluids, PPE, and other disposable equipment will be properly stored on site in labeled containers and disposed of properly. Be certain that waste containers are properly labeled and documented in the field log book. Review appropriate waste management SOPs, which may be state- or client-specific.

Data Recording and Management

Fluid level measurement data will be recorded legibly on “write-in-the-rain” field notebook in indelible pen and/or a PDA. Field situations such as apparent well damage or suspected tampering, or other observations of conditions that may result in compromised data collection will be photographically documented where practicable.

Quality Assurance

As described in the detailed procedure, the electronic water-level meter and/or NAPL- water interface probe will be calibrated prior to use versus an engineer’s rule to ensure accurate length demarcations on the tape or cable. Fluid interface measurements will be verified by gently raising and lowering the instrument through each interface to confirm repeatable results.

Attachment 5

Low Flow Groundwater

Sampling Procedures

SCOPE AND APPLICATION

Groundwater samples will be collected from monitoring wells to evaluate groundwater quality. The protocol presented in this standard operating procedure (SOP) describes the procedures to be used to purge monitoring wells and collect groundwater samples. This protocol has been developed in accordance with the United States Environmental Protection Agency (USEPA) Region I Low Stress (Low Flow) Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells (USEPA SOP No. GW0001; July 30, 1996). Both filtered and unfiltered groundwater samples may be collected using this low-flow sampling method. Filtered samples will be obtained using a 0.45-micron disposable filter. No wells will be sampled until well development has been performed in accordance with the procedures presented in the SOP titled Monitoring Well Development, unless that well has been sampled or developed within the prior 1-year time period. Groundwater samples will not be collected within 1 week following well development.

Personnel Qualifications

Personnel directing, supervising, or leading groundwater sample collection activities should have a minimum of 2 years of previous groundwater sampling experience. Personnel providing assistance to groundwater sample collection and associated activities should have a minimum of 6 months of related experience or an advanced degree in environmental sciences, engineering, hydrogeology, or geology.

The supervisor of the groundwater sampling team will have at least 1 year of previous supervised groundwater sampling experience.

Prior to mobilizing to the field, the groundwater sampling team should review and be thoroughly familiar with relevant site-specific documents including but not limited to the site work plan, field sampling plan, QAPP, HASP, and historical information.

Additionally, the groundwater sampling team should review and be thoroughly familiar with documentation provided by equipment manufacturers for all equipment that will be used in the field prior to mobilization.

Equipment List

Specific to this activity, the following materials (or equivalent) will be available:

- Health and safety equipment (as required in the site Health and Safety Plan [HASP];
- Site Plan, well construction records, prior groundwater sampling records (if available);

- Sampling pump, which may consist of one or more of the following:
- submersible pump (e.g., Grundfos Redi-Flo 2);
- peristaltic pump (e.g., ISCO Model 150); and/or
- bladder pump (e.g., Marschalk System 1, QED Well Wizard, etc.);
- Appropriate controller and power source for pump:
- Submersible and peristaltic pumps require electric power from either a generator or a deep cell battery;
- Submersible pumps such as Grundfos require a pump controller to run the pump;
- Bladder pumps require a pump controller and a gas source (e.g., air compressor or compressed N2 or CO2 gas cylinders);
- Teflon® tubing or Teflon®-lined polyethylene tubing of an appropriate size for the pump being used. For peristaltic pumps, dedicated Tygon® tubing (or other type as specified by the manufacturer) will also be used through the pump apparatus;
- Water-level probe (e.g., Solinist Model 101);
- Water-quality (temperature/pH/specific conductivity/ORP/turbidity/dissolved oxygen) meter and flow-through measurement cell. Several brands may be used, including:
- YSI 6-Series Multi-Parameter Instrument;
- Hydrolab Series 3 or Series 4a Multiprobe and Display; and/or
- Horiba U-10 or U-22 Water Quality Monitoring System;
- Supplemental turbidity meter (e.g., Horiba U-10, Hach 2100P, LaMotte 2020). Turbidity measurements collected with multi-parameter meters have been shown to sometimes be unreliable due to fouling of the optic lens of the turbidity meter within the flow-through cell. A supplemental turbidity meter will be used to verify turbidity data during purging if such fouling is suspected;
- Note that industry improvements may eliminate the need for these supplemental measurements in the future;
- Appropriate water sample containers (supplied by the laboratory);
- Appropriate blanks (trip blank supplied by the laboratory);
- 0.45-micron disposable filters (if field filtering is required);
- Large glass mixing container (if sampling with a bailer);

- Teflon® stirring rod (if sampling with a bailer);
- Cleaning equipment; and
- Groundwater sampling log (attached) or bound field logbook.

Note that in the future, the client may acquire different makes/models of some of this equipment if the listed makes/models are no longer available, or as a result of general upgrades or additional equipment acquisitions. In the event that the client uses a different make/model of the equipment listed, the client will use an equivalent type of equipment (e.g., pumps, flow-through analytical cells) and note the specific make/model of the equipment used during a sampling event on the groundwater sampling log. In addition, should the client desire to change to a markedly different sampling methodology (e.g., discrete interval samplers, passive diffusion bags, or a yet to be developed technique), the client will submit a proposed SOP for the new methodology for USEPA approval prior to implementing such a change.

The maintenance requirements for the above equipment generally involve decontamination or periodic cleaning, battery charging, and proper storage, as specified by the manufacturer. For operational difficulties, the equipment will be serviced by a qualified technician.

Precautions

If heavy precipitation occurs and no cover over the sampling area and monitoring well can be erected, sampling must be discontinued until adequate cover is provided. Rain water could contaminate groundwater samples.

Do not use permanent marker or felt-tip pens for labels on sample container or sample coolers – use indelible ink. The permanent markers could introduce volatile constituents into the samples.

It may be necessary to field filter some parameters (e.g., metals) prior to collection, depending on preservation, analytical method, and project quality objectives.

Store and/or stage empty and full sample containers and coolers out of direct sunlight.

To mitigate potential cross-contamination, groundwater samples are to be collected in a pre-determined order from least impacted to impacted based on previous analytical data. If no analytical data are available, samples are collected in order of up gradient, then furthest down gradient to source area locations.

Be careful not to over-tighten lids with Teflon liners or septa (e.g., 40 mL vials). Over- tightening can cause the glass to shatter or impair the integrity of the Teflon seal.

Health and Safety Considerations

Use caution and appropriate cut resistant gloves when tightening lids to 40 mL vials. These vials can break while tightening and can lacerate hand. Amber vials (thinner glass) are more prone to breakage.

If thunder or lighting is present, discontinue sampling and take cover until 30 minutes have passed after the last occurrence of thunder or lighting.

Use caution when removing well caps as well may be under pressure, cap can dislodge forcefully and cause injury.

Use caution when opening protective casing on stickup wells as wasps frequently nest inside the tops of the covers. Also watch for fire ant mounds near well pads when sampling in the south or western U.S.

Procedure

Groundwater will be purged from the wells using an appropriate pump. Peristaltic pumps will initially be used to purge and sample all wells when applicable. If the depth to water is below the sampling range of a peristaltic pump (approximately 25 feet), submersible pumps or bladder pumps will be used provided the well is constructed with a casing diameter greater than or equal to 2 inches (the minimum well diameter capable of accommodating such pumps). Bladder pumps are preferred over peristaltic and submersible pumps if sampling of VOCs is required to prevent volatilization. For smaller diameter wells where the depth to water is below the sampling range of a peristaltic pump, alternative sampling methods (i.e., bailing or small diameter bladder pumps) will be used to purge and sample the groundwater. Purge water will be collected and containerized.

1. Calibrate field instruments according to manufacturer procedures for calibration.

2. Measure initial depth to groundwater prior to placement of pumps.

3. Prepare and install pump in well: For submersible and non-dedicated bladder pumps, decontaminate pump according to site decontamination procedures. Non-dedicated bladder pumps will require a new Teflon® bladder and attachment of an airline, sample discharge line, and safety cable prior to placement in the well. Attach the airline tubing to the airport on the top of the bladder pump.

4. Attach the sample discharge tubing to the water port on the top of the bladder pump. Care should be taken not to reverse the air and discharge tubing lines during bladder pump set-up as this could result in bladder failure or rupture.

5. Attach and secure a safety cable to the eyebolt on the top of bladder pump (if present, depending on pump model used). Slowly lower pump, safety cable, tubing, and electrical lines into the well to a depth corresponding to the approximate center of the saturated screen section of the well. Take care to avoid twisting and tangling of safety cable, tubing, and electrical lines while lowering pump into well; twisted and tangled lines could result in the pump becoming stuck in the well casing. Also, make sure to keep tubing and lines from touching the ground or other surfaces while introducing them into the well as this could lead to well contamination. If a peristaltic pump is being used, slowly lower the sampling tubing into the well to a depth corresponding to the approximate center of the saturated screen section of the well. The pump intake or sampling tube must be kept at least 2 feet above the bottom of the well to prevent mobilization of any sediment present in the bottom of the well.

6. Connect the pump to other equipment. If using a bladder pump, the discharge water line should be connected to the bottom inlet port on the flow-through cell connected to the water quality meter.

7. Connect the airline to the pump controller output port. The pump controller should then be connected to a supply line from an air compressor or compressed gas cylinder using an appropriate regulator and air hose. Take care to tighten the regulator connector onto the gas cylinder (if used) to prevent leaks. Teflon tape may be used on the threads of the cylinder to provide a tighter seal.

8. Once the air compressor or gas cylinder is connected to the pump controller, turn on the compressor or open the valve on the cylinder to begin the gas flow. Turn on the pump controller if an on/off switch is present and verify that all batteries are charged and fully operating before beginning to pump.

9. Measure the water level again with the pump in the well before starting the pump. Start pumping the well at 200 to 500 milliliters (mL) per minute (or at lower site-specific rate if specified). The pump rate should be adjusted to cause little or no water level drawdown in the well (less than 0.3 feet below the initial static depth to water measurement) and the water level should stabilize. The water level should be monitored every 3 to 5 minutes (or as appropriate, lower flow rates may require longer time between readings) during pumping if the well diameter is of sufficient size to allow such monitoring. Care should be taken not to break pump suction or cause entrainment of air in the sample. Record pumping rate adjustments and depths to water. If necessary, pumping rates should be reduced to the minimum capabilities of the pump to avoid pumping the well dry and/or to stabilize indicator parameters. A steady flow rate should be maintained to the extent practicable. Groundwater sampling records from previous sampling events (if

available) should be reviewed prior to mobilization to estimate the optimum pumping rate and anticipated drawdown for the well in order to more efficiently reach a stabilized pumping condition. If the recharge rate of the well is very low, alternative purging techniques should be used, which will vary based on the well construction and screen position. For wells screened across the water table, the well should be pumped dry and sampling should commence as soon as the volume in the well has recovered sufficiently to permit collection of samples. For wells screened entirely below the water table, the well should be pumped until a stabilized level (which may be below the maximum displacement goal of 0.3 feet) can be maintained and monitoring for stabilization of field indicator parameters can commence. If a lower stabilization level cannot be maintained, the well should be pumped until the drawdown is at a level slightly higher than the bentonite seal above the well screen. Sampling should commence after one well volume has been removed and the well has recovered sufficiently to permit collection of samples.

10. During purging, monitor the field indicator parameters (e.g., turbidity, temperature, specific conductance, pH, etc.) every 3 to 5 minutes (or as appropriate). Field indicator parameters will be measured using a flow-through analytical cell or a clean container such as a glass beaker. Record field indicator parameters on the groundwater sampling log. The well is considered stabilized and ready for sample collection when turbidity values remain within 10% (or within 1 NTU if the turbidity reading is less than 10 NTU), the specific conductance and temperature values remain within 3%, and pH remains within units for three consecutive readings collected at 3- to 5-minute intervals (or other appropriate interval, alternate stabilization goals may exist in different geographic regions, consult the site-specific Work Plan for stabilization criteria). If the field indicator parameters do not stabilize within 1 hour of the start of purging, but the groundwater turbidity is below the goal of 50 NTU and the values for all other parameters are within 10%, the well can be sampled. If the parameters have stabilized but the turbidity is not in the range of the 50 NTU goal, the pump flow rate should be decreased to a minimum rate of 100 mL/min to reduce turbidity levels as low as possible. If dissolved oxygen values are not within acceptable range for the temperature of groundwater (Attachment 1), then check for and remove air bubbles on probe or in tubing. If the dissolved oxygen value is 0.00 or less, then the meter should be serviced and re-calibrated.

11. During extreme weather conditions, stabilization of field indicator parameters may be difficult to obtain. Modifications to the sampling procedures to alleviate these conditions (e.g., measuring the water temperature in the well adjacent to the pump intake) will be documented in the field notes. If other field conditions exist that preclude stabilization of certain parameters, an explanation of why the parameters did not stabilize will also be documented in the field logbook.

12. Complete the sample label and cover the label with clear packing tape to secure the label onto the container.

13. After the indicator parameters have stabilized, collect groundwater samples by diverting flow out of the unfiltered discharge tubing into the appropriate labeled sample container. If a flow-through analytical cell is being used to measure field parameters, the flow-through cell should be disconnected after stabilization of the field indicator parameters and prior to groundwater sample collection. Under no circumstances should analytical samples be collected from the discharge of the flow-through cell. When the container is full, tightly screw on the cap. Samples should be collected in the following order: VOCs, TOC, SVOCs, metals and cyanide, and others (or other order as defined in the site-specific Work Plan).

14. If sampling for total and filtered metals and/or PCBs, a filtered and unfiltered sample will be collected. Install an in-line, disposable 0.45-micron particle filter on the discharge tubing after the appropriate unfiltered groundwater sample has been collected. Continue to run the pump until an initial volume of "flush" water has been run through the filter in accordance with the manufacturer's directions (generally 100 to 300 mL). Collect filtered groundwater sample by diverting flow out of the filter into the appropriately labeled sample container. When the container is full, tightly screw on the cap.

15. Secure with packing material and store at 4°C in an insulated transport container provided by the laboratory.

16. Record on the groundwater sampling log or bound field logbook the time sampling procedures were completed, any pertinent observations of the sample (e.g., physical appearance, and the presence or lack of odors or sheens), and the values of the stabilized field indicator parameters as measured during the final reading during purging (Attachment 2 – Example Sampling Log).

17. Turn off the pump and air compressor or close the gas cylinder valve if using a bladder pump set-up. Slowly remove the pump, tubing, lines, and safety cable from the well. Do not allow the tubing or lines to touch the ground or any other surfaces which could contaminate them.

18. If tubing is to be dedicated to a well, it should be folded to a length that will allow the well to be capped and also facilitate retrieval of the tubing during later sampling events. A length of rope or string should be used to tie the tubing to the well cap. Alternatively, if tubing and safety line are to be saved and reused for sampling the well at a later date they may be coiled neatly and placed in a clean plastic bag that is clearly labeled with the well ID. Make sure the bag is tightly sealed before placing it in storage.

19. Secure the well and properly dispose of personal protective equipment (PPE) and disposable equipment.

20. Complete the procedures for packaging, shipping, and handling with associated chain-of-custody.

21. Complete decontamination procedures for flow-through analytical cell and submersible or bladder pump, as appropriate.

22. At the end of the day, perform calibration check of field instruments.

If it is not technically feasible to use the low-flow sampling method, purging and sampling of monitoring wells may be conducted using the bailer method as outlined below:

- Don appropriate PPE (as required by the HASP);
- Place plastic sheeting around the well; and
- Clean sampling equipment.
- Open the well cover while standing upwind of the well.
- Remove well cap and place on the plastic sheeting.
- Insert PID probe approximately 4 to 6 inches into the casing or the well headspace and cover with gloved hand.
- Record the PID reading in the field log. If the well headspace reading is less than 5 PID units, proceed; if the headspace reading is greater than 5 PID units, screen the air within the breathing zone. If the breathing zone reading is less than 5 PID units, proceed. If the PID reading in the breathing zone is above 5 PID units, move upwind from well for 5 minutes to allow the volatiles to dissipate. Repeat the breathing zone test. If the reading is still above 5 PID units, don appropriate respiratory protection in accordance with the requirements of the HASP.
- Record all PID readings. For wells that are part of the regular weekly monitoring program and prior PID measurements have not resulted in a breathing zone reading above 5 PID units, PID measurements will be taken monthly.
- Measure the depth to water and determine depth of well by examining drilling log data or by direct measurement. Calculate the volume of water in the well (in gallons) by using the length of the water column (in feet), multiplying by 0.163 for a 2-inch well or by 0.653 for a 4-inch well. For other well diameters, use the formula:
- Volume (in gallons) = • TIMES well radius (in feet) squared TIMES length of water column (in feet) TIMES 7.481 (gallons per cubic foot)

- Measure a length of rope or twine at least 10 feet greater than the total depth of the well. Secure one end of the rope to the well casing and secure the other end to the bailer. Test the knots and make sure the rope will not loosen. Check bailers so that all parts are intact and will not be lost in the well.

- Lower bailer into well and remove one well volume of water. Contain all water in appropriate containers.

- Monitor the field indicator parameters (e.g., turbidity, temperature, specific conductance, and pH). Measure field indicator parameters using a clean container such as a glass beaker or sampling cups provided with the instrument. Record field indicator parameters on the groundwater sampling log.

- Repeat Steps 7 and 8 until three or four well volumes have been removed. Examine the field indicator parameter data to determine if the parameters have stabilized. The well is considered stabilized and ready for sample collection when turbidity values remain within 10% (or within 1 NTU if the turbidity reading is less than 10 NTU), the specific conductance and temperature values remain within 3%, and pH remains within 0.1 units for three consecutive readings collected once per well volume removed.

- If the field indicator parameters have not stabilized, remove a maximum of five well volumes prior to sample collection. Alternatively, five well volumes may be removed without measuring the field indicator parameters.

- If the recharge rate of the well is very low, wells screened across the water table may be bailed dry and sampling should commence as soon as the volume in the well has recovered sufficiently to permit collection of samples. For wells screened entirely below the water table, the well should only be bailed down to a level slightly higher than the bentonite seal above the well screen. The well should not be bailed completely dry, to maintain the integrity of the seal. Sampling should commence as soon as the well volume has recovered sufficiently to permit sample collection.

- Following purging, allow water level in well to recharge to a sufficient level to permit sample collection.

- Complete the sample label and cover the label with clear packing tape to secure the label onto the container.

- Slowly lower the bailer into the screened portion of the well and carefully retrieve a filled bailer from the well causing minimal disturbance to the water and any sediment in the well.

The sample collection order (as appropriate) will be as follows:

- VOC;

- SVOCs;

- metals and cyanide; and others.
- When sampling for volatiles, collect water samples directly from the bailer into 40-mL vials with Teflon®-lined septa. For other analytical samples, remove the cap from the large glass mixing container and slowly empty the bailer into the large glass mixing container. The sample for dissolved metals and/or filtered PCBs should either be placed directly from the bailer into a pressure filter apparatus or pumped directly from the bailer with a peristaltic pump, through an in-line filter, into the pre-preserved sample bottle.
- Continue collecting samples until the mixing container contains a sufficient volume for all laboratory samples.
- Mix the entire sample volume with the Teflon® stirring rod and transfer the appropriate volume into the laboratory jar(s). Secure the sample jar cap(s) tightly.
- If sampling for total and filtered metals and/or PCBs, a filtered and unfiltered sample will be collected. Sample filtration for the filtered sample will be performed in the field using a peristaltic pump prior to preservation. Install new medical-grade silicone tubing in the pump head. Place new Teflon® tubing into the sample mixing container and attach to the intake side of pump tubing. Attach (clamp) a new 0.45-micron filter (note the filter flow direction). Turn the pump on and dispense the filtered liquid directly into the laboratory sample bottles.
- Secure with packing material and store at 4°C in an insulated transport container provided by the laboratory.
- After sample containers have been filled, remove one additional volume of groundwater. Measure the pH, temperature, turbidity, and conductivity. Record on the groundwater sampling log or bound field logbook the time sampling procedures were completed, any pertinent observations of the sample (e.g., physical appearance, and the presence or lack of odors or sheens), and the values of the field indicator parameters.
- Remove bailer from well, secure well, and properly dispose of PPE and disposable equipment.
- If a bailer is to be dedicated to a well, it should be secured inside the well above the water table, if possible. Dedicated bailers should be tied to the well cap so that inadvertent loss of the bailer will not occur when the well is opened.
- Complete the procedures for packaging, shipping, and handling with associated chain-of-custody.

Waste Management

Materials generated during groundwater sampling activities, including disposable equipment, will be placed in appropriate containers. Containerized waste will be disposed of by the client consistent with the procedures identified in the HASP.

Data Recording and Management

Initial field logs and chain-of-custody records will be transmitted to the PM at the end of each day unless otherwise directed by the PM. The groundwater team leader retains copies of the groundwater sampling logs.

Quality Assurance

In addition to the quality control samples to be collected in accordance with this SOP, the following quality control procedures should be observed in the field:

- Collect samples from monitoring wells in order of increasing concentration, to the extent known based on review of historical site information if available.
- Equipment blanks should include the pump and tubing (if using disposable tubing) or the pump only (if using tubing dedicated to each well).
- Collect equipment blanks after wells with higher concentrations (if known) have been sampled.
- Operate all monitoring instrumentation in accordance with manufacturer's instructions and calibration procedures. Calibrate instruments at the beginning of each day and verify the calibration at the end of each day. Record all calibration activities in the field notebook.
- Clean all groundwater sampling equipment prior to use in the first well and after each subsequent well using procedures for equipment decontamination.

References

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Attachment 6

Subsurface Soil-Gas Sampling and Analysis

Using USEPA Method TO-15 – Single Port,

Direct Push, Hollow-Stem and Hand Auger Installation

SCOPE AND APPLICATION

This document describes the procedures to collect subsurface soil-gas samples for the analysis of volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15).The TO-15 method uses a 6- liter SUMMA® passivized stainless-steel canister. An evacuated 6-liter SUMMA® canister (<28 inches of mercury [Hg]) will provide a recoverable whole-gas sample of approximately 5.5 liters when allowed to fill to a vacuum of 2 inches of Hg. The whole- air sample will be analyzed for VOCs using a quadruple or ion-trap gas chromatograph/mass spectrometer (GC/MS) system to provide compound detection limits of 0.5 parts per billion volume (ppbv).

The following sections list the necessary equipment and provide detailed instructions for the installation of soil-gas probes (using direct-push, hollow-stem and hand auger technologies) and the collection of soil-gas samples for VOC analysis.

This SOP should be reviewed prior to work plan preparation to ensure its compliance with specific regulatory and/or client requirements for subsurface soil-gas sampling.

Personnel Qualifications

Field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first-aid, and cardiopulmonary resuscitation (CPR), as needed. Field sampling personnel will be well versed in the relevant standard operating procedures (SOPs) and possess the required skills and experience necessary to successfully complete the desired field work. Personnel responsible for leading subsurface soil-gas sample collection activities must have previous subsurface soil- gas sampling experience.

Equipment List

The equipment required to install a soil vapor probe is presented below:

- Appropriate PPE (as required by the Health and Safety Plan);

  Appropriate drill rig to reach necessary sample depth (hollow-stem auger, direct-push rig, hand auger, etc. ;

- Direct-push rig (e.g., Power Probe™) equipped with interconnecting 4- foot lengths of 1.25-inch-diameter steel rods; or

- Hollow-stem auger drill rig with interconnecting augers. The inner diameter of typical augers range from 2.25-inches to 7.75 inches;

- Hand auger equipped with the necessary lengths of shaft extenders to reach the desired depth;
- Commercially available stainless steel sample screens;
- Expendable points (one per sample);
- Expendable point holder, and appropriate twist-to-lock (or Swagelok®) connector;
- Stainless steel, brass or Teflon® ball valve or needle valve;
- Photoionization Detector (with a lamp of 11.7 eV);
- ¼-inch inside diameter (ID) tubing (Teflon®, Teflon®-lined polyethylene, or PEEK);
- Commercially available clean sand or play sand;
- Non-coated bentonite (dry chips and wet slurry);
- Down-hole measuring device;
- Traffic-rated well cover (for permanent installations); and
- Kneeling pad.

The equipment required for soil-gas sample collection is presented below:

- Stainless steel SUMMA® canisters (order at least one extra, if feasible);
- Flow controllers with in-line particulate filters and vacuum gauges; flow controllers are pre-calibrated to specified sample duration (e.g., 30 minutes, 8 hours, 24 hours) or flow rate (e.g., 200 milliliters per minute [mL/min]);
- confirm with the laboratory that the flow controller comes with an in-line particulate filter and pressure gauge (order at least one extra, if feasible);
- flow controllers pre-calibrated to the appropriate duplicate sampling time (typically double the standard sample time);
- Slower flow rates will likely be required in silty or clay soils;
- 1/4-inch ID tubing (Teflon® or Teflon®-lined polyethylene);
- Twist-to-lock or Swagelok® fittings;
- Stainless steel “T” fitting (if collecting duplicate [i.e., split] samples);

- Portable vacuum pump capable of producing very low flow rates (e.g., 100 to 200 mL/min) with vacuum gauge;
- Rotameter or an electric flow sensor if vacuum pump does not have a flow gauge;
- Tracer gas source (e.g., helium);
- Tracer gas detector;
- PID;
- Appropriate-sized open-end or flare-nut wrench (typically 9/16-inch + ½"); flare-nut wrenches as opposed to open-end wrenches can reduce the risk of the wrench slipping off of the fitting while tightening (and possibly causing hand injury or damage to the sampling train;
- Chain-of-custody (COC) form;
- Sample collection log (attached); and
- Field notebook.

Precautions

Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, wear dry-cleaned clothing, or smoke cigarettes/cigars before and/or during the sampling event.

Care should be taken to ensure that the flow controller is pre-calibrated to the proper sample collection time (confirm with laboratory) and is capable of being transported without damage to the calibration. Sample integrity is maintained if the sampling event is shorter than the target duration, but sample integrity can be compromised if the event is extended to the point that the canister reaches atmospheric pressure.

Care must be taken to properly seal around the vapor probe at ground surface and to fully tighten (but not over-tighten) fittings to prevent leakage of atmosphere into the soil vapor probe and sampling train during purging and sampling. Temporary sampling points are to be sealed at the surface using hydrated bentonite. Permanent points are sealed at the surface using quick-setting hydraulic cement powder.

Health and Safety Considerations

Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances. For subsurface vapor probe installation, drilling with a direct-push or hollow-stem drilling rig should be done only by personnel with prior experience using such a piece of equipment.

PROCEDURE

Soil-Gas Steel Rod Monitoring Point Installation

1. Advance an assembly, consisting of interconnected lengths of decontaminated 1.25-inch-diameter steel drive rods, affixed with an expendable point holder and expendable point at the down hole end to the bottom of the desired sampling interval.

2. Cut a length of sample collection tubing slightly longer (e.g., 1 to 2 feet) than the collection depth. Attach a twist-to-lock connector to one end of the sample collection tubing and lower the twist-to-lock connector and attached tubing through the drive rods. Thread the twist-to-lock connector into the expendable point holder by twisting counterclockwise.

3. Hydraulically retract the sampling assembly approximately 6 inches or more if needed, allowing the expendable point to fall off and creating a void in the subsurface for soil-gas sample collection.

4. Fill annular space between the steel drive rod and the borehole wall (if any) with bentonite. Typically, only a bentonite surface seal is needed since there is no annular space between the steel drive rods and the borehole wall.

5. Proceed to soil-gas sample collection.

Soil-Gas Hollow-Stem Auger Monitoring Point Installation

1. Advance boring just past the bottom of deepest sampling interval.

2. Fill the boring with sand to the deepest sampling interval.

3. Cut a length of sample collection tubing slightly longer (e.g., 4 to 5 feet) than the collections depth. Attach a stainless steel sample screen to one end of the sample collection tubing and lower the screen and attached tubing down the middle of the augers.

4. Assure that the sample screen has reached the bottom of the boring and record this depth.

5. Being simultaneously filling in the area around the sample screen with clean sand and retracting the augers. Sand should be introduced to cover the sample screen then to extend above the screen per work plan instructions.

6. With the proper sand pack in place, slowly add a layer of dry bentonite chips to prevent moisture from the hydrated bentonite slurry from reaching the sampling point.

7. With the dry bentonite chips in place, slowly pour hydrated bentonite down the augers while simultaneously retracting the augers.

8. Seal the boring per work plan instructions (typically hydrated bentonite chips and concrete).

9. Affix a Swagelok® fitting and valve to the end of the tubing.

10. Properly label the sample tubing and valve with a permanent label to designate the sample number and screen depth

All soil-gas points should be allowed to equilibrate for a minimum of 48 hours before proceeding to soil-gas sample collection.

Hand Auger Monitoring Point Installation

The procedures for hand auger monitoring point installation are very similar to the hollow-stem auger procedure. Once the boring has been cleared to just past its final depth, the entire hand auger should be removed from the boring. Monitoring point installation should then commence as described for the hollow-stem auger installation.

Soil-Gas Sample Collection

Preparation of SUMMA®-Type Canister and Collection of Sample.

Record the following information in the field notebook, if appropriate (contact the local airport or other suitable information source [e.g., site-specific measurements, weatherunderground.com] to obtain the information):

- wind speed and direction;
- ambient temperature;
- barometric pressure; and
- relative humidity.

1. Connect a short piece of Teflon tubing to the sub-slab sampling port using a twist-to-lock fitting.
2. Connect a portable vacuum pump to the sample tubing. Purge 1 to 2 (target 1.5) volumes of air from the vapor probe and sampling line using a portable pump [purge volume = 1.5 Pi r2h] at a rate of approximately 100 mL/min. Measure organic vapor levels with the PID. Lower flow rates may be necessary in silt or clay to avoid excessive vacuum. Vacuum is >136 inches of water column are clearly excessive. Other sources site a cutoff of >10 inches of water column.

3. Check the seal established around the soil vapor probe by using a tracer gas (e.g., helium) or other method established in the state guidance documents.[Note: Refer to SOP "Administering Tracer Gas," adapted from NYSDOH 2005, for procedures on tracer gas use.]

4. Remove the brass or stainless steel plug from the SUMMA® canister and connect the flow controller with in-line particulate filter and vacuum gauge to the SUMMA® canister. Do not open the valve on the SUMMA® canister. Record in the field notebook and COC form the flow controller number with the appropriate SUMMA® canister number.

5. Connect the Teflon sample collection tubing to the flow controller and the SUMMA® canister valve. Record in the field notebook the time sampling began and the canister pressure.

6. Connect the other end of the polyethylene tubing to the sub-slab sampling port.

7. Open the SUMMA® canister valves. Record in the field notebook the time sampling began and the canister pressure.

8. Take a photograph of the SUMMA® canister and surrounding area. Termination of Sample Collection.

9. Arrive at the SUMMA® canister location at least 10 to 15 minutes prior to the end of the required sampling interval (e.g., 30 to 60 minutes).

10. Record the final vacuum pressure. Stop collecting the sample by closing the SUMMA® canister valves. The canister should have a minimum amount of vacuum (approximately 2 inches of Hg or slightly greater).

11. Record the date and local time (24-hour basis) of valve closing in the field notebook, sample collection log, and COC form.

12. Remove the particulate filter and flow controller from the SUMMA® canister, re-install the brass plug on the canister fitting, and tighten with the appropriate wrench.

13. Package the canister and flow controller in the shipping container supplied by the laboratory for return shipment to the laboratory. The SUMMA® canister does not require preservation with ice or refrigeration during shipment.

14. Complete the appropriate forms and sample labels as directed by the laboratory (e.g., affix card with a string).

15. Complete the COC form and place the requisite copies in a shipping container. Close the shipping container and affix a custody seal to the container closure. Ship the container to the laboratory via overnight carrier (e.g., Federal Express) for analysis.

Soil-Gas Monitoring Point Abandonment

Once the soil-gas samples have been collected, the soil-gas monitoring points will be abandoned by removing the drive rods and filling the resulting hole with bentonite.

Waste Management

Field personnel will collect and remove all investigation-derived waste materials (including disposable equipment) for proper disposal.

Data Recording and Management

Measurements will be recorded in the field notebook at the time of measurement with notations of the project name, sample date, sample start and finish time, sample location (e.g., GPS coordinates, distance from permanent structure), canister serial number, flow controller serial number, initial vacuum reading, and final pressure reading. Field sampling logs and COC records will be transmitted to the Project Manager.

Quality Assurance

Soil-gas sample analysis will be performed using USEPA TO-15 methodology. This method uses a quadruple or ion-trap GC/MS with a capillary column to provide optimum detection limits. The GC/MS system requires a 1-liter gas sample (which can easily be recovered from a 6-liter canister) to provide a 0.5-ppbv detection limit. The 6-liter canister also provides several additional 1-liter samples in case subsequent re- analyses or dilutions are required. This system also offers the advantage of the GC/MS detector, which confirms the identity of detected compounds by evaluating their mass spectra. All analytical results will be reported in units of • g/m3.

References

New York State Department of Health (NYSDOH). 2005. DRAFT “Guidance for Evaluating Soil Vapor Intrusion in the State of New York” February 23, 2005

Attachment 7

Ambient Air Sampling and Analysis

Using USEPA Method TO-15

SCOPE AND APPLICATION

This standard operating procedure (SOP) describes the procedures to collect ambient air samples for the analysis of volatile organic compounds (VOCs) using United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15). The TO-15 method uses a 6-liter SUMMA® passivized stainless steel canister. An evacuated SUMMA® canister (<28 inches of mercury [Hg]) will provide a recoverable whole-gas sample of approximately 5.5 liters when allowed to fill to a vacuum of 2-7 inches of Hg. The whole-air sample is then analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer (GS/MS) system to provide compound detection limits of 0.5 parts per billion volume (ppbv).

The following sections list the necessary equipment and detailed instructions for placing the sampling device and collecting ambient air samples for VOC analysis.

Personnel Qualifications

Field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. Field sampling personnel will be well versed in the relevant SOPs and possess the required skills and experience necessary to successfully complete the desired field work. Personnel responsible for leading ambient air sample collection activities must have previous ambient air sampling experience.

Equipment List

The equipment required for ambient air sample collection is presented below:

- 6-liter, stainless steel SUMMA® canisters (order at least one extra, if feasible);
- Flow controllers with in-line particulate filters and vacuum gauges (flow controllers are pre calibrated by the laboratory to a specified sample duration [e.g., 8-hour]). Confirm with lab that flow controller comes with in-line particulate filter and pressure gauge (order an extra set for each extra SUMMA® canister, if feasible);
- Appropriate-sized open-end wrench (typically 9/16-inch);
- Chain-of-custody (COC) form;
- Field notebook;
- Sample collection log (attached);
- Camera;

- Lock and chain; and
- Ladder or similar to hold canister above the ground surface (optional).

Precautions

Care must be taken to minimize the potential for introducing interferences during the sampling event. As such, care must be taken to keep the canister away from public roadways to prevent collection of automobile source pollutants (unless this is the objective of the study). Care must also be taken to keep the canister away from heavy pedestrian traffic areas (e.g., main entranceways, walkways). If the canister is not to be overseen for the entire sample duration, precautions should be taken to maintain the security of the sample (e.g., do not place in areas regularly accessed by the public, fasten the sampling device to a secure object using lock and chain, label the canister to indicate it is part of a scientific project, place the canister in secure housing that does not disrupt the integrity/validity of the sampling event). Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, or smoke cigarettes/cigars before and/or during the sampling event.

Care should also be taken to ensure that the flow controller is pre-calibrated to the proper sample collection time (confirm with laboratory). Sample integrity is maintained if the sampling event is shorter than the target duration, but sample integrity can be compromised if the event is extended to the point that the canister reaches atmospheric pressure.

A Shipping Determination must be performed, by DOT-trained personnel, for all environmental and geotechnical samples that are to be shipped, as well as some types of environmental equipment/supplies that are to be shipped.

Health and Safety Considerations

Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances.

Procedure

Preparation of SUMMA®-Type Canister and Collection of Sample

1. Record the following information in the field notebook (contact the local airport or other suitable information source [e.g., weatherunderground.com] to obtain the following information):
    - ambient temperature;

- barometric pressure; and
- relative humidity.

2. Choose the sample location in accordance with the sampling plan. If a breathing zone sample is required, place the canister on a ladder, tripod, or other similar stand to locate the canister orifice 3 to 5 feet above ground. If the canister will not be overseen for the entire sampling period, secure the canister as appropriate (e.g., lock and chain).
3. Record SUMMA® canister serial number and flow controller number in the field notebook and COC form. Assign sample identification on canister ID tag and record in the field notebook, sample collection log (attached), and COC form.
4. Remove the brass dust cap from the SUMMA® canister. Attach the flow controller with in-line particulate filter and vacuum gauge (leave swage-lock cap on the vacuum gauge during this procedure) to the SUMMA® canister with the appropriate wrench. Tighten with fingers first, then gently with the wrench.
5. Open the SUMMA® canister valve to initiate sample collection. Record the date and local time (24-hour basis) of valve opening in the field notebook, sample collection log, and COC form.
6. Record the initial vacuum pressure in the SUMMA® canister in the field notebook and COC form. If the initial vacuum pressure does not register less than -28 inches of Hg, then the SUMMA® canister is not appropriate for use and another canister should be used.
7. Take a photograph of the SUMMA® canister and surrounding area.

Termination of Sample Collection

1. Arrive at the SUMMA® canister location at least 10 to 15 minutes prior to the end of the sampling interval (e.g., 8-hour).
2. Stop collecting the sample when the canister vacuum reaches approximately 2- 7 inches of Hg (leaving some vacuum in the canister provides a way to verify if the canister leaks before it reaches the laboratory) or when the desired sample time has elapsed.
3. Record the final vacuum pressure. Stop collecting the sample by closing the SUMMA® canister valve. Record the date and local time (24-hour basis) of valve closing in the field notebook, sample collection log, and COC form.
4. Remove the particulate filter and flow controller from the SUMMA® canister, re- install brass plug on canister fitting, and tighten with wrench.

5. Package the canister and flow controller in the shipping container supplied by the laboratory for return shipment to the laboratory. The SUMMA® canister does not require preservation with ice or refrigeration during shipment.
6. Complete the appropriate forms and sample labels as directed by the laboratory (e.g., affix card with string).
7. Complete COC forms and place requisite copies in shipping container. Close shipping container and affix custody seal to container closure. Ship to laboratory via overnight carrier (e.g., Federal Express) for analysis.

Waste Management

No specific waste management procedures are required.

Data Recording and Management

Measurements will be recorded in the field notebook at the time of measurement, with notations of project name, sample date, sample start and finish times, sample location (e.g., GPS coordinates if available), canister serial number, flow controller number, initial vacuum reading, and final vacuum reading. Field sampling logs and COC records will be transmitted to the Project Manager.

Quality Assurance

Ambient air sample analysis will be performed using USEPA Method TO-15. This method uses a quadrupole or ion-trap GC/MS with a capillary column to provide optimum detection limits. The GC/MS system requires a 1-liter gas sample (which can easily be recovered from a 6-liter canister) to provide a 0.5 ppbv detection limit. The 6- liter canister also provides several additional 1-liter samples in case subsequent re-analyses or dilutions are required. This system also offers the advantage of the GC/MS detector, which confirms the identity of detected compounds by evaluating their mass spectra in either the SCAN or SIM mode.

Attachment 8

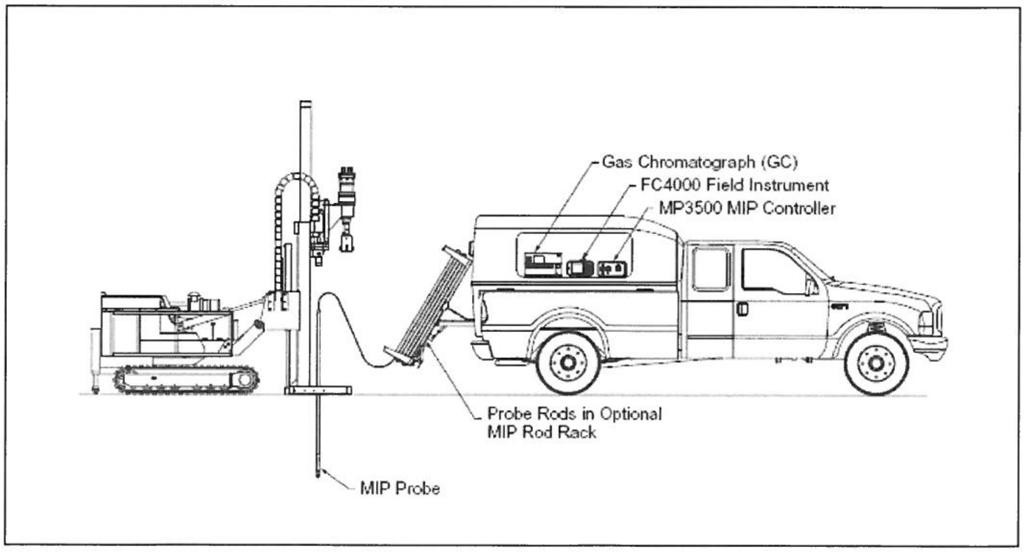
MIP SOP

GEOPROBE® MEMBRANE INTERFACE PROBE (MIP)

Standard Operating Procedure

Technical Bulletin No. MK3010

PREPARED: May, 2003
REVISED: April, 2012



THE MIP SYSTEM MAY BE DEDICATED TO A SINGLE CARRIER VEHICLE FOR USE IN TANDEM WITH MULTIPLE GEOPROBE® MACHINE MODELS

Geoprobe®, Geoprobe Systems®, and Direct Image® are registered trademarks of Kejr, Inc., Salina, Kansas

Table of Contents:

1.0 OBJECTIVE

This document serves as the standard operating procedure for use of the Geoprobe Systems® Membrane Interface Probe (MIP) used to detect volatile organic compounds (VOCs) at depth in the subsurface.

2.0 BACKGROUND

2.1 Definitions

Geoprobe®: A brand name of high-quality, hydraulically-powered machines that utilize both static force and percussion to advance sampling and logging tools into the subsurface. The Geoprobe® brand name refers to both machines and tools manufactured by Geoprobe Systems®, Salina, Kansas. Geoprobe® tools are used to perform soil core and soil gas sampling, groundwater sampling and testing, soil conductivity and contaminant logging, grouting, and materials injection.
**Geoprobe® is a registered trademark of Kejr, Inc., Salina, Kansas.*

Membrane Interface Probe (MIP): A system manufactured by Geoprobe Systems® for the detection and measurement of volatile organic compounds (VOCs) in the subsurface. A heated probe carrying a permeable membrane is advanced to depth in the soil. VOCs in the subsurface cross the membrane, enter into a carrier gas stream, and are swept to gas phase detectors at ground surface for measurement.

2.2 Discussion

The MIP is an interface between contaminates in the soil and the detectors at ground surface. It is a mapping tool used to find the depth at which the contamination is located, but is not used to determine concentration of the compound. Two advantages of using the MIP are that it detects contamination in situ and can be used in all types of soil conditions.

The MIP is a logging tool used to make continuous measurements of VOCs in soil. Volatile compounds outside the probe diffuse across a membrane and are swept from the probe to a gas phase detector at ground surface. A log is made of detector response versus probe depth. In order to speed diffusion, the probe membrane is heated to approximately 121°C. (Refer to Figure 2.1).

Along with the detection of VOCs in the soil, the MIP also measures the electrical conductivity of the soil to give a probable lithology of the subsurface. This is accomplished by using a dipole measurement arrangement at the end of the MIP probe so that both conductivity and detector readings may be taken simultaneously. A simultaneous log of soil electrical conductivity is recorded with the detector response.

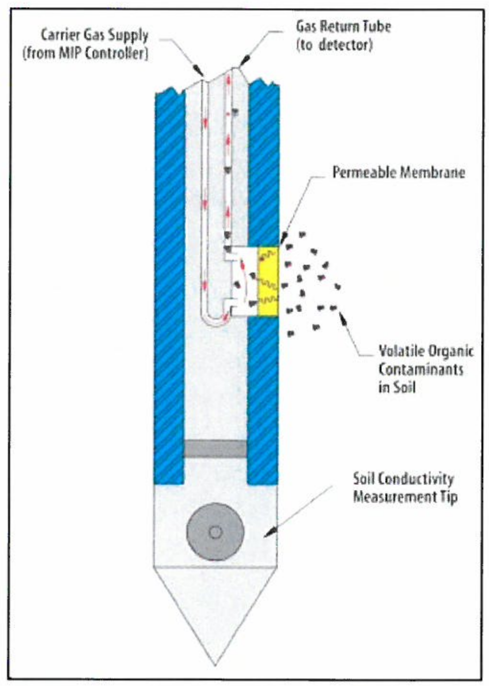


Figure 2.1: Diffusion across the membrane.

Interpretation of electrical conductivity (EC) logs comes with field experience. It is very important that soil core samples are taken to confirm lithologic changes as each EC log is unique per site. As a generalization, a high conductivity reading indicates a smaller grain size and a low conductivity reading indicates a larger grain size (See Fig. 2.2).

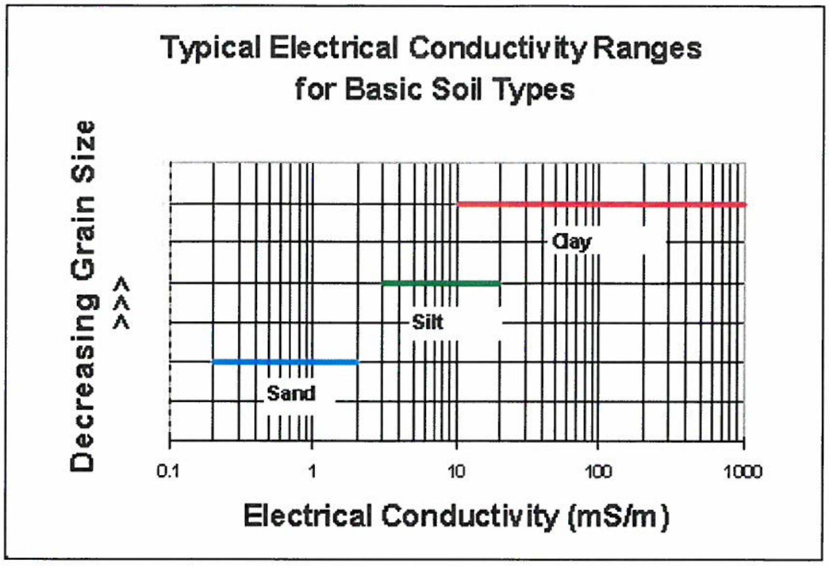


Figure 2.2: Generalized Electrical Conductivity Readings.

3.0 MIP/EC Interferences

3.1 Detector saturation may require a short period of time for the detector to return to baseline after a log has been performed in higher concentrations. The MIP system can be used in free product environments with the operator monitoring and making the necessary adjustments to the detector and software gain/attenuation settings to account for the higher voltage readouts.

3.2 The MIP system can be operated in a wide range of contaminant concentrations from low dissolved phase to free phase materials. During a log and the removal of the tool string, contaminants can absorb onto the surface of the membrane and trunkline material causing elevated detector baseline signals. It is very important that the probe and trunkline system is clean enough to see the low concentrations typically used in the chemical response test. Not adequately decontaminating the probe prior to performing a response test can elevate the concentration of the standard causing an inaccurate high response to the specific concentration of standard that was prepared for the test.

3.3 Electrical conductivity can provide false positives or higher than expected readings when the soil is impacted by ionic plumes (chloride, nitrate) originating from, but not limited to: agriculture practices, seawater, salt storage, mining practices. Encountering metallic objects in the subsurface can also result in high EC readings.

3.4 Some silt and clay soils will not have the typical ionic composition that an operator may be used to for similar soils. This can result in lower than expected readings and perhaps cause misidentification of the associated soil zone based on typical response of a courser grain material. This can occasionally be found in clays that have had the minerals leached out or in intermixed silt-sand zones.

4.0 Tools and Equipment

The following equipment is needed to perform and record MIP logs. Basic MIP system components are listed in this section in section 4.1 with optional equipment listed in section 4.2. Refer to Appendix V for a detailed illustration of the GC1000 setup configuration. Appendix VI shows the common MIP probe tool string diagrams. There may be more required tools as determined by your specific model of Geoprobe® direct push machine.

4.1 Basic MIP System Components

Description	Quantity	Part Number
Field Instrument	(1)	FC5000 / FI6000
MIP Controller	(1)	MP6500 / MP6505
Gas Chromatograph with PID, FID and XSD	(1)	GC1000
DI Acquisition Software	(1)	MP3517
MIP Probe	(3)	MP6520/MP8520
MIP PEEK Trunkline, 150-ft (45 m) length	(2)	14929
MIP Connection Tube	(3)	31641
MIP Adapter and Drive Head	(3)	20712
Agilent ADM 1000 Digital Flow Meter	(1)	17463
Hydrogen Gas Regulator	(1)	10344
Nitrogen Gas Regulator	(1)	13940
Vertical Gas Bottle Rack	(1)	ML2500
Stringpot (linear position transducer)	(1)	SC160-100
Stringpot Cordset	(1)	SC161
Stringpot Mounting Bracket (6600/7700)	(1)	16791
Stringpot Foot Bracket (6600/7700)	(1)	11751
Stringpot Piston Weight	(1)	SC112
Slotted 1.5" Drive Cap	(2)	13722
MIP Service Kit	(1)	MP6515
Drive Cushion (GH60)*	(1)	23321
Rod Wiper, 1.25/1.5" Rods	(1)	23852
Rod Wiper Weldment	(1)	23633

4.2 Optional Accessories

Description	Quantity	Part Number
Heated Trunkline Control Box	(1)	MP7000
Heated Trunkline, 100-ft (30m) length	(1)	MP7100
Heated Trunkline, 150-ft (46m) length	(1)	MP7150
Heated Transfer Line, 8-ft (2.4m) length	(1)	MP7010
Roll-out Rod Rack (30-1.5in rods)	(1)	20400-30
Rod Grip Pull Handle, for GH40 hammer	(1)	GH1255
Rod Grip Pull Handle, for GH60 hammer	(1)	9641
Stringpot Mounting Bracket (7822)	(1)	41932
Stringpot Foot Bracket (7822)	(1)	41993
Water Transport System	(1)	19011

*For Geoprobe® 66- and 78-Series Direct Push Machines only.

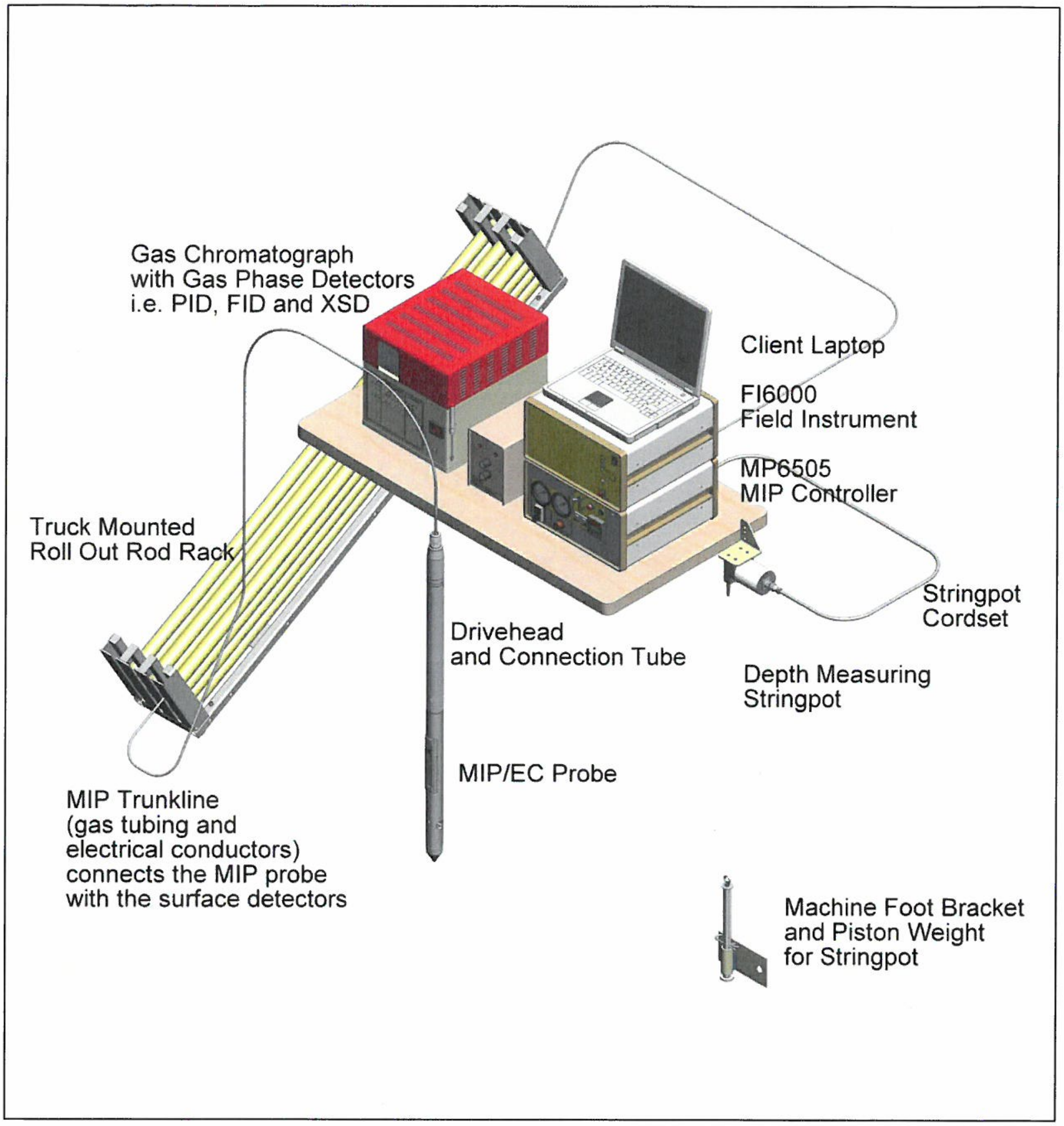


Figure 4.1: MIP System Components

5.0 Quality Assurance/Quality Control

Quality assurance (QA) is performed before and after each log to validate that the equipment being used is capable of generating good data. With MIP, chemical response tests (Fig. 5.1) must be performed to ensure that the probe, trunkline and series of detectors are working properly. The electrical conductivity (EC) portion of the MIP system is tested using an EC dipole test jig (Fig. 5.4)

Quality control (QC) is performed during and after each log is generated. Log QC will answer the following questions to ensure that the data is good and makes sense:

1. Does the log look correct? Does the elctrical conductivity appear to be in an acceptable range? Is there anything seen in the log that would make you suspect that the system wasn't working correctly, ie. a loss of temperature or gas pressure of the system.
2. Response Consistency? As more logs are completed do they show general consistency of EC and contaminant response? Review a cross section of logs in the DI-Viewer (Appendix VI).
3. Repeatablity? Replicate logs may be run every 10 to 20 locations to verify repeatability.
4. Are my lithogy changes consistant with physical soil cores? Take continuous or discreet confirmation soil samples to confirm your lithogy changes in EC.
5. Do my detector responses make sense for contaminant concentration. This must be verified by the collection of water or soil samples for lab analysis to confirm contaminants and their concentrations.

5.1 Chemical Response Test:

Response testing is an important quality assurance measure used to validate each log by proving that the integrity of the detector system is intact. Without running a response test, the operator will have no idea if the detector system is operating consistently or potentially even at all. Detector response heights should be monitored and can be graphed to evaluate membrane performance. With increased membrane footage, detector response will fall off indicating that it is time to change the membrane (see Appendix III). Response testing also enables the operator to measure the chemical trip time. This is the time it takes for the contaminant to travel through the trunkline from the probe to the detectors. This time needs to be entered into the MIP software to accurately plot the contaminants depth position.

5.1.1 Preparation of the Stock Standard

The following items are required for preparing the stock standard:

- Neat sample of the analyte of interest (i.e.: Benzene, Toluene, TCE, PCE, etc.) purchased from a chemical vendor
- Microliter syringes (recommended to have: 500 and/or 1,000 μL syringes).
- 25-mL or 50-mL Graduated cylinder
- Several 40-mL VOC vials with labels
- 25mL Methanol

Preparation of the stock standard is critical to the final outcome of the concentration to be placed into the testing cylinder.

1. The total volume of methanol and the compound added should equal 25mL.
2. Pour methanol into graduated cylinder to the 23.5-24mL mark, the volume depends upon the compound density (Table 5.1).
3. Pour the methanol from the graduated cylinder into a 40-mL VOC vial.
4. Add the appropriate volume of desired neat analyte into 40-mL VOC vial containing methanol. The required volume of neat analyte for seven common compounds is listed in Column 3 of Table 5.1. The equation at the bottom of this section shows how to calculate the appropriate neat analyte volume for other compounds of interest given the appropriate density.

5. Label the vial with the name of the standard (i.e. Benzene, Toluene, TCE, PCE), concentration (50mg/mL), date created, and created by (your name). This is the Stock Standard.
6. If stock standards are kept cold in a refrigerator they can last up to one month otherwise they should be made up more frequently as often as every 3 days if there is not cooling during the summer months. The more volatile the compound the quicker it will lose its concentration.

Table 5.1
Density and required volumes of neat compounds used to make a 50mg/mL stock standard into 25 ml of methanol.

Compound	Density (mg/µL)	Volume of Neat Standard Required to prepare Working Standard (0.5 L)
Benzene	0.876	1426
Toluene	0.867	1442
Xylenes	0.860	1453
Methylene Chloride	1.335	936
Carbon Tetrachloride	1.594	784
Chloroform	1.480	845
Trichloroethylene	1.464	854
Perchloroethylene	1.623	770

25mL (methanol) x 50mg/mL = 1250mg

1250mg x 1/density of analyte = amount of neat material to be placed with methanol to make up 25mL total volume

Example: Preparation of 50 mg/mL Benzene standard.

1250 mg x 1/0.8765mg/µL = 1426µL

Use 1426µL of neat Benzene in 23.5mL of Methanol to get a 50 mg/mL stock standard.

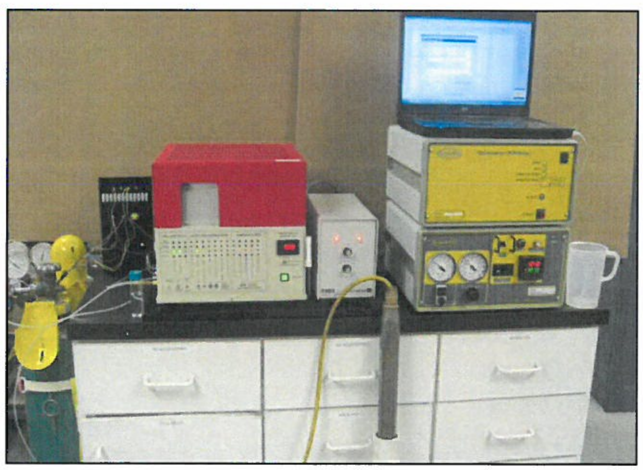


Figure 5.1: The MIP probe is placed into a steel or PVC pipe containing the standard solution.

5.1.2 Preparation of the Working Standard and Performing the Response Test

The following items are required to perform response testing:

- Microliter syringes (recommended to have: 10, 25, 100 & 500 □L syringes).
- Testing cylinder made from a nominal 2-in. PVC pipe with a length of 24 in.
- 0.5 L plastic beaker or pitcher
- Supply of fresh water, 0.5 L needed per test
- Stopwatch

1. On the FI6000 and the DI-Acquisition software you will begin a new log and proceed to the response test screen. The detector signals should be stable before proceeding. On the FC4000 and FC5000 system, access the MIP Time software and view the detector vs. time data.
2. Measure out 500mL of tap or distilled water and place into the testing cylinder.
3. Using Table 5.2, determine the desired volume of stock standard to place into the 500ml measured volume of water. This is the Working Standard.
4. Pour the working standard into a nominal 2-inch x 24-inch PVC pipe and immediately insert the MIP into the solution (Fig. 5.1). Leave the probe in the test solution for 45 seconds. At the end of 45 seconds, place the probe back in into a clean water source.
5. The chemical response trip time can be determined from the results on the Pre-Log Response Test. Using Fig. 5.2 the trip time would be approximately 55 seconds. Additional typical response test graphs are located in Appendix I.
6. A new, fresh working standard needs to be made for each test, it cannot be reused.

Table 5.2
Volume of stock standard and final concentration when making working standards.

Volume of Stock 50mg/mL Standard (μL)	Final Concentration (mg/L or ppm) in 0.5L
10	1.0
100	10
1000	100

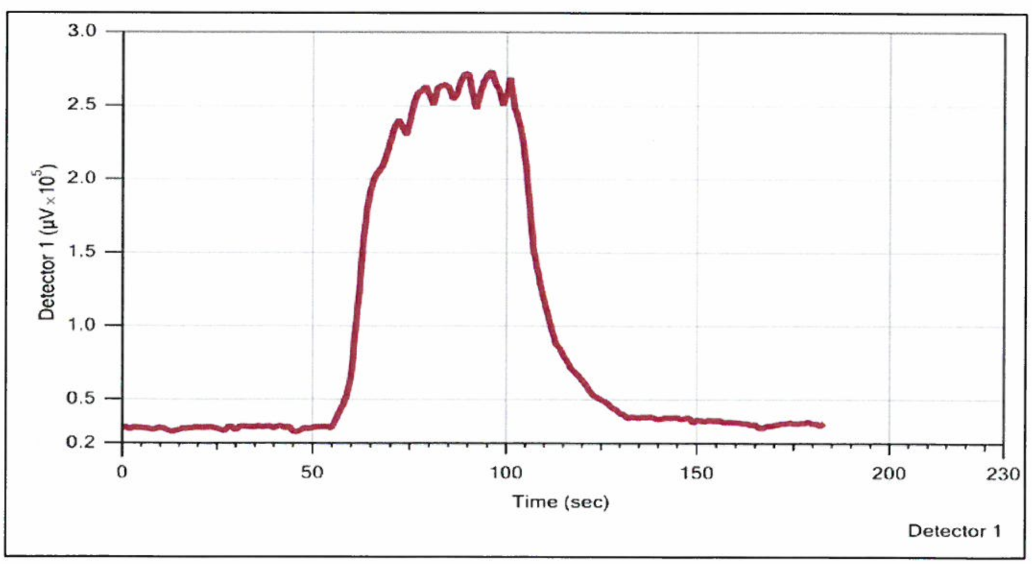


Figure 5.2: SRI PID Response Test - 10 ppm Benzene.

5.2 Operation of EC Dipole Test Jig

On the FI6000 and the DI-Acquisition software the EC dipole test screen will open up after the chemical response test is completed. When ready place the low (brass) side of the EC Dipole test jig (Fig 5.3) between the EC dipole and body of the probe and start the low level test, hold for 5 sec until the system captures the data (Fig 5.4). Repeat for the high (stainless steel) EC test. These tests should result in readings of 55mS/m and 290mS/m $\pm$10%.

In the FC4000 and FC5000 acquisition system these readings will need to be taken in the logging screen just prior to the beginning of the log.

If the EC readings do not pass, the DI Acquisition (FI6000) software will prompt the user to proceed through a series of troubleshooting tests (these tests used to be the standard test for EC in the FC4000 and FC5000 software). These tests will check the calibration of the EC board as well as the continuity and isolation of all of the wires in the system to determine the reason EC Tests loads have failed. This will give the operator an idea what needs to be done to fix the problem.

Figure 5.3: EC Dipole Test Jig.

Figure 5.4 Operation of the EC Dipole Test Jig.

6.0 Recommended Minimum MIP Response Test Levels and Maintenance Tips

Geoprobe Systems recommends the following guidelines as minimum MIP response test values for performing MIP logging.

Detector systems can vary in the level of response for a given chemical concentration depending on detector age, model, and maintenance performed. However, it should be expected that a detector system would be able to provide at least the following level of response in a chemical response test:

Chemical & Concentration	Detector Response	Baseline Noise
10ppm Benzene (see table 5.2)	PID-10,000μV	<3,000μV
10ppm Trichloroethylene (see table 5.2)	PID-5,000μV, XSD 10,000μV	<3,000μV

If these minimum response test levels are not achievable or throughout the day or project the detector sensitivity falls below these levels, the operator should perform maintenance on the system to enhance the sensitivity of the detectors. Corrective actions could include:

- Changing MIP membrane (see section 9.0)
- Making a fresh chemical stock standard (see section 5.1.1). It does not take long for a volatile chemical standard to lose the original concentration.
- Cleaning the PID bulb
- Replacing the PID bulb
- Checking and adjusting detector gas flows - especially in the FID.
- Replacing the XSD probe assembly
- Replacing the XSD reactor core
- Decreasing trunkline carrier gas flow
- Replacing the trunkline (an old trunkline can be a source of contaminant phase buildup. This will reduce detector sensitivity by causing contaminant dispersion in the trunkline which results in reduced response levels as well as delayed trip times).

7.0 Field Operation

1. Power on the generator.
2. Open the gas cylinders that will be used for the MIP system (i.e. nitrogen, hydrogen, air, etc.).
3. Power on the GC and detectors and allow them to warm up (min. 20 minutes) to set temperature.
4. Check the carrier flows of the system and psi on the mass flow controller. Compare these numbers to previous work.
5. Power on the MIP Controller, Field Computer or the Field Instrument and laptop computer.
6. Start the Acquisition software and start a new log.
7. Perform the chemical response test (Section 5.1.2) and record the height of the peak response and the trip time into a field notebook. Refer to Figure 5.2 and Appendix III.
8. Record the system parameters in a field notebook at this time (i.e. flow, pressure, trip time, detector baseline voltages).
9. Complete the EC Dipole test (Section 5.3) and finish setting up the log.
10. Connect the stringpot cable to the stringpot and the stringpot wire to the weight located on the probe foot and pull keeper pin so the weight will drop to the ground.

NOTE: Do not allow the stringpot cable to snap back into the stringpot housing at a high rate of speed. This will ultimately damage the stringpot transducer.

11. Place the drive cushion onto the probing machine head.
12. Place a slotted drive cap to the MIP drive head.
13. Place the rod wiper donut on the ground and insert the point of the MIP probe into rod wiper opening.
14. Align the probe exactly straight and advance the probe to the starting depth: MIP membrane even with the ground surface.
15. Place the trigger switch in the "ON" position.
16. Advance the probe at a rate of 1ft/min meaning: advance 1 ft (30 cm) in 15 seconds and then hold at depth for 45 seconds, then advance to the next depth interval (1 foot) over 15 seconds and wait for 45 seconds. Do this until the predetermined log depth or until refusal is attained.

NOTE: If the there is a loss in MIP pressure or temperature during the logging process, stop and evaluate the problem using the troubleshooting guide located in Appendix II.

NOTE: Refusal is attained when it takes longer than 1 minutes of continuous hammering to advance the probe one foot. This is the maximum time to reach one foot of probe travel.

17. When the MIP log is complete, turn the trigger off and slowly return the stringpot cable into the stringpot housing.
18. Turn off the heater switch to the probe during tool string retraction so no as few contaminants as possible are diffused through the membrane and into the trunkline during retraction.
19. Raise the probe foot of the direct push machines foot assembly and place the rod wiper holder under it to keep it in place during rod retraction.
20. Pull the probe rod string using either the Geoprobe® rod grip pull system or a slotted pull cap.
21. When the MIP probe reaches the surface, clean the probe and membrane well with a detergent/water mix and rinse off well.
22. Now turn the probe heat back on to back off the membrane. Make sure the probe membrane and trunkline are clean of contaminants and the detector baselines are stable prior to running a post log response test. View the detector activity in the response test screen.
23. When the baselines are stable run a post log response test. These response test results should be written down in the field notes and compared to the initial test. This system check ensures the data for that log is valid.
24. When using the FI6000, the data will be saved into your designated folder on your laptop in a compact .zip file. If you are using a FC5000 the data is saved on the field computer and the inserted flash card. When the log is complete the log files and response test files will need to be transferred to a field laptop for viewing on the DI Viewer.
25. Data from the MIP log can now be graphed and printed using the DI-Viewer software (Appendix IV).

8.0 GC Signal Adjustments

8.1 Dilution/Attenuation Changes

GC systems vary in signal output ranges such as 0-1V (typical for HP GCs) and 0-5V (typical for SRI & Shimadzu GCs) which means that when detector signals go beyond this voltage in the output, the acquisition software will display a flat line at the maximum voltage of 1 or 5Volts unless this signal output has been rescaled.

In highly contaminated soil regions (e.g. free product) detectors may flat line or reach a maximum signal output before they reach the observed signal of the contaminant in contact with the membrane. For example, on SRI GCs to be able to observe the actual response beyond the maximum output signal in these high response areas the PID gain switch should be adjusted from high to medium and the software attenuation set to 10. What this does is adjusts the detector output signal down by a factor of 10 which must then be readjust back up by the same factor of 10 in the acquisition software. To accurately map the grossly contaminated zones rescaling of the detectors must be done.

Detectors operated through a HP5890 GC have a 1V maximum signal output and the attenuation settings are based on a 2^x multiplication scale x = HP GC Range and the corresponding attenuation in the MIP software. SRI and Shimadzu GCs have maximum signal outputs of 5V and the attenuation settings are based on a 10^x multiplication factor.

Table 8.1
Gain/Attenuation Settings on the GC detectors and the Acquisition software.

HP GC* Range	FI6000 Attenuation		SRI GC Gain	XSD Gain	FI6000 Attenuation
0	1		High	High	1
1	2		Medium	Medium	10
2	4		Low	Low	100
3	8				

*- The detectors on the HP GC can have attenuation settings up to a range of 7 on the GC corresponding to an acquisition software multiplication value of 128.

9.0 Replacing a Membrane on the MIP Probe

A probe membrane is considered in good working condition as long as two requirements are met:

1. Adequate signal response is achieved during the chemical response tests to see the required detection limits.
2. The difference between the supply and return flow has not increased by more than 3mL/min from the original settings. (A digital or bubble flow meter should be kept with the system at all times).

If either one of these requirements are not met, a new membrane must be installed as follows.

1. Turn the heater off and allow the block to cool to less than 50° C on the control panel readout.
2. Clean the entire heating block with water and a clean rag to remove any debris.
3. Dry the block completely before proceeding.
4. Remove the membrane using the membrane wrench (Fig. 8.1). Keep the wrench parallel to the probe while removing the membrane to ensure proper engagement with socket head cap screw.

NOTE: Do <u>not</u> leave the membrane cavity open for extended periods. Debris can become lodged in the gas openings in the plug.

5. Remove and discard the copper washer as shown in Figure 8.2. Each new membrane is accompanied by a new copper washer. **Do not reuse the copper washer**.
6. Clean the inside of the membrane socket with a q-tip and methanol removing dirt and debris that will be present.
7. Insert the new copper washer around the brass plug making sure that it sits flat on the surface of the block.
8. Install the new membrane by threading it into the socket. Use the membrane wrench to tighten the membrane to a snug fit. Do not over-tighten.
9. Turn the gas on and leave the heater off. Apply water to the membrane and surrounding area to check for leaks. If a leak is detected (bubbles are formed in the water), use the membrane wrench to further tighten the membrane.
10. Use a flow meter to check carrier flow. The difference between the supply flow from the MP6505 and the return flow from the trunkline should be less than 3ml/min. Record the values in a field notebook.

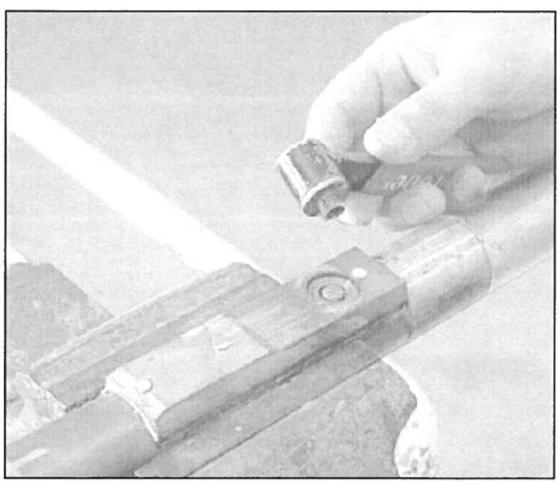


Figure 8.1: Unthread the membrane from the probe block.

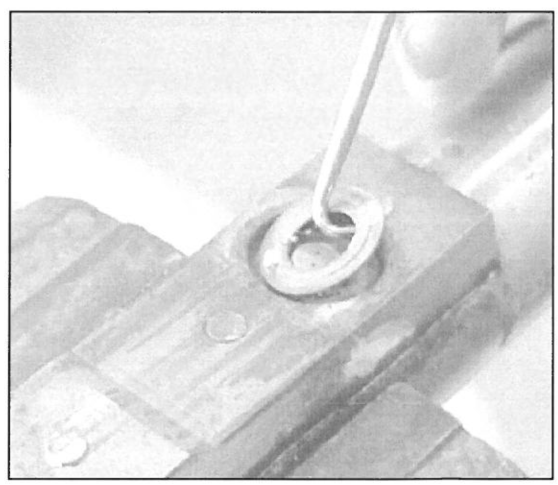


Figure 8.2: Remove and discard the copper washer.

APPENDIX I

Typical Response Test Data

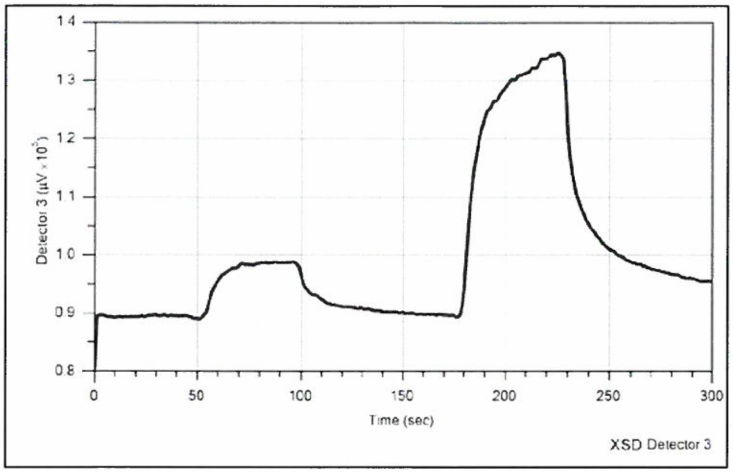


Figure 1: Chemical Response Test: TCE 1 & 5ppm on XSD.

System Parameters:

MP6520 Probe with 121°C setpoint
150' PEEK Trunkline
40ml/min of Nitrogen Carrier Gas
XSD Temperature of 1,100°C

System Response:

1ppm – 9,000µV
5ppm- 45,000µV

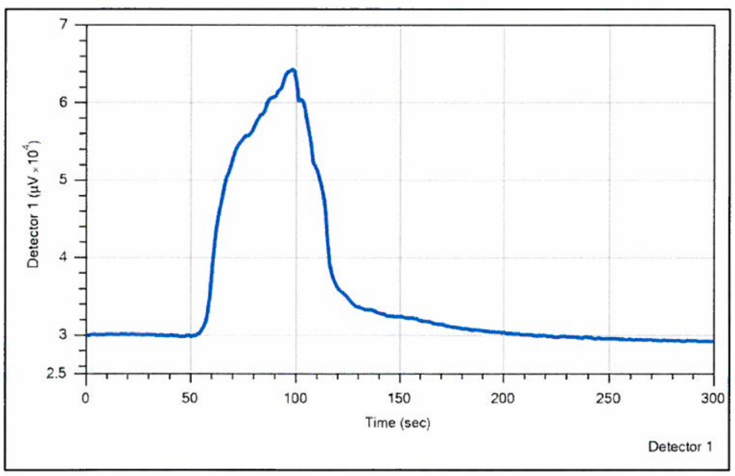


Figure 2: Chemical Response Test: Benzene 5ppm on PID.

System Parameters:

MP6520 Probe with 121°C setpoint
150' PEEK Trunkline
40ml/min of Nitrogen Carrier Gas
PID Lamp intensity

System Response:

5ppm- 35,000µV

APPENDIX II

Troubleshooting Guide

Loss of Pressure 1-2 PSI

- Punctured membrane: Are there any obvious holes in the membrane with bubbles streaming out of them? Replace membrane.
- Membrane leaking out of the face – heavy frothing of bubbles on membrane face but no obvious punctures in membrane. **With the heat off**, place your thumb over the membrane, if the pressure goes back up to the gas pressure prior to the boring the pressure and flow loss is due to a leak in at the membrane face. Replace the membrane.
- Swagelok fitting connecting one of the trunkline gas lines to stainless steel gas line of the probe is loose. Check with soapy water, if bubbles build, fix by slowly tighten the gas line 1/16" nut to the probe.
- Examine for cuts, kinks & cracks in the length of the observable gas line. Expect to see bubbling when MEOH or soapy water is placed on it. Cut gas line prior to this and replace nut and ferrule and reconnect onto the probes steel gas line connection.
- Broken gas line somewhere else up the trunkline. Confirmed when trunkline connections are removed from the probe and close coupled. The carrier gas supply and return should be within 2ml/min, if it is >5ml/min first check with soapy water at the connecting nuts and exposed gas line then look for cuts in throughout the trunkline and see if they will show bubbles with soapy water placed on them. If this is seen you will likely need to change the trunkline.

Loss of Pressure >5 PSI

- Large puncture in membrane. Either visible puncture or observable streaming bubble when soapy water or methanol placed on membrane. Replace membrane.
- Loosen the 1/8" Swagelok nut on gas line. Check and carefully tighten.
- Broken gas line in the probe. Compare the supply versus return flow values (should $\leq$ 2/ml/min) of trunkline connected with the probe and with a close coupled trunkline. If close coupled supply/return flow is good but connected to the probe shows a big leak, there is a break is in the probe. This may be seen with soapy water placed on the edges of the heater block or on the top of the probe where the connections come out. If this produces bubbles it confirms a broken internal line or connection point. Replace the probe.

Flash Warning:

The DI acquisition system, operated with the FI6000 field instrument, will flash a large warning screen – MIP pressure out of Range - to the operator if the probe pressure (PSI) changes over 1 PSI from the initial starting MIP pressure of the log. This alerts the operator that something in the system has changed and the operator can take the necessary precautions for a punctured membrane, broken gasline or a plug in the system.

Increase in Pressure (clearing a blockage)

After setting the mass flow, an increase of more than 3 PSI over the original set pressure indicates a potential blockage, especially if you can verify that the pressure first dropped a 2-5 PSI prior to rising toward 20PSI.

- Shut off the Nitrogen carrier gas flow ASAP. Do this by turning off the black regulator knob on the MIP controller or removing the carrier gas supply line from the breakout panel or the back of the MIP controller.
- Remove the tools from the ground.
- Look for a hole in the membrane and water or dirt got into the up-hole gas line just behind the membrane.
- Remove connection tube and membrane.
- Remove the trunkline gas lines from the top of the probe. Take note of which one had the gas flow coming out because this is the line that will be plugged.
- Look for any obvious particles in either holes behind the membrane or in the gas line at the top of the probe. If any are evident attempt to remove them.
- Take the return gas line at the surface and connect it to the supply gas connection on the breakout panel or on the back of the MIP controller.
- Place the probe end of this line into a jar of methanol to see if the line is clear which is evident by streaming bubbles. If there are no bubbles, increase the flow to try to expel the blockage. If this does not work you may need to cut back the trunkline.
- To clear out the probe take a 5 ml plastic syringe (or a 3 foot section of Teflon/PEEK gas line will work) filled with methanol and attempt to inject through the plugged gas line at the top of the probe. If it clears it will shoot the methanol in an arcing stream out one of the ports in the plug that sits behind the membrane.
- The probe must be dried of the methanol which can be accelerated by heating the probe. Don't reconnect the trunkline to the detectors until you are sure the blockage is clear and the methanol is out of the system.
- If the blockage cannot be cleared a new probe or trunkline will have to be connected.

Blinking Temperature Light

If the temperature light on the MP6505 begins blinking in an unreadable number, it means that there is an open thermocouple in the system.

- To complete the log in progress, replace the thermocouple for the trunkline with a thermocouple wire and twist-tie the wires together. This will fool the system to thinking there is continuity of the thermocouple wire and allow you to finish a log. The probe will continually heat set up this way and if left on when out of the ground it will overheat. When the log is complete remove the tricked thermocouple and remove tools from the ground.

When you have the probe out of the ground, replace the thermocouple as follows.

- Remove the connection tube from the probe.
- Check the crimp connections of the thermocouple wires from the trunkline to the probe.
  - If one of the crimp connections has broken then strip back the wire on both sides of the thermocouple – probe and trunkline ends and reconnect in a new crimp connection and see if the probe temperature comes back.
  - If the thermocouple connection is good, the thermocouple wire in the probe has likely broken. Cut off the crimp connections of the thermocouple wires between the probe and the trunkline. Check the resistance between the red and yellow thermocouple wires coming out of the probe. A resistance reading of approximately 40ohms indicates that the thermocouple is good reconnect. If they are open (O.L.) or mega ohms then the leads are broken on the thermocouple. Replace the thermocouple.

To check the trunkline thermocouple wires, measure each wire from top to bottom. The resistances will be different between the two colored wires but should be somewhere approximately 50 ohms – 150ohms for the length of the trunkline. The resistances will also increase with an increase in trunkline length.

- If they are open (no resistance) then there is a break in the trunkline. Replace the trunkline.

Spiking the Pressure and/or Temperature Data

If spikes show up in the temperature or pressure data especially when related to hammer strikes it is likely an intermittent break in the thermocouple connection. Spiking of the temperature may reach single point readings of 250°C in the data but may not be visible when watching the temperature display on the MIP controller.

- When you check the resistance between the two thermocouple wires they may check out at approximately 40 ohms, however there likely is an intermittent break in the wire.
- Replacing the thermocouple should eliminate the pressure and temperature data spikes.

Probe Not Reaching Temperature

If the heater light is on but the temperature seems low (<100°C with a set point of 120°C) a heater may have broken in the probe.

- Check the resistance of the heater wires.
  - If a heater is broken the resistance will be over 40 ohms. The probe needs to be replaced.
  - Two good heaters will read approximately 22 ohms on the MP6520, MP8520 and MK6530.
- Check to see if the thermocouple has pulled a few inches out of the probe.
  - If the thermocouple duct has broken and pulled back away from the probe, the probe will need to be replaced and rebuilt.
  - A thermocouple can unscrew and vibrate loose out of the thermocouple duct connection if it is not secured with shrink tubing or electrical tape. Reseat back into the leur-lock connection and secure. When the thermocouple pulls away from the probe it measures the probe temperature in the wrong location.

Flash Warning:

The DI acquisition system, operated with the FI6000 field instrument, will flash a large warning screen – Temperature out of Range - to the operator if the temperature goes outside of a set range from the setpoint temperature of 121°C. This alerts the operator that something in the system has failed and the operator can take the necessary precautions for a broken probe heater or thermocouple problem.

System Explanations and Warnings

- MIP Flow

  MIP flow is the carrier gas flow set by the MIP controller. This flow is supplying carrier gas to the trunkline and probe and is typically set to approximately 42ml/min. This parameter may be monitored by the DI-Acquisition system if the operator has the necessary components in their MIP Controller. The return flow, or Flow-R, is the flow coming back to the GC up the return gas line. Flow-S and Flow-R should be within 3-4ml/min and are usually much closer.

- MIP Pressure

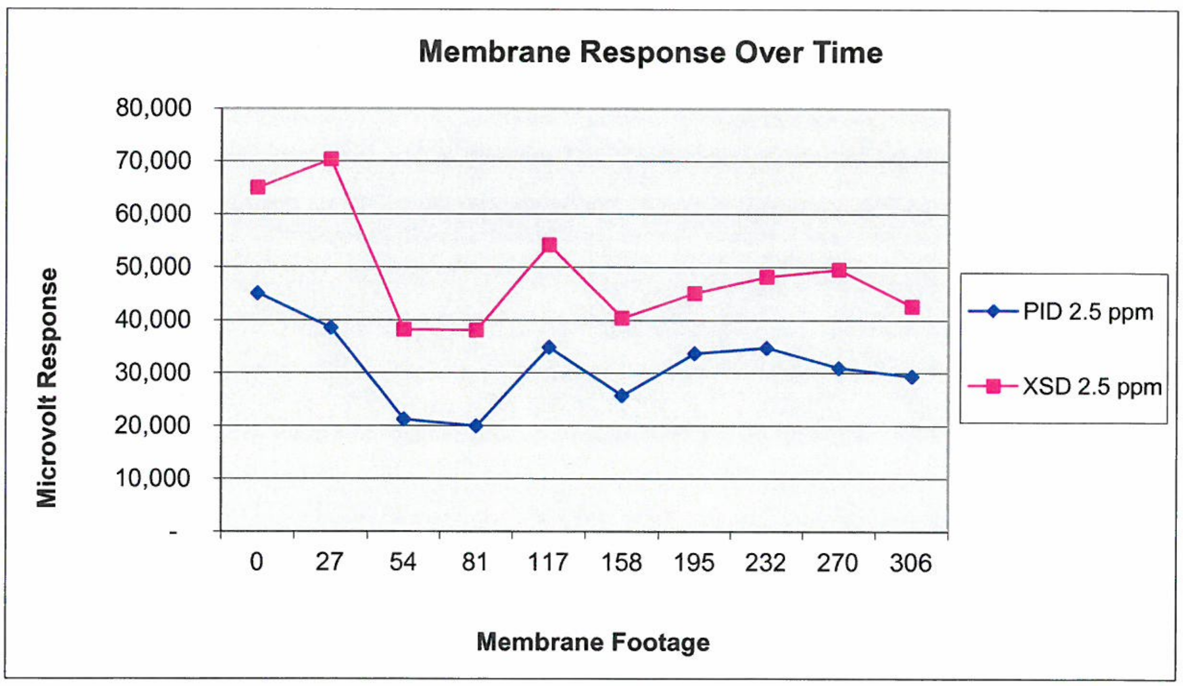
  The MIP pressure is the back pressure of the carrier gas as it moves through the trunkline and probe. This is monitored digitally on the DI-Acquisition screen as well as by an analog pressure gauge on the front of the MIP controller. The MIP pressure is directly related to the MIP return flow (Flow-R). If the MIP pressure falls, the return flow has also dropped, if the MIP flow (Flow-S) has remained the same then there is likely a punctured membrane of problem with the gas lines.

APPENDIX III

Membrane Performance Control Charts

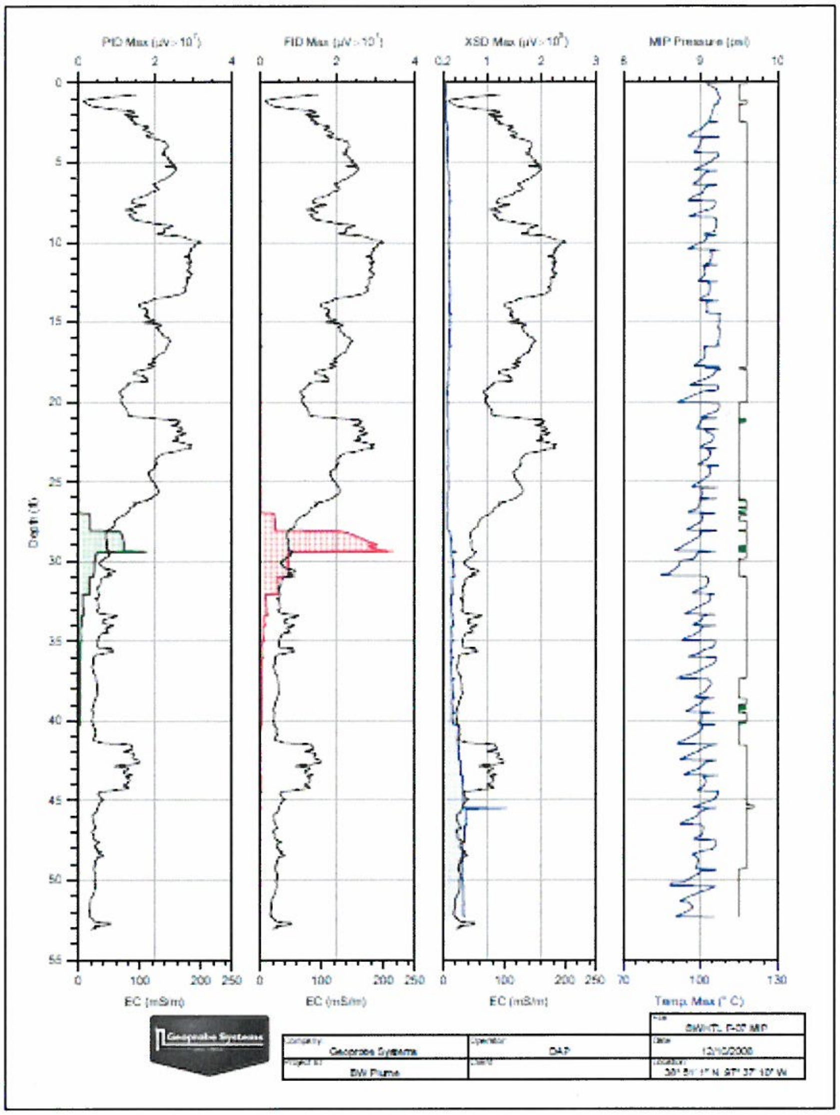
Response Tests using TCE

Pre or Post Log Response Test	Log ID:	PID Response 2.5 ppm	XSD Response 2.5 ppm	Log Footage	Membrane Footage
Pre-Log	MIP01	45,100	65,100	27	0
Pre-Log	MIP02	38,600	70,400	27	27
Pre-Log	MIP03	21,250	38,200	27	54
Pre-Log	MIP04	20,000	38,100	36	81
Pre-Log	MIP05	34,900	54,200	41	117
Pre-Log	MIP06	25,800	40,400	37	158
Pre-Log	MIP07	33.750	45,100	37	195
Pre-Log	MIP08	34,800	48,200	37	232
Pre-Log	MIP09	31,000	49,600	36	270
Post-Log	MIP09	29,400	42,700		306



APPENDIX IV

Sample Logs and Interpretation



Here is a MIP log showing the detectors (PID, FID and XSD) over the electrical conductivity graph as well as a graph of probe temperature and gas pressure.

The above log shows contamination from 27 ft to 33 ft bgs. The main detector response is on the PID and FID with minimal response on the XSD (Halogen Specific Detector). This indicates that the main contaminant would not contain halogenated (Cl-, Br-, Fl-) atoms, but would be likely be hydrocarbon based. The contaminants are present in the lower electrical conductivity formations which typically are courser grained, higher permeable formations. The increased temperature deflection of the MIP block heater around 25 ft provides an indication of where the water table may be in this log.

Detector Interpretation

Standard MIP systems are able to identify compound families and determine general compound classes. However the identification of individual compounds is not possible. Standard MIP systems have a continuous carrier gas flow that is brought to the detectors from the down-hole probe. To be able to effectively speciate (determine specific contaminant chemicals) the operator would need a highly modified system in place. The carrier gas stream would need to be trapped and run through either a mass spectrometry or secondary GC onsite.

Typical standard MIP configurations use 3 gas phase detectors: a photo-ionization detector (PID), flame-ionization (FID) and a halogen specific detector (XSD). The PID responds to compounds which have an ionization potential $\leq$ electron voltage of the PID bulb. These compounds include both chlorinated and non-chlorinated hydrocarbons. A typical PID bulb has a 10.6eV lamp. The FID will respond when organic compounds (anything containing carbon) are present in the carrier gas stream in high enough concentration burn up in the flame which increases the flames ionization voltage. The XSD responds only to halogenated compounds which are made up of chlorinated (typical halogen environmental contaminant), brominated and fluorinated compounds. Based upon which detector or detector series a contaminant responds on, we can determine if the contaminants are halogenated or petroleum based.

Petroleum hydrocarbons will respond on the PID and FID but not on the XSD. Fresh gasoline primarily contains aromatic hydrocarbons such as benzene, toluene, ethyl benzene and xylenes, which respond strongly on a photo-ionization detector (PID) and not so well on the FID. As gasoline breaks down or weathers the molecular structure changes from primarily aromatic to mainly straight chain hydrocarbons (single bonded hydrocarbons). Straight chain hydrocarbons typically do not show up on the PID do having a higher ionization potential but will respond on a flame ionization detector (FID). Weathered petroleum will still have a decent signal on the PID but may show a stronger FID signal.

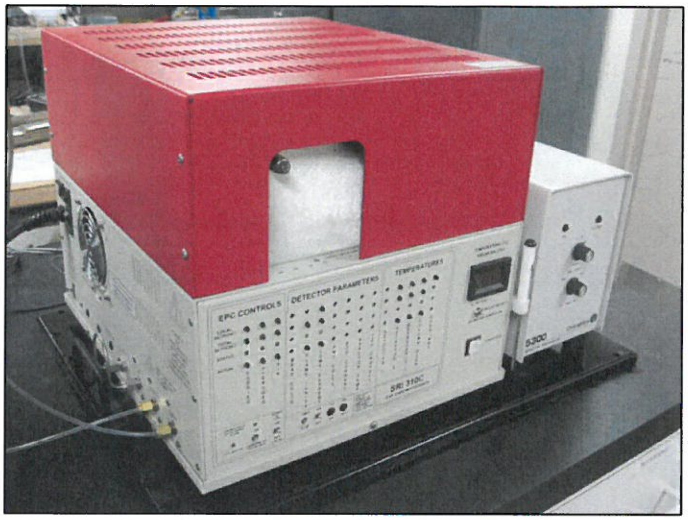
Chlorinated compounds such as trichloroethylene and perchloroethylene are detected by the XSD and PID and respond in a similar profile. This is typical of the common double bonded chlorinated compounds seen in the subsurface which have an ionization potential that the PID can see. Chlorinated compounds without multiple bonds such as chloroform, methylene chloride and 1,1,1,-trichloroethane have an ionization potential higher than the PID electron voltage which results in a solid response on the XSD but will not show up on the PID.

The only sure way of determining contaminant concentration from MIP responses is to take confirmation soil and/or groundwater samples for laboratory analysis. After obtaining the results the actual concentrations can be compared to the MIP detector responses and concentrations may be estimated across the site.

APPENDIX V

GC1000 Configuration and Operating Parameters

GC1000 Configuration



SRI310 GC with PID, FID & OI Analytical XSD (all standalone detectors)

Flows:

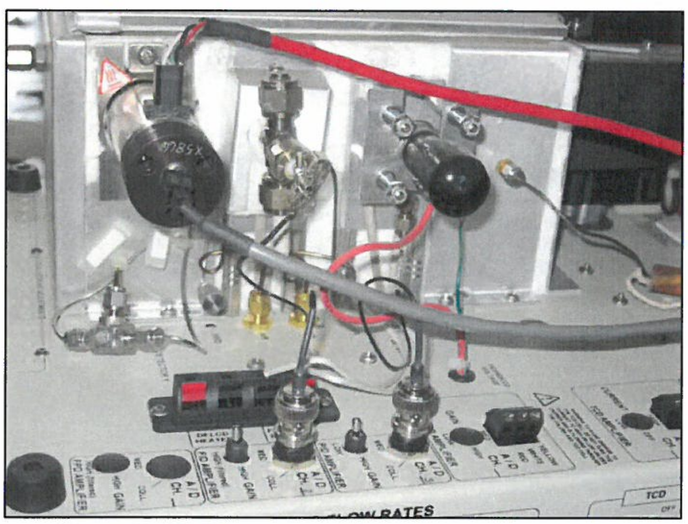
TL Carrier (N_2): 40ml/min
Detector split 60:40 – 24ml/min-XSD
16ml/min-FID

Nafion Dryer (installed in GC Oven)
80ml/min (2x carrier flow rate)

Figure 1: GC1000: SRI 310GC with XSD Controller.

A built in air compressor is split underneath the GC between the XSD & FID. The XSD & FID air supply is controlled through the GC air pressure screw control on front of GC and with different air line sizes and lengths to provide 250ml/min to the FID and 30 ml/min to the XSD.

Detectors front of GC to back: XSD, FID & PID



SRI 310 GC Detector 1 position – XSD (not controlled by GC)

SRI 310 GC Detector 2 position – FID

SRI 310 GC Detector 3 position – PID

Nafion dryer installed inside GC oven

GC Oven set to 85°C – 130°C max temp.

Figure 2: GC Detectors – left to right - XSD, FID, PID.

Flow comes into the GC oven via a 1/16" bulkhead fitting located in the 4th detector position furthest back (upper right inside oven) behind the PID detector. The trunkline will connect to this bulkhead and a 1/16" stainless steel line transports flow into the Nafion dryer. Silco steel takes this to the PID lamp which is inserted up to the lamp and backed off a 1/16" and tightened. A 1/16" stainless steel line brings it back into the GC oven where it is split between the FID and XSD and sent to them via a silco-steel line to the XSD and a stainless steel line to the FID.

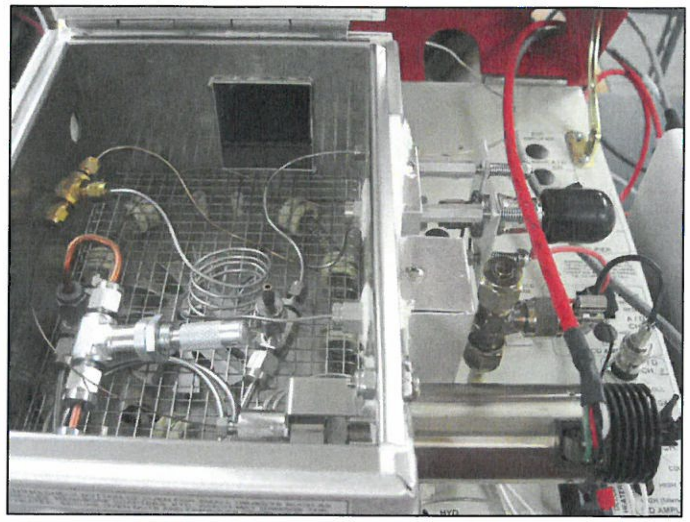


Figure 3: GC Oven Configuration.

Detector Operating Parameters:

<u>PID:</u>

- MIP Carrier Flow (N_2) – 100% - 40ml/min
- Carrier return back into oven split between XSD & FID
- Detector Temperature setting – 150°C
- PID current 70 (0.70ma)

<u>FID:</u>

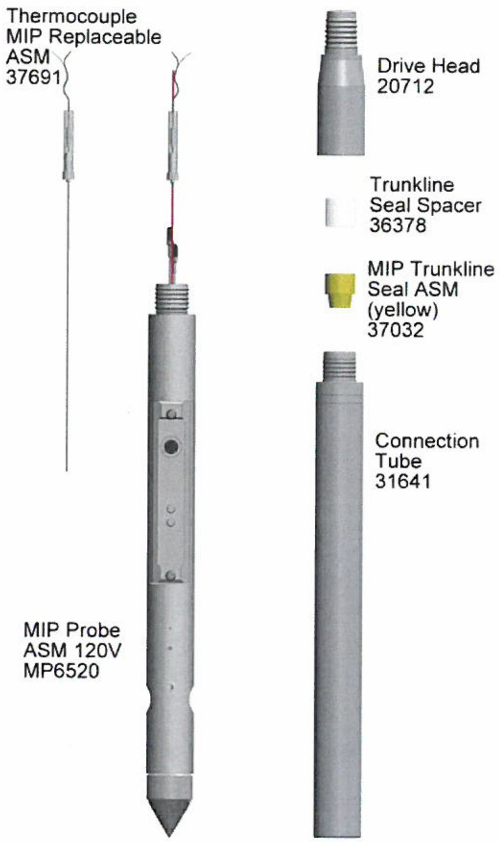
- Carrier N_2 MIP effluent – 40% - 16ml/min
- Hydrogen – 25ml/min
- AIR – 250ml/min
- Detector Temperature setting – 250°C
- FID igniter set at -600 (6.0V)

<u>XSD:</u>

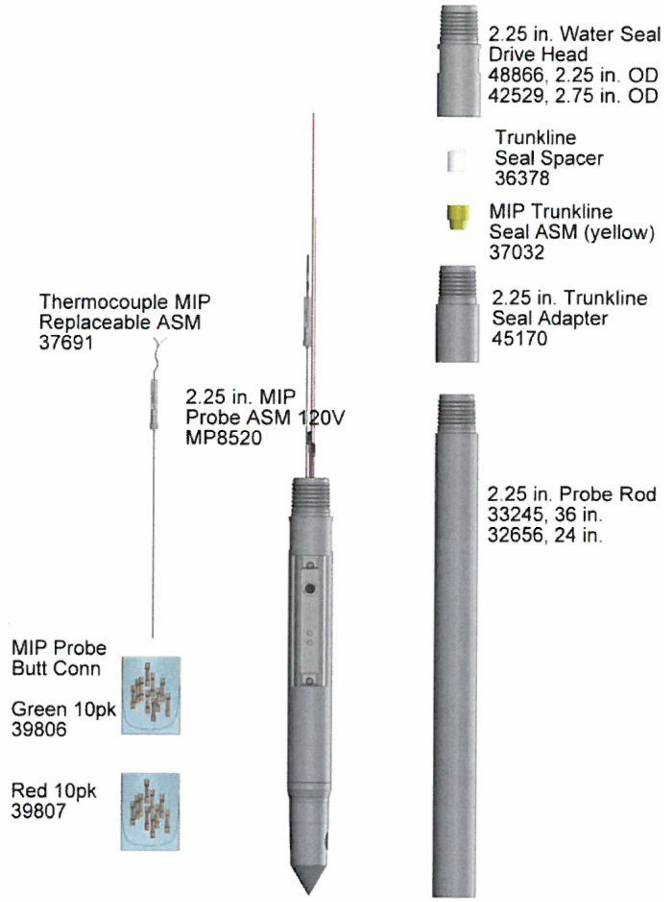
- Carrier N_2 MIP effluent – 60% - 24ml/min
- Air – 30ml/min (split 50:50 wall & jet input of XSD)
- Detector Temperature setting – 1,100°C

APPENDIX VI

Tool Configurations



MIP - MP6520 Probe for 1.5 in. rods



MIP - MP8520 Probe for 2.25 in. rods

Equipment and tool specifications, including weights, dimensions, materials, and operating specifications included in this document are subject to change without notice. Where specifications are critical to your application, please consult Geoprobe Systems®.

A DIVISION OF KEJR, INC.

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1835 Wall St. • Salina, KS 67401
1-800-GEOPROBE (1-800-436-7762) • Fax 785-825-2097
www.geoprobe.com

APPENDIX D

Quality Assurance Project Plan

(Provided Under Separate Cover)

APEX

APPENDIX E

Community Air Monitoring Program

Community Air Monitoring Plan
2002-2024 Cropsey Avenue Site
Brooklyn, New York
NYSDEC BCP # C224169

Prepared for:

Mr. Peter Neglia
2002 Cropsey Associates, LLC
2611 West 2nd Street
Brooklyn, NY 11223

Prepared by:

Apex Companies, LLC
120-D Wilbur Place
Bohemia, New York 11716

Date Submitted:

November 2014

APEX

COMMUNITY AIR MONITORING PLAN

2002-2024 CROPSEY AVENUE SITE

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COMMUNITY AIR MONITORING PLAN

2002-2024 CROPSEY AVENUE SITE
BROOKLYN, NEW YORK

NYSDEC BCP# C224169

1.0 INTRODUCTION

APEX has prepared this Community Air Monitoring Plan (CAMP) as a component of the Remedial Investigation (RI) Work Plan for the 2002-2024 Cropsey Avenue Site (the Site), 2022 Cropsey Avenue, Brooklyn, New York. The CAMP fulfills the general requirements set forth by the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (Attachment 1 of this CAMP) and the New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) #4031 “Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites” (Attachment 2 of this CAMP). The intent of this CAMP is to provide procedures to protect the downwind communities from potential airborne releases of constituents of concern during RI activities. As such, this CAMP specifies the potential air emissions, air monitoring procedures, monitoring schedule, and data collection and reporting for the RI activities to be conducted.

The CAMP should be used in conjunction with the RI Work Plan, the Field Sampling Plan (FSP), the Quality Assurance Project Plan (QAPP), and the Health and Safety Plan (HASP). The RI Work Plan presents the Site background and defines the field sampling program. The FSP describes the methods and procedures to be used for environmental sample collection during implementation of the RI field activities. The QAPP presents the quality assurance/quality control (QA/QC) procedures to be used during implementation of the RI Work Plan, as well as a description of the general field and laboratory procedures. The FSP, QAPP, and HASP are provided as Appendices B, C, and E of the RI Work Plan, respectively.

2.0 SITE DESCRIPTION

The Site is located at 2022 Cropsey Avenue in the Borough of Brooklyn, New York City, New York and occupies a portion of a parcel that is identified by Tax Map Number: Block 6467, Lot 1. As shown on RI Figure 1. The Site consists of a single-story multi-unit retail building which has a full basement and is approximately 15,000 square feet.

The Site is bounded by Cropsey Avenue to the northeast, 20th Avenue to the northeast, a residential parcel to the southwest, and Bay 25th Street to the southeast. Local groundwater flow is expected to be from roughly north to south towards Gravesend Bay. The elevation of the Site is approximately 20 feet above mean sea level (msl). Surface topography consists of a gentle downward slope to the south towards Gravesend Bay, which is approximately 1,000 feet from the Site. A narrow undeveloped strip of land extends along the entire south (rear) side of the Site building. The layout of the Site and surrounding properties is presented on RI Figure 2 (Site Plan). Currently, the Site is developed with a shopping center. Land use and zoning at the Site and the other properties in the area is commercial and residential.

3.0 SUMMARY OF SITE INVESTIGATION ACTIVITIES

The proposed RI activities for the Site include subsurface soil sampling, monitoring well drilling, installation, and development, groundwater sampling, and soil vapor sampling. A more detailed description of the investigation activities can be found in the RI Work Plan.

4.0 POTENTIAL AIR EMISSIONS RELATED TO INVESTIGATION ACTIVITIES

Certain intrusive RI activities to be conducted at the Site have the potential to generate localized impacts to air quality including drilling and subsurface soil sampling. Some non-intrusive RI activities to be conducted also have the potential to generate localized impacts to air quality and include the collection of groundwater samples.

4.1 Air / Odor Emissions and Control Measures

Air emissions control and fugitive dust suppression techniques will be used during the RI activities identified above, as necessary, to limit the air/odor emissions from the Site. Air monitoring will be conducted during both intrusive and non-intrusive Site activities.

Odor and dust control measures will be available at the Site and used when necessary. The following dust and odor suppression measures may be used during the RI activities, depending upon specific circumstances and air monitoring results:

- Water spray;
- Polyethylene sheeting (for covering drill cuttings, soil stockpiles, etc.);
- Containerize drill cuttings and groundwater in 55-gallon drums with the cover secured; and
- Odor and dust control measures will be implemented based on visual or olfactory observations, and the results of airborne particulate and volatile organic compound (VOC) monitoring.

4.2 Air Monitoring Procedures

Real-time air monitoring will be implemented at the Site for VOCs and particulate matter. Particulate monitoring will not be performed, however, during non-intrusive activities (i.e., groundwater sampling) and precipitation events. Upwind and downwind monitoring locations will be determined through visual observation (windsock or similar technique). Monitoring at each location will include the use of hand-held direct-reading survey instruments.

4.3 Monitoring Location Selection

Monitoring locations will be determined daily based on visual observation of a wind direction. A single upwind (background) location will be selected daily where both VOC and particulate monitoring will be conducted. This upwind location will be established at the start of each day before commencing investigation activities.

Monitoring activities will continue at a single downwind location throughout the day. If wind direction shifts radically during the day (greater than approximately +/- 60 degrees from original upwind) new upwind and downwind monitoring locations will be established. Any location changes will be documented in the field logbook.

4.4 VOC Monitoring

As required by the NYSDOH guidance for community air monitoring during intrusive activities, VOCs will be monitored continuously during intrusive Site activities (drilling of soil borings or installation of monitoring wells) with instrumentation that is equipped with electronic data-logging capabilities. A photoionization detector (PID) (MiniRAE 2000 [or equivalent]) will be used to conduct the real-time VOC monitoring. All 15-minute readings will be recorded by the equipment's electronic data-logging system; any instantaneous readings collected to facilitate activity decisions will be recorded in the field logbook.

During non-intrusive Site activities (monitoring well development and collection of groundwater samples from monitoring wells), periodic VOC monitoring will be conducted. Periodic monitoring may include monitoring upon arrival at the sample location, while opening a well cap, during well bailing and/or purging, and/or prior to leaving a sample location. However, if a sampling location is proximal to potentially exposed individuals, VOCs will be monitored continuously during sampling activities at that location.

4.5 Particulate Matter Monitoring

As required by the NYSDOH guidance, particulate matter will be monitored continuously during intrusive Site activities (drilling of soil borings or installation of monitoring wells) with instrumentation that is equipped with electronic data-logging capabilities. A particulate monitor (Thermo Scientific personal Data RAM pDR-1500 [or equivalent]) will be used to conduct the real-time monitoring of particulate matter less than 10 microns in size (PM-10). All 15-minute readings will be recorded by the equipment's electronic data-logging system; any instantaneous readings collected to facilitate activity decisions will be recorded in the field logbook.

Fugitive dust migration will be visually assessed during all work activities, and reasonable dust suppression techniques will be used during any Site activities that may generate fugitive dust. Fugitive dust control measures are discussed in Section 4.1 of this CAMP.

5.0 ACTION LEVELS

The action levels provided below are to be used to initiate response actions, if necessary, based on real-time monitoring.

5.1 Action Levels for VOCs

As outlined in the NYSDOH CAMP guidance document, if the ambient air concentration of total VOCs exceeds 5 parts per million (ppm) above background (upwind location) for the 15-minute average, intrusive Site activities will be temporarily halted while monitoring continues. If the total VOC concentration readily decreases (through observation of instantaneous readings) below 5 ppm above background, then intrusive Site activities can resume with continuous monitoring.

If the ambient air concentrations of total VOCs persist at levels in excess of 5 ppm above background but are less than 25 ppm above background, intrusive Site activities will be halted, the source of the elevated VOC concentrations will be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will be continued. Once these actions have been implemented, intrusive Site activities can resume provided that the following two conditions are met:

- The 15-minute average VOC concentrations remain below 5 ppm above background;
- The total VOC concentration 200 feet downwind of the sample location or half the distance to the nearest potential receptor or residential/commercial structure (whichever is less but in no case less than 20 feet) is below 5 ppm above background for the 15-minute average;
- If the ambient air concentrations of total VOCs exceed 25 ppm above background, the intrusive Site activities must cease, and emissions control measures must be implemented;
- Periodic monitoring for VOCs is required during non-intrusive activities. During these activities, ambient direct-reading (instantaneous) VOC data will be periodically collected at the location of the non-intrusive activity and recorded in the field activity logbooks;

5.2 Action Levels for PM-10

As required by the NYSDOH guidance, if the ambient air concentration of PM-10 at any one (or more) of the monitoring locations is noted at levels in excess of 100 micrograms per cubic meter ($\mu g/m^3$) above background (upwind location), or if airborne dust is observed leaving the work area, intrusive Site activities will be temporarily halted. The source of the elevated PM-10 concentration will be identified, corrective actions to reduce or abate the emissions will be undertaken, and air monitoring will be continued. Work may continue following the implementation of dust suppression techniques provided the PM-10 levels do not exceed 150 $\mu g/m^3$ above background.

If, after implementation of dust suppression techniques, PM-10 levels are greater than 150 $\mu g/m^3$ above background, work must be stopped and Site activities must be re- evaluated. Work may only resume provided that the dust suppression measures and other controls are successful in reducing PM-10 levels to less than 150 µg/m^3 above background and in preventing visible dust from leaving the Site.

If the ambient air concentration of PM-10 is above 150 µg/m^3 above background, the intrusive Site activities must cease and emissions control measures must be implemented.

5.3 Meteorological Monitoring

Wind direction is the only meteorological information considered relevant for the RI activities and CAMP. Meteorological monitoring will be conducted periodically at the Site using a windsock or other appropriate equipment. Wind direction will be established at the start of each work day and may be re-established at any time during the work day if a significant shift in wind direction is noted.

5.4 Instrument Calibration

Calibration of the VOC (PID) and PM-10 (particulate monitor) monitoring instrumentation will be performed in accordance with each of the equipment manufacturer's calibration and quality assurance requirements. The VOC and PM-10 monitoring instrumentation will be calibrated at least daily, and calibrations will be recorded in the field activity logbook.

6.0 MONITORING SCHEDULE DATA COLLECTION AND REPORTING

This section presents the monitoring schedule, data collection and reporting requirements.

6.1 Monitoring Schedule

Real-time VOC and PM-10 monitoring will be performed continuously throughout the intrusive activities. VOC monitoring will be performed periodically during non-intrusive sampling-type activities. Wind direction will be determined at the start of each day and at any other appropriate time during RI activities.

6.2 Data Collection and Reporting

Air monitoring data will be collected continuously by the VOC and PM-10 monitoring equipment during intrusive Site activities by an electronic data-logging system. The data management software will be set up so that instantaneous observed readings are recorded by the electronic data acquisition system and averaged over 15-minute time periods. All readings will be recorded and archived, and will be available for review by NYSDOH and NYSDEC personnel.

Attachment 1

NYSDOH Generic Community Air Monitoring Plan

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

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

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Attachment 2

NYSDOH Fugitive Dust and Particulate Monitoring Plan

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50° C (14 to 122° F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX F

HASP

(Provided Under Separate Cover)

APEX

APPENDIX G

Community Participation Plan

(Provided Under Separate Cover)

APPENDIX H

Tenant Information

Shore Haven Shopping Center LLC
List of Tenants

AMK Trading Corp. at 2002 Cropsey Avenue (1,462 sf near the 20th Avenue side of the parcel);

Carla Anna, Inc, at 2006 Cropsey Avenue (1,560 sf immediately east of AMK);

Eastern Chinese Restaurant at 2008 Cropsey Avenue (653 sf immediately east of Carla Anna, Inc.);

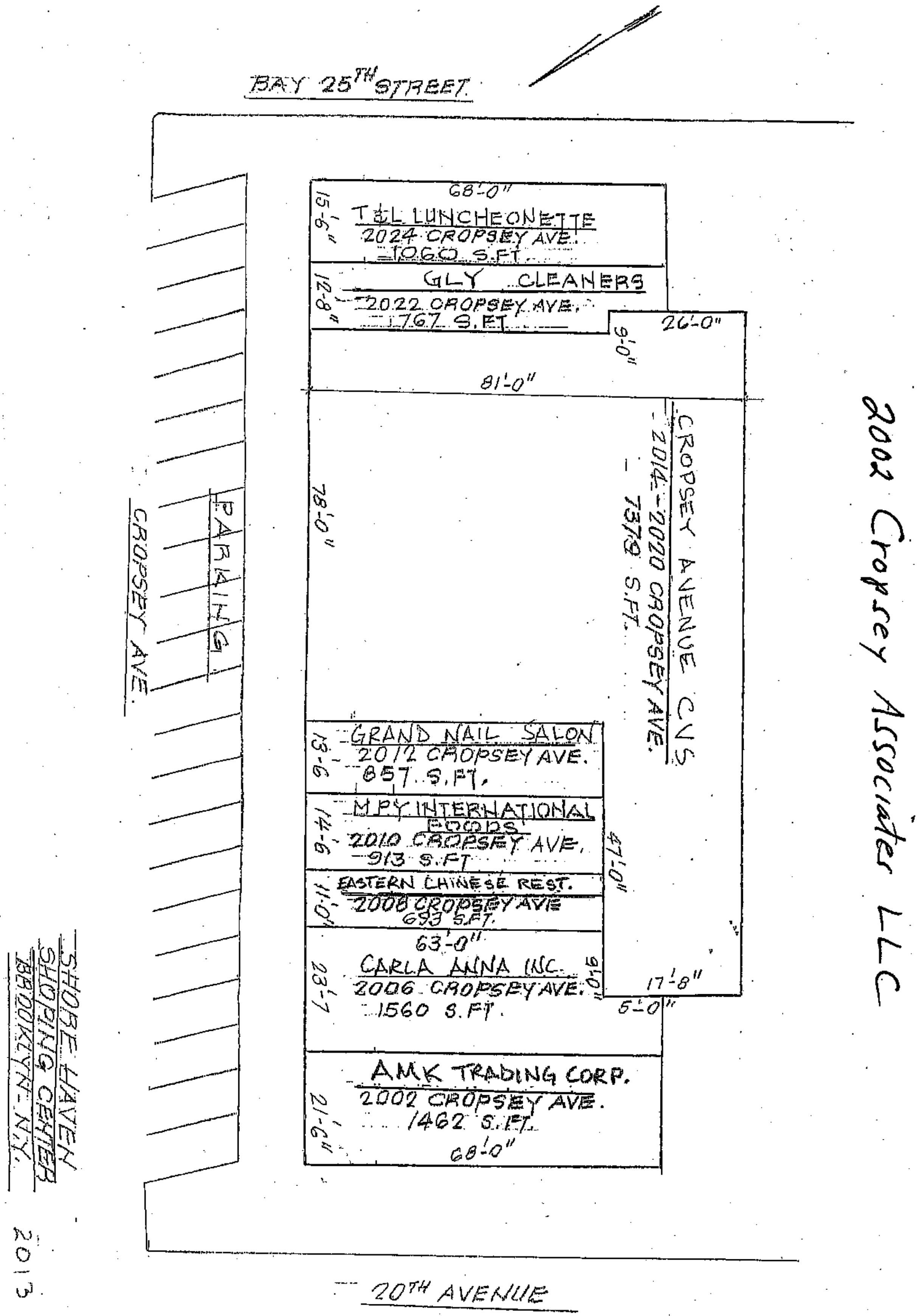
MPY International Foods at 2010 Cropsey Avenue (913 sf immediately east of Eastern Chinese Restaurant);

Grand Nail Salon at 2012 Cropsey Avenue (657 sf immediately east of MPY);

Cropsey Avenue CVS at 2014-2020 Cropsey Avenue (7,378 sf and the largest tenant space occupying about 1/3 of the shopping center near the middle of the parcel);

GLY Cleaners at 2022 Cropsey Avenue (767 sf and immediately west of T&L Luncheonette.
T&L Luncheonette at 2024 Cropsey Avenue (1060 sf located at the corner of Cropsey Avenue and Bay 25th Street).

Diagram of Tenant Locations



QUALITY ASSURANCE PROJECT PLAN

2002-2024 Cropsey Avenue Site
Brooklyn, New York
NYSDEC BCP # C224169

Prepared for:

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Date Submitted:
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Quality Assurance Project Plan

2002-2024 Cropsey Avenue Site
Brooklyn, New York

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QUALITY ASSURANCE PROJECT PLAN: 2002-2024 CROPSEY AVENUE SITE CROPSEY AVENUE, BROOKLYN NEW YORK

NYSDEC BCP# C224169

1.0 INTRODUCTION

Apex prepared this Quality Assurance Project Plan (QAPP) as a component of the Remedial Investigation (RI) Work Plan for the 2002-2024 Cropsey Avenue Site (the Site) located at 2022 Cropsey Avenue, Brooklyn, New York. The QAPP presents the quality assurance/quality control (QA/QC) procedures to be used during implementation of the RI Work Plan.

The overall QAPP objective is to ensure that data produced as a result of the various sampling and monitoring, including soil, groundwater, soil vapor, and ambient (indoor and outdoor) air is of the highest quality and usable for the intended purpose. For the purposes of this QAPP, soil vapor and ambient air samples will be collectively referred to as air samples. This QAPP has been prepared in accordance with the United States Environmental Protection Agency (USEPA) guidance entitled Guidance for Quality Assurance Project Plans EPA QA/G-5 (USEPA, 2002), the New York State Department of Environmental Conservation (NYSDEC) DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010), and considering requirements of the NYSDEC BCP program. This QAPP presents project organization and responsibilities, and QA/QC protocols related to field sampling and analysis activities associated with various sampling and monitoring requirements. The procedures in this QAPP will be implemented to ensure that precision, accuracy, representativeness, completeness, and comparability (PARCC parameters) of the data are documented, as applicable, and that data meet project requirements.

The QAPP will be used in conjunction with the RI Work Plan, the Field Sampling Plan (FSP), the Community Air Monitoring Plan (CAMP), and the Health and Safety Plan (HASP). The RI Work Plan presents the Site background and defines the field sampling program. The FSP describes the methods and procedures to be used for environmental sample collection during implementation of the RI field activities. The CAMP provides procedures to protect the downwind communities from potential airborne releases of constituents of concern during RI activities. The FSP, CAMP, and HASP are provided as Appendices B, D, and E of the RI Work Plan, respectively. Attachments 1 through 9 provided various sampling logs for use during the site work.

2.0 SITE DESCRIPTION

The Site is located at 2022 Cropsey Avenue in the Borough of Brooklyn, New York City, New York and occupies a portion of a parcel that is identified by Tax Map Number: Block 6467, Lot 1. The Site consists of a single-story multi-unit retail building which has a full basement and encompasses approximately 15,000 square feet.

The Site is bounded by Cropsey Avenue to the northeast, 20th Avenue to the northeast, a vacant lot residential parcel to the southwest, and Bay 25th Street to the southeast. Local groundwater flow is expected to be from roughly north to south towards Gravesend Bay.

The elevation of the Site is approximately 20 feet above mean sea level (msl). Surface topography consists of a gentle downward slope to the south towards Gravesend Bay, which is approximately 1,000 feet from the Site. A narrow undeveloped strip of land extends along the entire south (rear) side of the Site building. Currently, the Site is developed with a shopping center. Land use and zoning at the Site and the other properties in the area is commercial and residential.

3.0 REMEDIAL INVESTIGATION ACTIVITIES

The primary objectives of the proposed RI activities are listed in Section 1.1 of the RI Work Plan. Sample collection efforts include obtaining samples from one soil boring, obtaining qualitative data through the use of a membrane interface probe (MIP), obtaining groundwater samples from permanent monitoring wells, obtaining air samples (soil vapor samples from temporary soil vapor points, ambient air quality samples), and sampling of derived waste (IDW) solid and liquid media samples for waste characterization purposes.

Samples collected during the investigation will be analyzed in accordance with USEPA SW-846 Test Methods for Evaluating Solid Waste and USEPA Compendium Method TO-15, with New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) Revision 2005 (or most recent version).

4.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

A Project Organizational Chart is provided as **Figure 1**. The responsibilities of the key project personnel are detailed below. Resumes are presented in Attachment 10.

The Project Manager is responsible for the following: overseeing the implementation of the project tasks, overall project coordination, adherence to the project schedules, directing, reviewing, and assessing the adequacy of the performance of the Task Managers assigned to the project, implementing corrective action (if warranted), reviewing reports, and maintaining full and orderly project documentation. The Project Manager will review all documents and other correspondence concerning the activities performed pursuant to the project (i.e., all activities associated with the Site). The Project Manager is also responsible for the overall QA including technical adequacy of the project activities and reports and conformance to the scope of work.

The Task Manager(s) is responsible for the following: field activity QA/QC, task coordination, adherence to the project schedules, directing, reviewing, and assessing the adequacy of the performance of the technical staff and subcontractors assigned to the project (if warranted), interacting with the Project Manager, preparing reports, and maintaining full and orderly project documentation.

The project team members include the task managers, field hydrogeologists, and support staff (e.g., data processors, project assistants, etc.) who are qualified to oversee/perform the work, as appropriate, and will be responsible for work in their respective specialty areas. Project team members will be on-site to supervise all activities specified in the RI Work Plan.

The Project QA Officer is responsible for performing systems auditing, interfacing with the analytical laboratory to make requests and resolve problems and interfacing with the data validator. The Data Validator is responsible for developing a project-specific data usability summary report (DUSR).

The Site Health and Safety Officer is responsible for implementing the site- specific health and safety directives in the Health and Safety Plan (HASP – see RI Work Plan - Appendix E) and for contingency response.

The Data Validator is responsible for review of laboratory data for compliance with the QA objectives for analytical performance and the PARCC parameters (i.e., precision, accuracy, representativeness, completeness, and comparability) as set forth in this QAPP, and notifications to the Project QA Officer and Project Manager of any QC deficiencies that impact data usability.

5.0 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

The overall QA objective for this aspect of the project is to select and implement procedures for field measurements, sampling, and analytical testing that will provide data of known quality to support the intended use of the information. The data quality objective (DQO) process, as described in the USEPA guidance entitled Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4 (USEPA, 2006), is intended to provide a “logical framework” for planning field investigations. The following section addresses, in turn, each of the seven sequential steps in the EPA QA/G-4 DQO process.

Step 1: State the Problem

The RI will be conducted at the Site to determine the nature and extent of VOC related constituents of concern (COCs) in on-site and off-site soil, groundwater, and soil vapor. The sampling and analysis program is intended to generate data for the Site database that may potentially support further investigation work, if necessary.

Step 2: Identify the Goal of the Study

The goal of the study is to determine the nature and extent of VOC related COCs in on-site and off-site soil, groundwater, and soil vapor and to assess potential impacts to human health and the environment as a result of the release of COCs at the Site. The initial use of the data is descriptive (distribution and concentration). Subsequent to a review of the descriptive information, an evaluation will be performed based on the findings of the RI.

Step 3: Identify Information Inputs

Decision inputs incorporate both concentration and distribution. A fundamental basis for decision-making is that a sufficient number of data points of acceptable quality are available from the investigation to support the decision. Thus, the necessary inputs for the decision are: 1) the proportion of non-rejected (usable) data points; and 2) the quantity of data needed to thoroughly determine the nature and extent of VOC related COCs at the Site.

The soil, groundwater, and soil vapor sample data will be compared to the applicable New York State standards, criteria, and guidance (SCGs). The data will be evaluated for completeness, general conformance with requirements of this QAPP, and consistency among data sets as appropriate.

Step 4: Define the Boundaries of the Study

The Site is predominantly covered by paved surfaces and buildings. The limits of the Site were obtained from a review of historical Sanborn fire insurance maps, building surveys and prior investigations. One of the primary tasks of the RI is to further delineate the impacted media at the site as well in off-site areas. See figure 2.

Step 5: Develop the Analytic Approach

The decision on whether data can be used in the Site RI will be based on the validation results. Following validation, the data will be flagged, as appropriate, and any use restrictions noted. The sampling plan has been devised so that the loss of any single data point will not hinder description of the distribution of COCs or the evaluation of further investigation activity. Given this, a reasonable decision rule would be that 90% of the data points not be rejected and deemed unusable for evaluation purposes. Applicable actions would be evaluated, if needed, based on the results of the RI.

SCGs have been identified for the Site that pertain to meeting applicable regulations and RI objectives. The data will be compared to the applicable SCGs to evaluate COCs that exceed their respective SCG. The SCGs for the Site soils are based upon the selection of applicable values from the New York State Codes, Rules and Regulations Title 6 (6 NYCRR) Part 375 Remedial Program Restricted Use soil cleanup objectives (SCOs). The SCGs for groundwater are based on the NYSDEC Division of Water Technical and Operational Guidance Series (TOGS) (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. The SCGs for soil vapor / indoor air quality are based upon NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006, as amended.

Step 6: Specify Performance or Acceptance Criteria

Specifications for this step call for: 1) giving forethought to corrective actions to improve data usability; and 2) understanding the representative nature of the sampling design. This QAPP has been designed to meet both specifications for this step. The sampling and analysis program has been developed based on a review of historical information, existing Site data collected during the Site Characterization, and knowledge of present Site conditions. The representative nature of the sampling design has been developed by discussions among professionals familiar with the Site.

Step 7: Develop the Plan for Obtaining Data

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody (COC), laboratory analysis, and reporting that will provide results to support the evaluation of the Site data generally consistent with DER-10 requirements. Specific procedures for sampling, COC, laboratory instrument calibration, laboratory analysis, data reporting, internal quality control, audits, preventive maintenance of field equipment, and corrective action are described in other sections of this QAPP.

The sampling plan involves a phased approach to both sampling and analysis. This provides the opportunity to evaluate and focus each data collection step to optimize the overall data collection process.

Generally, the specific RI field sampling and analysis activities to be conducted during this project which require associated QA/QC include soil, groundwater, and air sampling (i.e., soil sampling, monitoring well groundwater sampling, temporary soil vapor point sampling, ambient air quality sampling, and liquid and solid waste characterization sampling). QA/QC protocols will be implemented to ensure the PARCC parameters of the data collected during these field activities meets the objectives of the overall project. Specifically, data will be gathered or developed using procedures appropriate for the intended use of the data. The field measurements and laboratory analyses will be used to support one or more steps in the sampling described above. The PARCC parameters are further defined in Section 12.1.

The QA/QC will include laboratory method performance, field decontamination procedures, calibration and maintenance of field instruments, and QC sample collection and analysis.

A DQO summary for the sampling investigation efforts is presented in the subsequent section. The summary consists of stated DQOs relative to data uses, data types, data quantity, sampling and analytical methods, and data measurement performance criteria.

5.1 Data Categories

Three data categories have been defined to address various analytical data uses and the associated QA/QC effort and methods required to achieve the desired levels of quality. These categories are:

- Screening Data: Screening data affords a quick assessment of Site characteristics or conditions. This DQO is applicable to data collection activities that involve rapid, non- rigorous methods of analysis and quality assurance. This objective is generally applied to physical and/or chemical properties of samples, degree of contamination relative to concentration differences, and preliminary health and safety assessment.

- Screening Data with Definitive Confirmation: Screening data allows rapid identification and quantitation, although the quantitation can be relatively imprecise. This DQO is available for data collection activities that require qualitative and/or quantitative verification of a select portion of sample findings

(10% or more). This objective can also be used to verify less rigorous laboratory-based methods.

- Definitive Data: Definitive data are generated using analytical methods such as approved USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files.

It is anticipated that both screening and definitive data categories will be generated during the investigation. Field parameters (e.g., turbidity, conductivity, temperature, and pH), which will be obtained during groundwater sampling for use in qualitatively interpreting other Site data, will be determined using screening techniques. Remaining parameters will be determined using definitive techniques.

For this project, only the full analytical data packages with supporting method performance data will be required from the analytical laboratory. The Level 4 data package is defined as follows:

- Level 4 – Full Reporting: Full "CLP-type" reporting is used for those analyses that, based on intended data use, require full documentation. The Level 4 report includes analytical data as well as instrument calibration, tuning, and other raw data associated with method performance. This reporting level meets the NYSDEC ASP Superfund and Category B reporting requirements.

The analytical methods to be used during the RI will be USEPA SW-846 methods and USEPA Compendium Method TO-15 with incorporation of the NYSDEC ASP Revision 2005 QA/QC requirements, and Category B reporting deliverables.

5.2 Field Investigations

As part of the RI, field investigations will be conducted to support the DQOs. Details of the field sampling investigations are described in Section 6 of the RI Work Plan.

6.0 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

In compliance with the Occupational Safety and Health Administration’s (OSHA) final rule, “Hazardous Waste Operations and Emergency Response,” 29 CFR 1910.120(e), personnel performing RI activities at the Site will have completed the requirements for OSHA 40-Hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training. Persons in field supervisory positions will have also completed the additional OSHA 8-Hour Supervisory Training.

The analytical laboratory will be accredited under the New York Environmental Laboratory Approval Program (ELAP) for all methods and parameters required, and as certification is afforded under this program.

7.0 DOCUMENTATION AND RECORDS

Samples of the various media will be collected as described in the RI Work Plan. Detailed descriptions of the documentation and reporting requirements are presented below.

7.1 Sample Designation System

7.1.1 Sample Codes

Samples will be identified with a unique designation system that will facilitate sample tracking. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events and conditions. An alpha-numeric system is considered appropriate and will be used by field personnel to assign each sample with a unique sample identification number. The sample identification number will consist of a two-letter prefix indicating the sample type followed by numbers indicating the sample location.

The samples types will be designated using the following codes:

- Soil Boring – "SB"
- Monitoring Well – "MW"
- Soil Vapor Point – "SV"
- Ambient Air Sample – "AA"
- Indoor Air Sampling – "IAS"
- MIP – "Membrane Interface Probe"
- Trip Blank – "TB"
- Equipment Blank – "EB"

Where necessary, the code system will be supplemented to accommodate additional sample identification information. For example, the code for soil samples, monitoring well groundwater samples, or soil vapor samples will include a qualifier to identify the section increment (e.g., SB-1 (2-3')).

Additional sample volumes collected for matrix spike (MS) and matrix spike duplicate (MSD) analysis will be noted on the COC forms. Trip blanks and equipment blanks will use the coding scheme noted above and a six-digit date format (e.g., an equipment blank collected on January 15, 2011 would be named EB011511). Field duplicates will be labeled as "DUP" and a six-digit date format (e.g., a field duplicate collected on January 15, 2011 would be named DUP011511). Duplicate samples will not be identified to the laboratory and the laboratory will analyze them as “blind” quality control samples. The source of the field duplicate will be noted in the field notes.

7.1.2 Field Documentation

Field personnel will complete comprehensive documentation covering aspects of field sampling, field analysis, and sample COC. This documentation constitutes a record that allows reconstruction of field events to aid in the data review and interpretation process. Documents, records, and information relating to the performance of the field work will be retained in the project file.

The various forms of documentation to be maintained throughout the action include:

- Daily Production Documentation – A field notebook consisting of a waterproof, bound notebook that will contain a record of activities performed at the Site.
- Sampling Information – Detailed notes will be made as to the exact sampling location, physical observations, and weather conditions (as appropriate).
- Forms will be utilized for repetitive data collection, such as depth to water in wells, groundwater sampling, etc. These field forms include a Soil Sample/Core Log, Low-Flow Groundwater Sampling Form, Water-Level Measurement Form, Soil Vapor (Canister) Sample Collection Field Form, and Ambient Air (Canister) Sample Collection Field Form as applicable to a specific field task. Forms are provided in Attachments 1 and 2.
- For all air samples, the initial canister vacuum and final canister vacuum must be recorded by field personnel. The initial canister vacuum should be greater than 28 inches of mercury (Hg). If the initial canister vacuum is less than 28 inches of Hg, then the canister should be returned to the laboratory and a replacement canister should be provided by the laboratory. Canister vacuums should also be recorded throughout the sampling period. Final canister vacuums of less than 1.0 to 0.1 inches of Hg upon receipt at the laboratory will result in an estimated value for detected compounds (J flag) and for non-detects (UJ flag) in accordance with NYSDEC directives. A final canister vacuum of 0.0 inches of Hg (ambient) upon receipt at the laboratory will result in an estimated value for detected compounds (J flag) and rejection for non-detects (R flag) in accordance with NYSDEC directives.
- COCs – COC forms will provide the documentation of record of responsibility for sample collection, transport, and receipt by the laboratory. COC forms will be filled out at each sampling location, at a group of sampling locations, or at the end of each day of sampling by Apex field personnel designated to be responsible for sample custody. In the event the samples are relinquished by the designated sampling person to other sampling or field personnel, the COC form

will be signed and dated by the appropriate personnel to document the sample transfer. The original COC form will accompany the samples to the laboratory, and copies will be forwarded to the project files. A sample COC form is included in Attachment 3.

Persons will have custody of samples when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

To document the calibration and maintenance of field instrumentation, calibration and maintenance logs will be maintained for each piece of field equipment that is not factory-calibrated.

7.2 Laboratory Documentation Files

7.2.1 Laboratory Project Files

The laboratory will establish a file for pertinent information and communications associated with this project. The file will include correspondence, faxed information, phone logs, and COC forms. Analytical method performance data shall be retained within the laboratory in accordance with internal information and document control procedures. The laboratory will retain project files, supporting analytical method performance raw data, and data packages for a period of 10 years.

7.2.2 Laboratory Logbooks

Workbooks, bench sheets, instrument logbooks, and instrument printouts will be used to trace the history of samples through the analytical process and document important aspects of the work, including the associated quality controls. As such, logbooks, bench sheets, instrument logs, and instrument printouts will be part of the permanent record of the laboratory.

Each page or entry will be dated and initialed by the analyst at the time of entry. Errors in entry will be crossed out in indelible ink with a single stroke, corrected without the use of white-out or by obliterating or writing directly over the erroneous entry, and initialed and dated by the individual making the correction. Pages of logbooks that are not used will be completed by lining out unused portions.

Information regarding the sample, analytical procedures performed, and the results of the testing will be recorded on laboratory forms or electronic information management systems and software as appropriate for the analytical method. Any analyst notes will be dated and will also identify the analyst, the instrument used, and the instrument conditions. Laboratory notebooks and electronic programs/calculations will be periodically reviewed by the laboratory group leaders for accuracy, completeness, and compliance to this QAPP. Entries and calculations will be verified by the laboratory group leader. If entries are correct, then the laboratory group leader will initial and date as appropriate to document the review process. Corrective action will be taken for incorrect entries before the laboratory group leader signs.

7.2.3 Computer and Hard Copy Storage

Electronic files and deliverables will be retained by the laboratory for not less than 10 years; hard copy data packages (or electronic copies) will also be retained for not less than 10 years.

7.3 Data Reporting Requirements

Data will be reported both in the field and by the analytical laboratory, as described below.

7.3.1 Field Data Reporting

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks or data sheets and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the FSP and the SOPs and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

If applicable, field data forms and calculations will be processed and included in appendices to the appropriate reports (when generated). The original field logs, documents, and data reductions will be kept in the project file at Apex's office.

7.3.2 Laboratory Data Reporting

The laboratory that analyzes the soil, groundwater, and air samples is responsible for preparing Level 4 (NYSDEC ASP Category B compliant) data packages for volatile organic compounds (VOCs). Each analytical report shall include a case narrative.

Analytical reports will include, at a minimum, the following items:

Narrative: Summary of activities that took place during the course of sample analysis, including the following information:

- Laboratory name and address;

- Date of sample receipt;
- Cross-reference of laboratory identification number to field sample identification;
- Deviations from specified protocol; and
- Corrective actions taken.

Included with the narrative will be any sample handling documents, including field and internal COC forms, air bills, and shipping tags.

Analytical Results: Reported according to analysis type and including the following information, as acceptable:

- Sample ID;
- Laboratory ID;
- Date of collection;
- Date of receipt;
- Date of extraction;
- Date of analysis;
- Analytical methods used;
- Method and Reporting detection limits;
- Initial and continuing calibrations;
- Instrument tuning;
- Summary of quality control data: laboratory control samples, matrix spikes, laboratory duplicates, surrogate recoveries;
- Method, preparation, and continuing calibration blanks;
- Quantitation reports;
- Chromatograms;
- Extraction, preparation, digestion, and run logs;
- Raw data; and
- Any other documentation required by the NYSDEC ASP Category B reports.

Sample results on the report forms will be adjusted for sample volume/weight and any applicable dilutions. Soil samples will be reported on a dry weight basis. Results will not be corrected for associated blank contamination.

7.4 Project File

Project documentation will be placed in project files according to Apex's requirements for document management. Project files typically consist of the following components:

- Proposals/Agreements;
- Purchase Orders/Change Orders;
- Invoices;
- Project Management;
- Correspondence;
- Notes and Data;
- Regulatory Document; and
- Final Reports/Presentations.

8.0 SAMPLING PROCESS DESIGN

Information regarding the sampling design and rationale and associated sampling locations can be found in the RI Work Plan.

9.0 SAMPLING METHOD REQUIREMENTS

Groundwater, soil, and air samples will be collected as described in the RI Work Plan, the FSP, and the SOPs. The FSP and SOPs also contain procedures that will be followed to drill and sample soil borings; drill, install, and develop monitoring wells; measure water levels; collect groundwater samples; drill and sample temporary soil vapor points; collect ambient air quality samples; perform field measurements; and handle, package, and ship collected samples. Sampling Procedures are discussed in detail in the FSP.

10.0 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

This section presents sample handling and custody requirements.

10.1 Sample Containers and Preservation

Appropriate sample containers (bottles), canisters (SUMMA® canisters), preservation methods, and laboratory holding times for RI samples are provided in Table 1.

The analytical laboratory will supply appropriate sample containers and preservatives, as necessary, or canisters. The bottles will be purchased pre-cleaned according to USEPA Office of Solid Waste and Emergency Response (OSWER) Directive 9240.05A requirements. The canisters will be cleaned and batch certified by the laboratory following the requirements of Method TO-15.

For all air samples, the initial canister vacuum and final canister vacuum must be recorded by field personnel. Canister vacuums should also be recorded throughout the sampling period. The following are special considerations for all air samples.

The initial canister vacuum should be greater than 28 inches of Hg. If the initial canister vacuum is less than 28 inches of Hg, then the canister should be returned to the laboratory and a replacement canister should be provided by the laboratory. The final canister vacuums should be 5 inches of Hg.

Once the canister is opened, the vacuum flow rate will be checked periodically and at least once approximately one or two hours (for ambient air samples – 8- hour sampling period) after initiating sampling to make sure the vacuum is changing consistent with the allocated sampling period. If the sampling period is 30 minutes to 60 minutes (for soil vapor samples), the canister will be monitored during the entire sampling period.

If an unexpected canister vacuum is observed, the gauge will be lightly tapped by hand to make sure it isn't stuck.

Sampling personnel will return to the sampling location approximately two hours (ambient air samples) prior to the end of the sampling period. Soil vapor sample canister vacuums will be monitored during the entire sampling period.

If the canister has more than 5 inches of Hg, sampling will continue to the end of the established sampling period (8 hours for ambient and sub slab air samples and 30 to 60 minutes for soil vapor samples). The canister will be closed at the end of the allocated sampling period if the vacuum is 10 inches of Hg or less. If the vacuum is greater than 10 inches of Hg at the end of the allocated sampling period, the project, task or field manager will be contacted to decide a course of action. Leaving greater than 10 inches of Hg in the canister will likely result in elevated reporting limits.

If the canister reaches 5 inches of Hg, the canister valve will be closed and sample collection will be terminated.

Canisters valves will be tightened securely when sample collection is completed.

Overall, it should be noted that the analog gauges that are used on SUMMA® canisters are not extremely accurate. When in doubt, the pre-determined sampling period will be followed as a guide to when the canister should be closed. In all cases, the SUMMA® canister vacuum should NOT be allowed to go to below 5 inches of Hg. If the canister is received by the laboratory with zero pressure (ambient), it will be assumed that a leak occurred and the data may be considered invalid.

The field personnel will be responsible for properly labeling containers and canisters and preserving samples (as appropriate). Sample labeling procedures are discussed in Section 10.2.2.

10.2 Field Custody Procedures

The objective of field sample custody is to assure that samples are not tampered with from the time of sample collection through time of transport to the analytical laboratory. Persons will have “custody of samples” when the samples are in their physical possession, in their view after being in their possession, or in their physical possession and secured so they cannot be tampered with. In addition, when samples are secured in a restricted area accessible only to authorized personnel, they will be deemed to be in the custody of such authorized personnel.

Field custody documentation consists of both field logbooks and field COC forms.

10.2.1 Field Logbooks

Field logbooks will provide the means of recording data collection activities performed. As such, entries will be described in as much detail as possible so that persons going to the Site could reconstruct a particular situation without reliance on memory.

Field logbooks will be bound field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in a secure location when not in use. Each logbook will be identified by the project specific document number. The title page of each logbook will contain the following:

- Person to whom the logbook is assigned;
- Logbook number;
- Project name;
- Project start date; and
- End date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the Site, field sampling or investigation team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. Entries will be made in ink, and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark. Whenever a sample is collected or a measurement is made, a detailed description of the location of the station shall be recorded. The number of the photographs taken of the station, if any, will also be noted. Equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures described in the FSP and the SOPs. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume, and number of containers. Sample identification numbers will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description

10.2.2 Sample Labeling

Sample labels will be affixed to sample bottles at the sampling location. The following information is required on each sample label:

- Project;
- Date collected;
- Time collected;
- Sample identification (per protocol provided in Section 7.1.1);
- Sampler;

- Analysis to be performed; and
- Preservative, as applicable.

10.2.3 Field COC Forms

Completed COC forms will be required for samples. COC forms will be initiated by the sampling team in the field. The COC forms will contain the unique sample identification number, sample date and time, sample matrix, preservation (if any), and analyses required. The original COC form will accompany the samples to the laboratory. Copies of the COC will be made prior to shipment (or multiple copy forms used) for field documentation. The COC forms will remain with the samples at all times. The samples and signed COC forms will remain in the possession of the sampling crew until the samples are hand delivered to the laboratory or laboratory courier, delivered to the express carrier (e.g., FedEx), or placed in secure storage.

Sample labels will be completed for each sample using waterproof ink. The labels will be completed as described above in Section 10.2.2. The completed labels will be affixed to each sample bottle and covered with clear tape.

Whenever samples are split with a government agency or other party, a separate COC will be prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the agency should request the representative's signature acknowledging sample receipt. If the representative is unavailable or refuses, this is noted in the "Received By" space.

10.3 Management of Investigation-Derived Materials and Wastes

Management of investigation-derived materials and wastes will be performed consistent with the USEPA guidance Guide to Management of Investigation-Derived Wastes (USEPA, 1992) and following the procedures described in the Investigation-Derived Waste Handling and Storage SOP. Disposable equipment (including personal protective equipment [PPE]) and debris will be containerized and appropriately labeled during the sampling events, and will be disposed of accordingly. Purged groundwater and water generated during equipment decontamination and soil cuttings associated with drilling of soil borings will be containerized, labeled and temporarily stored on site in Department of Transportation (DOT)-approved 55-gallon steel drums, and will be disposed of properly based on analytical results. Equipment will be decontaminated, as appropriate, as discussed in the FSP and the SOP.

10.4 Packing, Handling, and Shipping Requirements

Sample packaging and shipment procedures are designed to insure that the samples will arrive at the laboratory, with the COC, intact.

Samples will be packaged for shipment as outlined below:

- Ensure that sample containers have the sample labels securely affixed to the container with clear packing tape;
- Check the caps on the sample containers to ensure that they are properly closed and sealed;
- Complete the COC form with the required sampling information and ensure that the recorded information matches the sample labels. If the designated sampler relinquishes the samples to other sampling or field personnel for packing or other purposes, the sampler will complete the COC prior to this transfer. The appropriate personnel will sign and date the COC form to document the sample custody transfer;
- Using duct tape, secure the outside drain plug (if present) at the bottom of the cooler;
- Wrap sample containers in bubble wrap or other cushioning material;
- Place bubble wrapped sample containers in Ziploc® or equivalent bags;
- Place 1 to 2 inches of cushioning material at the bottom of the cooler;
- Place the sealed sample containers into the cooler;
- Place ice in plastic bags and seal and place loosely in the cooler;
- Fill the remaining space in the cooler with cushioning material;
- Place COC forms in a plastic bag and seal. Tape the forms to the inside of the cooler lid;
- Close the lid of the cooler and secure with packing tape;
- Wrap strapping tape around both ends of the cooler at least twice; and
- Mark the cooler on the outside with the following information: shipping address, return address, “Fragile” labels, and arrows indicating “this side up.” Cover the labels with clear plastic tape. Place a signed custody seal over the sample cooler lid.

For air samples, canisters will be packaged for shipment as outlined below:

- Check that the canister valves are properly closed;

- Record the initial and final canister vacuum on the COC form and on the Sample Collection Field Form;
- Place the canisters into the shipping box;
- Place COC forms in a plastic bag, seal, and place in shipping box;
- Close the flaps of the shipping box and secure with packing tape; and
- Place a signed custody seal over the shipping box flaps.

Samples will be hand-delivered, delivered by a laboratory courier, or delivered by an express carrier within 24 hours of the time of collection. Shipments will be accompanied by the COC form identifying the contents. The original form will accompany the shipment; copies will be retained by the sampler for the sampling office records. If the samples are sent by common carrier, a bill of lading will be used.

Receipts or bills of lading will be retained as part of the permanent project documentation. Commercial carriers are not required to sign off on the COC form as long as the forms are sealed inside the sample cooler and the custody seals remain intact.

Sample containers, coolers, canisters, shipping boxes, and packing materials will be provided by the analytical laboratory. The filled, labeled, and sealed containers will be placed in a cooler on ice and carefully packed to minimize the possibility of container breakage. The labeled canisters will be placed in a shipping box.

Additional procedures for packing, handling, and shipping environmental samples are presented in the FSP and the Chain-of-Custody, Handling, Packing and Shipping SOP.

10.5 Laboratory Custody Procedures

Upon sample receipt, laboratory personnel will be responsible for sample custody. The original field COC form will accompany all samples requiring laboratory analysis. The laboratory will maintain internal chain of custody in accordance with laboratory policy. Samples will be kept secured in the laboratory until all stages of analysis are complete. Laboratory personnel having samples in their custody will be responsible for maintaining sample integrity.

10.5.1 Sample Receipt and Storage

Immediately upon sample receipt, the laboratory sample custodian will open the cooler or shipping box, document the temperature (not applicable for air samples), and compare the contents against the field COC. If a sample container or canister is missing, a sample container is received broken, a canister appears to have leaked during shipment, the sample is in an inappropriate container, or has not been preserved by appropriate means, the Apex Project Manager will be notified. The laboratory sample custodian will be responsible for logging the samples in, assigning a unique laboratory identification number to each sample, labeling the sample bottle or canister with the laboratory identification number, and moving the sample to an appropriate storage location to await analysis. The project name, field sample code, date sampled, date received, analysis required, storage location and date, and action for final disposition will be recorded in the laboratory tracking system. Relevant custody documentation will be placed in the project file. After the sample login process has been completed, the laboratory project manager will send a sample login acknowledgement to Apex to confirm the analyses to be performed.

10.5.2 Sample Analysis

Samples will be organized into sample delivery groups (SDGs) by the laboratory. A SDG may contain up to 20 field samples (field duplicates, trip blanks, and equipment blanks are considered field samples for the purposes of SDG assignment). Field samples assigned to a single SDG shall be received by the laboratory over a maximum of 7 calendar days and must be processed through the laboratory (preparation, analysis, and reporting) as a group. A minimum of one site-specific MS/MSD pair will be included per 20 field samples.

10.5.3 Sample Storage Following Analysis

Samples will be maintained by the laboratory for at least one month after the final report is delivered to Apex. The laboratory will be responsible for the eventual and appropriate disposal of the samples. Unused portions of the samples, sample extracts and associated wastes will be disposed of by the laboratory in accordance with applicable rules and regulations as specified in their SOP for waste disposal and federal and state requirements.

11.0 ANALYTICAL METHOD REQUIREMENTS

This section presents analytical method requirements.

11.1 Field Parameters and Methods

Field analytical procedures will include the measurement of dissolved oxygen (DO), oxidation-reduction potential (ORP), pH, temperature, conductivity, turbidity, and groundwater levels. Specific field measurement protocols and instrument calibration are provided in the FSP and the SOPs.

11.2 Laboratory Parameters and Methods

All soil, groundwater, and air samples will be analyzed by a New York State Department of Health (NYSDOH)-approved laboratory. The methods listed below include the analyses expected to be performed.

Laboratory analytical requirements presented in the sub-sections below include a general summary of requirements, specifics related to each sample medium to be analyzed, and details of the methods to be used for this project. SW-846 methods, Compendium Method TO-15, and NYSDEC ASP Revision 2005 QA/QC and reporting deliverables requirements will be utilized for all analytes.

The following tables summarize general analytical requirements:

Table	Title
Table 1	Sample Containers, Analytical Methods, Preservation, and Holding Times
Table 2	Quality Assurance/Quality Control Sample Summary
Tables 3 and 4	Compound List and Target Reporting Limits for Water, Soil, and Air Analyses
Table 5	Project QA/QC control limits for precision and accuracy

11.2.1 RI Sample Matrices

11.2.1.1 Groundwater

Analyses will be performed following the methods listed in Table 1. Analytical results for analyses will be reported in the units presented in Table 3.

11.2.1.2 Soil

Analyses will be performed following the methods listed in Table 1. Analytical results will be reported as dry weight, and in the units presented in Table 3. Moisture content will be reported separately.

11.2.1.3 Air

Analyses will be performed following the method listed in Table 1. Analytical results for analyses will be reported in the units presented in Table 4.

11.2.2 Analytical Requirements

The primary sources to describe the analytical methods to be used during the investigation are provided in USEPA SW-846 Test Methods for Evaluating Solid Waste, Third Edition as updated, and USEPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition, and NYSDEC ASP Revision 2005. Detailed information regarding QA/QC is provided in NYSDEC ASP Revision 2005.

12.0 QUALITY CONTROL REQUIREMENTS

This section presents quality control requirements

12.1 Quality Assurance Indicators

The overall quality assurance objective for this QAPP is to develop and implement procedures for sampling, COC, laboratory analysis, instrument calibration, data reduction and reporting, internal quality control, audits, preventive maintenance, and corrective action, such that valid data will be generated. The PARCC parameters as related to project DQOs are discussed in this section. Specific quality control checks are discussed in Sections 12.2 and 12.3.

Quality assurance indicators are generally defined in terms of five parameters:

- Precision;
- Accuracy;
- Representativeness;
- Completeness; and
- Comparability.

Each parameter is defined below. Specific objectives for the Site actions are set forth in other sections of this QAPP as referenced below.

12.1.1 Precision

Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the project objectives. To maximize precision, sampling and analytical procedures will be followed. Work for this investigation will adhere to established protocols presented in the RI Work Plan.

Checks for analytical precision will include the analysis of MSDs, field duplicates, and laboratory duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision quality control checks is provided in Section 12.4.

12.1.2 Accuracy

Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, MSs, blank spikes, and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data. Further discussion of these quality control samples is provided in Section 12.5.

12.1.3 Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent Site conditions, and is dependent on sampling and analytical variability and the variability of environmental media at the Site. The actions have been designed to assess the presence of the chemical constituents at the time of sampling. The RI Work Plan presents the rationale for sample quantities and location. This QAPP presents field sampling and laboratory analytical methodologies. The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data.

12.1.4 Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the total amount that was obtained. This will be determined upon final assessment of the analytical results, as discussed in Section 12.6.

12.1.5 Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between this investigation, and to the extent possible, with existing data will be maintained through consistent sampling and analytical methodologies set forth in the FSP, the SOPs, and this QAPP, SW-846 analytical methods, Compendium Method TO-15, with NYSDEC ASP Revision 2005 QA/QC requirements, Category B reporting deliverables, and through use of QA/QC procedures and appropriately trained personnel.

12.2 Field Quality Control Checks

12.2.1 Field Measurements

To verify the quality of data using field instrumentation, duplicate measurements will be obtained and reported for field measurements. A duplicate measurement will involve obtaining measurements a second time at the same sampling location.

12.2.2 Sample Containers

Certified-clean sample containers in accordance with Exhibit I of the NYSDEC ASP Revision 2005 (Eagle Picher pre-cleaned containers or equivalent) will be supplied by the laboratory. Batch certified-clean canisters in accordance with Method TO-15 will be supplied by the laboratory.

12.2.3 Field Duplicates

Field duplicates will be collected from the different environmental media to verify the reproducibility of the sampling methods and potential non-homogeneity of sample locations. Field duplicate soil samples will be prepared by placing well homogenized aliquots (except samples for VOC analysis) from the same sample location into individual sample containers, which are submitted blind to the laboratory. Field duplicate soil samples for VOC analysis will constitute co-located samples rather than homogenized aliquots. In general, field duplicates will be analyzed at a 5% frequency (every 20 samples) for the chemical constituents. Table 2 provides an estimated number of field duplicates to be collected for environmental media samples to be collected during the RI.

12.2.4 Equipment Blanks

Equipment blanks are used to monitor the cleanliness of the sampling equipment and the effectiveness of the cleaning procedures. Equipment blanks will be prepared and submitted for analysis once per day per matrix when equipment decontamination is performed. Equipment blanks will be prepared by filling sample containers with analyte-free water (supplied by the laboratory) which has been routed through or over a cleaned sampling device. When dedicated sampling devices or sample containers are used to collect the samples, equipment blanks will not be necessary. Table 2 provides an estimated number of equipment blanks for environmental media samples to be collected during the RI.

12.2.5 Trip Blanks

Trip blanks will be used to assess whether Site samples have been cross- contaminated by volatile constituents during storage and transport. Trip blanks will be analyzed at a frequency of once per day, per cooler containing samples to be analyzed for volatile organic constituents. A trip blank will be prepared by the laboratory and consist of a VOA vial filled with analyte-free water. The trip blanks will be shipped with the empty sample containers by the laboratory, will be returned with the field samples, and will remain unopened until analysis. Trip blanks will be analyzed for VOCs only.

Table 2 provides an estimated number of trip blanks for environmental media samples to be collected during the RI.

12.3 Analytical Laboratory Quality Control Checks

Internal laboratory quality control checks will be used to monitor laboratory method performance and data integrity. These checks will include method blanks, MS/MSDs (not applicable for air samples), laboratory spike blanks, internal standards, surrogate compounds, calibration standards, and reference standards. Project quality control limits for precision and accuracy are identified in Table 5.

12.3.1 Method Blanks

Sources of contamination in the analytical process, whether specific analyses or interferences, need to be identified, isolated, and corrected. The method blank is useful in identifying possible sources of contamination within the analytical process. For this reason, it is necessary that the method blank is initiated at the beginning of the analytical process and encompasses all aspects of the analytical work. As such, the method blank would assist in accounting for any potential contamination attributable to glassware, reagents, instrumentation, or other sources which could affect sample analysis. One method blank will be analyzed with each analytical batch associated with no more than 20 samples.

12.3.2 Laboratory Control Samples

An LCS or LCS Duplicate (LCSD) consists of ASTM Type II water and, where practical, pre-cleaned sand or sodium sulfate for solid matrices, or a purchased performance testing sample. The source of the chemicals utilized for LCS spiking will be from a different supply source than the calibration standards. Where second source standards are not available, the LCS must be spiked with materials from a separate manufacturing lot of the standard. The LCS is generally spiked with all of the analytes of interest near the mid-point of the calibration range as defined by the method. The LCS is processed under the same sample preparation, surrogate and internal standards addition, and analytical protocols as the project samples. LCSs are analyzed at the frequency of 1 per batch of 20 samples or fewer of similar matrices.

The recovery of target analytes in the LCS provides an evaluation of method performance and accuracy. Method control may be established based on the subset of compounds listed in the method. LCSDs are analyzed with some methods but are not required QA components. LCSDs are prepared and analyzed by the same protocols as the LCS. LCSD analyses provide precision evaluation of the method performance in addition to the accuracy information.

12.3.3 MS/MSDs

MS/MSDs will be used to measure the accuracy of analyte recovery from the sample matrices and will be site-specific. Except for air samples, MS/MSD pairs will be analyzed at a 5% frequency (every 20 samples or once every week, whichever comes first).

When MS recoveries are outside quality control limits, associated control sample and surrogate spike recoveries will be evaluated, as applicable, to attempt to verify the reason for the deviation and determine the effect on the reported sample results.

Table 2 provides an estimated number of MS and MSD analyses for each applicable parameter.

12.3.4 Laboratory Duplicates

A laboratory duplicate consists of a second aliquot selected by the laboratory from the same project sample. Selection of duplicate samples from a heterogeneous matrix requires homogenization to ensure that representative portions are analyzed.

Laboratory duplicates are performed for air analyses, for which matrix spikes are not applicable. Additionally, when sample volume is limited, or for metals and general chemistry methods, a laboratory duplicate may be performed in lieu of the MSD. One sample per batch of 20 samples or fewer per matrix is analyzed as a laboratory duplicate under the above scenarios. The relative percent difference (RPD) between the results in the original and duplicate sample measure the precision of the analytical method on the actual project samples. The RPD is calculated using the same formula as the RPD for the MS/MSD and field duplicates.

12.3.5 Surrogate Spikes

Surrogates are compounds which are unlikely to occur under natural conditions that have properties similar to the analytes of interest. This type of control is primarily used for organic samples analyzed by gas chromatography/mass spectrometry (GC/MS) and GC methods and is added to the samples prior to purging or extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a sample-specific basis. This control reflects analytical conditions that may not be attributable to sample matrix.

If surrogate spike recoveries exceed specified quality control limits, the analytical results need to be evaluated thoroughly in conjunction with other control measures. In the absence of other control measures, the integrity of the data may not be verifiable and reanalysis of the samples with additional control may be necessary.

Surrogate spike compounds will be selected utilizing the guidance provided in the analytical methods.

12.3.6 Calibration Standards

Calibration check standards analyzed within a particular analytical series provide insight regarding the instrument's stability. A calibration check standard will be analyzed at the beginning and end of an analytical series, or periodically throughout a series containing a large number of samples.

In general, calibration check standards will be analyzed after every 12 hours, or more frequently, as specified in the applicable analytical method. In analyses where internal standards are used, a calibration check standard will only be analyzed in the beginning of an analytical series. If results of the calibration check standard exceed specified tolerances, then samples analyzed since the last acceptable calibration check standard will be reanalyzed.

Laboratory instrument calibration standards will be selected utilizing the guidance provided in the analytical methods, as summarized in Section 13.

12.3.7 Internal Standards

Internal standard areas and retention times will be monitored for organic analyses performed by GC/MS methods. Method-specified internal standard compounds will be spiked into field samples, calibration standards, and quality control samples after preparation and prior to analysis. If internal standard areas in one or more samples exceed the specified tolerances, the cause will be investigated, the instrument will be recalibrated if necessary, and affected samples will be reanalyzed.

The acceptability of internal standard performance will be determined using the guidance provided within the analytical methods.

12.3.8 Reference Standards/Calibration Verification

Reference standards are standards of known concentration and independent in origin from the calibration standards. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes preparation of calibration standards, validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

12.4 Data Precision Assessment Procedures

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system including sampling, handling, shipping, storage, preparation, and analysis.

Laboratory data precision for organic analyses will be monitored through the use of MS/MSD and laboratory duplicates as identified in Table 2.

The precision of data will be measured by calculation of the RPD by the following equation:

RPD = (A-B)/ [(A+B)/2] X100

Where:

A = Analytical result from one of two duplicate measurements B = Analytical result from the second measurement Precision objectives for LCS, LCSD, MS, MSDs, and laboratory duplicate analyses are identified in the NYSDEC ASP Revision 2005 and presented in Table 5.

12.5 Data Accuracy Assessment Procedures

The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters, and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via the use of MSs, surrogate spikes, internal standards, and reference standards. Accuracy will be calculated in terms of percent recovery as follows:

% Recovery = A-X x 100B

Where:

A = Value measured in spiked sample or standard X = Value measured in original sample

B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for LCS, LCSD, MS, MSD, and surrogate recovery analyses are identified in the NYSDEC ASP 2005 Revision and presented in Table 5.

12.6 Data Completeness Assessment Procedures

Completeness of a field or laboratory data set will be calculated by comparing the number of valid sample results generated to the total number of results generated.

Completeness = number valid results x 100 total number of results generated. As a general guideline, overall project completeness is expected to be at least 90%. The assessment of completeness will require professional judgment to determine data usability for intended purposes.

13.0 INSTRUMENT / EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS

Testing and maintenance schedules have been developed for both field and laboratory instruments. A summary of the testing and maintenance activities to be performed is presented below.

13.1 Field Instruments and Equipment

Prior to field sampling, each piece of field equipment will be inspected to ensure that it is operational. If the equipment is not operational, it will be serviced prior to its use.

Meters which require charging or batteries will be fully charged and have fresh batteries. If instrument servicing is required, it is the responsibility of the appropriate Task Manager or field personnel to follow the maintenance schedule and arrange for timely service. Field instruments will be maintained according to the manufacturers' instructions.

Logbooks will be kept for each field instrument. Each logbook will contain records of operation, maintenance, calibration, and any problems and repairs. Logbooks for each piece of equipment shall be maintained in project records. The Task Managers will review calibration and maintenance logs.

13.1.1 Equipment Maintenance

Measuring and testing equipment to be used in support of the RI activities that directly affect the quality of the analytical data shall be subject to preventative maintenance measures that minimize equipment downtime. Equipment will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual to ensure that maintenance requirements are being observed. Field notes from previous sampling events will be reviewed to ensure that any prior equipment problems are not overlooked and that any necessary repairs to equipment have been carried out.

Field equipment returned from a site will be inspected to confirm that it is in working order. The inspection will be recorded in the logbook or field notebooks, as appropriate. It will also be the obligation of the last user to record any equipment problems in the logbook. Non-operational field equipment will either be repaired or replaced. Appropriate spare parts will be made available for field meters.

Apex-owned, subcontractor-owned, or leased equipment maintenance shall be in accordance with the manufacturer's instructions.

13.2 Laboratory Instruments and Equipment

Laboratory instrument and equipment documentation procedures include details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (which will include information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer.

13.2.1 Instrument Maintenance

Maintenance schedules for laboratory equipment adhere to the manufacturer's recommendations. Records reflect the complete history of each instrument and specify the time frame for future maintenance. Major repairs or maintenance procedures are performed through service contracts with manufacturer or qualified contractors. Paperwork associated with service calls and preventative maintenance calls will be kept on file by the laboratory.

Laboratory Systems Managers are responsible for the routine maintenance of instruments used in the particular laboratory. Any routine preventative maintenance carried out is logged into the appropriate logbooks. The frequency of routine maintenance is dictated by the nature of samples being analyzed, the requirements of the method used, and/or the judgment of the Laboratory Systems Manager.

Major instruments are backed up by comparable (if not equivalent) instrument systems in the event of unscheduled downtime. An inventory of spare parts is also available to minimize equipment/instrument downtime.

13.2.2 Equipment Monitoring

On a daily basis, the operation of balances, incubators, ovens, refrigerators, and water purification systems will be checked and documented. Any discrepancies will be immediately reported to the appropriate laboratory personnel for resolution.

14.0 INSTRUMENT CALIBRATION AND FREQUENCY

This section presents instrument calibration procedures and frequency.

14.1 Field Instruments and Equipment

The calibration of field instruments is governed by specific SOPs documented in the FSP for the applicable field analysis method, and such procedures take precedence over the following discussion.

Field personnel are responsible for ensuring that a master calibration/maintenance log is maintained following the procedures specified for each measuring device. Where applicable, each log will include, at a minimum, the following information:

- Name of device and/or instrument calibrated;
- Device/instrument serial/identification numbers;
- Calibration method;
- Tolerance;
- Calibration standard used;
- Frequency of calibration;
- Date(s) of calibration(s); and
- Name of person(s) performing calibration(s)

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated at the intervals specified by the manufacturer or more frequently, and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications. In the event that an internally calibrated field instrument fails to meet calibration/checkout procedures, it will be returned to the manufacturer for service. Equipment found to be out of tolerance during the period of use shall be removed from the field and measuring and testing activities performed using the equipment shall be addressed via the corrective action system described in Section18.3 of this QAPP.

14.2 Laboratory Instrument and Equipment

Instrument calibration will follow the specifications provided by the instrument manufacturer or specific analytical method used. The analytical methods for target constituents are identified separately below.

VOCs

Equipment calibration procedures will follow SW-846 Method 8260 protocols and guidelines presented in NYSDEC ASP Revision 2005, Exhibit E, Part II, and Section 2.

Air Samples

Equipment calibration procedures will follow Method TO-15 protocols and guidelines presented in NYSDEC ASP Revision 2005, Exhibit D.

15.0 INSPECTION / ACCEPTANCE REQUIREMENTS FOR SUPPLIES AND CONSUMABLES

Supplies to be used in the field and laboratory will be available as needed. Preservatives and containers or canisters will be free of target chemicals and interferences. Standards will be verified against a second source standard. The laboratory will follow a “first in first out” procedure for the storage and use of consumables to minimize the risk of contamination and degradation. The various supplies and consumables required on site for field operations are listed in the FSP and field SOPs.

16.0 DATA MANAGEMENT & ACQUISITION REQUIREMENTS FOR NON-DIRECT MEASUREMENTS

Historical background and site usage information concerning the activities at the Site and previous investigation data collected by Apex will be used as guidance in determining sampling locations for the RI.

The purpose of data management is to ensure that the generated data are accurate and readily accessible to meet the analytical and reporting objectives of the project. The field investigations require a structured, comprehensive, and efficient program for management of data.

The data management program established for the project includes field documentation, methods for tracking and managing the data, and a system for filing Site-related information. Data management procedures will be employed to efficiently process the information collected such that the data are readily accessible and accurate. These procedures are described in detail in the following section which consists of five elements: 1) sample designation system; 2) field activities; 3) sample tracking and management; 4) data management system; and, 5) document control and inventory.

16.1 Sample Designation System

The sample designation system provides a unique sample numbering scheme that will facilitate both sample tracking and easy re-sampling of select locations to evaluate data gaps, if necessary. The sample designation system to be employed during the sampling activities will be consistent, yet flexible enough to accommodate unforeseen sampling events or conditions. A combination of letters and numbers will be used to yield a unique sample number for each field sample collected, as outlined in Section 7.1.1.

16.2 Field Activities

Field activities designed to gather the information necessary to make decisions during the RI process require consistent documentation and accurate record keeping. During Site activities, standardized procedures will be used for documentation of field activities, data security, and quality assurance. These procedures are described in further detail in the following subsections.

16.2.1 Field Documentation

Complete and accurate record keeping is a critical component of the field investigation activities. When interpreting analytical results and identifying data trends, investigators realize that field notes are an important part of the review and validation process. To ensure that the field investigation is thoroughly documented, several different information records, each with its own specific reporting requirements, will be maintained, including:

- Field and sampling logs;
- COC forms; and
- Instrument calibration records, as appropriate.

A description of each of these types of field documentation is provided below.

16.2.1.1 Field Logs

The personnel performing the field activities will keep field logs that detail observations and measurements made during the RI. Data will be recorded directly into site- dedicated, bound notebooks, with each entry dated and signed. To ensure at any future date that notebook pages are not missing, each page will be sequentially numbered. Erroneous entries will be corrected by crossing out the original entry, initialing it, and then documenting the proper information. In addition, certain media sampling locations will be surveyed to accurately record their locations. The survey crew will use their own field logs and will supply the sampling location coordinates to the Project Manager.

16.2.1.2 COC Forms

COC forms document sample possession from time of collection to the time of disposal. A COC form will accompany each field sample collected, and one copy of the form will be filed in the office. Field personnel will be briefed on the proper use of the COC procedure. COC procedures are included in the FSP and the Chain-of-Custody, Handling, Packing, and Shipping SOP

16.2.1.3 Instrument Calibration Records

As part of data quality assurance procedures, field monitoring and detection equipment will be routinely calibrated. Instrument calibration ensures that equipment used is of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration procedures for the various types of field instrumentation are described in Section 14.1. In order to demonstrate that established calibration procedures have been followed, calibration records will be prepared and maintained to include, as appropriate, the following:

- Calibration date and time;
- Type and identification number of equipment;

- Calibration frequency and acceptable tolerances;
- Identification of individual(s) performing calibration;
- Reference standards used;
- Calibration data; and
- Information on calibration success or failure.

The calibration record will serve as a written account of monitoring or detection equipment QA. Erratic behavior or failures of field equipment will be subsequently recorded in the calibration log.

16.2.2 Data Security

Measures will be taken during the field investigation to ensure that samples and records are not lost, damaged, or altered. When not in use, field notebooks will be stored at the office or locked in the field vehicle. Access to these files will be limited to the field personnel who utilize them.

16.3 Sample Management and Tracking

A record of field documentation will be maintained to ensure the validity of data used in the Site analysis. To effectively execute such documentation, specific sample tracking and data management procedures will be used throughout the sampling program.

Sample tracking will begin with the completion of COC forms as summarized in Section 10.2.3. The completed COC forms associated with samples collected will be transmitted to the QA Officer. Copies of completed COC forms will be maintained in the office. The laboratory shall verify receipt of the samples electronically (via e-mail) on the following day.

When analytical data are received from the laboratory, the QA Officer will review the incoming analytical data packages against the information on the COCs to confirm that the correct analyses were performed for each sample and that results for samples submitted for analysis were received. Any discrepancies noted will be promptly followed-up by the QA Officer.

16.4 Document Control and Inventory

Project files will be maintained by Apex. The types of files to be retained consist of, but are not limited to, the following:

- Proposals/Agreement;

- Purchase Orders/Change Orders;
- Invoices;
- Project Management;
- Correspondence;
- Notes and Data;
- Regulatory Documents; and
- Final Reports/Presentations.

17.0 ASSESSMENT AND RESPONSE ACTIONS

Performance and systems audits may be completed in the field and laboratory during the RI as described below.

17.1 Field Audits

The following field performance and systems audits will be completed during this project.

The appropriate Task Manager will monitor field performance. Field performance review summaries will contain an evaluation of field activities to verify that activities are performed according to established protocols. The QA Officer will review field reports and communicate concerns to Apex Project Manager and/or Task Managers, as appropriate. Apex QA Officer or designee will review the equipment blank and trip blank data to identify potential deficiencies in field sampling and cleaning procedures. In addition, systems audits comparing scheduled QA/QC activities from this document with actual QA/QC activities completed will be performed. The appropriate Task Manager and QA Officer will periodically confirm that work is being performed consistent with this QAPP, the RI Work Plan, the FSP, and the SOPs.

17.2 Laboratory Audits

The laboratory will perform internal audits consistent with NYSDEC ASP 2005 Revision, Exhibit E and in accordance with the New York ELAP accreditation requirements.

Internal laboratory audits are conducted by the laboratory QA manager. As part of the audit, the overall performance of the laboratory staff is evaluated and compared to the performance criteria outlined in the laboratory quality assurance manual and SOPs.

The results of the audits are summarized and issued to each department supervisor, the Laboratory Manager, and the Laboratory Director. A systems audit of each laboratory is also performed by the QA manager to determine if the procedures implemented by each laboratory are in compliance with the quality assurance manual and SOPs.

In addition to the laboratory's internal audits, as participants in state and federal certification programs, the laboratory is audited by representatives of the regulatory agency issuing certification. Audits are usually conducted on an annual or biennial basis and focus on laboratory conformance to the specific program protocols for which the laboratory is seeking certification. The auditor reviews sample handling and tracking documentation, analytical methodologies, analytical supportive documentation, and final reports. The audit findings are formally documented and submitted to the laboratory for corrective action, if necessary.

Apex reserves the right to conduct an on-site audit of the laboratory prior to the start of analyses for the project. Additional audits may be performed during the course of the project, as deemed necessary.

17.3 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP, the FSP, the SOPs, or the RI Work Plan. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for the actions are described below.

17.3.1 Field Procedures

When conducting the field work, if a condition is noted by the field team that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action implemented by the Field Manager or a designee, will be documented on a Corrective Action Form and reported to the appropriate Apex Task Manager, QA Officer, and Project Manager.

Examples of situations that would require corrective actions are provided below:

- Protocols as defined by the QAPP, RI Work Plan, the FSP, and SOPs have not been followed;
- Equipment is not in proper working order or is not properly calibrated;
- QC requirements have not been met;
- Issues resulting from performance or systems audits have not been resolved;
- Air canister valve pressure or gauges not in compliance with project requirements;
- Project personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

17.3.2 Laboratory Procedures

In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause, and corrective action taken will be documented and reported to the Project Manager and QA Officer.

Corrective action may be initiated, at a minimum, under the following conditions:

- Specific laboratory analytical protocols have not been followed;
- Protocols as defined by this QAPP have not been followed;
- Predetermined data acceptance standards are not obtained;
- Equipment is not in proper working order or calibrated;
- Sample and test results are not completely traceable;
- QC requirements have not been met; and
- Issues resulting from performance or systems audits have not been resolved.

Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities. Corrective action is initiated at a point where the problem has been identified. At whatever level this occurs (analyst, supervisor, data review, or quality control), it is brought to the attention of the laboratory QA Officer and, ultimately, the Laboratory Director. Final approval of any action deemed necessary is subject to the approval of the Laboratory Director.

Any corrective action deemed necessary based on system or performance audits or the results of data review will be implemented. The corrective action may include sample re-extraction, re-preparation, re-analysis, cleanup, dilutions, matrix modifications, or other activities.

18.0 REPORTING

This section presents reporting requirements.

18.1 Internal Reporting

The analytical laboratory will submit analytical reports to Apex for review. The reports will then be submitted to the data validator for review. Supporting data (i.e., historic data, related field or laboratory data) will also be reviewed to evaluate data quality, as appropriate. Apex QA Officer will incorporate results of the data validation reports and assessments of data usability into a summary report (if required) that will be submitted to Apex Project Manager and appropriate Task Managers. If required, this report will be filed in the project file at Apex's office and will include the following:

- Assessment of data accuracy, precision, and completeness for both field and laboratory data;
- Results of the performance and systems audits;
- Significant QA/QC problems, solutions, corrections, and potential consequences; and
- Analytical data validation report.

18.2 RI Reporting

Upon sample transport to the laboratory, a copy of the COC and laboratory sample login documentation will be forwarded to the Apex Project Manager. Upon receipt of the analytical data package from the laboratory, the Apex QA Officer or designee will determine if the data has met the required data quality objectives. The analytical data package will be submitted to the Apex Project Manager and the analytical data will be incorporated into the RI Report in an electronic formated data deliverable compatible with EQuIS.

19.0 DATA REDUCTION AND REVIEW

After field and laboratory data are obtained, the data will be subject to the following:

- Reduction, or manipulation mathematically, or otherwise into meaningful and useful forms;
- Review;
- Data validation;
- Organization, interpretation, and reporting.

19.1 Field Data Reduction and Review

Information collected in the field through visual observation, manual measurement, and/or field instrumentation will be recorded in field notebooks or data sheets, and/or on forms. Such data will be reviewed by the appropriate Task Manager for adherence to the RI Work Plan, the FSP, the SOPs, and this QAPP and for consistency.

Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

19.2 Field Data Review

Field data calculations, transfers, and interpretations will be conducted by the field personnel and reviewed for accuracy by the appropriate Task Manager and the QA Officer. Logs and documents will be checked for:

- General completeness;
- Readability;
- Usage of appropriate procedures;
- Appropriate instrument calibration and maintenance;
- Reasonableness in comparison to present and past data collected;
- Correct sample locations; 19d
- Correct calculations and interpretations.

19.3 Laboratory Data Reduction and Review

19.3.1 Laboratory Data Reduction

The calculations used for data reduction will be specified in each of the analytical methods referenced previously. Whenever possible, analytical data will be transferred directly from the instrument to a computerized data system. Raw data not amenable to electronic management will be entered into permanently bound laboratory notebooks. The data entered are sufficient to document factors used to arrive at the reported value. Concentration calculations for chromatographic analyses will be based on response factors. Quantitation will be performed using either internal or external standards.

Inorganic analyses will be based on regression analysis. Regression analysis is used to fit a curve through the calibration standard data. The sample concentrations will be calculated using the resulting regression equations.

Non-aqueous values will be reported on a dry-weight basis. Values will not be corrected for blank contamination.

19.3.2 Laboratory Data Review

Data will be subject to multi-level review by the laboratory. The group leader will review data reports prior to release for final data report generation. The QA manager will review approximately 10% of the final data reports and the Laboratory Project Manager will review a cross-section of the final data reports prior to shipment to Apex.

If discrepancies or deficiencies exist in the analytical results, then corrective action will be taken, as discussed in Section 18.3. Deficiencies discovered as a result of internal data review, as well as the corrective actions to be used to rectify the situation, will be documented on a Corrective Action Form and summarized in the case narrative.

19.3.3 Data Validation and Verification

Data generated for site investigation purposes will be subjected to the data validation and verification procedures outlined in Section 21. Data generated for waste characterization and disposal purposes will not be reviewed unless anomalous results are observed.

20.0 DATA VALIDATION AND VERIFICATION

Data validation entails a review of the quality control data and the raw data to verify that the laboratory was operating within required limits, the analytical results were correctly transcribed from the instrument read outs, and which, if any, environmental samples were related to any out-of-control quality control samples. The objective of data validation is to identify any questionable or invalid laboratory measurements.

Apex will validate data generated and produce a NYSDEC DUSR using this QAPP, analytical method performance criteria, laboratory control limits, NYSDEC ASP Revision 2005 requirements, the USEPA's National Functional Guidelines (USEPA, 2004; USEPA, 2008), and USEPA Region 2 SOPs for data validation. These procedures and criteria may be modified as necessary to address project-specific and method-specific criteria, control limits, and procedures. Data validation will consist of data screening, checking, reviewing, editing, and interpretation to document analytical data quality and to determine whether the quality is sufficient to meet the DQOs. The data validator will verify that reduction of laboratory measurements and laboratory reporting of analytical parameters is in accordance with the procedures specified for each analytical method and/or as specified in this QAPP and NYSDEC ASP Revision 2005. Deviations from the analytical method or any special reporting requirements apart from that specified in this QAPP will be detailed in the analytical reports.

Upon receipt of laboratory data, the following procedures will be executed by the data validator:

- Evaluate completeness of data package;
- Verify that field COC forms were completed and that samples were handled properly;
- Verify that holding times were met for each parameter. Holding time exceedances, should they occur, will be documented. Data for samples exceeding holding time requirements will be flagged as either estimated or rejected. The decision as to which qualifier is more appropriate will be made on a case-by-case basis. In general, if the holding time is exceeded by less than two times the EPA recommended holding time, the data will be qualified as estimated;
- Verify that parameters were analyzed according to the methods specified;
- Verify compliance with canister pressure requirements and tracking;
- Review QA/QC data (i.e., make sure duplicates, blanks, and spikes were analyzed on the required number of samples, as specified in the method;
- Verify that accuracy and precision of quality control data are acceptable);

- Review blank contamination, mass spectrometer tuning, calibration information [initial and continuing calibrations], surrogates/system monitoring compounds, internal standard performance, MS/MSD analysis, LCS/LCSD analysis, field duplicate analysis, compound identification, overall system performance, and raw data;

- Prepare a Data Usability Summary Report (DUSR); and

- Investigate anomalies identified during review. When anomalies are identified, they will be discussed with the Project Manager and/or Laboratory Manager, as appropriate;

If data appears suspect, further data evaluation will be performed to investigate the specific data of concern. This review may include evaluation of verification of calculations and other reviews of raw data.

Deficiencies discovered as a result of the data review will be documented and submitted in the form of a written validation report addressing the following topics as applicable to each method:

- Assessment of the data package;

- Description of any protocol deviations;

- Summary of the QC failures observed;

- Assessment of any compromised data; and

- Summary of the qualified data.

It should be noted that qualified results do not necessarily invalidate data. The goal to produce the best possible data does not necessarily mean producing data without quality control qualifiers. Data qualified as estimated will be utilized for site evaluation. Rejected data will not be used. Resolution of any issues regarding laboratory performance or deliverables will be handled between the laboratory and the data validator. Suggestions for re-sampling or reanalysis may be made by the Apex QA Officer at this point.

DUSRs will be kept in the project file at Apex's office and provided to NYSDEC upon request.

21.0 RECONCILIATION WITH USER REQUIREMENTS

The data results will be examined to determine the performance that was achieved for each data usability criteria. The performance will then be compared with the project objectives and DQOs. Deviations from objectives will be noted. Additional action may be warranted when performance does not meet performance objectives for critical data. Options for corrective action relating to incomplete information, questionable results or inconsistent data, may include any or all of the following:

- Retrieval of missing information;
- Request for additional explanation or clarification;
- Re-extraction or reanalysis of sample (when appropriate); and
- Recalculation or reinterpretation of results by the laboratory.

These actions may improve the data quality, reduce uncertainty, and may eliminate the need to qualify or reject data.

If these actions do not improve the data quality to an acceptable level, the following additional actions may be taken:

- Extrapolation of missing data from existing data points;
- Use of historical Site use information; and
- Evaluation of the critical/non-critical nature of the sample.

If the data gap cannot be resolved by these actions, an evaluation of the data bias and potential for false negatives and positives can be performed. If the resultant uncertainty level is unacceptable, the following action must be taken:

- Additional sample collection and analysis

22.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC). 2010. DER-10 Technical Guidance for Site Investigation and Remediation. May 2010.

U.S. Environmental Protection Agency (USEPA). 2008. USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, USEPA-540-R-08-01. June 2008.

U.S. Environmental Protection Agency (USEPA). 2006. Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4, EPA/240/B- 06/001. February 2006.

U.S. Environmental Protection Agency (USEPA). 2004. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540- R-04-004. October 2004.

U.S. Environmental Protection Agency (USEPA). 2002. Guidance for Quality Assurance Project Plans, EPA QA/G-5, EPA/240/R-02/009. December 2002.

U.S. Environmental Protection Agency (USEPA). 1992. Guide to Management of Investigation-Derived Wastes, Publication 9345.3-03FS. January 1992.

TABLES

Table 1 Summary of Sample Containers, Analytical Methods, Preservation, and Holding Times

Parameter	Method [1,2]	Sample Container	Preservation	Holding Time
Soil				
VOCs	8260C	1 x 2-oz glass jar with Teflon®-lined septa	Cool 4° C	14 Days
SVOCs	8270D	250 ml wide mouth glass container with PTFE lined lid	Cool 4° C	14 Days
PCBs	8082A	250 ml wide mouth glass container with PTFE lined lid	Cool 4° C	14 Days
Metals	6010C	1 x 16 oz. glass container	Cool 4° C	180 Days
Pesticides/Herbicides	8081B/8151A	250 ml wide mouth glass container with PTFE lined lid	Cool 4° C	14 Days
Water				
VOCs	8260C	3 x 40-mL glass vial with Teflon®-lined septa	Cool 4° C, HCL to pH <2	14 Days
SVOCs	8270D	4 x 1- L amber glass container with PTFE lined lid	Cool 4° C	7 Days
PCBs	8082A	4 x 1- L amber glass container with PTFE lined lid	Cool 4° C	7 Days
Metals	6010C	1 x 1-L plastic or glass container	HNO_3, to pH,2, Cool 4° C	180 Days
Pesticides/Herbicides	8081B/8151A	4 x 1- L amber glass container with PTFE lined lid	Cool 4° C	7 Days
Air				
TO-15 VOCs Expanded	TO-15	One (1) 6-L SUMMA® Canister	---	30 Days

1 USEPA. Office of Solid Waste. *Test Methods for Evaluating Solid Waste (SW-846).*

2 USEPA. Compendium of Methods for the Determination of TOCs in Ambient Air - Second Edition. Volatile Organic Compounds.

oz Ounce.

mL Milliliter.

L Liter.

C Celsius.

HCL Hydrochloric Acid.

HNO_3 Nitric Acid

Table 2 Quality Assurance/Quality Control Sample Summary

Parameter	Estimated Sample Quantity	Field QC Samples						Laboratory QC Samples				Total
		Equipment Blanks		Trip Blanks		Field Duplicates		Matrix Spike		Matrix Spike Lab Duplicate		
		Frequency	Quantity	Frequency	Quantity	Frequency	Quantity	Frequency	Quantity	Frequency	Quantity	
Soil 1												
Volatile Organic Compounds (SW-846 8260B)	1	1/Day	20	1/Cooler	1	1/20	1	1/20	1	1/20	1	2
Water												
Volatile Organic Compounds (SW-846 8260B	10	1/Day	10	1/Cooler	1	1/20	1	1/20	1	1/20	1	11
Air												
TO-15 VOCs Expanded	12	NA	NA	NA	NA	1/20	1	NA	NA	NA	NA	13

1 Sample Quantity is an approximation; the final sample quantity will be determined in the field based on field conditions and observations.
TCL Target Compound List. TAL Target Analyte List.
QC Quality Control
NA Not Applicable

Table 3   Compound List and RLs for Water and Soil VOC Analysis

Laboratory Reporting Limits

Compound	Water (ug/L)	Soil (ug/kg)
Dichlorodifluoromethane	5	5
Chloromethane	5	5
Vinyl Chloride	5	5
Bromomethane	5	5
Chloroethane	5	5
Trichlorofluoromethane	5	5
1,1-Dichloroethene	5	5
1,1,2-Trichloro-1,2,2-trifluoroethane	5	5
Acetone	10	25
Carbon Disulfide	5	5
Methyl Acetate	5	5
Methylene Chloride	5	20
trans-1,2-Dichloroethene	5	5
Methyl tert-Butyl Ether	5	5
1,1-Dichloroethane	5	5
cis-1,2-Dichloroethene	5	5
2-Butanone	10	25
Chloroform	5	5
1,1,1-Trichloroethane	5	5
Cyclohexane	5	5
Carbon Tetrachloride	5	5
Benzene	5	5
1,2-Dichloroethane	5	5
Trichloroethene	5	5
Methylcyclohexane	5	5
1,2-Dichloropropane	5	5
Bromodichloromethane	5	5
cis-1,3-Dichloropropene	5	5
4-Methyl-2-pentanone	10	25
Toluene	5	5
trans-1,3-Dichloropropene	5	5
1,1,2-Trichloroethane	5	5
Tetrachloroethene	5	5
2-Hexanone	10	25
Dibromochloromethane	5	5
1,2-Dibromoethane	5	5
Chlorobenzene	5	5
Ethylbenzene	5	5
Xylenes (total)	5	10
Styrene	5	5
Bromoform	5	5
Isopropylbenzene	5	5
1,1,2,2-Tetrachloroethane	5	5
1,3-Dichlorobenzene	5	5
1,4-Dichlorobenzene	5	5
1,2-Dichlorobenzene	5	5
1,2-Dibromo-3-chloropropane	5	10
1,2,4-Trichlorobenzene	5	5
1,4-Dioxane	50	200
n-Butylbenzene	5	5
n-Propylbenzene	5	5
sec-Butylbenzene	5	5
tert-Butylbenzene	5	5
1,2,4-Trimethylbenzene	5	5
1,3,5-Trimethylbenzene	5	5

1. Compound list is a combination of USEPA Contract Laboratory Program Statement of Work OLM04.2 TCL for Volatile Compounds and compounds listed in 6 NYCRR Subpart 375-6.

RLs Reporting Limits.
VOC Volatile Organic Compound.
TCL Target Compound List.
ug/L Micrograms per liter.
ug/kg Micrograms per kilogram.

Table 4   Compound List and RLs for Water and Soil VOC Analysis

Laboratory Reporting Limits

Compound	Water (ug/L)	Soil (ug/kg)
Dichlorodifluoromethane	5	5
Chloromethane	5	5
Vinyl Chloride	5	5
Bromomethane	5	5
Chloroethane	5	5
Trichlorofluoromethane	5	5
1,1-Dichloroethene	5	5
1,1,2-Trichloro-1,2,2-trifluoroethane	5	5
Acetone	10	25
Carbon Disulfide	5	5
Methyl Acetate	5	5
Methylene Chloride	5	20
trans-1,2-Dichloroethene	5	5
Methyl tert-Butyl Ether	5	5
1,1-Dichloroethane	5	5
cis-1,2-Dichloroethene	5	5
2-Butanone	10	25
Chloroform	5	5
1,1,1-Trichloroethane	5	5
Cyclohexane	5	5
Carbon Tetrachloride	5	5
Benzene	5	5
1,2-Dichloroethane	5	5
Trichloroethene	5	5
Methylcyclohexane	5	5
1,2-Dichloropropane	5	5
Bromodichloromethane	5	5
cis-1,3-Dichloropropene	5	5
4-Methyl-2-pentanone	10	25
Toluene	5	5
trans-1,3-Dichloropropene	5	5
1,1,2-Trichloroethane	5	5
Tetrachloroethene	5	5
2-Hexanone	10	25
Dibromochloromethane	5	5
1,2-Dibromoethane	5	5
Chlorobenzene	5	5
Ethylbenzene	5	5
Xylenes (total)	5	10
Styrene	5	5
Bromoform	5	5
Isopropylbenzene	5	5
1,1,2,2-Tetrachloroethane	5	5
1,3-Dichlorobenzene	5	5
1,4-Dichlorobenzene	5	5
1,2-Dichlorobenzene	5	5
1,2-Dibromo-3-chloropropane	5	10
1,2,4-Trichlorobenzene	5	5
1,4-Dioxane	50	200
n-Butylbenzene	5	5
n-Propylbenzene	5	5
sec-Butylbenzene	5	5
tert-Butylbenzene	5	5
1,2,4-Trimethylbenzene	5	5
1,3,5-Trimethylbenzene	5	5

1. Compound list is a combination of USEPA Contract Laboratory Program Statement of Work OLM04.2 TCL for Volatile Compounds

RLs Reporting Limits.
VOC Volatile Organic Compound.
TCL Target Compound List.
ug/L Micrograms per liter.
ug/kg Micrograms per kilogram.

Table 5 VOC Analytical QC Limits

VOC Surrogate Recovery Limits	% Recovery		RPD	
	Water	Soil/Sediment	Water	Soil/Sediment
Compound 1,2-Dichloroethane-d4	66-137	64-126	NA	NA
Toluene-d8	71-126	71-125	NA	NA
4-Bromofluorobenzene	73-120	72-126	NA	NA
LCS (Blank) and Matrix Spike Recovery and RPD Limits				
Compound 1,1,1-Trichloroethane	73-126	77-121	15	20
1,1,2,2-Tetrachloroethane	70-126	80-120	15	20
1,1,2-Trichloro-1,2,2-trifluoroethane	60-140	60-140	20	20
1,1,2-Trichloroethane	76-122	78-122	15	20
1,1-Dichloroethane	71-129	79-126	20	20
1,1-Dichloroethene	65-138	65-153	16	20
1,2,4-Trichlorobenzene	70-122	64-120	20	20
1,2,4-Trimethylbenzene	76-121	74-120	20	20
1,2-Dibromo-3-Chloropropane	56-134	63-124	15	20
1,2-Dichlorobenzene	77-120	75-120	20	20
1,2-Dichloroethane	75-127	77-122	20	20
1,2-Dichloropropane	76-120	75-124	20	20
1,3,5-Trimethylbenzene	77-121	74-120	20	20
1,3-Dichlorobenzene	77-120	74-120	20	20
1,4-Dichlorobenzene 1,4-Dioxane 2-Butanone (MEK)	75-120 --- 65-127	73-120 --- 70-134	20 --- 15	20 --- 20
2-Hexanone	56-142	59-130	15	20
4-Methyl-2-pentanone (MIBK)	71-124	65-133	13	20
Acetone	66-128	61-137	15	20
Benzene	36-150	79-127	15	20
Bromodichloromethane	59-134	80-122	15	20
Bromoform	72-134	68-126	15	20
Bromomethane	72-120	37-149	25	20
Carbon disulfide	75-125	64-131	15	20
Carbon tetrachloride	69-136	75-135	15	20
Chlorobenzene	73-127	76-124	20	20
Chloroethane	49-142	69-135	15	20
Chloroform	74-124	80-118	15	20
Chloromethane	74-124	63-127	15	20
cis-1,2-Dichloroethene	70-130	81-117	20	20
cis-1,3-Dichloropropene	80-122	82-120	15	20
Cyclohexane	33-157	70-130	20	20
Dibromochloromethane	77-123	76-125	15	20
Dichlorodifluoromethane	77-122	57-142	20	20
Ethylbenzene	60-140	80-120	20	20
Isopropylbenzene	57-140	72-120	20	20
Methyl acetate	71-125	60-140	35	20
Methyl tert-butyl ether	64-127	63-125	37	20
Methylcyclohexane	60-140	60-140	20	20
Methylene Chloride	57-132	61-127	15	20
n-Butylbenzene	71-128	70-120	15	20
N-Propylbenzene	77-120	70-130	15	20
sec-Butylbenzene	74-127	74-120	15	20
Styrene	70-130	80-120	20	20
tert-Butylbenzene	75-123	73-120	15	20
Tetrachloroethene	74-122	74-122	20	20
Toluene	70-122	74-128	15	20
trans-1,2-Dichloroethene	73-127	78-126	20	20
trans-1,3-Dichloropropene	72-123	73-123	15	20
Trichloroethene	74-123	77-129	16	20
Trichlorofluoromethane	62-152	64-146	20	20
Vinyl chloride	65-133	61-133	15	20
Xylenes, Total	76-122	70-130	16	20

The recovery limits for any of the compounds listed above may be expanded at any time during the period of performance if USEPA determines that the limits are too restrictive.

See NYSDEC Revision 2005 for additional method performance criteria.

VOC Volatile Organic Compound.

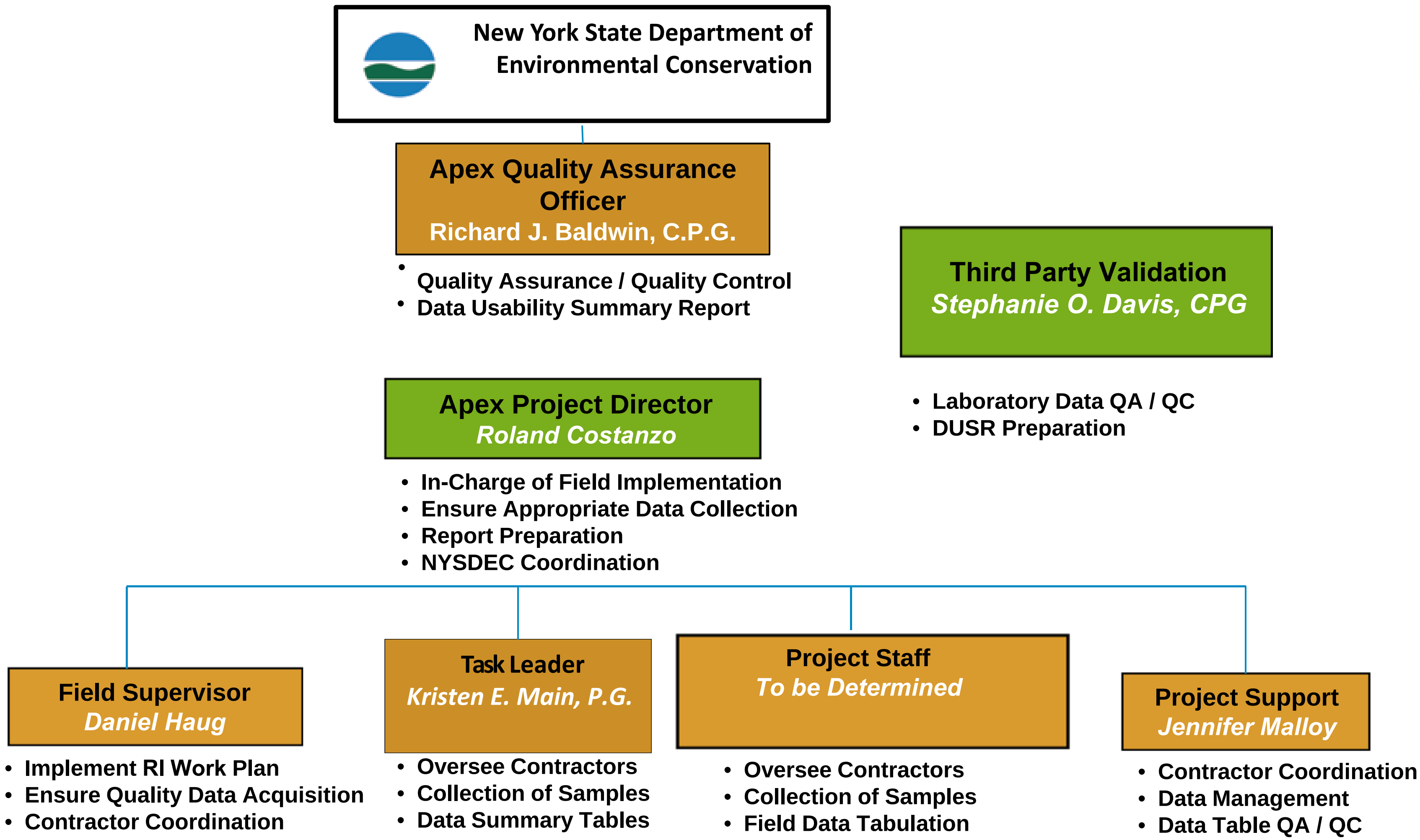
QC Quality Control.

LCS Laboratory Control Sample or Blank Spike.

RPD Relative Percent Difference.

FIGURES

Figure 1
Project Organization Chart



APEX

Figure 2
Site Plan

Client:	2002 Cropsey Associates, LLC
Project No.:	85265.001
Project:	2002-2024 Cropsey Avenue Site
Date:	July 2014

Attachment 1

Ambient Air Sample Collection Field Form

Ambient Air (Canister) Sample Collection Field Form

Project ff ______________________ Consultant ______________________

Project Name ______________________ Collector ______________________

Sample ID ______________________

Vacuum gauge "zero" ("Hg) ______________

Start Date/Time ______________________ Start Pressure ("Hg} ______________

End Date!Time ______________________ End Pressure ("Hg) ______________

Canister !D ______________________ End pressure > "zero"? ______________

Flow controller JD ______________________ Sampling duration (intended) ______________

Tubing type used ____________ Length of tubing ____________cm Tubing volume________________cc

Volume purged ____________cc@ ________min 1 to 3 volumes purged @ < 200cc/min? ________

Weather Conditions at Start of Sampling:

Air temperature (°F) ____________ Rainfall ____________ Wind direction ____________

Barometric pressure ____________ Relative humidity ____________ Wind speed (mph) ____________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Site Plan showing sample location, building(s) being sampled, building HVAC inlet, outdoor air sources, wind direction

Comments: ____

____

____

____

____

Attachment 2

Soil Vapor Sample Collection Field Form

Soil Vapor (Canister) Sample Collection Field Form

Project # ____________________ Consultant ____________________

Project Name ____________________ Collector ____________________

Sample ID ____________________

Vacuum gauge "zero" ("Hg) ____________

Start Date/Time ____________________ Start Pressure ("Hg) ____________

End Date/Time ____________________ End Pressure ("Hg) ____________

Canister ID ____________________ End pressure > "zero"? ____________

Flow controller ID ____________________ Sampling duration (intended) ____________

Associated ambient air sample ID ____________ Depth of sample point below grade ____________

Tubing type used ________ Length of tubing ________ cm Tubing volume ________ cc

Volume purged ________ cc @ ________ min 1 to 3 volumes purged @ < 200cc/min? ______

Chamber tracer gas conc. ____________ Tracer gas conc. during purging ____________

Weather Conditions during Probe Installation:

Air temperature (°F) ________ Rainfall ____________ Wind direction ________

Barometric pressure ________ Wind speed (mph) ________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Weather Conditions at Start of Sampling:

Air temperature (°F) ________ Rainfall ____________ Wind direction ________

Barometric pressure ________ Wind speed (mph) ________

Substantial changes in weather conditions during sampling or over the past 24 to 48 hrs:

____

____

Site Plan showing sample location, buildings, landmarks, potential soil vapor and outdoor air sources, preferential pathways

Comments: ____

____

____

____

Attachment 3

Chain of Custody

ID#:

CHAIN OF CUSTODY & LABORATORY ANALYSIS REQUEST FORM

Page ___ of ___

Lab Work Order #

Send Results to:

Contact & Company Name:	Telephone:
Address:	Fax:
City State Zip	E-mail Address:
Project Name/Location (City, State):	Project #:
Sampler's Printed Name:	Sampler's Signature:

Preservative							
Filtered (✓)							
# of Containers							
Container Information							

PARAMETER ANALYSIS & METHOD

Keys

Preservation Key:
A. H_2SO_4
B. HCL
C. HNO_3
D. NaOH
E. None
F. Other: ______
G. Other: ______
H. Other: ______

Container Information Key:
1. 40 ml Vial
2. 1 L Amber
3. 250 ml Plastic
4. 500 ml Plastic
5. Encore
6. 2 oz. Glass
7. 4 oz. Glass
8. 8 oz. Glass
9. Other: ______
10. Other: ______

Matrix Key:
SO - Soil
W - Water
T - Tissue
SE - Sediment
SL - Sludge
A - Air
NL - NAPL/Oil
SW - Sample Wipe
Other: ______

Sample ID	Collection Date	Collection Time	Type (✓) Comp	Type (✓) Grab	Matrix								REMARKS

Special Instructions/Comments:

☐ **Special QA/QC Instructions(✓):**

Laboratory Information and Receipt		Relinquished By	Received By	Relinquished By	Laboratory Received By
Lab Name:	Cooler Custody Seal (✓)	Printed Name:	Printed Name:	Printed Name:	Printed Name:
☐ Cooler packed with ice (✓)	☐ Intact ☐ Not Intact	Signature:	Signature:	Signature:	Signature:
Specify Turnaround Requirements:	Sample Receipt:	Firm:	Firm/Courier:	Firm/Courier:	Firm:
Shipping Tracking #:	Condition/Cooler Temp: ______	Date/Time:	Date/Time:	Date/Time:	Date/Time:

Distribution: WHITE – Laboratory returns with results YELLOW – Lab copy PINK – Retained by ARCADIS

Attachment 4

Soil Sample Core Log

Sample/Core Log (Cont.d)

Boring/Well ______________________ Page ____ of ____

Prepared by ______________________

Sample/Core Depth (feet below land surface)					
From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description	PID (ppm)

Sample/Core Log

Boring/Well ______ Project Name/No. ______ Page ___ of ___

Site Location ______ Drilling Started ______ Drilling Completed ______

Total Depth Drilled ______ feet Hole Diameter ______ inches Type of Sample/ Coring Device ______

Length and Diameter of Coring Device ______ Sampling Interval ______ feet

Land Surface Elev. ______ feet ☐ Surveyed ☐ Estimated Datum ______

Drilling Method ______ Drilling Fluid Used ______

Drilling Contractor ______ Driller ______ Helper ______

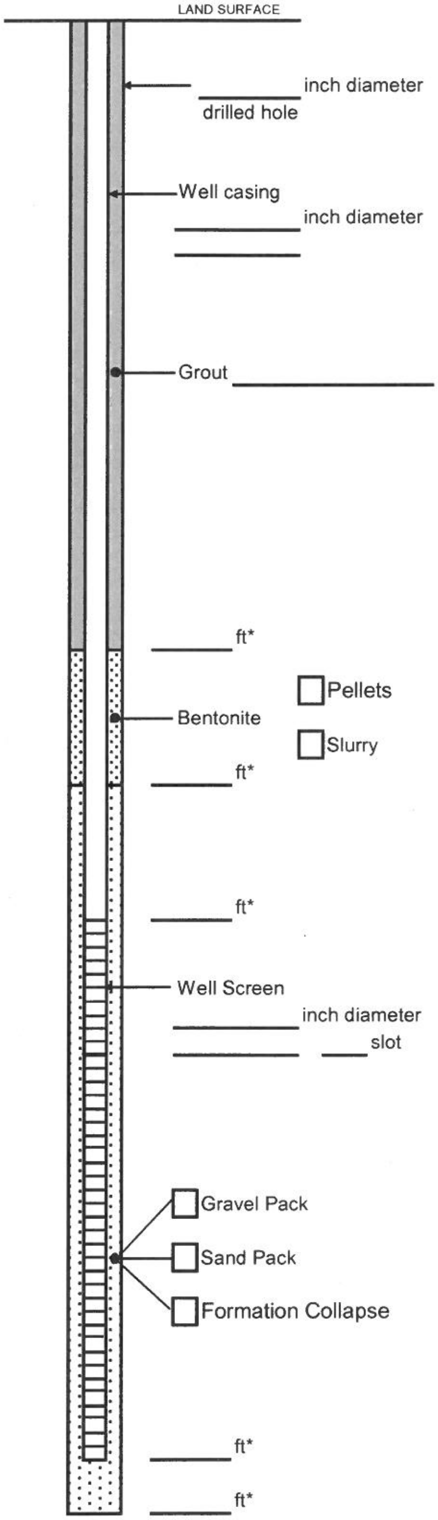
Prepared By ______ Hammer Weight ______ pounds Hammer Drop ______ inches

Sample/Core Depth (feet below land surface) From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	Sample/Core Description	PID (ppm)

Attachment 5

Well Construction Log

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

* Depth Below Land Surface

Project ______ Well ______

Town/City ______

County ______ State ______

Permit No. ______

Land Surface and Measuring Point Elevation: Datum: ______

Land Surface ______ feet ☐ Surveyed

Measuring Point ______ feet ☐ Estimated

Installation Date(s) ______

Drilling Method ______

Drilling Contractor ______

Drilling Fluid ______

Development Technique(s) and Date(s)

Fluid Loss During Drilling ______ gallons

Static Depth to Water ______ feet below M.P.

Water Removed During Development ______ gallons

Pumping Duration ______ hours

Well Purpose ______

Remarks ______

Prepared by ______

Attachment 6

Well Development Log

WELL DEVELOPMENT LOG

Project ______________________ Well ______________ Date ______________

Developed By: ______________________ Well Material ______________

Initial Static Depth to Water (ft bmp) ______________ Well Diameter ______________

Initial Total Depth of Well (ft bmp) ______________ Total Gallons Removed ______________

Final Static Depth to Water (ft bmp) ______________ Pump Decontaminated Prior to Development YES

Final Total Depth of Well (ft bmp) ______________

Time	Pumping Rate (gpm)	Depth to Water (ft bmp)	Gallons Removed	Turbidity (NTU)	Conductivity (mS/cm)	pH (s. u.)	Temp (ºC)	Appearance

ft bmp Feet Below Measuring Point.

Attachment 7

Low Flow Groundwater Sampling Log

Low-Flow Groundwater Sampling Log

Project ____________________

Project Number ____________ Site Location ____________ Well ID ____________

Date ____________ Sampled By ____________

Sampling Time ____________ Recorded By ____________

Weather ____________ Coded Replicate No. ____________

Instrument Identification

Water Quality Meter(s) ____________ Serial # ____________

Casing Material ____________ Purge Method ____________

Casing Diameter ____________ Screen Interval (ft bmp) Top ____________ Bottom ____________

Sounded Depth (ft bmp) ____________ Pump Intake Depth (ft bmp) ____________ ____________

Depth to Water (ft bmp) ____________ Purge Time Start ____________ Finish ____________

Field Parameter Measurements During Purging

Time	Minutes Elasped	Flow Rate (mL/min)	Volume Purged	Temp (°C)	pH (s.u.)	Conductivity (umhos or mS/cm) [1]	ORP (mV)	DO (mg/L)	Turbidity (NTU)	Depth to Water (ft bmp)

Collected Sample Condition Color____________ Odor____________ Appearance____________

Parameter	Container	No.	Preservative

PID Reading ____________

Comments ____________

1) Circle one unit type

Attachment 8

Water Level Log

Water Level Record

Project Name/No. ____ Date ______________

Well(s)	Depth to Water (ft bmp)	Time	Remarks

Attachment 9

PID Calibration log

PID CALIBRATION AND MAINTENANCE LOG

Instrument Model Number

Instrument Serial Number

Calibration Gas ppm

Date/Time	Initials	Battery Check	Calibration			
			Background Value	True Gas Value	Measured Gas Value	Adjust

COMMENTS:

Attachment 10

Resumes of Key Personnel

Roland Costanzo
Division Manager

EDUCATION

M.S Coursework., Environmental Management, UMUC, Maryland
B.S., Environmental Science, FIU, Miami

PROFESSIONAL REGISTRATIONS/ CERTIFICATION/ TRAINING

- Registered Environmental Manager, #10117
- NJ Subsurface Evaluator, #031179720
- CFR 1910 40-Hour OSHA
- CFR 1910 8-Hour Supervisor
- CFR 1926 Trenching Excavation Supervisor Certifications

GENERAL EXPERIENCE

2014 - Present	**Apex Companies, LLC, New Jersey**
Present -	***Division Manager***
2008 – 2014	**Senior Environmental Consultant, AIG Insurance, Jersey City, NJ**
2005 – 2007	**Executive Vice President, KOVARS, East Brunswick, NJ**
1998 – 2005	**Senior Program Manager, HERTZ, Park Ridge, NJ**
1997 – 1998	**Senior Project Manager & Industrial Group Manager, GES, Wall, NJ**
1993 – 1997	**Project Manager & Staff Scientist, Groundwater Technology, Ft. Lauderdale, FL**
1993 – 1992	**Research Intern, Drinking Water Research Center, Miami, FL**

PROJECT EXPERIENCE

Senior Environmental Consultant. Managed outside consultants providing engineering oversight and direction for all environmental claims including source identification, project development, and costing. Worked closely with legal team on technical and regulatory complexities of environmental projects. Identified and reported on waste, overcharges, ineffective strategies, and fraudulent submissions. Oversaw in excess of 200 claims valued at greater than $275M at facilities throughout the U.S. and Canada. Serviced and maintained 30+ high volume location clients from oil and chemical, transportation, mining, environmental engineering, construction, developers, and municipalities.

- Generated >$20M savings through technical delineation of responsibility, identification of any unreasonable cost/activities, and coordinating cost effective remedial approaches with consultants.
- Acted as internal expert regarding claims on Airport and Airport tenant Facilities.
- Demonstrated expertise in remedial technologies, tank system operations, and regulations to train and develop staff of non-technical claims adjusters.
- Netted a 12% to 25% per petroleum industry claim savings in Florida through optimum data management and establishment of a competitive bid cost structure.
- Developed a national lab cost structure resulting in a savings of 30-60% on laboratory costs.
- Applied sophisticated forensic techniques and utilized experts to prove comingled plumes and identify significant subrogation opportunities on multiple claims.

Executive Vice President. Charged with start-up of east coast operations for this non-environmental business unit; conducted site selection, negotiated lease agreement, managed construction process and set-up all marketing, sales, and operational plans/programs. Negotiated with individual and institutional investors; hired, trained, and managed regional staff.

- Played a key role in developing processes between Regional and Corporate offices.
- Tripled operational locations and revenue within a 2-year period via modeling and business requirement input that generated revenue predictions with a location selection model and trained staff on same.

Senior Program Manager, Environmental Compliance & Remediation. Managed staff of 1 compliance, 1 contract report and up to 60 outside consultants on assignments. Defined, developed, and managed assessment, remediation, and due diligence projects throughout the U.S. Canada, and the Caribbean; Planned, coordinated, and facilitated all compliance reporting activities, participated on PRP groups, and served as internal expert for Legal and Real Estate Departments, as well as shared Emergency Response oversight. Administered operational budget of >$15M.

- Created and instituted national due diligence program establishing unit costs with an average of 23% savings from prior strategy while standardizing quality and reducing turnaround by 50% to satisfy Legal and Real Estate Department needs.
- Utilized business negotiation and technical knowledge to maximize project effectiveness (i.e. Saved $1.2M in remediation costs through negotiations with airport on innovative remedial technology application at Stapleton Airport remediation).
- Developed and implemented National Emergency Response Program utilizing process design and subcontractor coordination with a tier notification approach that offset subcontractor liability.

Senior Project Manager and Industrial Group Manager. Managed staff and operations of the Industrial Group. Initiated and maintained quality business relationships with clients. Secured major new projects for the company, facilitated bidding and budget process, and oversaw all stages from start-up to successful conclusion.

- Landed multimillion dollar Brownfield assessment, remediation, and development initiative for company.
- Honed in on innovative technology solutions that improved productivity and client satisfaction.

Project Manager and Staff Scientist. Managed staff and operations for all site remediation and assessment projects. Consulted with clients and oversaw all project stages from start-up to successful conclusion. Spearheaded numerous Industrial Assessment and Remediation projects for the Aerospace, Pharmaceutical, and non-petroleum based industries.

- Directed multimillion dollar Dade County contract for several Assessment and Remediation Projects at Miami International Airport, Water and Sewer Authority, Dade County Schools, and County Transportation Authority.
- Managed major State Hazardous Waste Contract associated with Dry Cleaner Remediation and Assessments and extensive work required of the State's Petroleum Reimbursement Program.
- Recognized with numerous "Case Closed" Awards for bringing all projects to regulatory closure.

Stephanie O. Davis, P.G., C.P.G.

FPM group — Engineering and Environmental Science

Ms. Davis has diversified experience in geology and hydrogeology. Her professional experience includes groundwater and soil investigations, design and management of soil remediation projects, design and installation of groundwater containment and remediation systems, groundwater flow modeling, aquifer testing and interpretation, evaluation of site compliance with environmental regulations, environmental permitting, and personnel training.

Functional Role	Title	Years of Experience
Senior Hydrogeologist	**Department Manager - Hydrogeology**	**26**

Personal Data

Education

M.S./1984/Geology/University of Southern California
B.S./1981/Geology/Bucknell University

Registration and Certifications

Certified Professional Geologist #9487, (AIPG) 1995
California Registered Geologist #5192, 1991
Pennsylvania Registered Geologist #PG-000529-G, 1994
OSHA – Approved 40 hour Health and Safety Training Course (1990)
OSHA - Approved 8 hour Health and Safety Training Refresher Courses (1991-Present)
OSHA-Approved 8-hour Site Safety Supervisor Training Course (2008)
National Ground Water Association
Long Island Association of Professional Geologists

Employment History

1993-Present	FPM Group
1992-1993	Chevron Research and Technology Co.
1990-1992	Chevron Manufacturing Co.
1984-1990	Chevron Exploration, Land, and Production Company

Continuing Education

- Treatment of Contaminated Soil and Rock
- Groundwater Pollution and Hydrology
- Environmental Law and Regulation
- Remedial Engineering
- Soil and Foundation Engineering
- Environmental Geochemistry

Detailed Experience

Environmental Data Analysis

- Received multiple sessions of environmental geochemistry training provided by environmental geochemists, including physical chemistry, thermodynamics, ionic interactions, complexation, biologic effects, and other basic principles. Training also included field sampling procedures and effects on chemical data, chemical analytical methods and equipment, and QA/QC procedures and interpretation.
- Reviewed and evaluated numerous soil, groundwater, product, indoor/ambient air and soil vapor chemical analytical datasets, including evaluation of batch and site-specific QA/QC samples, laboratory narratives, comparison to regulatory agency criteria, historic data, and background data.
- Developed and implemented numerous Quality Assurance Project Plans (QAPP), including QAPP design, sample delivery group (SDG) evaluations, sampling procedures and sequences, and QA/QC sample preparation/collection.
- Attended periodic environmental chemistry training sessions hosted by environmental laboratories and participated in hands-on training in data and QA/QC evaluation.
- Prepared Data Usability Summary Reports (DUSRs) for numerous chemical analytical datasets for projects overseen by the USEPA, NYSDEC and other regulatory agencies. Datasets evaluated have included soil, groundwater, soil vapor, indoor air, and ambient air.
- Performed forensic assessments of historic environmental chemical analytical data to resolve apparent discrepancies with modern data and other dataset inconsistencies.
- Assessed various leachate test protocols and results to determine the most applicable methods to evaluate and develop soil cleanup objectives for non-regulated compounds.
- Interpreted numerous organic parameter datasets to evaluate breakdown sequences, likely original parameters, and rates of degradation.
- Formulated numerous chemical treatment plans for insitu remediation of environment contaminants, including assessment of contaminant concentrations and distribution, chemical processes and indicators, natural attenuation indicators, additional stociometric demands, and hydrogeologic factors.

Site Investigations

- Provides oversight and coordination for ongoing investigation and remedial projects at several New York State Inactive Hazardous Waste Disposal Sites, Voluntary Cleanup Program Sites, and Brownfield Cleanup Program Sites. Investigations have included site characterization, Remedial Investigation/ Feasibility studies, and RCRA Facility Investigations. Remedial Services have included contaminated soil removals; ORC and ARC injections; design, installation and operation of all sparge/soil vapor extraction systems; sub-slab depress investigation, capping, and other remedial services.
- Provides program coordination and oversight for all Phase I ESA, Phase II investigations, and remediation projects for a major commercial developer on Long Island, New York. Projects have included environmental services associated for the purchase and redevelopment of office buildings, aerospace facilities, former research and development facilities, and large manufacturing plants. Remedial Services have provided RCRA closures, UIC closures, tank removals, and Brownfield Cleanup Program projects.
- Planned and managed a Resource Conservation and Recovery Act (RCRA) Facilities Investigation (RFI) at Barksdale AFB, Louisiana for AFCEE. Responsible for all aspects of field program planning, solicitation and selection of subcontractors, mobilization and establishment of a field office, supervising multiple field crews, installation and sampling of monitoring wells, collection and soil samples, data tracking and management and preparation of an RFI report. The scope of work included characterization of the nature and extent of groundwater and soil contamination at thirteen Solid Waste Management Units (SWMUs), performing a base-wide evaluation of background contaminant concentrations, and developing a long-term groundwater monitoring program for the base.
- Managed field sampling crews for major underground storage tank (UST) investigation at Plattsburgh AFB, NY, for AFCEE. Responsible for field crew training, coordination of sampling crews at separate sites, sample labeling, handling, tracking, and shipping, field data management and remote field office management. The scope of work included collection of over 450 groundwater samples to characterize groundwater conditions in the vicinity of 150 USTs using a Geoprobe sampling rig, wellpoints, and rapid turnaround-time analysis.
- Managed site investigation activities, including soil vapor sampling, soil sampling and analysis, groundwater sampling and analysis, and geotechnical evaluation for numerous sites in Suffolk County, New York. The resulting data were utilized by a major supermarket company in the negotiations for the purchase of the properties and in the property remediation prior to development.
- Performed site investigation activities including soil vapor analysis, soil sample analysis, and groundwater sampling and analysis at an active commercial bus terminal in the Bronx, NY. Made recommendations for site remediation including UST removal, soil excavation and disposal, and free-phase product extraction.
- Prepared various work plans and reports, including a RCRA Facilities Investigation Work plan, incorporating existing geologic, chemical and historical data, evaluating newly-acquired site data, and developing recommendations for further investigation and remedial action at a City of Richmond former municipal landfill
- Managed on-site and off-site soil and ground-water sampling program at a manufacturing facility in Bay Shore, NY. Compiled resulting data and prepared a comprehensive report of the investigation results for the Suffolk County Department of Health Services (SCDHS) and NYS Department of Environmental Conservation (NYSDEC). Proposed remediation technologies for on-site soil contamination and on-site and off-site groundwater contamination.
- Managed and conducted a soil and groundwater sampling program using a Geoprobe sampler adjacent to Newark Airport Runway 29 for the Federal Aviation Administration. Analyzed resulting chemical analytical data and presented results to client.
- Supervised and conducted drilling, soil sampling, cone penetrometer testing, and well installation at a refinery process water effluent treatment system and former municipal landfill.
- Supervised drilling, installation, development, and sampling of monitoring wells at numerous sites in the greater New York metropolitan area. Utilized resulting stratigraphic, hydrologic, and chemical analytical data to evaluate site conditions.

Remediation

- Project Manager for all investigation and remedial activities at a NYSDEC Brownfield Cleanup Program site in New York City. Prepared the Remedial Investigation and Remedial Work Plan; coordinated with the owner, other contractors, and the NYSDEC; prepared for and conducted citizen participation activities; supervised all waste characterization, profile preparation, and waste management; developed the Final Engineering

Report (FER) and Site Management Plan (SMP) for NYSDEC approval; and ensured that all remedial requirements were met such that the Certificate of Completion (COC) was issued. Continuing activities include coordination of the ongoing site management activities, communications with the NYSDEC and NYSDOH, and preparation of the annual Certification Report.

- Developed pilot test plans, evaluated pilot test results, and prepared conceptual designs for several air sparge/soil vapor extraction (AS/SVE) systems to treat petroleum and/or chlorinated solvent VOCs. These systems were subsequently installed and Ms. Davis provides ongoing review of system operations and remedial monitoring results.
- In responsible charge of several task orders for waste characterization of a 90,000-cy construction soil stockpile at a municipal sewer facility. Responsibilities included development and implementation of Sampling and Analysis Plans (SAP), coordination of staffing, review of lab data, preparation of Field Sampling Summary Reports (FSSR), coordination with disposal facilities, and preparation of waste profiles.
- Designed soil remediation plan and managed contractor support for a metal parts plating and manufacturing facility in Suffolk County, New York. Soil remediation was overseen and approved by the SCDHS.
- Designed and performed indoor underground storage tank abandonment program, leaching pool remediation plan, and managed contractor support for a tape measure manufacturing facility in Suffolk County, New York. SCDHS provided oversight and approval.
- Participated in the design process for a groundwater containment and remediation system for a former municipal landfill, including subsurface groundwater barrier walls and extraction wells.
- Designed soil remediation plan and supervised contractor performance of soil remediation activities at an active construction site in Carle Place, NY. Project involved excavation and disposal of approximately 5,000 tons of PCB-, metal-, and petroleum-contaminated soil. NYSDEC provided oversight and approval of the completed remediation.
- Coordinated technical aspects of subsurface groundwater barrier wall construction, including routing, permitting, design, material selection, and field activities.

Hydrogeologic Evaluations

- Prepared Engineer's Report for Long Island Well Permit for a 230-gpm irrigation supply well. Responsible for evaluation of well interference, salt water upcoming, impacts from contaminants, and other factors affecting the proposed well.
- Performed well design (gravel pack size, screen size, etc.) for numerous groundwater wells on Long Island. Familiar with sieve analyses, well construction and development methods.
- Utilized Visual Modflow groundwater modeling program to evaluate the impact of a contaminant plume on a proposed SCWA wellfield. Model development included evaluation of recharge, aquifer properties, subsurface stratigraphy, boundary conditions, plume source and concentration, and various wellfield locations and pumping rates.
- Participated in a multi-day, multi-well aquifer pumping test for New York City Transit (NYCT) Lennox Avenue site. Responsible for operating and maintaining data logging equipment, coordinating manual water level measurements, and analyzing resulting drawdown data.
- Evaluated subsurface geologic conditions for NYCT Avenue T site utilizing existing boring logs, topographic, and historic map data.
- Supervised drilling, installation and development of groundwater extraction, injection, and monitoring wells at a USEPA Superfund site in Deer Park, New York. Interpreted aquifer and well performance from development data and made recommendations for modification of drilling and development procedures.
- Performed slug tests on monitoring wells at a New York City Transit Authority site, and evaluated hydrologic properties using the HYDROLOGIC ISOAQX computer program.
- Performed aquifer pumping and slug tests and evaluated hydrologic properties using the computer program AQTESOLV.
- Performed water level and water quality monitoring at an industrial site in Mattituck, NY. Constructed groundwater elevation contour maps and utilized chemical analytical data to predict contaminant plume migration.

Landfills

- Prepared work plans for Closure Investigations of two Town of East Hampton landfills. Each work plan included a Hydrogeologic investigation, methane investigation, surface leachate investigation, and vector investigation. Prepared final Closure Investigation Reports, which were accepted by the NYSDEC.
- Supervised the installation of groundwater and methane monitoring wells to complete the monitoring networks at the Town of East Hampton landfills. Services provided included hollow-stern auger and mud-rotary well installations, split-spoon

soil sampling and boring log preparation, oversight and interpretation of wireline electric logging, and completion of initial baseline monitoring events.

- Supervises ongoing groundwater and methane monitoring programs for Town of East Hampton landfills. Responsibilities include field team coordination, communications with the Town, report scheduling, data package review, and report review prior to distribution to the client and NYSDEC.
- Performed groundwater sampling at a radio tower facility constructed on a landfill in NJ. Analyzed results and made recommendations to client.
- Conducted methane monitoring at Springs-Fireplace Road and Montauk Landfills for the Town of East Hampton.
- Used the PC-based modeling program FLOW PATH to predict groundwater flow directions and evaluate extraction well locations and pumping rates for a groundwater containment and remediation system at a former municipal landfill.
- Negotiated successfully with NYSDEC for reduced monitoring frequencies at Town of East Hampton based on historic monitoring results. Maintained quarterly monitoring frequency only for specific containments at key locations.
- Manages monthly methane monitoring for all Town of Islip landfills. Monitoring program includes onsite and offsite methane wells, methane collection systems, and flare systems. Data is recorded electronically and downloaded to computer for formatting prior to delivery to Town. Data is reported in final form within two days of collection.
- Supervises and reviews production of quarterly and annual monitoring reports for all monitoring programs at Town of Smithtown landfill. Project includes tabulation and reporting of groundwater and methane monitoring data, solid waste and recycling collection data, yard waste composting operations, and landfill leachate collection and disposal data. Multiple copies of each report are prepared for Town delivery to the NYSDEC.

Community Impacts

- Developed Community Monitoring Plans (CMP) for several hazardous waste sites. These plans included monitoring procedures, action levels, and mitigation measures for odors, traffic, noise, dust and/or vapors with the potential to affect surrounding communities during investigation and/or remediation. Each CMP was reviewed and approved by the NYSDEC and NYSDOH and was implemented under the oversight of these agencies.
- Developed and implemented an odor abatement plan for highly-odorous soil discovered during a remediation project in New York City. The remediation site was surrounded by three public schools and complaints of nuisance odors were received following discovery of the odorous soil, resulting in a job shutdown until the nuisance was abated. The odor abatement plan was prepared and implemented within 24 hours and involved immediate covering of the odorous soil followed by spot excavation and removal during non-school hours (night work) and the use of odor-controlling foam. The removal was completed within one week without further incident and the NYSDEC and NYSDOH approved the completed work, allowing the job to recommence.
- Attended and presented at numerous community meetings for various environmental sites to explain the purpose of CMPs, the types of observations and their interpretation, and mitigation measures. Addressed community and agency questions and issues.
- Evaluated and implemented abatement for vectors (rodents, flies, and seagulls) at several Long Island landfills in association with landfill closure. These activities included inspection and reporting of vector populations, development of vector abatement plans, and assisting Town personnel with vector abatement.
- Conducted inspections of intense fly infestations at a Town transfer station building. The inspections were used to identify the locations and migration pathways of flies inside the building and to develop an abatement plan. This plan was successfully implemented by Town personnel to abate the nuisance fly infestations.
- Developed and implemented air and soil vapor investigations of residential and commercial properties to evaluate potential air quality impacts. These investigations were conducted using plans approved by the NYSDEC and NYSDOH. The resulting data were used to evaluate whether air quality impacts were present and whether mitigation or monitoring were necessary. These evaluations were submitted for NYSDEC and NYSDOH review and approval, together with appropriate monitoring/mitigation designs.
- Conducted odor, dust, noise and organic vapor monitoring at several community areas surrounding environmental sites. Data were collected and interpreted in accordance with NYSDEC and/or NYSDOH guidance and the results were submitted to these agencies together with recommendations for mitigation, if appropriate.

Expert Witness/Technical Services

- Provided expert witness and technical services regarding environmental conditions and remedial procedures for a proposed residential redevelopment of a former oil terminal. Services included preparing and obtaining NYSDEC and NCDOH approval of remedial work plans for three environmental areas of concern, preparing remedial cost estimates and schedules, and providing testimony at a public hearing before the North Hempstead Town Board from which a change of zone was requested. The proposed change of zone, although subject to considerable public opposition, was approved, allowing redevelopment and associated remediation of the property to move forward.
- Provided expert witness and technical services to the legal team defending a petroleum company against NYSDEC cost recovery claims at a petroleum spill site. The spill site was complex, involving two very large petroleum releases at gasoline stations adjoining the defendant's property. Services provided included evaluating petroleum tank tests, groundwater, soil and soil vapor chemical analytical data, petroleum fingerprint data, remediation activities and costs. Products prepared include numerous detailed timelines of various activities, large displays showing site information and subsurface conditions, and cost allocation calculations. A detailed subsurface investigation was also performed to evaluate stratigraphic conditions.
- Assisted the Village of Larchmont legal team in successfully opposing the construction of an IKEA superstore in the adjoining community of New Rochelle. Work performed included evaluating the previous environmental investigations of the proposed store site, developing cost estimates and scopes of work for a full environmental evaluation of the site, preparing scoping cost estimates for likely remediation scenarios, preparing technical documents in support of the Village of Larchmont's position and making a presentation at a large public hearing for the project. The proposed project was subsequently withdrawn.
- Provided technical evaluation of a proposed water district in the Town of Carmel in support of legal efforts to oppose the district. The proposed water district was opposed by existing residents due to limited available water supplies and likely impact on their existing wells. The scope of work included evaluation of aquifer pumping tests, determining impacts on nearby wells, assessment of likely increased water demand, preparation of several supporting documents, and presentations (including providing testimony to a judge) at project hearings. The proposed project was subsequently conditionally approved by the NYSDEC with significant modifications to protect the water rights of existing residents.
- Prepared several affidavits regarding environmental conditions at client properties in support of pending legal actions. Issues evaluated included landfill issues, wetlands and navigatable waterway issues, and petroleum spill issues.
- Provided technical support to the Croton Watershed Clean Water Coalition (CWCWC) in assessing the impacts of several proposed road construction projects on the Kensico Reservoir and other nearby water bodies of the New York City water supply system. This work included evaluating stormwater pollutant loading calculations, assessing impacts to wetlands, promoting application of more accurate stormwater runoff calculation methods, assessing proposed stormwater management techniques, attending and making presentations at public meetings, preparing technical statements for submittal to regulatory agencies, and participating in the NYSDOT's Stormwater Pollution Prevention Plan (SPPP) Guidance committee.

Health and Safety

- Performed health and safety monitoring at investigation and remediation sites during intrusive activities. Monitoring included calibration and operation of photoionization detector (PID) and flame-ionization detector (FID) for organic vapors and combustible gas indicator (CGI) for methane. Compared results to applicable action levels and took preventative/protective measures as necessary.
- Performed community monitoring, including monitoring for noise, particulates (dust), and organic vapors. Recorded observations and compared to applicable action levels. Familiar with calibration and operation of noise meters, particulate monitors, and PID/FID.
- Performed screening for radiation at select sites. Familiar with operation of Geiger counter in different radiation modes and with background readings.

Miscellaneous Projects

- Performed numerous Phase I Site Assessments for residential and industrial sites on Long Island, New York.
- Conducted aquifer pumping and soil vapor extraction test training. Instructed classes for site investigation methods, aquifer pumping test analysis, and risk assessment.
- Performed various project management functions, including development and management of project

- budgets and schedules, coordination of field and office staffing, document preparation, review, editing, and interaction with clients, regulatory, legal, real estate, consultant, and compliance personnel.
- Organized, supervised, and conducted remote field mapping studies in Alaska.
- Directed well site geophysical logging operations and interpreted geophysical well logs.
- Conducted methane monitoring at Springs-Fireplace Road and Montauk Landfills for the Town of East Hampton.
- Processed and interpreted seismic reflection data and constructed seismic velocity models.
- Evaluated site compliance with environmental regulations. Assisted and reviewed regulator's revision of proposed risk assessment-based UST cleanup guidelines. Reviewed proposed USEPA NPDES permits for remediation system effluent.
- Constructed and interpreted structural and stratigraphic cross sections, and structure contour, fault surface, isochore, and isopach maps.

APEX

Daniel Haug
Environmental Scientist

Mr. Daniel Haug is an Environmental Scientist with three years of experience in the environmental industry. Mr. Haug's responsibilities include: the collection of soil, water and air samples; asbestos inspections/project monitoring; data management; research and support for various projects; litigation support services for class action lawsuits; Phase I and Phase II field work and reporting, and; coordinating with clients and sub-contractors to accomplish project activities.

EDUCATION

B.S., Environmental Earth Science, State University of New York at Oneonta

PROFESSIONAL REGISTRATIONS/ CERTIFICATION/ TRAINING

- 40 Hour OSHA HAZWOPER
- OSHA Confined Space Entry Training
- Red Cross CPR Adult/Child/Infant
- Red Cross First Aid
- New York State Department of Labor Asbestos Inspector
- New York State Department of Labor Air Sampling Technician
- New York State Department of Labor Project Monitor
- New York City Department of Environmental Protection Asbestos Investigator (pending)

PROJECT EXPERIENCE

Field Project Manager, Industrial Property, Glen Cove, NY
Mr. Haug is the field manager of the large-scale New York State Department of Environmental Conservation (NYSDEC) Resource and Recovery Act (RCRA) Closure project being conducted at a large, former industrial site located in Glen Cove, NY. Mr. Haug is responsible in assisting with the preparation and submission of NYSDEC approval for all project-related work plans, as well as implementing the soil and groundwater investigation phases of the project. Based upon these data, the NYSDEC approved a remedial action plan to address impacted soils across the 16-acre site, which is currently underway. Mr. Haug is responsible for all field management, including regulatory communication / coordination, as well as client communications. The client's goal for the project is to remediate the site to allow for future unrestricted residential use.

Phase I Inspections, Several Large Real Estate and Retail Companies
Mr. Haug coordinated with the client a field survey which includes a full visual inspection, photo-documenting the property, interviewing the owner and/or property representatives and reporting. The reporting includes due diligence research of online databases (Sanborns, topographic maps, aerial photos, EDR packages, etc.).

Phase II Inspections, Property Owners, NY
Mr. Haug provided field services for two properties which were former dry cleaner locations. The field protocol included groundwater, soil and sub-slab/interior air quality sampling. Field work also required oversight of drilling subcontractors.

Compliance Sampling for New York City Sewer Effluent Limitations
Mr. Haug is responsible for scheduling, coordinating, and executing quarterly field sampling events (including sampling of effluent water) for three flush truck facilities throughout New York City.

Asbestos Inspections and Abatement Oversight
Mr. Haug is a certified asbestos inspector, project monitor and air sampling technician in the State of New York. He has performed asbestos inspections for several national retail chains and a major national bank chain in Upstate New York, Manhattan, Queens, Brooklyn, Bronx, Staten Island, New Jersey, Nassau and Suffolk Counties. He has performed project monitoring at several sites throughout New York State.

Operations and Maintenance of SVE/SSDS systems, NYSDEC Superfund site, Long Island, NY
Mr. Haug provides monthly and semi-annual inspections of a soil vapor extraction (SVE) system in Nassau County. This is an ongoing monitoring program of the site to ensure proper filtering and functioning of the system. Mr. Haug also performs monthly operations and maintenance on a sub-slab depressurization system in Nassau County.

Litigation Support, Major Petroleum Company
Mr. Haug provided support for the defense of an MTBE class action suit related to a retail petroleum station. This project covers spill number closure in addition to review of documents; coordination with counsel; development of expert opinions and reports, and; review of reports and expert documents provided by others.

Waterways Projects, New Bedford Harbor, New Bedford, MA; and Lake Wickaboag, West Brookfield, MA
Mr. Haug assisted with a geophysical survey of the EPA's capped CAD cell at New Bedford Harbor. He also performed vibracore sampling as well as sediment sampling / soil characterization of New Bedford Harbor and Lake Wickaboag.

Port Authority of NY & NJ, Building 22A, JFK Airport, Jamaica, NY
Mr. Haug provided oversight for the removal of two underground storage tanks and oversight for the reclamation of the site. Work included removal of concrete and overlying material; sampling of soils for VOCs, and; reclamation of the site once approved by PANYNJ.

RCRA Closure Support – Assisted with the coordination and oversight of the environmental closure of a printing and manufacturing facility. Responsible for conducting TCLP sampling events of several demolished piles.

Community Air Monitoring Program and Radiation Field Screening – Implemented and enforced CAMP using particulate meter while at the same time field screening excavated materials for total VOCs using a PID.

APEX

Kristen E. Main, P.G.
Senior Project Manager

Ms. Main is a professional geologist with twenty seven years of diverse experience in environmental evaluations, investigations and remediations at sites located throughout the United States and Canada. Previously responsible for over 120 environmental projects (claims) with the international insurance company, AIG. Employed unique combination of technical expertise, client service capabilities and knowledge of environmental regulations to successfully manage numerous complex environmental site assessments for real estate transfers and property redevelopment. Participated in several insurance litigation cases Other experience include the redevelopment of heavily contaminated Brownfield properties, remediation of sites impaired by the presence of leaking underground storage tanks, and commercial properties impacted by unregulated, uncontrolled industrial operations.

EDUCATION

Master's Degree – Environmental Management	Montclair University, Montclair, N.J. January 1994
Master's Degree - Geological Sciences	Brooklyn College of the City University of New York, Brooklyn, N.Y. February 1990
Bachelor's Degree - Geological Sciences Minor - Oceanography	Kean University, Union, N.J. June 1985

PROFESSIONAL REGISTRATIONS/ CERTIFICATION/ TRAINING

- Professional Geologist, Delaware, No. 855 (1994 - present)
- NJDEP UST Certification No. 0001775 - Closure and Subsurface Evaluator
- 40 Hour OSHA approved, Hazardous Waste Training course, March 1989
- 8 Hour OSHA approved, Health and Safety Training course for Supervisors of Hazardous Waste Operations, August 1989
- 8 Hour OSHA approved, Hazardous Waste Training Refresher course, 1990 through December 2014
- New Jersey State Liscensed Asbestos Inspector, December 2014

CONTINUING EDUCATION

2012 through 2015

- National Groundwater Association, Measurement of LNAPL Transmissivity via Manual Skimming Tests, March 2012
- Rutgers, Cook College Continuing Education, Glacial Deposits, March 2012
- Rutgers, Cook College Continuing Education, NJDEP Site Remediation Reform Act – The Final Rule Package, August 2012
- Rutgers, Cook College Continuing Education, Advanced Petroleum Forensics, October 2012
- Rutgers, Cook College Continuing Education, NJDEP Vapor Intrusion Guidance, April 2013
- Pennsylvania Counsel of Professional Geologists, Structural and Hydro-Structural Geology – Theory and Applications for the Practicing Professional, June 2013
- Rutgers, Cook College Continuing Education, Ecological Risk Assessment – March 2014
- PCPG, Inorganic and Organic Groundwater Geochemistry – July 2014
- National Asbestos & Environmental Training Institute, EPA/AHera New York State Asbestor

Inspector, December 2014

- Rutgers, Cook College Continuing Eduction, UST Evaluator Certification – March 2015

GENERAL EXPERIENCE

Senior Project Manager with management of multi-phased environmental projects, NYSDEC sites, ISRA closures, property transactions, and brownfield redevelopment, as well as supervision of project personnel and subcontractors in compliance with local, state and federal regulations for private, corporate and municipal interests. Project experience includes direct interaction with regulatory agencies and client representatives, management of Preliminary Assessments, Site Investigations, Remedial Investigations/Remedial Actions, and property transactions. Technical experience includes regulatory interpretation, project and budget management, report preparation, and grant request preparation.

- **July 2014 - Present** Senior Project Manager - Apex Companies, LLC, East Brunswick, New Jersey
- **November 2006 to April 2014 –** Senior Environmental Consultant – AIG, Jersey City, New Jersey
- **March 2005 to November 2006 –** Senior Project Manager – PMK Group, Cranford, New Jersey
- **January 2001 to March 2005 –** Senior Project Manager – BEM Systems, Inc., Chatham, New Jersey
- **October 1999 to December 2000 –** Project Manger – The Whitman Companies, Inc. – East Brunswick, New Jersey
- **February 1997 to October 1999 –** Senior Project Manger – TRC/Vectre Corporation – Lafayette, New Jersey
- **January 1991 to November 1996 –** Project Manger – James C. Anderson Associates, Inc. (JCA), Clark New Jersey
- **January 1989 to December 1990 –** Assistant Project Manger – JCA
- **April 1988 to December 1989 –** Staff Geologist - JCA

PROJECT EXPERIENCE – Highlights

Senior Project Manager – Neptune, LLC – Brooklyn, New York
Management and project oversight for the redevelopment of a retail property into a residential high rise. Site is a historic manufactured gas plant (MGP) facility with residual impacts to groundwater and soil that will require remediation during the construction phase of the site. Site also operated as a commercial laundry and contained infrastructure from the New York City subway system. Developed site investigation to evaluate impacts from the former site uses and determine need for site remediation.

Senior Project Manager - Former AC & C, Elizabeth, New Jersey
Oversaw final remedial investigation of off-site contamination. Prepared remedial action workplan and subsequent remedial investigation reports. Designedof groundwater remediation and subsequent CEA, with monitored natural attenuation program. Implemented long term groundwater monitoring program. Preparedf annual groundwater monitoring reports and recalculation of CEA. Developmed remedial closure strategy for property for its eventual sale. Managed the environmental conditions while the site was being developed as residential properties as consultant for the new property owner. Oversee the installation and maintenance of the engineering control.

Senior Project Manager- Colgate – Palmolive (aka Former Hotel Research Laboratories, Inc.),

Closter, New Jesey
Completed groundwater remediation under monitored natural attenuation scenario, development of CEA and completion of quarterly groundwater sampling. Preparation of annual groundwater sampling reports, recalculation of CEA. Installation of barrier system to redirect groundwater flow direction that was being changed due to a trench system.

Senior Project Manger - Perth Amboy Dry Dock, Perth Amboy, New Jersey
Identified of numerous areas of environmental concern, including possible impact to the New Jersey Waters of the State and off-site properties. The site evaluation included biological testing of organisms to determine impact from the site. Once the extent and nature of the contaminants was determined developed a remedial plan that enabled the site to continue to operate as a ship repair yard. Project management included negotiations with the New Jersey Department of Environmental Protection (NJDEP) Bureau Industrial Site Remediation, NJDEP Land Use Regulations, NJDEP Southern Field Office and NJDEP Wetlands Mitigation to implement the remedial action.

Senior Project Manager - NJDEP Background Stie Soils Sampling Project Phase III
Senior Project Manager for the implementation of a research study sponsored and funded by New Jersey Department of Environmental Protection. Scope of project included the mapping of unique soil series, collection of samples from specified soil types and development of a GIS database to locate and track the sampling locations. This project is the third in a series completed by BEM for NJDEP. NJDEP is attempting to determine the natural concentrations of metals and polycyclic aromatic hydrocarbons in the Valley and Ridge, New Jersey Highlands and Coastal Plain physiographic provinces of New Jersey.

Project Manager - Former Mastic Asphalt, Elizabeth, New Jersey
Prepared and implementedf remedial action for hot spot areas of soil contamination, preparation of Remedial Action Report and Remedial ActionWorkplan for additional soils remediation. Prepared Remedial Investigation Workplan for groundwater.

APEX

Richard J. Baldwin C.P.G., P.G
Project Director

Mr. Baldwin is an environmental specialist with nearly 30 years of experience with particular experience in conducting and supervising resiliency projects, storm recovery actions, environmental investigations, remedial actions and waterways studies / projects at industrial, private, Federal and publicly-owned facilities. Mr. Baldwin's education focused on sedimentary processes, especially with respect to lake, river, coastline, bay and estuarine environments. Mr. Baldwin is well versed in the collection and analysis of bottom sediment samples, water column samples and the interpretation of the resulting data and is responsible for designing and implementing associated services such as evasive-species identification and eradication, bathymetric surveys, geotechnical evaluations, permit evaluation/acquisition, contractor evaluation/oversight, public awareness /education, etc. associated with this market area.

EDUCATION

- Graduate Course Work, San Jose State University, 1985-1988
- BA, Geology, San Francisco State University, 1982

CONTINUEING EDUCATION

- Princeton Groundwater Hydrogeology and Pollution course
- Environmental Law and Regulations Course, U.C. Berkeley Extension
- NGWA MODFLOW and MODPATH Modeling Course
- NGWA Visual MODFLOW Modeling Course

PROFESSIONAL REGISTRATIONS/ CERTIFICATION/ TRAINING

- Professional Geologist, PG-000552-G, Commonwealth of Pennsylvania
- Certified Professional Geologist, CPG #9158, Amer. Inst. of Prof. Geologists
- OSHA Certification, 40-hour Health and Safety Training at Hazardous Waste Sites
- OSHA Certification, 8-hou Refresher Health and Safety Training at Hazardous Waste Sites
- OSHA Certification, 8-hour Management Training
- OSHA Certification, 8-hour Radiation Safety Training

GENERAL EXPERIENCE

Mr. Baldwin has been either the principal-in-charge or co-team leader for Super Storm Sandy recovery operations and post-Sandy resiliency projects, including the United States Department of Housing and Urban Development (HUD) Rebuild by Design (RBD) competition.

Mr Baldwin has extensive experience in the selection, design, installation and maintenance or a wide range of soil and groundwater remediation systems. Remedial systems have included both active and passive free-product recovery, traditional groundwater pump and treat, soil-vapor extraction, air sparging, bioventing, bioremediation, excavation impacted-soil management and natural attenuation.

Mr. Baldwin has been the principal-in-charge and directly responsible for hundreds of projects related to the wireless telecommunications field. He has overseen the conduct of hundred of Phase I Environmental Site Assessments (ESAs) and limited Phase II ESAs. He has developed and implemented Soil and Groundwater Management Work Plan to address environmental impairment issues. He has been instrumental in developing appropriate mitigation measures with various project team members including site acquisition, legal counsel and headquarters level staff.

2006 - Present Apex Companies, LLC, 120-D Wilbur Place, Bohemia, New York 11716

PROJECT EXPERIENCE

Principal-in-Charge for HUD Rebuild By Design Stages 1, 2 and 3
Mr. Baldwin was one of Apex's Principals-in-Charge and a key player of the recently completed HUD RBD Stages 1, 2 and 3 design competition as part of the Interboro Team. RBD, an initiative of the Hurricane Sandy Rebuilding Task Force and HUD, is aimed at addressing structural and environmental vulnerabilities that Hurricane Sandy exposed in communities throughout the region and developing fundable solutions to better protect residents from future climate events. Because of the enormity of this challenge, the RBD process was developed to find better ways of implementing designs and informing policy. As part of RBD, the Interboro was responsible for developing a multi-layer hurricane defense for the southern coast line of Nassau County.

Mr. Baldwin was part of a multi-national team which developed a five-part resilience strategy, that when fully implemented, will protect the south shore, back bay and tributary stream areas of Nassau County from major meteorological events. As part of the project, Mr. Baldwin was personally responsible for meeting and developing resiliency strategies with Dutch team member, project partners (i.e., Nassau County DPW, City of Long Beach, Town of Hempstead, and the Villages of Freeport, East Rockaway, Rockville Centre and East Rockaway). Mr. Baldwin also met with and developed potential innovative permitting strategies with major regulatory authorities including the NYSDEC, Town of Hempstead and the United States Army Corps of Engineers (USACE). Mr. Baldwin also attended, led and / or participated in literally hundreds of private and public meetings with a wide-variety of project stakeholders ranging from Sustainable Long Island to the Long Island Regional Economic Council to the Long Island Housing Partnership to Operation Splash, to name a few. Mr. Baldwin's expertise in stormwater management, hydrology, hydrogeology and coastal sediment processes; as well as his personal experience with the regions physical conditions and various stakeholders, proved extremely valuable to the Interboro Team as part of the HUD RBD competition.

Co-Team Leader for Super Storm Sandy Recovery
Mr. Baldwin was a co-team leader for Super Storm Sandy recovery operations for a major financial institution, many of whose facilities suffered damage during the storm. Within a few days of Sandy, Mr. Baldwin took part in several facility damage assessments in which the level of flooding and related damage (e.g., mold, building materials damage, etc.) was assessed. Many of these inspections were conducted in areas where power had not yet been re-established. Based upon these data, site mitigation plans were developed and implemented including the requirement to abate asbestos-containing materials (ACM), if any, and replace damaged building materials such as carpeting, tile flooring, dry wall, insulation, etc. Post build-back inspections were conducted which included indoor air quality testing to ensure the safety of facility employees and customer safety.

Project Director for Industrial Project, Glen Cove, NY
Mr. Baldwin is the principal-in-charge of the large-scale New York State Department of Environmental Conservation (NYSDEC) Resource and Recovery Act (RCRA) Closure project being conducted at a large, former industrial site located in Glen Cove, NY. Mr. Baldwin was responsible for preparing, submitting and receiving NYSDEC approval for all project-related work plans, implementing the soil and groundwater investigation phases of the project. Based upon these data, the NYSDEC approved a remedial action plan to address impacted soils across the 16-acre site, which is currently underway. Mr. Baldwin is responsible for all project management, including regulatory communication / coordination, as well as all client communications. The client's goal for the project is to remediate the site to allow for future unrestricted residential use.

Project Director for Major NY Metro Airport Project
Mr. Baldwin is part of a large project team which has been tasked by a coalition of major airlines to evaluate the efficacy of re-instituting the delivery of jet fuel via a water-borne barge delivery system. As part of the project, Mr. Baldwin evaluated the requirements for permits from various agencies including the NYSDEC, USACE, NYSDOS and New York City. Mr. Baldwin has also been providing ongoing

evaluations of potential project design scenarios which required the evaluation of existing data sets (e.g., bathymetric surveys, former permits, etc.), conducting cost-benefit analyses assuming various dredge spoil disposal options, etc. This is a major, on-going project with long-term ramifications at all of the major New York Metropolitan airport facilities.

Project Director for Marina Property Assessment, Hampton Bays, NY

The owner of this active marina facility was served with a Notice of Violation (NOV) by the NYSDEC for various environmental issues, mostly related to on-site petroleum storage / delivery systems, as well as impacts potentially associated with marine-activity uses such as vessel bottom paint removal and application, use of preserved woods, vessel maintenance activities, housing-keeping issues, etc. Apex was responsible, with input from the NYSDEC, for developing and implementing a Site Investigation Program to investigate potential soil and groundwater impacts associated with the aforementioned on-site practices. Based upon the results of the investigation, Apex was able to conclude that the fuel distribution system was not leaking and that groundwater was not deleteriously impacted. Minor areas of impacted soil, likely from vessel bottom cleaning activities, were identified. Apex prepared and implemented a NYSDEC-approved Remedial Action Plan which included the following: 1) targeted removal of metals-impacted soils; 2) conversion of the existing gasoline / diesel underground storage tank (UST) / sub-grade distribution system to non-regulated biofuel use; 3) confirmation of facility use of aboveground storage tanks (ASTs) equipped with double-walled containment, 4) permitting a vessel-washing rinsate containment/treatment system; and, 5) use of asphaltic/concrete paving as engineering controls to minimize future potential user contact with remaining impacted soils.

Project Director for Marina Property Assessment, Center Moriches, NY.

Mr. Baldwin was responsible for conducting an evaluation of environmental conditions at this active marina which was under consideration for re-development with residential housing. Issues evaluated included soil and groundwater conditions associated with on-site vessel repair, bottom paint application/removal, USTs and dredge spoils. Based upon the results of the investigation, impacted soils were excavated, transported to and disposed of at an appropriately-licensed facility. The dredge spoils were not impacted above regulatory criteria and required not special actions. Based upon the results of the investigation and remediation activities, the Suffolk County Department of Health Services approved the site for residential re-development.

Dielectric Fluid Release, Village of Port Washington, NY.

During excavation activities being conducted for installing a team building at a Town-owned marina facility, Town of North Hempstead personnel encountered and broke a major, unmarked buried electric line. This rupture caused the immediate and catastrophic release of an estimated 30,000 gallons of dielectric fluid. Mr. Baldwin was retained by the Town of North Hempstead to oversee the cleanup of surface materials, as well as the evaluation of dielectric fluid floating on top of the water table. Adsorbent booms were placed and maintained along the associated wetlands and all identified areas of impacted soils were remediated. A series of monitoring wells were installed and evaluated to ensure the absence of dielectric fluid floating on the water table which would eventually discharge to the adjacent water way. Based upon the work conducted, the released dielectric fluid did not contain polychlorinated biphenyls (PCBs), and the NYSDEC was satisfied that the released had been adequately remediated.

Brownfield Re-development, Greenport, NY.

Mr. Baldwin managed one of the few active NYSDEC Brownfield sites on Long Island utilizing New York State Environmental Bond Act funding. The work included evaluating a large Village-owned undeveloped water-front property for the presence of undocumented USTs utilizing surface geophysical techniques, removing the USTs and associated impacted soils and preparing Site Investigation and Remedial Action reports. Responsible for all regulatory interactions, subcontractor management and Citizen Participation Plan implementation. The work was conducted concurrently with the redevelopment of the site for use as a public park including a water-front walk way, amphitheater and historic carousal.

Private Developer / REIT, Expedited Due Diligence of Shopping Center, Centereach, NY

A private developer / REIT was considering the purchase of a shopping center and, due to contract restraints, the client required the acquisition of due diligence information on an expedited basis. Based upon review of existing environmental reports, there had formerly been a dry cleaner at the facility. Additionally, the overall facility was improved with several on-site sanitary waste disposal systems and a stormwater abetment system consisting of several dozen dry wells. An expedited Phase II sampling program was designed and implemented to assess the highest-risk issues including potential impacts to groundwater and soil vapor associated with the former dry cleaning uses and potential remediation costs associated with on-site cesspools and drywells. The results of the investigation indicated a high risk associated with potential soil vapor intrusion issues and the initial remedial costs to address the on-site leaching structures was higher than originally anticipated.

Large Shopping Center Owner, Multiple Facilities, Upstate New York

Designed, coordinated and conducted the removal of gasoline underground storage tank (UST) systems at three Upstate New York facilities as part of divestiture activities. All three sites exhibited soil and groundwater impacts from gasoline; however, based upon the available data, it appeared that the systems removed by Apex were not leaking and the observed impacts were associated with former tanks systems which were never in control of the client. Assisted the project legal team in supporting our position with the NYSDEC that our client was not responsible for the observed releases and that the former property owners were responsible for associated investigation and remediation actions.

Private Developer, Due Diligence and Soil Remediation, Central Islip, NY

Was responsible for Phase I/II activities for a nation-wide developer at this site which was the improved with infrastructure associated with a sewage treatment plant of landfill associated with a former psychiatric facility. The data indicated the presence of fill materials which were impacted by lead in contravention of regulatory guidance values. A soil management plan was designed and implemented in which on-site fill materials were screened and tested. Screened materials containing acceptable levels of lead were used as on-site backfill while lead-impacted materials were disposed of off-site. The design and implementation of ther soil management plan allowed the developer to deal with impacts in a cost-effective fashion and resulted in a profitable project.

Phase I Environmental Site Assessments, Various Sites and Clients, Nationwide

Directed multiple Phase I Environmental Site Assessments in accordance with ASTM and non-ASTM formats as required. Work included site reconnaissance, records reviews, FOIL searches, occupant interviews, and summaries of all actions in Phase I ESA reports. Much of this work was performed for developers and real estate attorneys and reports focused on concerns typical of these types of projects including impacts to planned re-development, schedule impacts to meet regulatory requirements, release reporting obligation reviews, and soil management plan preparation for future construction.

Day Care Facility, Due Diligence, Soil Management and Soil Vapor Mitigation

Was responsible for conducting Phase I/II ESA activities which identified the presence of impacted fill at a facility slated for development by a non-for-profit day care facility. Designed and implemented a soil management plan which allowed re-development of the site. Additionally, design, installed and operated a large-scale sub-slab depressurization system (SSDS) to address soil vapor intrusion concerns.

Former Fuel Terminal, Patchogue River, Patchogue, NY

Conducted a site investigation program at this former major fuel oil terminal site to evaluate the efficacy of same for residential re-development, which would have included a residence-use only marina. The site had been the subject of previous site remediation activities, and the NYSDEC had closed its spill file assuming that the site would only be utilized for commercial or industrial purposes. Soil, groundwater, soil vapor and outdoor ambient air samples were collected and analyzed as part of this evaluation. The results of the investigation indicated that, in part due to the presence of MTBE and other gasoline-related VOCs, additional soil remediation would have been required to make the property suitable for residential re-development. Additionally, the NYSDEC would have likely required the installation and operation of sub-slab depressurization systems for all on-site residential buildings prior to their approving the plans for the site.

New York State Department of Environmental Conservation, Groundwater Evaluation and Treatment, Taconic Developmental Disabilities Services Office, Wassaic, NY

Worked on a public water supply site in New York conducting a full-scale groundwater investigation in the vicinity of the facility's supply wells which have been impacted by MTBE. Multiple well clusters were installed surrounding the high-capacity wells to evaluate subsurface conditions. One impacted well was converted to a remediation well to provide hydraulic capture of the MTBE plume prior to its impacting the remaining downgradient wells. A large-scale granulated-activated carbon (GAC) system was installed to treat the water extracted from the well. A 40,000-pound GAC unit was also installed in standby mode to address the facility's drinking water should the concentrations of MTBE ever warrant treatment. Several rounds of groundwater investigation were also conducted to confirm the MTBE source area as a nearby gasoline service station. Pilot testing was conducted and an on-site groundwater treatment system was being designed to provide source area remediation.

New York State Department of Environmental Conservation, Potable Water Treatment System, Village of Brewster, NY

Designed and constructed a supplemental water treatment system at a public water supply plant to address MTBE contamination in the system prior to its distribution. The treatment system consisted of a large air stripping tower, installed in line with an existing air stripper to remove the MTBE to non-detectable concentrations. Additionally, a source area investigation was being conducted to determine the potential source(s) of the MTBE contamination.

New York State Department of Environmental Conservation, Potable Water Treatment System, Sullivan Correctional Facility, Fallsburg, NY

Worked with the NYSDEC to evaluate, design and install a supplemental water treatment system to address MTBE present in a New York State Correctional Facility's drinking water. All four of the facility's wells were impacted. Several remedial options including utilizing GAC or air strippers were evaluated. The selected alternative was a 20,000-pound GAC system which was installed inline and in standby mode.

New York State Department of Environmental Conservation, Large Scale Investigation / Remediation Project, Lake Success, New York

Managed large-scale site activities at a major Long Island aerospace facility. Activities included operations of on-going IRMs (soil vapor extraction and groundwater extraction and treatment systems); citizen participation activities; design and implementation of on-site remedies (drywell removal and soil excavation, installation of fencing and an 1,800 gallon per minute groundwater extraction and treatment system); on- and off-site RIs; regulatory compliance activities; client interactions; multi-task, multi-contractor scheduling and management; and general project management. As part of the RI, prepared a large three-dimensional groundwater flow and particle model utilizing Visual MODFLOW and MODPATH. The model was then utilized to design an optimum groundwater treatment system.

Prepared a scoping plan and RI report for an Inactive Hazardous Waste Disposal site in New York under the NYSDEC Superfund program. The work involved evaluating the nature and extent of halogenated solvents in soil and groundwater both on and off of the site. Was responsible for overseeing all phases of the report preparation, including communications with the NYSDEC and for implementing the citizen participation program. Also involved in the preparation of the FS report and selection of the final remedy which included the use of an innovative groundwater treatment technology, in-well air stripping.

APEX

Miscellaneous Relevant Project Esperance

Designed and managed targeted on-and off-site groundwater investigations, reporting and remedial design activities for a Class 2a Inactive Hazardous Waste site under the NYSDEC Voluntary Cleanup Program (VCP). By utilizing existing and recently acquired data, that resulted in a significant cost savings to the client. Oversaw the design of an air sparge/soil vapor extraction system to remediate halogenated volatile organic compounds in the site's source area unsaturated soils and underlying groundwater.

Conducted all phases of an expedited buried medical waste program at a large New York State psychiatric hospital. Upon discovery of buried medical waste during the installation of a sewer main, a site investigation program was designed and implemented for the purpose of determining the extent of the buried waste. A successful remediation program was then implemented, which included a project-specific Health and Safety Plan dealing with medical "sharps" and potential blood-borne pathogens. The work was conducted under NYSDEC oversight.

Designed and implemented a subsurface investigation and oxygen release compound (ORC)/bio-venting pilot testing program at an upstate New York State psychiatric facility to remediate a No. 6 fuel oil spill. Due to the existence of on-site infrastructure, in-situ bioremediation techniques were required to remediate the petroleum without disrupting facility operations.

Responsible for preparing various chapters of Environmental Impact Statements (EISs) including Geology, Soil and Topography; Groundwater; Utilities, Open Space and Recreational Resources; and Project Alternatives. Reviewed other consultants' EISs for local municipalities to determine compliance with the State Environmental Quality Review Act (SEQRA) and to evaluate the potential impacts of proposed projects. Prepared potential environmental impact sections (e.g., groundwater, wetlands, air quality, visual quality, zoning, etc.) of New York Public Service Commission Article X pre-application packages for four proposed power plants.

Conducting large-scale environmental investigations at United States Military and Department of Energy facilities. Assignments included: evaluating the nature and extent of soil and groundwater contamination associated with landfills, fire training facilities and miscellaneous disposal areas on several military bases for the United States Army Corps of Engineers and the United States Navy; characterizing the nature and extent of unexploded ordnance; obtaining and interpreting surface and borehole geophysical surveys; conducting large-scale aquifer pumping tests; preparing Remedial Investigation and Site Investigation reports.

Citizen Participation Plan
2002-2024 Cropsey Avenue Site,
Brooklyn, NY

NYSDEC BCP # C224169

Prepared for:

Mr. Peter Neglia
2002 Cropsey Associates, LLC
2611 West 2nd Street
Brooklyn, New York 11223

Prepared by:

Apex Companies, LLC
120-D Wilbur Place
Bohemia, New York 11716

Date Submitted:
November2014

APEX

CITIZEN PARTICIPATION PLAN

2002-2024 CROPSEY AVENUE SITE

Apex Companies, LLC
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CITIZEN PARTICIPATION PLAN

2002-2024 CROPSEY AVENUE SITE
CROPSEY AVENUE, BROOKLYN NEW YORK

NYSDEC BCP# C224169

1.0 INTRODUCTION

Citizen participation is an integral component of remedial programs in New York State. Input from affected or interested individuals and organizations on the remedial program helps ensure outcomes that account for both technical and human concerns for protecting public health and the environment. A project-specific plan is needed to inform and involve community residents, public and private leaders, and other stakeholders. This Citizen Participation Plan (CPP) documents the planned project-specific public outreach activities and resources organized for the remedial program associated with the GLY Cleaners site (Site), a Dry Cleaning establishment.

The primary purpose of this CPP is to outline a variety of communication methods that, based on applicable New York State law and New York State Department of Environmental Conservation (NYSDEC) regulations and guidance, provide for constructive communication of program activities between the stakeholders and other interested parties. This CPP includes methods intended to inform interested parties of program developments, elicit responses and public involvement, and provide a central point of contact for inquiries regarding the remedial program for the Site. Given this context, this CPP presents the planned communication and outreach activities, describes how interested individuals and groups can participate in the remedial program, and provides a variety of reference materials to facilitate gaining access to project-specific information and management personnel.

Both the NYSDEC and the Principal Responsible Party (PRP) are committed to the implementation of this CPP as required by Environmental Conservation Law 27-1417 and Title 6 of the New York Codes, Rules and Regulations (NYCRR) Part 375, applicable NYSDEC guidance (e.g., DER-23/Citizen Participation Handbook for Remedial Programs (January 2010).

As required by 6 NYCRR Part 375-1.10 and 375-3.10, NYSDEC and The PRP will review and update this CPP to account for significant changes in the remedial program.

2.0 BASIC SITE INFORMATION

The 2002-2024 Cropsey Avenue Site (the Site) is located at 2022 Cropsey Avenue in the Borough of Brooklyn, New York City, New York and occupies a portion of a parcel that is identified by Tax Map Number: Block 6467, Lot 1. as shown on **Figure 1.** The Site consists of a single-story multi-unit retail building which has a full basement and is approximately 15,000 square feet.

The Site is bounded by Cropsey Avenue to the northeast, 20th Avenue to the northeast, a residential parcel to the southwest, and Bay 25th Street to the southeast. Local groundwater flow is expected to be from roughly north to south towards Gravesend Bay. The elevation of the Site is approximately 20 feet above mean sea level (msl). Surface topography consists of a gentle downward slope to the south towards Gravesend Bay, which is approximately 1,000 feet from the Site. A narrow undeveloped strip of land extends along the entire south (rear) side of the Site building. The layout of the Site and surrounding properties is presented on **Figure 2**. Currently, the Site is developed with a shopping center. Land use and zoning at the Site and the other properties in the area is commercial and residential.

2.1 Current Conditions

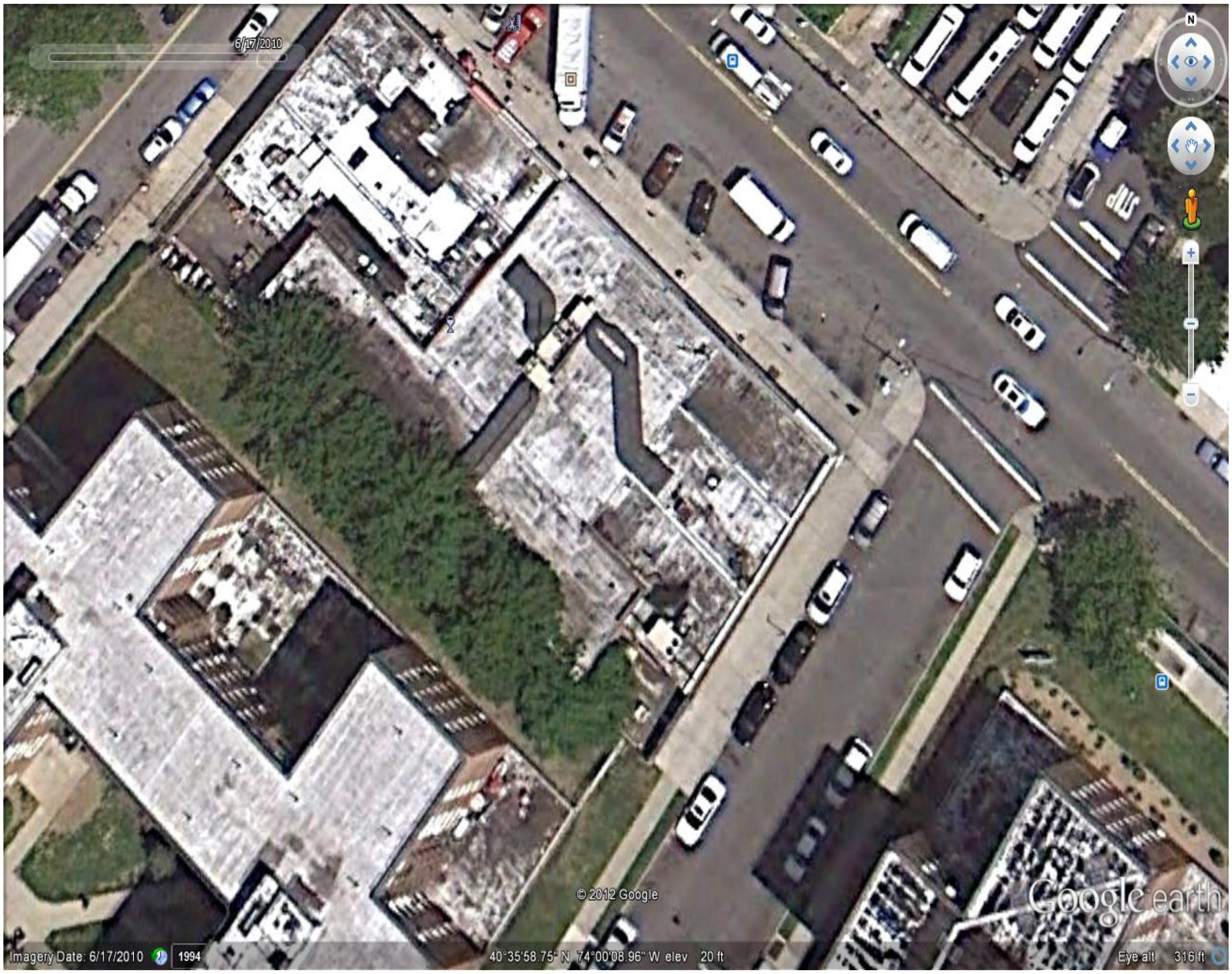
As discussed above, the Site is currently occupied by a shopping center. As shown on **Figure 2** the majority of the Site is either paved or developed with buildings with the exception of a strip of land behind the site.

Current shopping center occupants are as follows:

- T&L Luncheonette Inc. — 2024 Cropsey Avenue, Brooklyn NY
- GLY Cleaners, Inc. — 2022 Cropsey Avenue, Brooklyn NY
- Cropsey Avenue CVS LLC — 2020-2014 Cropsey Avenue Brooklyn, NY
- Grand Nail Spa — 2012 Cropsey Avenue, Brooklyn NY
- MPY International Food Inc. — 2010 Cropsey Avenue, Brooklyn NY
- Eastern Chinese Restaurant — 2008 Cropsey Avenue, Brooklyn NY
- Carla Anna Inc. — 2006 Cropsey Avenue, Brooklyn NY
- AMK Trading Corp. — 2002-2004 Cropsey Avenue Brooklyn NY

As noted, the Site is developed with a shopping center.

Aerial Map of Cropsey Cleaners Site



3.0 REMEDIAL PROGRAM OVERVIEW

3.1 New York State Remedial Program Overview

For more information on the remedial program and process in New York State, interested parties can contact any of the state representatives listed in CCP - Appendix D or visit the NYSDEC Website at: http://www.dec.ny.gov/chemical/8430.html.

3.2 Project Area Investigation History

This section of the work plan discusses the previous investigations that have been performed at the site.

3.2.1 Merritt Limited Investigation

Merritt Environmental Consulting Corp. (Merritt) conducted a limited Subsurface Investigation on February 27, 2012, to evaluate groundwater quality conditions downgradient of the GLY Cleaners facility. The Merritt report indicated that the groundwater flow direction in the vicinity of the Site was not determined during their investigation, but was believed to be "*from roughly north to south towards Gravesend Bay"* which would place the GLY Cleaners facility hydraulically upgradient of the AMA property if correct. Accordingly, it appears as if two of the three borings performed by Merritt were conducted at the side yard of the 8831 and 8841 20th Avenue properties in what was believed by Merritt to be hydraulically down gradient of GLY Cleaners.

The soil/groundwater samples collected by Merritt were field screened; however none of the soil samples were reportedly submitted for laboratory analyses. Tetrachloroethylene (PCE) was detected in all three groundwater samples with the highest concentration recorded at 63,000 micrograms per liter (µg/L). This groundwater sample was collected from the rear of the dry cleaner's space and is assumed to be hydraulically downgradient of the rear of the dry cleaner. The NYSDEC Class GA Groundwater Quality Standard (GWQS) for PCE is 5 µg/L.

Following review of data generated by Merritt, which indicated elevated compound concentrations in the soil borings, NYSDEC and Spill No. 11-13648 was assigned to the Site (i.e. GLY Cleaners, 2022 Cropsey Avenue).

3.2.2 Apex Limited Phase II

Apex completed a soil vapor intrusion (SVI), soil and groundwater investigation on the Site from July 11, 2012 to July 13, 2012. Apex installed three (3) interior soil borings, six (6.) exterior soil borings, three (3) groundwater monitoring wells and five (5) sub slab probesThe complete Apex Limited Phase II is noted as **Appendix A** of the Remedial Investigation Work Plan (RI Work Plan).

3.2.2.1 SVI Sampling

Soil vapor and indoor air quality (IAQ) samples were collected from five (5) co-located locations within the on- site dry cleaner and at the residential parking garage closest to the dry cleaner facility.

The SVI sampling results indicated the presence of elevated PCE and trichloroethene (TCE) concentrations in the soil vapor underlying the dry cleaner and the parking garage. The highest concentrations of PCE and TCE in soil vapor and from samples located beneath the dry cleaner's unit were 420,000 micrograms per cubic meter $\mu g/m^3$ and 6,600 $\mu g/m^3$. The highest soil vapor concentrations from samples collected beneath the residential structures were detected under the parking garage at 8841 20th Avenue. PCE concentrations of 210,000 $\mu g/m^3$ and TCE concentration of 790 $\mu g/m^3$ were detected. Elevated levels of PCE and TCE were also noted in the indoor air quality (IAQ) samples collected in the basement of the dry cleaner. The highest concentrations in IAQ samples were 100 $\mu g/m^3$ PCE and 18 $\mu g/m^3$ TCE. The IAQ samples collected within the parking garage at the residential building did not exhibit elevated levels of PCE or TCE. The maximum concentrations of the parking garage IAQ samples were 4.3 $\mu g/m^3$ PCE and 1.1 $\mu g/m^3$ TCE. Based on the high levels of contamination in sub-slab vapors at all locations sampled, it is very likely that soil vapor contamination extends further to the south and, most likely, further to the east from the source at the dry cleaner facility. The delineation of the extent of elevated soil vapor concentrations of PCE and TCE is the focus of the remedial investigation.

3.2.2.2 Soil Sampling

Nine (9) soil borings were advanced and samples were collected from these borings. In general, there was minimal soil contamination detected by Apex during the ESCs, with the exception of one area located beneath the dry cleaner basement. PCE was detected at 14,000 micrograms per kilogram (µg/kg) (three (3) feet to four (4) feet below grade surface [bgs]) which exceeded the NYS Unrestricted Use Soil Cleanup Objective (SCO) for PCE of 1,300 µg/kg. All other VOCs in all other soil sample locations were; 1. non-detectable above the method reporting limit; 2. detected well below their respective Unrestricted Use SCOs; or, 3. detected at low concentrations in blank samples as well as the characterization samples.

3.2.3.3 Groundwater Sampling

Apex collected nine (9) groundwater samples to assess groundwater quality; three (3) from the newly installed monitoring wells (MW-1, MW-2, and MW-3) and six (6) from temporary wells that originated as soil borings. All samples were sent to the NYS ELAP certified laboratory for NYS TCL VOCs and NYS TCL SVOCs analyses PCE concentrations in groundwater exceeded the Class GA GWQS of 5 µg/L in all nine (9) samples with the highest results detected at MW-1 (2,500 µg/L) and MW-2 (1,400 µg/L). TCE concentrations exceeded the Class GA GWQS of 5 µg/L in three (3) of the nine (9) wells. A PCE degradation product, cis-1, 2-dichlorethene was also detected above its respective Class GA GWQS of 5 µg/L in the same wells as the PCE and TCE exceedances.

The highest concentrations of PCE in the groundwater samples were detected near the courtyard area (located behind the rear dry cleaner door) as well as further to the southwest and southeast. PCE concentrations exceeded 1,000 µg/L along the southeast property line indicating probable off-site migration of the groundwater plume to the south and east, consistent with the inferred groundwater flow direction.

The groundwater concentrations in the sample collected from the expected upgradient well contained a PCE concentration of 14 µg/L. All SVOCs compound concentrations were below their respective Class GA GWQS.

Based upon review of groundwater data, there is a groundwater plume emanating from the dry cleaner facility that is migrating toward the south-southeast. The plume extent is not currently defined and is being addressed in the RI Work Plan.

4.0 CITIZEN PARTICIPATION ACTIVITIES

This section presents the specific citizen participation and outreach activities planned for implementation during the remedial program and to be implemented in accordance with 6 NYCRR Part 375 and DER-23. Operating under project-specific citizen participation goals, clearly defined objectives will be achieved by implementing a range of communication tools and methods. The planned activities are geared toward making project-specific information (e.g., work plans, technical reports, information sheet summaries) available to the public; facilitating communication among stakeholders including the creation of contact lists; scheduling and conducting public meetings; establishing comment periods; and notifying the public of document availability, public meetings, comment periods and major program milestones.

2002 Cropsey Avenue Associates, LLC and the NYSDEC have maintained a limited communications presence in the community near the site throughout the early phases of the project. These activities included briefings of local officials and other interested parties and the publication and distribution of Fact Sheets announcing the Site Characterization. A Fact Sheet has been prepared to announce the start of the Remedial Investigation.

4.1 Goals and Objectives

The central goal of this CPP is to achieve effective, open communication about the Remedial Investigation among stakeholders and interested parties, PRP and the NYSDEC. Common goals include:

- Communicate program goals and major milestones, actions and outcomes;
- Inform citizens and others of ongoing project activities, status and progress;
- Provide citizens (and all stakeholders) a forum for input and comment; and
- Engender a public understanding of constituents of interest, their potential effects on human health and the environment, and appropriate responses to mitigate those effects.

In order to accomplish these goals, the following specific objectives will be pursued through the implementation of this CPP:

- Consistently communicate goals, accomplishments and status of the project to the contact list (including community leaders, public officials and the wider community, as necessary) through appropriate means;
- Establish, maintain, update and utilize the contact lists;
- Educate the community, in lay terms, about the nature and magnitude of potential site risks, including instructions for mitigating risk (if appropriate) and assurances that the environment and worker/public health and safety are protected;
- Provide interested parties the opportunity to review and comment on technical reports generated through the remedial program (e.g., public comment periods and document repository as required by 6 NYCRR Part 375);
- Provide interested parties the opportunity to present opinions and ideas during the remedial program (e.g., conduct public meeting/comment period and availability session as required by 6 NYCRR Part 375); and
- Periodically review the effectiveness of the citizen participation and outreach activities during the remedial program and make adjustments in this CPP's methods and/or activities, if necessary.

The community contact list is provided in CCP 0 Appendix C and 2002-2024 Cropsey Avenue Site Project Management contacts (NYSDEC, NYSDOH and PRP representatives) are provided in CCP - Appendix D.

4.2 Tools and Methods

There are many ways to reach and communicate with the community and other interested parties as this CPP is implemented over the course of the remedial program. A variety of outreach tools and methods will be used to ensure proper communication with the interested parties that include various organizations, public and business leaders, and a diverse assemblage of individuals of all ages, education backgrounds and cultures.

Interested parties will be informed and invited to participate in the planned citizen participation activities through appropriate means such as mailings to the contact list, legal notice in newspapers, press releases, and notices posted on the site's website, information sheets and other documents made available in the document repository.

The following specific public participation activities will be implemented as required by 6 NYCRR Part 375 and current NYSDEC guidance (DER-23).

4.2.1 Document Repository

A Local Document Repository has been established at the New Utrecht Library, which maintain in one file all of the relevant documents related to the Site. A Repository is also maintained at the NYSDEC offices in Albany, New York. Contact information for the Local Document Repository:

New Utrecht Library

1743 86th Street

Brooklyn NY

Attn.: Ms. Tambe John

The following documents are available in the Repository, or will be made available when completed and accepted by the NYSDEC:

- Citizen Participation Plan;
- Remedial Investigation Work Plans (including Supplemental Investigations);
- Final Remedial Investigation Report;
- Feasibility Study;
- Brownfields Cleanup Program Application;
- Final Remedial Design Work Plan;
- Remedial Action Work Plan;

- Remedial Design; and
- Other Materials (e.g., Information Sheets, Notices, etc.).

4.2.2 Public Meetings and Fact Sheets

Milestone Public Meetings will be scheduled by the NYSDEC and Fact Sheets announcing such meetings will be distributed to the site's mailing list. Pursuant to DER-23, a Public Meeting will be scheduled at the time of Proposed Remedial Action Plan. Fact Sheets will be produced and distributed to the Site's contact list at the time the NYSDEC issues a Record of Decision, before the start of Remedial Action after the acceptance of the Remedial Design Report.

4.2.3 Information Newsletters/Handouts

Information newsletters will be prepared and distributed to the contact list in order to announce activities that may impact normal community activities or to announce major project milestones and accomplishments throughout the remedial program. Written in lay terms, information newsletters or handouts will describe and summarize current and planned work on the Site, particularly any which may impact routine community activities.

4.3 Roles and Responsibilities

The specific roles and associated responsibilities for implementing this CPP are:

NYSDEC Remedial Project Manager - The NYSDEC Project Manager is responsible for enforcement, oversight and management of the overall remedial program. Typical citizen participation-related activities include making presentations at public meetings, reviewing project documents such as information sheets and providing technical assistance in preparing the responsiveness summary or answering public inquiries.

NYSDEC Citizen Participation Specialist - The Citizen Participation Specialist assists the project manager in implementing the CPP. Typical activities include preparation and/or review of information sheets and the responsiveness summary and coordination of public meetings and availability sessions.

4.4 Schedule for Implementing Elements of the CPP

Implementing elements of this CPP will depend upon completion by the PRP and final approval by the NYSDEC of various plans and reports required by the Order on Consent governing the Site

5.0 SUMMARY

Guided by the goals and objectives of this CPP, implementation of the planned public outreach and citizen participation activities will ensure the timely communication of important program information of interest to the local community. Citizen involvement and interaction in the remedial program will be facilitated through specific opportunities such as public meetings, public comment periods and the Document Repository. Throughout the remedial program, this CPP and its specific outreach tools and methods will be monitored and, as required and agreed by the NYSDEC and PRP will be adjusted to improve its effectiveness in responding to community needs.

FIGURES

CCP - Appendix A

Glossary of Key Citizen Participation

Terms and Major Program Elements

CCP - Appendix B

Identification of Document Repositories

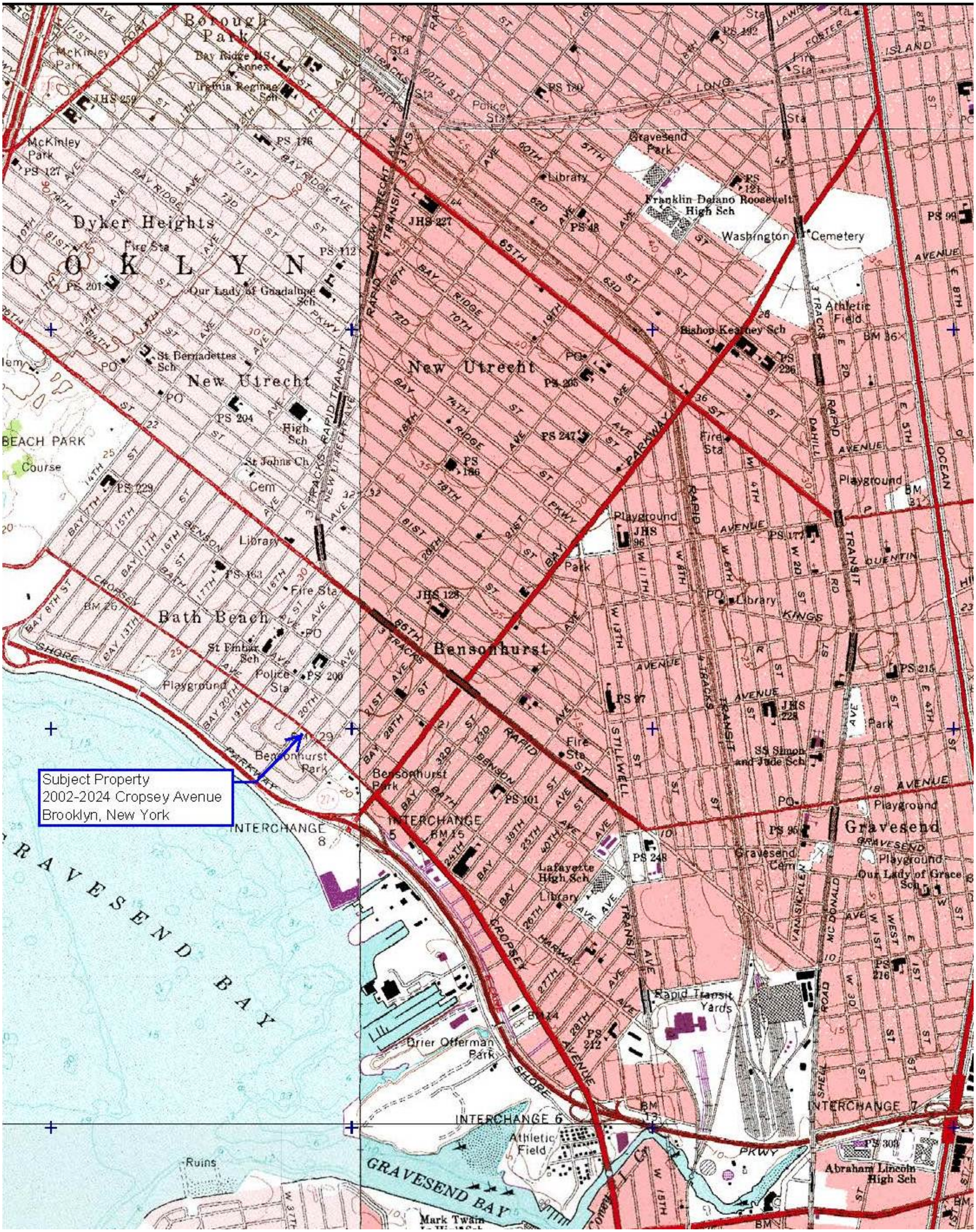
APEX

CCP - Appendix C

Identification of Affected or Interested Parties

CCP - Appendix D

Identification of Project Management Contacts



APEX

Figure 1
Site Location

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: 2002-2024 Cropsey Avenue Site
Date: Revised July 2014

APEX

Figure 2
Site Plan

Client: 2002 Cropsey Associates, LLC
Project No.: 85265.001
Project: 2002-2024 Cropsey Avenue Site
Date: July 2014

GLOSSARY OF KEY CITIZEN PARTICIPATION
TERMS AND MAJOR PROGRAM ELEMENTS

Citizen Participation Plan (CPP) - A document that describes the project-specific citizen participation and outreach activities that will take place alongside the technical components of the remedial program. The CPP also provides project information, citizen participation goals and objectives, and lists of contact persons and document repositories.

Citizen Participation Specialist - An NYSDEC staff member whose duty it is to provide guidance and assistance in carrying out the CPP. The Citizen Participation Specialist is the key contact for public inquiries about the project and the remedial activities.

Contact List - A list in the CPP (Appendix C) containing names and addresses of individuals, groups, organizations, news media and public representatives interested and/or affected by the project. The contact list is used to distribute important information and notices about the project and the remedial program.

Document Repository - Project documents and other information are placed in the Document Repository to facilitate convenient public access to these materials. Documents are available for public reference and review at the offices of Community Board 13. Refer to Appendix B for more information about the Document Repository location.

Feasibility Study (FS) - Based on information gathered during the Remedial Investigation (RI), the FS is a process for developing, evaluating and selecting appropriate Remedial Action (RAs) for limiting or eliminating the potential human and environmental hazards of a site. The FS sets out the goals of the remedial actions to be taken, evaluates the most appropriate alternatives and selects the best alternative based on several criteria. The selected remedy is then recommended for implementation in the Proposed Remedial Action Plan (PRAP), which is subject to public review and comment.

Interim Remedial Measure (IRM) - A discrete action which can be conducted at a site relatively quickly to reduce the risk to people's health and the environment from a well defined waste problem. An IRM can involve cutting and plugging waste conduits, removing contaminated soil and securing a site.

Remedial Design (RD) - This report will include a detailed description of the remedial objectives and the means by which each essential element of the selected remedial alternative will be implemented to achieve those objectives. It incorporates the findings of the FS Report to provide a remedial design which will be implemented during the performance of the cleanup activities at the site.

Remedial Investigation (RI) - A process to determine the nature and extent of contamination at a site by analyzing data collected from sampling (e.g., water, soil, air, etc.) at a site. Information gathered throughout the RI is then used to conduct a Feasibility Study (FS), which proposes and evaluates various remedial alternatives for the site.

Responsiveness Summary - The Responsiveness Summary is prepared by the NYSDEC to address public comments, questions and concerns regarding the proposed remedial action (PRAP) to be taken at a site. The Responsiveness Summary is issued as part of the Remedial Action Program.

Volatile Organic Compounds (VOCs) - Volatile Organic Compounds are typical contaminants found at dry cleaning sites such as Tetrachloroethylene (PCE) and Trichloroethene (TCE).

Identification of Document Repositories

Community Board 13
1201 Surf Avenue
Brooklyn NY 11224
718 266 3001
Attn.: Chuck Reichenthal -- Call for Appointment

NYSDEC
Division of Environmental
Remediation 625 Broadway
Albany, NY 12233-7014
(518) 402-9564
Call for Appointment and Hours

Identification of Affected or Interested Parties

1. Chief Executive Officer and Planning Board Chairperson of Site Location:

   Brooklyn Borough President
   Attention: Eric Adams
   Brooklyn Borough Hall
   209 Joralemon Street
   Brooklyn, New York 11201

   Department of City Planning – City of New York
   Attention: Carl Weisbrod
   Director of City Planning
   Department of City Planning – City of New York
   22 Reade Street
   New York, N.Y. 10007

2. Owners of Subject Property:

   2002 Cropsey Associates, LLC
   2611 West 2nd Street
   Brooklyn, NY

3. Local News Media:

   The following is the local newspaper to be used for required postings and information distribution:

   The New York Post
   1211 Avenue of the Americas
   New York, New York
   212-930-5753

4. Public Water Supplier:

   City of New York Department of Environmental Protection
   59-17 Junction Boulevard, 13th Floor
   Flushing, NY 11373

5. Local Community Board

   Attention: Chair: William Guarinello
   Brooklyn Community Board 11
   2214 Bath Avenue,
   Brooklyn, NY 11214

6. Local Document Repository

   Ms. Tambe John
   New Utrecht Branch Library
   1743 86th Street
   Brooklyn, NY 11214

Identification of Project Management Contacts

New York State Department of Environmental Conservation

Jane O'Donnell
Project Manager
NYSDEC Division of Environmental Remediation
47-40 21st Street
Long Island City, New York 11101

New York State Department of Health
Albert DeMarco
NYSDOH
Bureau of
Environmental
Exposure Investigation
547 River Street
Troy, NY 12180-2216
(518) 402-7880, or
1-(800) 458-1158

SITE SPECIFIC HEALTH AND SAFETY PLAN
2002-2024 CROPSEY AVENUE SITE
Brooklyn, New York

NYSDEC BCP # C224169

Prepared for:

Mr. Peter Neglia
2002 Cropsey Associates, LLC
2611 West 2nd Street
Brooklyn, NY 11223

Prepared by:

Apex Companies, LLC
120-D Wilbur Place
Bohemia, New York 11716

Date Submitted:

December 2014

APEX

SITE SPECIFIC
HEALTH AND SAFETY PLAN
2002-2024 CROPSEY AVENUE SITE

Apex Companies, LLC
120-D Wilbur Place · Bohemia, NY 11716 · T 631.567.1777 · F 631.567.1967 · apexcos.com

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SITE SPECIFIC HEALTH AND SAFETY PLAN

2002-2024 CROPSEY AVENUE SITE
CROPSEY AVENUE, BROOKLYN NEW YORK

NYSDEC BCP# C224169

1.0 INTRODUCTION

Apex Companies LLC. (Apex) has prepared this Site Specific Health and Safety Plan (HASP) for the 2002-2024 Cropsey Avenue Site (the Site) located at 2022 Cropsey Avenue, Brooklyn, New York. The Site occupies a portion of one parcel located along Cropsey Avenue between Bay 25th Street and 20th. The Site location is shown on **Figure 1**.

This HASP has been prepared in accordance with the requirements of the NYSDEC Brownfields Cleanup Program (BCP) (Index# C224169) that was entered into by 2002 Cropsey Associates, LLC and the NYSDEC on May 12, 2014 and approved by the NYSDEC on May 28, 2014.

1.1 Anticipated Hazards

This comprehensive site specific Health and Safety Plan (HASP) is needed for the following types of operations in which employee exposures to safety or health hazards are anticipated:

- Clean-up operations required by a governmental body, which involves hazardous substances that are conducted at uncontrolled hazardous waste sites, including, but not limited to, the EPA's National Priority Site List (NPL), state priority site lists, sites recommended for the EPA NPL, and initial investigations of government identified sites which are conducted before the presence or absence of hazardous substances has been ascertained;

- Corrective actions involving clean-up operations at sites covered by the Resource Conservation and Recovery Act of 1976 (RCRA);

- Voluntary clean-up operations at sites recognized by federal, state, local or other governmental bodies as uncontrolled hazardous waste sites;

- Operations involving hazardous wastes that are conducted at treatment, storage and disposal (TSD) facilities regulated by 40 CFR Parts 264 and 265 pursuant to RCRA, or by agencies under agreement with the USEPA to implement RCRA regulations; and

- Emergency response operations for releases of, or substantial threats of releases of, hazardous substances, without regard to the location of the hazard.

2.0 EMERGENCY RESPONSE/PLANNING

2.1 Emergency Telephone Numbers/Directions to Hospital

The following telephone numbers and directions to the hospital from the site are provided to expedite emergency assistance if needed at the site.

Nearest Hospital:	Coney Island Hospital
	2601 Ocean Parkway
	Brooklyn, NY 11235
	General #: (718) 616-3000
	See **HASP - Appendix A** for map and directions to hospital.
Fire Department:	911 or (718) 999-2000
Police Department:	911 or (718) 236-2611
Ambulance:	911 or (718) 680-1111
CHEMTREC	(Chemical Transportation Emergency Center)
	2501 M Street, NW
	Washington, D. C. 20037
Tel. No.:	800-424-9300
Poison Control Center:	800-336-6997
Project Manager:	
Daniel J. Smith, P.E.	(914) 319-9375 – Cell
	(631) 567-1777 ext. 102 – Office dsmith@apexcos.com – E-mail
Client Contact:	
Peter Neglia	(718) 743-8030 ext. 140 – Office
	PeterN@aptmngt.com – E-mail
Corporate Health and Safety:	
Hal Heckman, CHMM	(610) 722-9050 ext. 216 – Office
	(610) 766-1277 - Cell

2.2 Evacuation Procedures

If evacuation from the site is required due to an emergency such as a fire or explosion, the following action should be taken:

- First person recognizing need for evacuation will immediately notify all on-site personnel via voice, air horn or other means;
- Leave the area and report to a designated rally point established by the Site Health and Safety representative. This evacuation point may vary daily based upon site activities and weather conditions and location should be discussed at the Daily Tailgate Safety Meeting;
- Notify emergency medical services, if appropriate at 911;
- Account for all site personnel;
- Contact the Apex project manager and health and safety representative, and Client contact as soon as practical; and
- Establish site security and control measures for the neighborhood safety until emergency responders arrive and take control.

2.3 Medical Emergency

Response to a medical emergency:

- Initially survey the situation; do not enter an area that could jeopardize your safety;
- Establish the level of consciousness and then call for help, informing the Emergency Medical Service (EMS) of the patient's condition;
- If the person is unconscious, perform a primary assessment by checking for arousal, airway, breathing and circulation. (Only trained First Aid/CPR personnel should perform these tasks; state that you are medically trained);
- Conduct a secondary assessment to the conscious patient by checking for bleeding (control with direct pressure) and monitoring for vital signs;
- Do not move the person unless the location is hazardous;
- Provide First Aid to the level trained; and
- Contact the project manager and health and safety representative as soon as practical and document the incident in a report to the health and safety representative.

2.4 Fire Emergency

Response to a fire emergency:

- Evacuate the area immediately and notify EMS.
- Extinguish small fires with an all-purpose fire extinguisher and provided that you have had training in the use of an extinguisher.
- Contact the project manager and health and safety representative and document the incident; document for the project file and send a copy to the health and safety representative.

2.4 Release of Hazardous Material

Response to a spill or release of hazardous material:

- Wear appropriate PPE and stay upwind of the incident.
- Turn off all sources of ignition and shut down pumps and valves to equipment in the immediate area; if possible, plug leaks and collect drippings in a container.
- Place absorbent around the incident site to soak up hazardous material.
- Call the fire department if potential for a fire exists.
- Determine if the client wants to repair the damage and whether a contractor has to be used.
- Advise the client of any release notification requirements for state or federal agencies and determine who is to complete and submit forms. Submit or report to regulatory agencies only if authorized to do so by client. Completely document interaction with client and regulatory agency. The project manager must contact the client or generator of the spill/release.
- Do not approve for transport, or transport contaminated environmental media until appropriate manifest or shipping paper have been completed and approved. Do not sign any manifest as a generator of waste. Discuss waste transportation issue with Corporate and Division representative prior to resolution for disposal.
- Notification must be made by the client, or by Apex, with permission from the client, to the proper governmental agencies. Spills/releases entering waterways must be reported to the Coast Guard and the National Response Center at 800-424-8802. The New York State Department of Environmental Conservation (NYSDEC) spill hotline is 800-457-7362.

3.0 SITE HISTORY AND DESCRIPTION

3.1 Historical Information on Hazardous Material Usage/Disposal at the Site

Apex was retained to provide environmental consulting services in conjunction with the presence of chlorinated VOCs in soil, soil vapor and groundwater at the Site. Based on previous environmental investigations completed by Merritt, GLY Cleaners is believed to have utilized VOCs as part of their daily operations historically before 2003. Merritt also completed soil borings on the Subject Property that indicated high levels of PCE in groundwater. The NYSDEC was contacted and Spill No. 11-13648 was assigned to the GLY Cleaners facility located at 2022 Cropsey Ave.

Historical environmental reports or other information have indicated that the following contaminants and contaminant levels have been identified at the site:

CONTAMINANTS ANTICIPATED TO BE ENCOUNTERED AT THE PROJECT SITE:

CONTAMINANT	MEDIA	CONCENTRATION RANGE OF CONTAMINANT	COMMENTS
PCE	Groundwater, soil and soil vapor	720 to 63,000 µg/L	In groundwater

These contaminants have the following associated exposure limits established by the Occupational Safety and Health Administration (OSHA), American Conference of Governmental Industrial Hygienists (ACGIH) or the National Institute of Occupational Safety and Health (NIOSH):

OCCUPATIONAL EXPOSURE LIMITS FOR CONTAMINANTS IN AIR

CONTAMINANT	OSHA LIMIT PEL/STEL/C	ACGIH LIMIT TLV/STEL/C	NIOSH LIMIT REL/STEL/C/IDLH
PCE	PEL: 100 ppm (TWA) C: 200 ppm (5 mins.) with max of 300 ppm	N/A	IDLH: 150 ppm

PEL = Permissible Exposure Limit

C = Ceiling Value

TWA = Time Weighted Average

IDLH = Immediately Dangerous to Life or Health

The source of the suspected contamination is from historical operations of the GLY Cleaners facility located adjacent to the Subject Property. The materials safety data sheet (MSDS) for PCE is attached as **HASP - Appendix M**.

3.2 Facility Description/Known or Anticipated Hazardous Areas

The facility consists of an apartment building in a neighborhood comprised of mostly residential areas with commercial corridors. The attached site plan in ***Figure 1-1*** indicates the general location of the project activities. This health and safety plan (HASP) is being prepared for Apex personnel to use, as guidance in conducting work activities at the site is a safe manner.

Known or anticipated hazardous areas on the site include soil, groundwater and soil vapors located below the concrete slab which serves as the base of the building.

4.0 WORK PLAN ELEMENTS

The work plan tasks and task objectives for this project are tabulated below.

PROJECT TASKS AND OBJECTIVES

TASK #	DESCRIPTION	OBJECTIVE
1	SVI Investigation of Subject Property and GLY Cleaners.	Install SVI points and collect sub-slab, interior and exterior air samples.
2	Soil and Groundwater Investigation of GLY Cleaners.	Collection of sub-slab soil samples and installation of groundwater monitoring wells.
3	Soil and Groundwater Investigation of Subject Property.	Install soil borings and collect samples of soil and groundwater.

5.0 HAZARD ANALYSIS AND CONTROL MEASURES

A variety of potential hazards are believed associated with the project scope of work. The following table can be used to identify anticipated hazards for the project based on the project scope of work and site conditions. The hazards have been checked for the project tasks. This hazard checklist has been provided as a guide for developing control measures to be implemented to protect worker health and safety.

HAZARD ANALYSIS MATRIX

HAZARD	SVI	Dry Cleaners	Subject Property
CHEMICAL	X	X	X
BIOHAZARD			
RADIATION			
MECHANICAL	X	X	X
ELECTRICAL			
HEAT STRESS		X	X
COLD STRESS		X	X
BIOMECHANICAL (ERGONOMIC)			
ANIMAL/SNAKE/ INSECT BITES		X	X
POISONOUS PLANTS		X	X
WATER DROWNING			
NOISE	X	X	X
CONFINED SPACES			
UNDERGROUND UTILITIES	X	X	X
OVERHEAD UTILITIES	X	X	X
VEHICULAR		X	X

TRAFFIC			
CONSTRUCTION	X	X	X
LANDFILL or SEWER GASES			
RADON or OTHER GASES			
SLIPS/FALLS	X	X	X
INCLEMENT WEATHER	X	X	X
DRUM HANDLING		X	X
PHYSICAL/BACK INJURY	X	X	X
HIGH CRIME AREA	X	X	X
ACCIDENT PREVENTION	X	X	X
SITE PREPARATION AND RESTORATION	X	X	X
WELDING, CUTTING or BRAZING			
HIGH PRESSURE STEAM, WATER, or AIR			
DUSTY CONDITION	X	X	X

TASK	HAZARD	CONTROL MEASURE
All Project tasks	Chemical	Potential for exposure to contaminated soils, soil vapor and groundwater. Utilize proper PPE and minimize contact with contaminated materials.
All Project tasks	Mechanical	Proper implementation of PPE including hard hats, steel toe boots and reflective work vests if necessary. Make sure everybody in the work zone is aware of all operations taking place.
All Outdoor Activities	Heat Stress	Know signs and symptoms of heat stress-related illnesses. Block out direct sunlight or other heat sources. Use cooling fans / air-conditioners if needed. Drink lots of water. Wear lightweight, light colored loose-fitting clothes. Avoid alcohol, caffeinated drinks or heavy meals. See **HASP - Appendix J**.
All Outdoor Activities	Cold Stress	Know signs and symptoms of cold stress-related illnesses. Make sure all personnel are properly dressed with hat, gloves, boots etc. Provide a warm and dry area on site to relieve any person showing signs of cold stress. Provide warm and sweet drinks to those showing signs of cold stress. See **HASP - Appendix I**.
All Outdoor Activities	Animal / Snake / Insect Bites	Wear full length pants and long sleeved shirts in light colors in order to visually detect any insects on your body. Tuck your pant legs into your socks. Keep a cold pack and a means of washing any wounds resulting from animal bites. Educate workers on signs and symptoms of animal bites as well as emergency response. **See HASP - Appendix G**.
All Outdoor Activities	Poisonous Plants	Wear long sleeved shirts and pants tucked into boots. Wear cloth or leather gloves. Apply barrier creams to exposed skin. Educate workers on identification of poisonous plants. Educate workers on signs and symptoms of poisonous plant contact. See **HASP - Appendix G**.
All Project Tasks	Noise	Provide all workers with a means of reducing noise exposures including earplugs and headsets. Keep the source of noise to a minimum. Do not warrant the length of high decibel noise exposure to last long enough to affect the hearing of any employees.

All Project Tasks	Underground Utilities	See Section 16.0.
All Project Tasks	Overhead Utilities	See Section 17.0.
All Outdoor Activities	Vehicular Traffic	Be aware of traffic patterns at all times.
All Project Tasks	Construction	All workers must be aware of their surrounding during construction activities. Wear proper PPE.
All Project Tasks	Slips/Falls	Wear appropriate foot-wear. Do not stand closely to banks of excavated areas. Evaluate the area ahead of you before entering unknown areas. See **HASP -Appendix L**.
All Outdoor Activities	Inclement Weather	All workers will be prepared for all types of weather anticipated. Should be prepared with a dry set of clothes, rain-jackets, and dress in layers in order to adjust to changes in weather.
All Outdoor Activities	Drum Handling	Workers will follow proper procedure for moving and storing drums. They will then be properly labeled for disposal.
All Project Tasks	Physical / Back Injury	All workers shall use proper technique when moving heavy items on site. Bending at the knees and using your back minimally to move items is important to the health of all personnel on site.
All Project Tasks	High Crime Area	Be aware of your surroundings and ensure that a communication device is always on in case of an emergency.
All Project Tasks	Accident Prevention	See **HASP - Appendix K**.
All Project Tasks	Site Preparation and Restoration	See **HASP - Appendix H**.
All Project Activities	Dusty Condition	Proper PPE should be worn at all times to prevent damage to the eyes. Wetting surfaces that may produce dust before performing work should be completed.

6.0 ENVIRONMENTAL MONITORING PROGRAM

6.1 Air Monitoring

Photo-Ionization Detector (PID) readings will be taken periodically and documented in an air-monitoring log. Instruments must be calibrated according to manufacturer's recommendations.

Action Levels for Worker Breathing Zone

Instrument	Action Level	Level of Respiratory Protection/ Action
PID	Background to 25ppm (one minute sustained in BZ)	Level D
PID	>25 to 250 ppm (one minute sustained in BZ)	Utilize APR[2] (Level C)
PID	>250 to <500 ppm (one minute sustained in BZ)	Level B
PID	>500ppm **IDLH level**	Stop Work[3] (ventilate, apply foam, etc.)

6.2 Noise Monitoring Program

Unprotected exposure to high levels of continuous or impulse noise can cause permanent hearing loss. The greater the intensity, the higher the frequency, and/or the longer the exposure, the more damaging is the effect on the auditory mechanism and the loss of hearing. OSHA requires a hearing conservation program if noise levels exceed a time weighted average of 85 dBA. Noise levels in excess of 85 dBA are possible at worksites given the nature of the work activities.

OSHA's permissible exposures levels are presented in the table below.

Permissible Noise Exposures

DURATION PER DAY (hours)	SOUND LEVEL SLOW RESPONSE (dBA*)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115**

** Decibels A-weighted.*
*** Maximum exposure of 115 dBA for 15 minutes or less.*
Impact (impulsive) noise limited to a maximum of 140 dBA (peak);
Various combinations of duration and intensity are permissible; and
Exposure limits for various durations, pursuant to Table G-16 of 29 CFR 1910.95.

6.3 Community Air Monitoring Program (CAMP)

The entire ground-intrusive intrusive field activities (e.g., excavation, sampling, etc.) will be conducted in accordance with NYSDOH generic CAMP program included in the DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010 (**Appendix D** of the RI Work Plan).

The following CAMP activities will be conducted:

- All monitoring activities will be conducted on a continuous basis during periods when any of the aforementioned activities are being conducted;
- The portion of the subject property where these activities are being conducted will be delineated by traffic-exclusion devices and designated as an exclusion zone;
- The presence of VOCs will be monitored continuously utilizing a PID along the downwind perimeter of the exclusion zone;
- The presence of respirable particulates (i.e., less than 10 micrometers in size [PM-10]) will be monitored utilizing an appropriate field screening instrument both upwind and downwind of the exclusion zone. Further, the presence of visible dust leaving the exclusion zone will be continuously monitored. It is expected that sprayed water will be required as a dust-suppression technique.

7.0 EXCAVATION ACTIVITIES

There will be minor excavation activities associated with this project (installation of hand augured borings and borings by drilling equipment). It is the responsibility of each supervisor to implement and maintain the procedures and steps set forth in this program. All employees working in and around the excavation must be trained in the recognition of hazards associated with trenching and excavating. Each employee involved with excavation and trenching work is responsible to comply with all applicable safety procedures and requirements of this program. The competent person assigned to any excavation/trenching activities provides oversight and collects data to determine the effectiveness of protective systems, PPE, and personnel safety. The competent person must be trained in accordance with the most recent version of the OSHA Excavation Standard, and all other programs that may apply and must demonstrate a thorough understanding and knowledge of the programs and the hazards associated.

All other employees working in and around the excavation must be trained in the recognition of hazards associated with trenching and excavating.

7.1 General Requirements

Before any work is performed and before any employees enter the excavation, a number of items must be checked and insured:

- Underground utility locations must be determined. Verification of utility locations will be conducted by the competent person.
- All overhead hazards (surface encumbrances) that create a hazard to employees must be removed or supported to eliminate the hazard;
- A competent person will inspect all excavations and trenches daily, prior to employee exposure or entry, and after any rainfall, soil change, or any other time needed during the shift.
- Excavations and trenches that have the potential for toxic substances or hazardous atmospheres will be tested at least daily by the competent person. A log of the test results must be kept at the work site;
- Adequate protective systems will be utilized to protect employees. This can be accomplished through sloping, shoring, or shielding;
- If a trench or excavation is four feet or deeper, stairways, ramps, or ladders will be used as a safe means of access and egress. For trenches, the employee must not have to travel any more than 25 feet of lateral travel to reach the stairway, ramp, or ladder;
- Walkways shall be provided where employees or equipment are required or permitted to cross over excavations. Guardrails, which comply with 1926.502(b), shall be provided where walkways are six feet or more above lower levels;

- Workers must be supplied with and wear any PPE deemed necessary to assure their protection;

- Employees shall not work in excavations in which there is accumulated water, or in excavations, in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

- If water is controlled or prevented from accumulating by the use of water removal equipment, a competent person must ensure proper operation and shall monitor the water removal equipment and operations.

- All spoil piles will be stored a minimum of two (2) feet from the sides of the excavation. The spoil pile must not block the safe means of egress.

- No personnel shall be permitted underneath loads handled by lifting or digging equipment. Workers shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any falling materials.

8.0 CONFINED SPACES

There are not confined space entries anticipated for this project. A confined space has the following characteristics:

- It is a space or work area large enough to physically enter to perform assigned work;

- It is a space or work area not designed or intended for continuous human occupancy;

- It is a space or work area having limited means of access and egress.

In order for a confined space to be defined as a permit-required confined space, one or more of the following characteristics must be true:

- The space contains or has a potential to contain a hazardous atmosphere;

- The space contains a material that has the potential for engulfing an entrant;

- The space has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

- The space contains any other recognized serious safety or health hazard.

However, should confined spaces be identified during the project and work personnel be required to enter to perform needed tasks, no Apex Companies, LLC or Apex subcontractors shall enter such an area without having training that meets OSHA requirements in 29 CFR 1910.146. Rescue arrangement will need to be arranged in advance of such activities and all involved personnel will be trained in the OSHA requirements for entrants, attendants and supervisors. A permit will be required for such work and will be posted at the entrance to the confined space.

9.0 ENVIRONMENTAL, SAFETY AND HEALTH ROLES AND RESPONSIBILITIES OF PROJECT PERSONNEL

The following table summarizes personnel responsibilities at the job site. This information should be reviewed with all project personnel prior to commencing site activities.

ROLES AND RESPONSIBILITIES OF PROJECT PERSONNEL

PERSONNEL	ROLES AND RESPONSIBILITIES
Program Managers	• Provides direction, management and resources to achieve goals and objectives of project • Responsible for developing and implementing systems to ensure employees follow the HASP • Responsible for general safety performance of employees and implementing a phased disciplinary program for employees violating health and safety programs • Assigns and communicates safety and health responsibility to subordinates and holds subordinates accountable for their performance
Project Managers	• Ensures that specific work tasks are properly prioritized, planned and conducted in a safe manner • Verifies all site workers meet OSHA regulatory requirements • Provides resources and equipment necessary to conduct and execute assigned tasks in a safe manner • Designates an adequate number of health and safety specialists with the necessary authority and responsibility to develop and implement the HASP and to verify its effectiveness • Provides periodic health and safety program reviews/audits to ensure program effectiveness and quality
Health and Safety Specialists	• Provides technical expertise necessary to carry out requirements and support work activities • Provides training on the HASP, Hazard Communication, and other project specific health and safety training • Implements and enforces HASP requirements, with project personnel assigned to work under their jurisdiction • Conducts initial site safety review and conducts exposure and environmental monitoring • Ensures that adequate safety controls are maintained • Obtains related information on suspect hazardous materials to facilitate preparation of hazardous material abatement • Ensures that appropriate health and safety-related project documentation is maintained for the project
Site Laborers	• Conduct work in a safe manner in accordance with the HASP, other applicable safe work procedures and controls specified in permits

	• such as hot work or confined space entry permits • Appropriately uses assigned personal protective equipment • Observes their work area surroundings for potential safety issues • Reports unsafe work conditions or practices to the health and safety specialist/site safety and health officer • Initiates feasible personal action to eliminate/mitigate unsafe conditions
Visitors	• Remain outside designated work zones unless authorized by Project Manager to enter hot or contamination reduction zones wearing appropriate PPE • Comply with all site specific HASP requirements including safe practices and levels of PPE • Comply with training, medical surveillance and other requirements of the HASP, if access is permitted on the site

10.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) AND CLOTHING

The minimum level of PPE to be worn for this project is (fill in Level of PPE required). All work activities will commence in Level D PPE. Air monitoring results will determine whether PPE will need to be upgraded to Level C or Level B. Whenever high pressure water rinsing is conducted, workers in the immediate area of the washer must wear a face shield in addition to Level D PPE.

CATEGORIES OF PPE

LEVEL OF PPE	PERSONAL PROTECTIVE EQUIPMENT
A	• Positive pressure full face-piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved) • Totally encapsulating chemical –protective suit • Coveralls[1] • Long underwear[1] • Gloves, outer, chemical-resistant • Gloves, inner, chemical-resistant • Boots, chemical-resistant, steel toe and shank • Hard hat (under suit)[1] • Disposable protective suit, gloves and boots (depending on suit construction, may be worn over totally-encapsulating suit)
B	• Positive pressure, full-face piece self-contained breathing apparatus (SCBA), or positive pressure supplied air respirator with escape SCBA (NIOSH approved) • Hooded chemical-resistant clothing (overalls and long-sleeved jacket; coveralls; one or two-piece chemical-splash suit; disposable chemical-resistant overalls) • Coveralls[1] • Gloves, outer, chemical-resistant • Gloves, inner, chemical-resistant • Boots, outer, chemical-resistant, steel toe and shank • Boot-covers, outer, chemical-resistant (disposable)[1] • Face shield[1] • Hard hat[1]
C	• Full-face or half-mask, air purifying respirators (NIOSH approved) • Hooded chemical-resistant clothing (overalls; two-piece chemical-splash suit; disposable chemical-resistant overalls) • Coveralls[1]

	• Gloves, outer, chemical-resistant • Gloves, inner, chemical-resistant • Boots, outer, chemical-resistant steel toe and shank[1] • Boot-covers, outer, chemical-resistant (disposable)[1] • Hard hat[1] • Escape mask[1] • Face shield[1]
D	• Coveralls • Gloves[1] • Boots/shoes, chemical-resistant steel toe and shank • Boots, outer, chemical-resistant (disposable) [1] • Safety glasses with side shields, or chemical splash goggles • Hard hat • Escape mask[1] • Face shield[1] • Traffic vest[1] • Cooling vest[1]

[1] optional, as applicable

TYPES OF HAZARDS FOR WHICH LEVEL A, B, C AND D PPE ARE APPROPRIATE

PPE LEVEL	WHEN TO USE
A	• The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured, or potential for, high concentration of atmospheric vapors, gases, or particulates of materials that are harmful to skin; • The site operation and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin; • Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or, • Operations are being conducted in confined, poorly ventilated areas, and the absence of conditions requiring Level A has not yet been determined.
B	• The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection; • The atmosphere contains less than 19.5% oxygen; or, • The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin. • Use of Level B involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a sever skin hazard, or do not meet the criteria for use of air-purifying respirators.
C	• The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin; • The types of air contaminants have been identified, concentrations measured, and an air-purifying respirator is available that can remove the contaminants; and, • All criteria for the use of air-purifying respirators are met.
D	• The atmosphere contains no known hazard; and, • Work functions preclude splashes, immersion, or the potential for unexpected inhalation of, or contact with hazardous levels of any chemicals.

Combinations of personal protective equipment other than those described for Levels A, B, C, and D protection may be more appropriate and may be used to provide the proper level of protection.

The table below lists the minimum initial level of personal protective equipment required for each task of the project scope of work.

MINIMUM PPE LEVEL FOR EACH TASK

TASK	LEVEL OF PPE	COMMENTS
1	Level D.	Eye protection must be worn during events that create dust.
2	Level D.	Eye protection must be worn during events that create dust.
3	Level D.	Eye protection must be worn during events that create dust.

10.1 Respiratory Protection Program

To control the incidence of occupational diseases, OSHA requires that hazardous air contaminant levels at Apex project sites be reduced to the lowest possible levels by instituting engineering controls and work practices designed to prevent atmospheric contamination. However, when such controls are not feasible or while they are in the process of being instituted, respirators may be used as a means of controlling employee exposure to hazardous air contaminants. The policies and procedures found in Apex's Respiratory Protection Program are to be followed whenever respirators are used to control personal exposures to hazardous airborne substances.

All site workers required to wear respiratory protection must be included in a medical surveillance program. No worker on the project site is permitted to wear a respirator unless that individual has been medically qualified and has been found to be physically fit to wear respiratory protection, has had appropriate training on the use and limitations of the respirator and is knowledgeable of the requirements of the employer's Respiratory Protection Program.

11.0 PROJECT STANDARD OPERATING PROCEDURES AND PRACTICES

All site personnel must adhere to the following standard operating procedures and practices:

All safety equipment and protective clothing is to be kept clean and well maintained.

All prescription eyeglasses in use will be safety glasses and will be compatible with respirators. Contact lenses should not be worn in areas where there is a potential for injury to the eye due to particulate, fume, vapors, gases or other air contaminant.

The Safety Officer will approve all disposable or reusable gloves worn on the site.

During periods of prolonged air-purifying respirator usage in contaminated areas, respirator filters will be changed according to the change-out schedule for the project, or sooner, if breakthrough is indicated. At a minimum, respirator cartridge filters will be changed on a daily basis.

Footwear used on site will be covered by rubber over boots when entering or working in the “hot zone” or “contamination reduction zone”. Boots will be washed with water and detergent to remove dirt and contaminated sediment before leaving these work zones.

All personal protective equipment (PPE) used on site will be decontaminated or disposed of at the end of the workday. The Safety Officer will be responsible for ensuring decontamination of personal protective equipment before reuse.

All respirators will be individually assigned and not interchanged between workers without cleaning and sanitizing.

Any site personnel unable to pass a fit test as a result of facial hair or facial configuration shall not enter or work in an area that requires respiratory protection.

All project personnel shall have a vision or corrected vision to at least 20/40 in one eye.

On-site personnel found to be disregarding any provisions of the HASP or SOP will, at the request of the Safety Officer, be barred from the project.

Used disposable outerwear will be removed upon leaving the hot zone and will be placed inside disposable containers provided for that purpose. These containers will be stored at the site at the designated staging area and the Contractor will be responsible for proper disposal of these materials at the completion of the project.

Tyvek™ suits, or other outer garments, which become torn or badly soiled will be replaced immediately.

Eating, drinking, chewing gum or tobacco, smoking, etc., will be prohibited in the hot and contamination reduction zones.

All personnel will thoroughly cleanse their hands, face, forearms and other exposed areas prior to eating smoking, drinking, or using the toilet facilities.

Showers at the end of the shift are required for personnel who have worked in the hot zone.

No alcohol or drugs (without prescription) will be allowed on-site at any time. Firearms are only allowed for security purposes, if allowed by the local law enforcement agency.

All personnel who are on medication should report it to the Safety Officer who will make a determination whether or not the individual be allowed to work and in what capacity. The Safety Officer may require a letter from the individual's personal physician stating what limitations, if any, the medication may impose on the individual.

At least one copy of these work practices shall be available for review at the job work site.

Legible and understandable, precautionary labels shall be affixed prominently to containers of contaminated scrap, waste, debris and clothing.

Removal of contaminated soil from protective clothing or equipment by blowing, shaking or any other means that disperse contaminants into the air is prohibited.

Transportation and disposal of contaminated materials shall comply with all applicable local, state, and federal regulations. The transporter and disposer will address these items.

Drummed contaminated materials shall be stored in tightly closed containers in well-ventilated areas.

Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.

All trenching, shoring and excavation work must comply with all federal OSHA rules.

Portable or fixed emergency shower/eyewash stations shall be located near work activities and routinely checked to ensure that the equipment is functioning.

Before daily site operations begin, a tailgate safety meeting will be held to review the HASP concerns for the work activities and emergency response procedures. The Daily Tailgate Safety Meeting Logs will be maintained as part of the HASP. The Daily Tailgate Safety Meeting Form and Topics Guide are located in **HASP - Appendix C.**

Smoking is not permitted in the site's hot or contamination reduction zones.

A change in level of protection will be based on air monitoring equipment readings taken in the breathing zone.

Field personnel will use air monitoring equipment and not their nose to determine site contamination (i.e., sniffing sampled soils or water in jars, confined spaces, open bore holes or trenches, etc.). Odors detected during the course of standard operating procedures, however, should be noted in the daily log.

Field personnel should not stand with their head directly over a container of hazardous material or well when it is being opened.

Events surrounding accidents/injuries will be recorded in the daily log. Document the incident on Apex's Incident Report and submit copies within 24 hours to incidents@apexcos.com.

First aid kit(s) and fire extinguisher(s) will be available in all company vehicles and on project sites for responding to emergency situations.

Workers will not stand on drums.

All welding, cutting, burning, grinding or other open flame work in close proximity to the environmental/construction work site will require the issuance of a "Hot Work Permit".

Lockout-tag out procedures will be followed prior to performing any work on equipment for controlling hazardous energy.

Only authorized entrants, attendants and supervisors trained in confined space entry procedures will be permitted to enter and conduct work in confined spaces. OSHA confined space entry standard requirements must be complied with.

Use of a "buddy system" will be used in hazardous areas.

Engineering controls and work practices shall be instituted to reduce and maintain employee exposure to, or below, the permissible exposure limits (PEL) for substances regulated by OSHA, except to the extent that such controls and practices are not feasible.

Where feasible, engineering controls should include the use of pressurized cabs or control booths on equipment, and/or the use of remotely operated material handling equipment.

Work practices should be implemented, where feasible, such as removing all non-essential employees from potential exposure during opening of drums, wetting down dusty operations and locating employees upwind of possible hazards.

11.1 Tailgate Safety Meetings

Tailgate safety meetings are an important element of Apex's Safety Program. They are an effective training aid and an essential means of increasing an employee's hazard awareness and improving job performance. Daily Tailgate Safety Meeting shall include, as a minimum, the following:

- Review of all Safety Bulletins and other important topics that relate to the work;
- Instructions in the safe and efficient planning and performance of their work;
- Review of project accidents, injuries, illnesses, near misses, hazards and unsafe acts; and
- Discuss other suggestions and comments relating to safety.

All project employees will attend the daily Tailgate Safety Meetings. The subject material shall be pertinent to the work being performed or to be performed in the near future. Records of all Tailgate Meetings will be maintained at the site (**HASP - Appendix C**).

11.2 Training and Briefing Topics

Site-specific training will include information needed to ensure that the personnel working at the site are able to respond effectively to emergencies. This segment of the training will include a description of the communications systems to be used and the procedures for responding to fires and other emergencies. Briefings will be provided prior to site entry and, as required, each morning before work begins and after each day's field activities have been completed. The SSHO will document topics addressed in these briefings and those in attendance. The SSHO will hold and document supervisory safety meetings to assess work performance.

11.3 Equipment Operators

All operators of heavy equipment, (e.g., backhoe operators, welders, and explosive-actuated tool operators), must be qualified and experienced. Equipment operators can demonstrate qualifications through specific training, experience, field demonstration or a combination of all. These qualifications must be presented to the SSHO or PM. Only those operators qualified to operate a particular type of machinery may operate that type of machinery.

11.4 Documentation

For each day that on-site health and safety monitoring is performed, daily reports will be prepared which record air monitoring results (if applicable), daily site activities, and health and safety action items. Reports will be submitted to the appropriate personnel as necessary. All personal and environmental monitoring will be made part of the permanent project record. All safety inspections will be conducted by the SSHO on a daily basis as needed.

Training and medical records for personnel shall be made available for inspection by the SSHO prior to job start. Also, subcontractors are required to make training and medical records available for inspection, as required.

12.0 VIOLATIONS OF THE HASP

Apex will not tolerate violations of the HASP including standard operating procedures. Apex has the right to remove any individual who violates safety practices. Disciplinary measures are at the discretion of the Safety Officer and will be commensurate with the severity of the infraction. It is the responsibility of each individual to understand and comply with safety procedures and request clarification as needed. Supervisors carry additional oversight and enforcement responsibilities and, consequently, disciplinary measures will be more severe. The following guidelines apply for minor infractions for Apex employees and Apex contract employees:

- First infraction: verbal warning with no further action if individual corrects infraction immediately and acknowledges the infraction.
- Second infraction: written warning and possible time off site without pay to review safety procedures.
- Third infraction: individual banned from the site.

For serious or imminent hazards, safety violations will result in temporary or permanent banishment from the site.

13.0 TRAINING REQUIREMENTS

Site workers must have completed the following training programs:

- Field personnel must complete 40 hours of hazardous waste activity instruction (OSHA 29 CFR 1910.120/1926.65);
- Field personnel must complete 24 hours of supervised field instruction (29 CFR 1910.120/1926.65);
- Field personnel must complete 8 hours of refresher training each year (29 CFR 1910.120/1926.65);
- On-site supervisors/managers directly responsible for employees engaged in hazardous waste operations must have an additional 8 hours of supervisory training (29 CFR 1010.120/1926.65);
- Field personnel assigned to provide first aid assistance at the site must be trained in first aid/cardio-pulmonary resuscitation (CPR) and blood borne pathogens training (1926.50)
- All site personnel must attend and participate in "Daily Safety Tailgate Meeting and document attendance (29 CFR 1910.120);

- Competent person training (29 CFR 1926, Subpart P) for on-site managers and supervisors (subcontractor) directly responsible for employees engaged in excavation/trenching operations;
- Hazard communication training on any hazardous substance's chemical and physical properties (29 CFR 1910.1200);
- Personal protective equipment training for personnel required to wear protective clothing (29 CFR 1910.132 and 134);
- Personnel performing air monitoring must be trained in the calibration, and operation of instrumentation used at the site (29 CFR 1910.120);
- Personnel required to extinguish small fires on site are required to be trained in the proper use of a fire extinguisher (29 CFR 1910.156/1926.150);
- All site personnel must review this HASP and be able to obtain emergency information, if needed. They must also be familiar with established emergency response and evacuation procedures for the site. This information is to be reviewed with all project personnel prior to commencement of field activities (29 CFR 1910.120);
- Workers required to enter confined spaces must be trained in the requirements of confined space entry (29 CFR 1910.146);
- Workers required to provide first aid must be trained in the hazards of blood borne pathogens (29 CFR 1910.1030);
- Other training, as required, to comply with OSHA health and safety standards.

14.0 MEDICALSURVEILLANCE

Medical surveillance consisting of a baseline, annual and termination examination are required of all Apex employees and subcontractors, whose job may require working in environments with potential exposure to health hazards such as hazardous waste, petroleum products, materials, noise, lead and crystalline silica. Examination criteria and frequency will be determined by Apex's and subcontractor occupational physicians based upon guidance and regulatory requirements provided in the applicable OSHA Hazardous Waste Operation and Emergency Response Regulation (29 CFR 1910.120 or 29 CFR 1926.65). More frequent examinations may be performed at the recommendation of a qualified occupational physician.

Apex and subcontractors are also required to retain and provide employee access to medical and exposure monitoring records in compliance with OSHA 29 CFR 1910.1020 or 1926.33, Access to Employee Exposure and Medical Records.

14.1 Heat Stress Evaluation

Heat stress is not anticipated to be a significant health and safety issue associated with this project due to the nature of the hazards anticipated to be encountered or because of the time of the year the work is being conducted. The four forms of heat stress include heat rash, heat cramps, heat exhaustion and heat stroke. It is very important to be able to recognize symptoms associated with the various forms of heat stress and to know first aid measures. A table listing forms and symptoms of heat stress is located below. More specific information on heat stress from Occupational Safety and Health Administration (OSHA) is located in **HASP - Appendix J** as a reference. This information should be reviewed with employees prior to commencing the project.

FORMS AND SYMPTOMS OF HEAT STRESS

FORM	SYMPTOMS	FIRST AID MEASURES
Heat Rash	• Prickly heat • Slight to extensive skin irritation could occur	• Keep skin clean and dry for at least 12 hours per day • Change wet clothing
Heat Cramps	• Skin is sweaty • Painful muscle spasms • Body temperature is normal	• Provide fluids • Gently massage cramped muscles
Heat Exhaustion	• Clammy or pale skin • Weakness and fatigue • Profuse sweating • Nausea, vomiting • Disorientation • Headache • Normal or slightly elevated body temperature	• Remove from heat • Loosen clothing • Sponge skin with cool water • Fan victim; stop if victim shivers or develops goose bumps • Give fluids; give victim a drink solution of one pint water and one teaspoon salt every 30 minutes until recovers • Obtain medical help if victim does not improve
Heat Stroke	• Unconsciousness or mental confusion • Dizziness • Staggered walk • Appears to be agitated • Hot, dry skin • Extremely high body temperature; could reach 105° F	• Get emergency medical aid immediately • Remove victim from heat • Remove clothing, place victim in a cool bath, or apply cool compresses • Do not give any fluids • Do not leave victim alone • Do not allow victim to become so cold that victim shivers • Do not give aspirin or other medication in an attempt to lower fever

14.2 Cold Stress Evaluation

The stress of working in a cold environment can cause a variety of strains on the body including constriction of blood vessels of the skin, shivering, localized frostbite, and generalized hypothermia. The frequency of accidents may be higher in cold environments. Nerve impulses are slowed; exposed workers react sluggishly, fumble with their hands and become clumsy. There are also safety problems common to cold environments. They include ice, snow blindness, reflection from snow and the possibility of burns from contact with cold metal surfaces. More information could be found in **HASP - Appendix I**.

Hypothermia is caused by a decrease in core body temperature below 96ºF. The central (brain and spinal cord) and peripheral (skin and muscle) activity normally maintains the body temperature. Interference with any of these mechanisms can result in hypothermia, even in the absence of what is usually considered a “cold” ambient temperature. Symptoms of hypothermia include shivering, apathy, listlessness, sleepiness, and unconsciousness.

Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperature drops below freezing and usually less than 2ºF. Symptoms of frostbite include a sudden blanching or whitening of the skin. The skin has a waxy or white appearance and is firm to the touch. Affected tissues are cold, pale and solid.

Prevention of cold-related illness can be aided by educating workers on recognizing the symptoms of frostbite and hypothermia and by identifying and limiting known risk factors. The workers should be provided with enclosed, heated shelters on, or adjacent to, the worksite, dry changes of clothing and warm drinks. When working in extremely cold climates, frequent work breaks should be encouraged.

The following table provides symptoms associated with a drop in core body temperature.

PROGRESSIVE CLINICAL SYMPTOMS OF HYPOTHERMIA

CORE BODY TEMPERATURE (ºF)	SYMPTOMS
99.6	Normal core body temperature
96.8	Metabolic rate increases
95.0	Maximum shivering
93.2	Victim conscious and responsive
91.4	Severe hypothermia
89.6-87.8	Consciousness clouded, blood pressure difficult to obtain, pupils dilated but react to light, shivering ceases
86.0-84.2	Progressive loss of consciousness, muscular rigidity increases, pulse and blood pressure difficult to get, respiratory rate decreases
78.8	Victim is seldom conscious
64.4	Lowest accidental hypothermia victim to recover

Apex employees must be trained to minimize the risk of the hazards of working in cold environments and periodically reinforced in the recognition of the physiologic responses of the body to cold stress. The use of insulated work clothing, warm shelters and work/warming regimens should be used to minimize the potential hazards of cold stress. Also, special attention should be given to equipment warm-up time and freeze protection for vessels, piping, equipment, tools, and walking/working surfaces. The American Conference of Governmental Industrial Hygienists (ACGIH) TLVs for cold stress should be used as a guideline.

Control measures to prevent cold related symptoms include:

- Prevent continuous exposure of skin when the wind-chill factor results in an equivalent temperature of -32C (-26F). Workers exposed to air temperatures of 2C (35.6F) or lower who become immersed in water or whose clothing gets wet should change into dry clothing immediately and be treated for hypothermia.
- Use heated warming shelters such as tents and cabins when work is performed continuously in an equivalent chill temperature of -7C (20F) or below.
- Ensure frequent intake of warm, sweet, caffeine-free, non-alcoholic drinks or soup.
- Minimize sitting still or standing for long periods of time.
- Ensure use of appropriate PPE.

The correct clothing depends on the specific cold stress situation. It is important to preserve the air space between your body and the outer layer of clothing in order to retain body heat. The more air pockets each layer of clothing has, the better the insulation. However, the insulating effect is negated if the clothing interferes with the evaporation of sweat, or if the skin or clothing is wet.

15.0 RECORD KEEPING REQUIREMENTS

This is a relatively long-term project, which will have the first phase conducted in one day and the O&M conducted as-needed for several months. At a minimum, the following records should be maintained at the project site in Apex's possession: (select only those items that are appropriate for the project):

- The Health and Safety Plan including emergency response, contingency, evacuation plans and Acknowledgement page;
- Environmental monitoring data;
- Equipment calibration records;
- Visitor log;
- Daily Tailgate Safety Meeting logs and summaries of meetings;
- Copies of HAZWOPER, first aid and other training records;
- Copies of medical clearances;
- OSHA 200 Injury and Illness Log and injury/illness/incident reports;
- OSHA citations, if any, must be posted in conspicuous location for specified time;
- Right-to-Know poster and other mandatory federal and state posters;
- An Assured Equipment Grounding Conductor Program, if applicable;
- A Confined Space Entry Program, if applicable;
- Lockout-Tag-out Program, if applicable;
- Respiratory Protection Program and fit testing records, if applicable;
- Blood-borne Pathogens Exposure Control Plan, if applicable;
- Material Safety Data Sheets or other references for hazardous materials on the project site;
- Hearing Conservation Program, if applicable;
- Hazard Assessment for PPE (usually part of HASP);
- Fall Protection Plan for Construction;

- Hazardous Waste Manifests;
- Hazard Communication Program;
- OSHA Job Safety and Health Poster-Form 2203;
- Emergency phone numbers (in HASP);
- Wage and Hour Division: Family and Medical Leave Act posting; and
- Equal Employment Opportunity Commission: Americans with Disabilities Act posting.

16.0 WORK ZONES/SITE CONTROL

Work zones at the site will be established by the project manager (PM) and site health and safety representative to delineate high-traffic and hazardous locations and to contain contamination generated from field activities to the smallest area possible. Workers entering these work zones must wear appropriate PPE for that area. Work and support zones will be established from air monitoring data, required security measures and other conditions at the site.

17.0 DECONTAMINATION PROCEDURES

Field equipment and personal protective equipment may become contaminated during site activities. It is important to halt the spread of contamination to vehicles, personnel and support areas by using appropriate decontamination procedures. Work clothing and Level D PPE must not be brought to workers' residences and left either at the site or in the company vehicle. Any laundering of contaminated clothing must be done by an approved laundering service and not at the workers home. The decontamination procedures discussed for workers and the area previously can be used and can be supplemented by the following procedures.

18.0 UNDERGROUND UTILITIES

The importance of safe excavation practices cannot be overstated. In addition to the safety hazards encountered when excavating around buried utilities, there are serious potential service outages that could occur if a utility is damaged or severed. There are hundreds of thousands of miles of underground utilities. Many of these are potentially dangerous or even deadly to the excavator that might hit them accidentally when excavating. This includes danger to professional excavators, homeowners, and others.

18.1 One-Call Facility Locate Request (Utility Mark-out)

Project Personnel should request the location of underground utilities at each site by notifying the utility owner/operator through the one-call system.

Provide all the necessary information during the one-call:

- Nearest intersection and/or closest street;
- Type of work being performed (i.e. drilling, trenching);
- Extent of excavation; and
- Date work is scheduled.

The more information available about the site and the job to be performed the better.

Additional resources for obtaining site specific information:

- Request onsite meeting with the property owner;
- Request as-built schematics;
- Request plans for repairs, upgrades or modifications; and
- Retain independent utility contractor.

When the excavation site cannot be clearly and adequately identified on the locate ticket, onsite personnel should designate the route and/or area to be excavated using white pre-marking prior to the arrival of the locator. The route of the excavation should be marked with white paint, flags, stakes, or a combination of these to outline the dig site prior to notifying the one-call and before the locator arrives on the job.

When the request to the one-call center is made, he/she is told which utility owners/operators will be notified. Project personnel should log these on his/her job sheet so that he/she can identify which utility owners/operators have responded by marking and which ones have cleared the area. On the flip side, when a utility owner/operator does not respond by marking or clearing, this could signal that the utility owner/operator did not receive a locate notice.

GREEN Sewer and Drain Lines	BLUE Potable Water	RED Electric Power Lines, Cables, Conduit, and Lighting Cables	WHITE Proposed Excavation
PURPLE Reclaimed Water, Irrigation, and Slurry Lines	YELLOW Gas, Oil, Steam, Petroleum, or Gaseous Materials	ORANGE Communication, Alarm or Signal Lines, Cables, or Conduit	PINK Temporary Survey Markings

Project personnel should call the one-call center to refresh the ticket when excavation continues past the life of the ticket (sometimes, but not always, defined by state law). If not currently defined in state law, ticket life would best be 10 working days but not to exceed 20 working days.

Many utility owners/operators do not perform their own locates and utilize the services of a contracted facility locator. These contracted facility locators may not be aware of work planned in the near future. By excavators refreshing the locate ticket, the contract locator has another opportunity to identify newly placed utilities. This practice also gives the utility owner/operator another chance to identify the location of their utilities and to avoid a possible damage and disruption of service should something have been marked incorrectly or missed on a previous locate.

18.2 Locate Reference Number

Personnel should receive and maintain a reference number from the one-call center that verifies the located requested. The number is proof of notification to the members. The computer generated request identifies the date, time, and sequence number of the locate request. Each locate request ticket (notification) is assigned a unique number with that one-call center, the requestor and the utility owner/operator. This number separates this ticket from all other tickets so that it can be archived and recalled upon request with the details of that request only.

18.3 Separate Locate Requests

Every contractor on the job should have a separate one-call reference number before excavating. Often, there are several excavators on a job site performing work. The construction schedule may dictate different types of work requiring excavation from different specialty contractors simultaneously. In these situations it is imperative for each excavator to obtain a one-call reference number before excavation to ensure that the specific areas have been appropriately marked by any affected underground utility owner/operator.

18.4 Pre-Excavation Meeting

When practical, personnel should request a meeting with the utility locator at the job site prior to the actual marking of utility locations. The meeting will facilitate communications, coordinate the marking with actual excavation, and assure identification of high priority facilities. An on-site pre-excavation meeting between on-site Company personnel, the utility owners/operators and locators (where applicable) is recommended on major or large projects. This includes projects such as road, sewer, water, or other projects that cover a large area, progress from one area to the next, or that are located near critical or high priority utilities.

Such utilities include, but are not limited to;

- High-pressure gas, high voltage electric,
- Fiber optic communication, and
- Major pipe or water lines.

18.5 Utility Owner/Operator Response

The utility owner/operator is required to mark its underground facilities with stakes, paint or flags or notify the excavator that the facility owner/operator has no underground facilities in the area of excavation.

In addition, the party making the notification to the one-call center should be notified by the utility owner/operator of the tolerance zone of the underground utility by marking, flagging, or other acceptable methods at the work site, or is notified that a no conflict situation exists. If a utility owner/operator determines that the excavation or demolition is not near any of its existing underground utilities, it notifies the excavator that no conflict exists and that the excavation or demolition area is "clear."

This notification may be provided by:

- Face-to-face communications;
- Phone or phone message;
- Facsimile or other electronic means;
- Posting at the excavation of demolition area; and
- Marking the excavation or demolition area.

If an excavator has knowledge of the existence of an underground facility and has received an "all clear," personnel must attempt to communicate that a conflict does indeed exist and the locator should make marking these utilities a priority before excavation begins.

If the utility owner/operator fails to respond or if the utility owner/operator communicates that the underground utility cannot be marked within the time frame and a mutually agreeable date for marking cannot be arrived at, personnel should re-call the one-call center.

The utility owner/operator and the excavator should partner together to ensure facilities are marked in an acceptable time frame to allow for underground utility protection. Prior to excavation, excavators verify they are at the correct location and verify locate markings and, to the best of their ability, check for unmarked utilities.

18.6 Excavation/Construction

Upon arrival at the excavation site prior to beginning the excavation, personnel should:

Verify that the dig site matches the one-call request that all utilities have been marked, reviewing color codes if in doubt, and all service feeds from buildings and homes.

Check for any visible signs of underground utilities, such as pedestals, risers, meters, and new trench lines and for any utilities that are not members of the one-call.

Review the location of underground utilities with site personnel.

18.7 Marking Preservation

Project personnel should protect and preserve the staking, marking, or other designations for underground utilities until no longer required for proper and safe excavation. They should stop excavating and notify the one-call center for re-marks if any facility mark is removed or no longer visible.

During long complex projects, the marks for underground facilities may need to be in place far longer than the locating method is durable. Paint, staking and other marking techniques last only as long as the weather and other variables allow. When a mark is no longer visible, but work continues around the utility, request a re-mark to ensure the protection of the utility.

18.8 Excavation Observer

Project personnel should have an observer to assist the equipment operator when operating excavation equipment around known underground utilities. The observer is a worker who is watching the excavation activity to warn the equipment operator while excavating around a utility to prevent damaging that buried utility.

18.9 Excavation Tolerance Zones

Project personnel will observe a tolerance zone which is comprised of the width of the utility plus 18" on either side of the outside edge of the underground utility on a horizontal plane.

- Methods to consider, based on certain climate or geographical conditions, include:
- Hand digging when practical (pot holing);
- Soft digging;
- Vacuum excavation methods;
- Pneumatic hand tools; and
- Other mechanical methods with the approval of the utility owner/operator, or other technical methods that may be developed.

When excavation is to take place within the specified tolerance zone, personnel will exercise such reasonable care as may be necessary for the protection of any underground utility in or near the excavation area.

18.10 Mis-Marked Facilities

Project personnel should notify the utility owner/operator directly or through the one-call system if an underground utility is not found where one has been marked or if an unmarked underground utility is found.

If an unmarked or inaccurately marked utility is found, excavation should stop in the vicinity of the facility and perform notification. If excavation continues, plan the excavation to avoid damage and interference with other utilities and protect utilities from damage.

18.11 Exposed Utility Protection

Project personnel should support and protect exposed underground utilities from damage. Protection of exposed underground utilities is as important as preventing damage to the utility when digging around it. Protecting exposed underground utilities helps to insure that the utility is not damaged and at the same time protect employees working in the vicinity of the exposed utility.

Exposed utilities can shift, separate, or be damaged when they are no longer supported or protected by the soil around them. Personnel should support or brace exposed utilities and protect them from moving or shifting which could result in damage. This can be accomplished in different ways, for example, by shoring the facility from below or by providing a timber support with hangers across the top of an excavation to insure that the utility does not move or bend. In addition, workers should be instructed not to climb on, strike, or attempt to move exposed utilities which could damage protective coatings, bend conduit, separate pipe joints, damage cable insulation, damage fiber optics, or in some way affect the integrity of the utility.

18.12 Facility Damage Notification

Project Personnel discovering or causing damage to underground utilities should notify the utility owner/operator and the one-call center. All breaks, leaks, nicks, dents, gouges, groves, or other damages to utility lines, conduits, coatings or cathodic protection should be reported.

The possibility of utility failure or endangerment of the surrounding population dramatically increases when a facility has been damaged. While the utility may not immediately fail, the underground utility owner/operator should have the opportunity to inspect the damage and make appropriate repairs.

18.13 Notification of Emergency Personnel

If the protective covering of an electrical line is penetrated or gases or liquids are escaping from a broken line which endangers life, health or property, project personnel should immediately contact local emergency personnel or call "911" to report the damage location. This practice minimizes the danger to life, health or property by notifying the proper authorities to handle the emergency situation. In these situations, local authorities are able to evacuate as appropriate and command substantial resources unavailable to personnel or underground utility owner/operator.

18.14 Emergency Excavation

When an emergency excavation, maintenance, or repair is required, initiation may be immediately performed, provided that the excavator notifies the one-call center and utility owner/operator as soon as reasonably possible. This includes situations that involve danger to life, health, or property, or that require immediate correction in order to continue the operation of or to assure the continuity of public utility service or public transportation.

19.0 OVERHEAD POWER LINES

If work is to be performed near overhead lines, the lines should be de-energized and grounded, or other protective measures shall be provided before work is started. (This activity would normally be performed by Utility Company workers.) If protective measures are provided, such as guarding, isolating, or insulating, these precautions shall prevent employees from bodily contacting such lines directly or indirectly.

Never operate any crane near electrical power lines. Auto crane companies recommend that a crane, rigging and load being lifted never be moved any closer to a power line (including telephone lines) than 20 feet at any point.

If it is necessary that the crane or equipment being lifted would come closer than 20 feet to any power line in order to complete the job, then the electrical company which owns or controls the power line shall be notified and the power line will be de-energized or disconnected for the duration of the lift.

Unauthorized personnel working near overhead lines, whether in an elevated position or on the ground will not approach a conductive object (an unguarded, energized line) closer than the following distances:

VOLTAGE RANGE (Kilovolts, kV)	MINIMUM SEPARATION DISTANCE
50 kV or less	10 feet
More than 50 kV	10 feet plus four (4) inches for every 10 kV over 50 kV

When **authorized personnel** are working near overhead lines, whether in an elevated position or on the ground, they will not approach or take any conductive object, without an approved insulated handle, closer to exposed energized parts than the following distances:

VOLTAGE RANGE (Volts, V; Kilovolts, kV)	MINIMUM SEPARATION DISTANCE
Less than or equal to 300 V	Avoid contact
Greater than 300 V but less than 750 V	12 inches
Greater than 750 V but less than 2 kV	18 inches
Greater than 2 kV but less than 15 kV	2 feet
Greater than 15 kV but less than 37 kV	3 feet
Greater than 37 kV but less than 87.5 kV	3.5 feet
Greater than 87.5 kV but less than 121 kV	4 feet
Greater than 121 kV but less than 140kV	4.5 feet

Vehicular and Mechanical Equipment

Any vehicle or mechanized equipment (for example, man-lift) capable of having part of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased four inches for every 10kV over that voltage.

Whenever using mechanical equipment (drill rigs, back hoes, excavators, etc.) near overhead utilities, a dedicated spotter must be assigned. Requirements for spotters include:

1. Only one present
2. Identified by a high-visibility traffic vest
3. Not assigned any other duties during the times the equipment is near the limits of approach
4. Both signaler and operator know all crane and hoist signals.

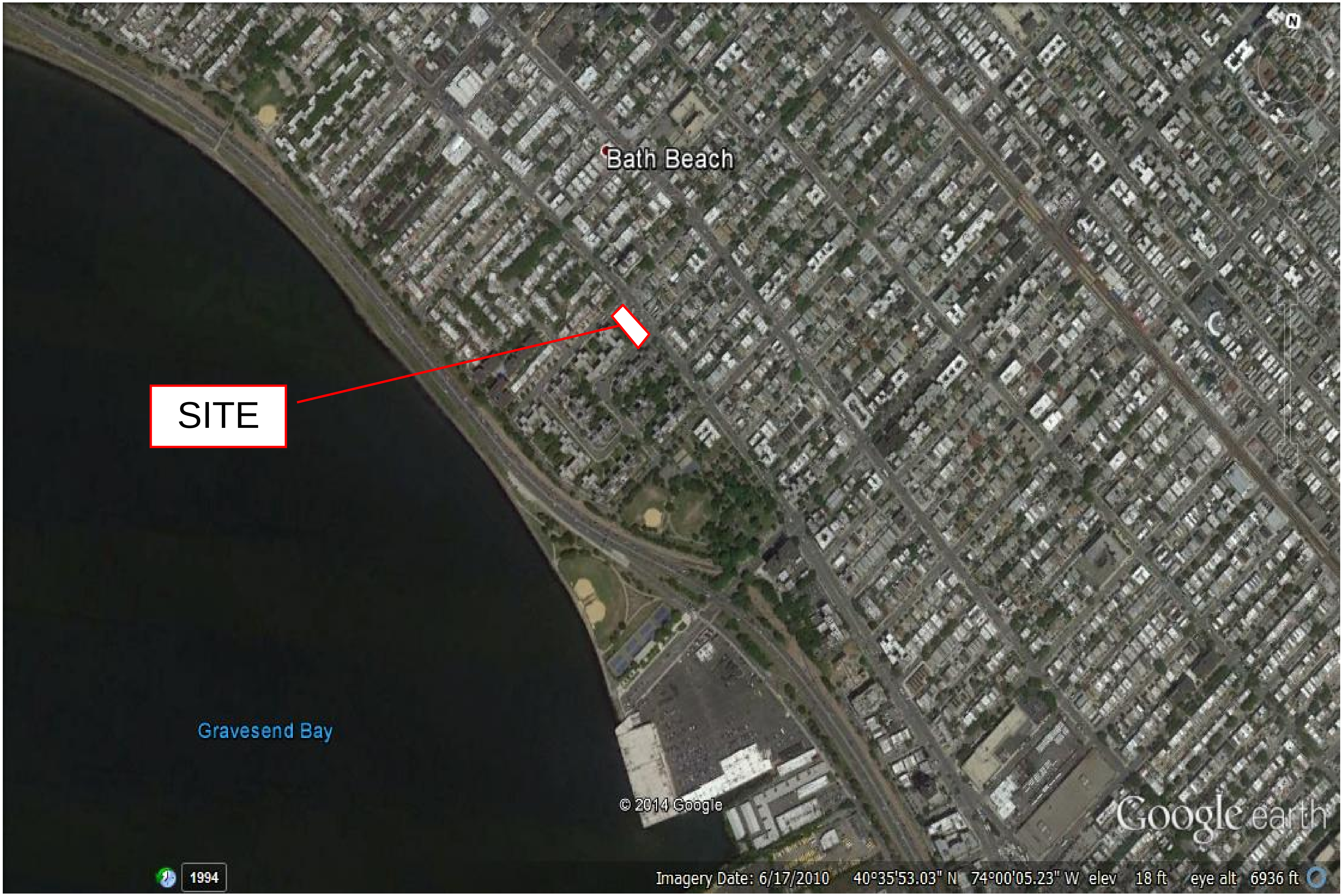
Bodily Contact with Conductive Materials

Any conductive materials or equipment that is in contact with any part of an employee's body shall be handled in a manner that will prevent them from contacting exposed energized conductors or circuit parts. If long dimensional conductive objects (pipes, rods, ducts) must be handled around exposed live parts, work practices to include guarding, insulating or safe material handling techniques will be used to minimize the hazard.

Portable Ladder Use

Any portable ladder used by an employee that could contact exposed energized parts shall have non-conductive side-rails (wood, fiberglass).

FIGURES



APEX

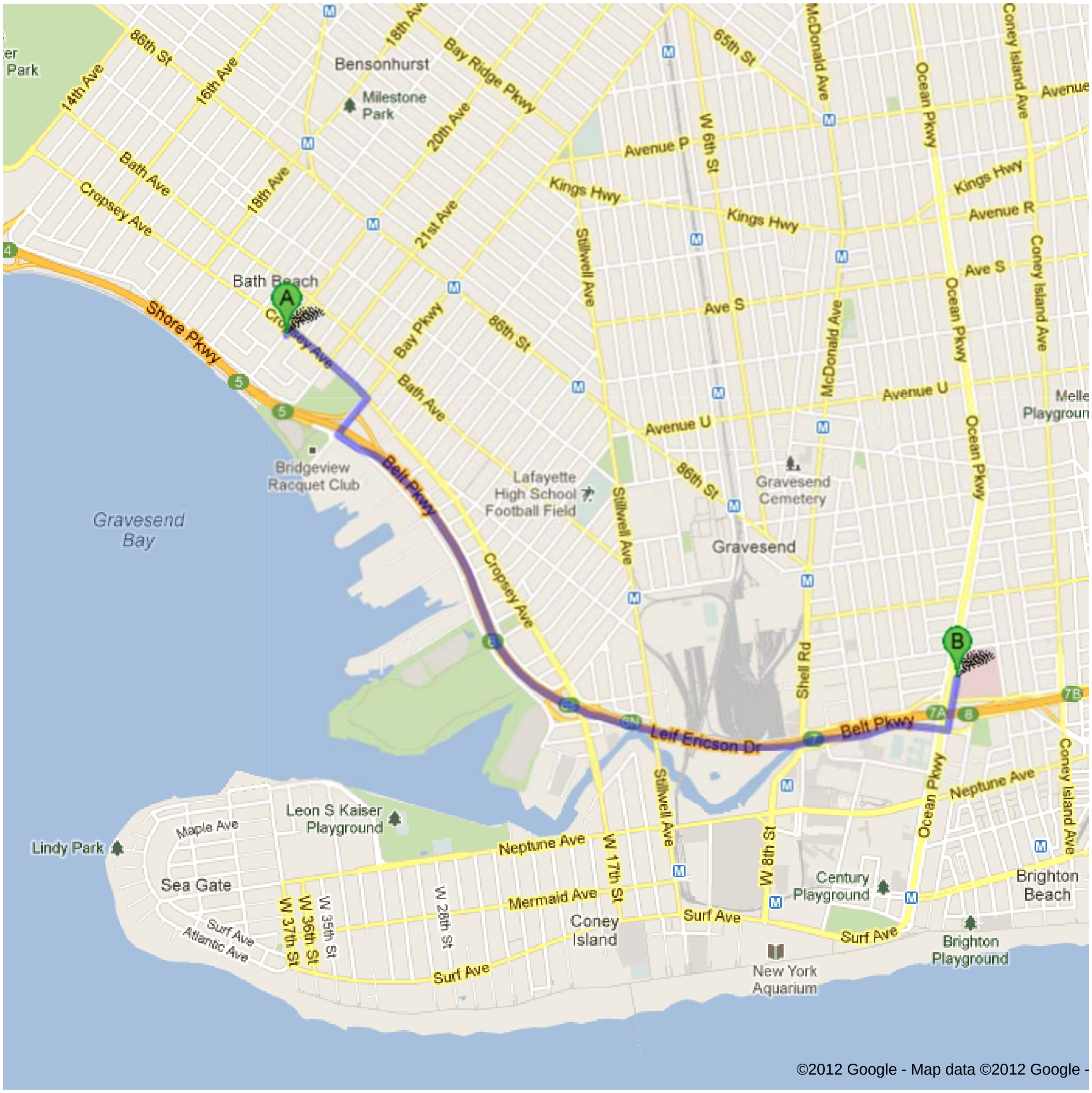
Figure 2
Site Plan

Client:	2002 Cropsey Assoc., LLC
Project No.:	85265.001
Project:	2002-2024 Cropsey Avenue Site
Date:	November 2014

Appendix A

Directions to Hospital

Directions to Coney Island Hospital
New York, NY - (718) 616-3000
2.8 mi – about **7 mins**



A 8831 20th Ave, Brooklyn, NY 11214

1.	Head **northeast** on **20th Ave** toward **Cropsey Ave**	go 115 ft total 115 ft
2.	Take the 1st right onto **Cropsey Ave** About 1 min	go 0.3 mi total 0.3 mi
3.	Turn right onto **Bay Pkwy**	go 0.1 mi total 0.5 mi
4.	Turn left onto **Shore Pkwy**	go 390 ft total 0.5 mi
5.	Take the ramp on the left onto **Belt Pkwy/Leif Ericson Dr/Shore Pkwy** About 3 mins	go 1.7 mi total 2.3 mi
6.	Take exit **7** toward **Ocean Pkwy**	go 0.1 mi total 2.4 mi
7.	Merge onto **Shore Pkwy**	go 0.3 mi total 2.7 mi
8.	Turn left onto **Ocean Pkwy** Destination will be on the right About 1 min	go 0.2 mi total 2.8 mi

B **Coney Island Hospital**
New York, NY - (718) 616-3000

Appendix B

Emergency First Aid Procedures

First Aid

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Ελληνικά(Ellinika) (http://wikibooks.org/w/wiki.phtml?title=%CE%A0%CF%81%CF%8E%CF%84%CE%B5%CF%82_%CE%92%CE%BF%CE%AE%CE%B8%CE%B5%CE%B9%CE%B5%CF%82&action=edit) | Română (http://wikibooks.com/wiki/Primul_Ajutor)

Notices and Disclaimers

Please note that this text is still in the early stages of development

This is a wiki textbook -- feel free to edit it, update it, correct it, and otherwise increase its teaching potential. To find out more about wikis, see the Wikipedia main page. This textbook grew out of the First Aid article at Wikipedia.

Legal Disclaimers

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The contributions to this document reflect the best knowledge and intentions of the many and often anonymous authors contributing to the textbook. Many parts of first aid involve the use of detailed knowledge, motor skills and attitudes which can only be developed through proper training and practice. The practice of first aid is very serious business and *prior training by a person trained in first aid instruction is strongly recommended*.

No person or organization, including Wikipedia and Wikibooks, can assume any liability or take any responsibility for the content of this document. As is always true, any actions that might be taken in performing first aid are the sole responsibility of the first aider.

Persons in need of medical help should always obtain authoritative medical advice, support and care from trained professionals. First aid is a limited set of techniques and procedures for:

- care for minor injuries not requiring a doctor's care, such as small cuts, minor bruises, and blisters
- use in the interval between the recognition of a medical emergency and the arrival of professional help
- use in austere settings such as developing countries, wilderness or the battlefield where professional help is delayed or unavailable

First aiders should know their limits and seek professional medical advice, support and care when it is available.

Laws regarding first aid vary around the world. Follow local laws. If providing advanced first aid or wilderness first aid, consistently following the guidelines in your training is your best defense from legal consequences.

This textbook was prepared by persons with training in various first aid curriculas from around the world, including copyrighted curricula prepared by various organizations including the American Red Cross (http://www.redcross.org/) and Medic First Aid (http://www.medicfirstaid.us/). The mention of these organizations is not intended to and *does not* imply support, endorsement, or involvement in the preparation of this Wikibook text. Any accidental use of copyrighted training suggestions and curricula is unintentional and will be removed on request from an authorized member of any such organization(s).

First Aid - Table of Contents

NOTE: Material below this point is being cut-and-paste transitioned to the table of contents indicated above. THANK YOU.

Contents

Chapter One - Introduction

The following are basic guidelines for how to perform first aid.

The most important rule is not to panic. Many people learn first aid and are then too frightened to use it when it becomes necessary, or use it inaccurately; they tend to feel an urge to act, resulting in precipitated and possibly dangerous actions for the patient (for instance, a conscious victim ran over by a car in a quiet street would be moved by untrained helpers) or for themselves (what wounded one is likely to produce the same effect on another person). It is important to take the level of competence into account (Note that a doctor or a qualified nurse are usually *less* qualified for field emergency care than trained paramedics).

STOP (Stop, Think, Observe and Plan) is a helpful acronym that can be easily used to start first aid. It is important that the first aider calmly takes in what he or she sees and forms a plan based on the available information. Do not hesitate to take a two -second break to evaluate the situation; time seems to run very quickly during an emergency, but thinking for two seconds is unlikely to kill even the victim of a massive heart failure, while taking an inaccurate action can induce stress to the patient, the witnesses and yourself, delay proper care administration, and even harm the patient.

Most importantly, the first aider must check for possible dangers so as not to increase the number of victims.

Eventually, bringing a feeling of comfort and safety is often the most valuable thing that first aid offers to conscious patient.

Chapter Two - Providing Care

Consent

If the patient is conscious, it is important to ask for permission before proceeding. Touching another person without that person's permission is considered assault in most jurisdictions. Consent for treatment is implied if the patient is:

- Unconscious
- Intoxicated

- Irrational (i.e. delusional, insane or confused due to the injuries)
- Not an adult (parent or guardian must give consent if present and able, otherwise consent is implied)

Since the victim will likely be frightened, explaining your actions and talking in a calm, reassuring voice will have a beneficial effect in reducing stress and increasing the probability of survival.

Protective Precautions

It is necessary for the first aider to protect themselves against various diseases which can be transmitted through blood and other bodily fluids. In the United States, OSHA has established a Bloodborne Pathogens requirement for training those who are required in their job to perform first aid.

The best protection is to avoid contact with blood and bodily fluids. The next best protection, often very effective, is to use barrier methods such as gloves, masks and gowns. When performing CPR and/or rescue breathing, breathing barriers should be used if available.

Legal Liability

Good Samaritan laws in many countries protect people who give first aid without seeking financial compensation. Acting beyond or outside your training may have civil or criminal consequences. On the other hand, some countries prosecute people for not providing needed help. In any case, you are the person on the spot and you will need to make the best decision you can given the circumstances.

Laws regarding first aid vary around the world. Follow local laws. If providing advanced first aid or wilderness first aid, consistently following the guidelines in your training is your best defense from legal consequences.

Diagnosis and First Aid

If the patient is breathing and has a pulse with no severe bleeding, the next step is to decide what the injury or illness is and form a plan of treatment. The "nature of illness" or "method of injury" is determined. Even if the first aider cannot help in the field, the collection of this information is invaluable to proper transport and treatment of the patient by emergency medical technicians and doctors.

In some cases such as abdominal pain it is difficult to determine the seriousness of an injury. Only advanced training and expert advice can help in these cases, and any error should be on the side of caution.

A person trained in advanced first aid may conduct a survey, which is a careful head to toe examination of the injured person for possible additional injuries and symptoms. Often a survey will reveal serious injuries which appear minor but are life-threatening, such as entry and exit wounds from gunshots, a flail chest or collapsed ribcage, or injuries consistent with internal bleeding. A survey at the first-aid level should not involve unnecessary touching of the patient or the removal of clothing unless trained in how to do so safely and with respect for the patient.

One advanced first aid diagnostic technique is to check for perfusion by depressing the fingernail and observing capillary refill. The tissue under a person's fingernail is normally full of blood and refills within 2 seconds after being pressed. In a person with serious blood loss (whether internal or external), the tissue under the fingernail remains white and bloodless. Such a person needs advanced medical care immediately.

First Aid and Mental Status

Sometimes an ille or injured person is disoriented or incoherent, which may mask serious medical conditions or injuries. A level of mental responsiveness can be determined by asking three questions:

- What is your name?
- Where are you?
- What day of the week is it? (note: stressed patients, even totally coherent, tend to respond that it is the day during which they last woke up)

Patients' mental coherence will fall into one of four categories (the AVPU system)

- A = alert, responds correctly to all three questions above
- V = responds to verbal stimuli inappropriately
- P = responds to painful stimuli only (such as rubbing the sternum)
- U = unresponsive to any stimuli

A person with an altered mental status who does not recover quickly requires advanced medical care and should be carefully watched. Suspect concussion or other head injury if trauma is among the mechanisms of injury.

Chapter Three - "ABCD" Basic Life Support

A for Airway

An unconscious person's airway may be blocked when their tongue relaxes and falls across the airway. A technique used to open the airway is called the "head-tilt chin-lift" technique. The patient is lying on their back. With one hand on the forehead and the other hand under the chin, the victim's head is lifted to put the airway back into anatomical position. This simple procedure opens the airway and has saved many lives.

If a neck injury is suspected then the "jaw thrust" technique should be used. Place your fingers behind the victims jaw bones, on both sides, just below the ear. Then push forward.

If the victim is choking on a foreign object lodged in the airway, the object must be removed. The Heimlich maneuver is the standard method for conscious victims. If the victim is unconscious, the object may be removed by reaching in the mouth (using the head-tilt-chin-lift technique from CPR), or with a modified form of the Heimlich maneuver. If the airway is cleared and breathing is not restored, rescue breathing should be applied.

B for Breathing

If a person has stopped breathing but still has a pulse, it is possible for someone else to breathe for them. In artificial respiration, the rescuer alternates breaths taken for his own benefit with breaths into and out of the victim's mouth.

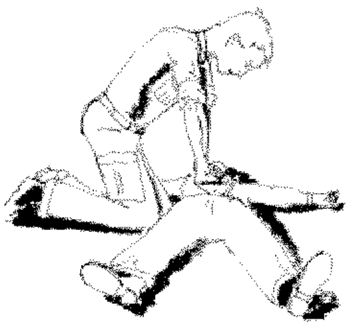
Proper check of the patient's respiration : the helper listens to the breath, tries to feel the air flowing on her cheek, the chest going up and down, and see the movements of the chest.

C for Circulation

(also known as cardiac arrest)

Cardiopulmonary resuscitation (CPR) is a manual method used to induce artificial breathing and heartbeat in a victim who has suffered cardiac arrest. CPR may spontaneously restore natural breathing and heartbeat; if it does not, it may keep the victim alive until professional medical personnel arrive and administer more appropriate treatment. CPR is a manual skill that must be taught with the assistance of a training "dummy" or simulator.

Checking the carotidian pulse



Correct position for CPR. The arms are fully extended and the thrusts are given fom the hips.

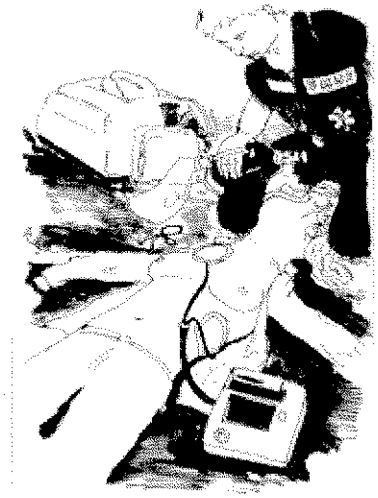
Positionning the hand before giving the CPR. The hand must be placed two fingers away from the solar plexus.

Circulation can also include the consideration of severe bleeding, which can cause shock and even stop the heart.

D for Defibrillation

Defibrillation is an electric shock which re-initialises the cells of the heart and allows cardiac nervous pulsations to re-take control of the heart and restart normal heart beats. Modern semi-automatic defibrillators can monitor a patient's heart and decide wether a shock is recommended or not. They can be used over a pace-maker. The system begin very safe, it can be used by trained non-professional personel. Defibrillation is an essential part of the CPR : survival chances of a fibrillating patient start at 90% if defibrillated immidiately, and decrease by 10% every minute. Protocols differ by location. Consult your local EMS for more information.

Defribrillation operations start by removing all metallic parts of the patient (jewelery, nipple piercings, etc.), shaving the chest of exceptionally hairy patients, and placing defibrillation patches : one on the left side, under the heart, and the other over the right breast. When the defibrillator is turned on it will start monitoring the patient to determine wether a shock is appropriate. Most automated external defibulators loudly announce their instructions, follow the steps provided by your system.



Typical view of the defibrillator operator. The leader is at the head of the patient, administrating oxygen. Note how the head of the patient in secured between the leader's knees. The defibrilation patches are on.

CPR must be stopped for the examination. In all cases, defibrillation has a priority on CPR.

If the defibrillator advises a shock, the operator will shout "Warning, shocking ! Clear !" while waving his hand all over the patient. **Touching the patient is dangerous** when the shock is aministrated. If all is clear, the shock is administered by pressing the appropriate button.

Do not shock if

- The patient is close to explosive or inflammable material.
- The patient is wet.
- The patient is on a conductive surface.
- There is running oxygen.

If necessary, protect the patient from water and dry him, or displace the patient a few meters between each CPR cycle until the area is safe for defibrillation.

Defibrillators can also be used for monitoring and recording purpose only; a different set of patches is availlable (two or three small round patches). Should fibrillation occure when the monitoring patches are on, the defibrillator will ask the operator to change patches.

Chapter Four - Bleeding

Bleeding is the most common reason for the application of first aid measures. Minor bleeding can be stopped with direct pressure over the wound, as the blood will naturally clot. In order to prevent infection, a sterile or clean bandage should be used.

Bleeding can be stopped with the following steps. In order, they are

- Direct pressure on the wound
- Elevation of the wound above the heart (depending on the location of the wound)
- Pressure point (pressing down on an artery above the wound to keep blood from flowing to the wound)

Life Threatening Bleeding

The key element in treating severe bleeding is the application of firm, direct pressure to the wound, using a surgical glove or other infection barrier if available. The wound may be elevated above the heart to reduce blood pressure, though this should not be done if there is a risk of disturbing fractures. Pressure may also be applied to *pressure points* where blood vessels run close to the surface upstream from the wound.

The use of a tourniquet is rarely taught in first aid because it is rarely required to control severe bleeding and poses life-threatening risks. Even wounds from amputated limbs can be controlled with direct pressure, pressure points and elevation.

Chapter Five - Shock

Internal Injuries and Trauma

Seriously injured persons often suffer hypovolemic shock which can be caused either by external or internal bleeding. Symptoms include rapid breathing (a normal adult rate is 12-20 respirations per minute) and cold, clammy skin. The patient should be kept warm and the patient's feet should be elevated approximately six inches off the ground (unless spinal or other injures preclude this). The object is to raise the blood pressure to their inner organs to prevent oxygen starvation of major tissues.

Persons with internal injuries or who have suffered traumatic injuries often require immediate surgery to save their lives. The most important way a first-aider can help these victims is to arrange for immediate rapid transport to a trauma center or other equipped facility for immediate transfusion and surgery. The best way to do it is to call for help and let the professionals decide where best to transport the victim.

Anaphylactic shock

Anaphylaxis is a life-threatening medical emergency because of rapid constriction of the airway, often within minutes of onset. It can be triggered by insect bites as well as exposure to allergens in some people. Call for help immediately. First aid for anaphylaxis consists of obtaining advanced medical care at once; rescue breathing (a skill that is part of CPR is likely to be ineffective but should be attempted if the victim stops breathing. Look to see if a device such as an Epi-pen is available for administration of epinephrine by a layperson.

Blast Injuries

Blast injuries are caused by explosions and are most often seen in industrial accidents or through effects of military weapons such as grenades, explosives, and antipersonnel mines. Blast injuries may also be the result of bombings by terrorists. Great caution should be taken by the first aider to avoid becoming a casualty themselves, particularly in the event of a secondary blast or in a possible ambush.

Internal injuries are likely in direct proportion to the size of the blast and the distance from the victim. Whether or not the victim was shielded by any nearby object should be considered.

Chapter Six - Soft Tissue Injuries

Soft tissues include skin and muscles.

Cuts, Scrapes and Bruises

Cuts, scrapes and bruises should be washed with soap and water. Any foreign objects or dirt should be removed to avoid infection. Apply a clean dressing; it is worth the time to locate a sterile dressing for this purpose.

Any long cut or laceration may require stitches to heal properly, especially on the face and scalp. See medical attention in these cases. Most wounds should be sutured within 6 hours of the injury, although facial and scalp wounds can go as long as 12 hours. Clean tap water can be used to clean a laceration, and should be done as soon as possible.

Avulsions and Amputations

An avulsion is a piece of skin or flesh which is separated from the person, for example a torn-off earlobe. An amputation is a body part that has been separated from the person.

Apply normal care for bleeding. Find the separated part and take it with the injured person to the hospital. Surgical reattachment is often possible if performed promptly. Do not ice the part.

Burns

First cool the burn with large quantities of water. Do not use ice. Then cover the burn with sterile or clean dressings. Then seek help for serious burns or burns that impair breathing, cause shock, or are caused by unusual means (radiation, chemicals, electricity).

Do *not* lance burn blisters.

Bandages and Dressings

A dressing is something used to cover a wound, typically a sterile or clean piece of cloth or gauze. A bandage is used to hold the covering over the wound, such as adhesive tape or wrapped cloth, gauze or elastic.

The skill of bandaging and dressing an injury is part of the performance of first aid.

Chapter Seven - Bones, Joints, and Muscles

Bone Injuries

A bone injury can be internal or external. Even internal bone injuries that do not break the skin can cause major bleeding and shock.

The primary first aid technique for bone injuries is splinting. Proper splinting can reduce pain and discomfort, especially if the victim must be moved, but should not be attempted if advanced medical help is on the way.

Joint Injuries

Joint injuries include strains and sprains. Some joint injuries occur when a joint is over-stressed. Sports trainers recommend following the acronym RICE for

- Rest, which is essential to allow healing
- Ice, intermittently applied
- Compression, with an elastic bandage

- Elevation, above the heart

Muscle Injuries

As with joint injuries, muscle injuries are often treated using RICE.

Chapter Eight - Environmental Injuries

Heat Injuries

Heat cramps. Heat exhaustion. Heat stroke.

Cold Injuries

Frostbite. Hypothermia.

Patients should be kept in a reasonably warm place. The stress of excessive heat or cold can stress an injured or ill body further, increasing the danger. Temperatures as low as 55 F (about 13 C) or as high as 95 F (35 C) can injure by exposure for an hour -- this is a major hazard in longer term care.

Pulmonary and cardio-vascular functions of hypothermia patients might cease. Such patients can only be pronounced dead when appropriately brought to normal temperature ; first aid procedures can therefore continue until professional help is available.

CPR

NOTE: The content below has been moved from Wikipedia, and should be merged with the above:

- First Aid/CPR
- First Aid/CPR summary

NOTE: Material above this point is being cut-and-paste transitioned to the table of contents indicated above. Please do not add material below this point. THANK YOU.

Science

Retrieved from "http://en.wikibooks.org/wiki/First_Aid"

Appendix C

Daily Tailgate Safety Meeting Forms

DAILY TAILGATE SAFETY MEETING FORM

Instructions:

- **Conduct a Daily Tailgate Safety Meeting with site personnel prior to commencing daily activities. Safety topics can be selected from the attached table.**
- **Address potential hazards and controls for tasks that will be conducted.**
- **Discuss air monitoring, training, PPE and other appropriate requirements.**
- **Follow-up on noted items and document the resolution of any action items.**

Date: ________________

Meeting conducted by: ____

Project/Site: ____

Safety topics/information reviewed: ______________________________________

____

____

____

____

____

Follow-up action items/comments: _______________________________________

____

____

____

____

____

Attendance:

NAME	SIGNATURE	COMPANY/AGENCY/OTHER ORG.

DAILY TAILGATE SAFETY MEETING TOPICS GUIDE

1. ACCIDENT REPORTING
2. AIR MONITORING
3. AIR MONITORING AND ACTION LEVELS
4. ALCOHOL CONSUMPTION AND WORKSITE SAFETY
5. COLD STRESS
6. CONFINE SPACE ENTRY
7. CRANE SAFETY
8. DAILY WORK TASK HAZARDS
9. DECONTAMINATION
10. DISCIPLINARY POLICY FOR NOT FOLLOWING SAFETY RULES/SAFE WORK PRACTICES
11. DRILL RIG SAFETY
12. ELECTRICAL SAFETY
13. EMERGENCY RESPONSE
14. ERGONOMICS
15. EXCAVATION/TRENCHING HAZARDS
16. EYE WASH STATION LOCATION (S)
17. FALL PROTECTION
18. FIRE SAFETY/BONDING-GROUNDING TECHNIQUES
19. FIRST AID/CPR
20. FUGITIVE DUST CONTROL
21. GENERAL SITE SAFETY RULES
22. HAND TOOL HAZARDS
23. HAZARD COMMUNICATION/LOCATION OF MSDS/REVIEW OF HAZMAT PROPERTIES
24. HEALTH AND SAFETY PLAN
25. HEARING PROTECTION
26. HEAT STRESS
27. HEAVY MACHINERY
28. HOSPITAL DIRECTIONS
29. HOUSEKEEPING
30. MATERIAL HANDLING
31. MECHANICAL HAZARDS/GUARDING/LOTO
32. OVERHEAD HAZARDS
33. PERSONAL PROTECTIVE EQUIPMENT
34. RESPIRATORY PROTECTION AND FILTER CHANGE-OUT SCHEDULE
35. ROLES AND RESPONSIBILITIES
36. SITE SECURITY
37. SMOKING AND BREAK AREAS
38. TANK REMOVAL SAFETY
39. UNDERGROUND UTILITIES
40. USE OF “BUDDY SYSTEM”
41. VAPOR CONTROL
42. WATER HAZARDS
43. WELDING SAFETY
44. WORK STOPPAGE

Appendix D

Safe Work Permit

SAFE WORK PERMIT

DATE ISSUED ___________________TIME ISSUED _______________________

EXPIRATION DATE ___________________(Permit not valid for any date other than date issued)

LOCATION OF WORK / DISTANCE FROM APEX OFFICE
____

PROJECT MANAGER/PHONE #
____

CONTRACTOR/PHONE #
____

The location where this work will take place will be examined before the start of field operations and all the appropriate precautions (**including any that exceed those outlined below**) will be taken.

Signature of Field Personnel conducting work __________________________
Date ___________

Signature of Project Manager _______________________________________
Date _______________

FIELD SAFETY PRECAUTIONS

BEFORE THE WORK - All of the following precautions must be taken:

Person(s) doing field work and the project manager must initial next to each line below:

☐	☐	All tasks to be conducted have been identified and appropriate task specific PPE (i.e., face shield, anti-vibration work gloves etc.) has been identified (if needed).
☐	☐	Distance of the site and tasks to be conducted by field personnel have been evaluated to determine if potential fatigue hazards exist due to long hours.
☐	☐	Means of contacting emergency help and the office area available at the site.

☐	☐	Evaluation of whether the buddy system should be employed has been made.
☐	☐	Provisions have been made for breaks and/or rotating especially repetitive motion tasks are involved.
☐	☐	Health and Safety Plan has been reviewed and signed off on.
☐	☐	All field personnel using power tools and equipment have been properly trained and evaluated.

Where applicable, the following precautions will also be taken before the work begins:

Person(s) doing field work must initial next to each line below:

☐	☐	Field personnel will check in with the Apex office and will appropriate site personnel
☐	☐	Work area marked with caution tape.
☐	☐	Inspected all equipment and tools prior to using.

DURING / AFTER THE WORK - The following precautions will be taken:

Person(s) doing field work must initial next to each line below:

☐	☐	Verify that appropriate PPE is being worn by all field personnel.
☐	☐	Verify breaks as needed and / or tasks are rotated to avoid potential ergonomic / repetitive motion disorders (i.e., weed whacking).
☐	☐	Breaks are taken as necessary dependent upon the weather conditions to avoid potential heat or cold stress.
☐	☐	All potential hazards and concerns have been reported to the project manager and/or the Regional or Corporate Health and Safety Manager. All near-miss incidents should be reported.

Appendix E

Apex Good Catch Report Form

Apex *Good Catch* Report

Good Catch Reporting is the process of indentifying and preventing an unsafe act or unsafe condition before it causes an injury or illness. This form is used to formally document the recognition of a hazard, the change that is made to prevent the reoccurrence of the hazard and to share the lessons learned with Apex employees

If a worker has been injured or property damage occurred, DO NOT USE THIS FORM!
Worker accidents resulting in injury or property damage require completion of the Apex Incident Report.

All information is required. Submit report to: nearmiss@apexcos.com.

Date of incident: ____________________ Time of incident: ____________________

Form Submitted by (name): ____________________

Apex office location: ____________________

Work being performed:: ____________________

Location of Good Catch:

Describe the Good Catch

What steps can be taken to prevent a similar incident?

Who is responsible for taking these actions and following up to see that they are complete?

Expected Completion Date:		Actual Completion Date:	

Submit by Email

Appendix F

Apex Incident Report Form

APEX INCIDENT REPORT

This Apex Incident Report (AIR) Form is to be completed by the Apex employee experiencing any of the incident types listed on this form. This form is to be completed for motor vehicle accidents/incidents involving personal or rented/leased vehicles, environmental incidents, injuries or illness, fires, property damage, thefts, community complaints, utility interruptions and other incidents deemed important for review by Apex management. All near miss incidents are to be reported using the separate Near Miss Report Form.

The AIR must be submitted within 24 hours. (You can hit F1 on some of the fields and a help box will appear.)

☐ MOTOR VEHICLE

Injury involved? ☐Yes ☐No

Please complete this block prior to submitting for Motor Vehicle accidents and describe the incident and corrective actions in the space provided at the end of this report. If injury is involved, please complete the Injury section of this report.

☐ Apex company vehicle ☐ Personal vehicle ☐ Rental vehicle

Rental company notified? ☐ Yes ☐ No ☐ NA Please attach copy of the rental agreement.

Vehicle Year/Make/Model: _____ VIN number _____

Was another vehicle involved? ☐ Yes ☐ No

Other driver's name: _____ License plate # _____

Other driver's insurance: _____ Policy # _____

Police report filed? ☐ Yes ☐ No Police report # _____

Police dept. name: _____ Police dept. phone: _____

Location of accident: _____

City _____ State __

Date of accident: _____ Time of accident: _____ Time you began work today:: _____

Witness name: _____ Telephone # _____

Witness name: _____ Telephone # _____

Email addresses if available _____

***Attach witness statement if possible *Attach police report if available *Attach photos if available**

☐ PROPERTY DAMAGE
☐ THEFT

Please complete this block prior to submitting for Property Damage and Theft and describe the incident and corrective actions in the space provided at the end of this report.

Property description: _____ Estimated value: _____

<u>Police report must be filed for all thefts over $200.</u> ☐ Yes ☐ No Police report # _____

Police dept. name: _____ Police dept. phone: _____

Location of accident: _____

City _____ State __

Date of damage/theft: _____ Time of damage/theft: _____ Time you began work today: _____

☐ **INJURY** — **Please complete this block prior to submitting for Injuries and describe the incident and corrective actions in the space provided at the end of this report.**

☐ Treated at ER ☐ Non emergency ☐ Self/No treatment needed

Date of treatment or admitted: _____ Admitted to hospital? ☐ Yes ☐ No

Name of medical facility: _____ Telephone # _____
Medical facility address: _____

Injury involve a subcontractor: ☐ Yes ☐ No Sub employee name: _____
Sub company name: _____
Contact info for sub: _____

Describe injury (body part): _____
Location of incident: _____
City _____ State __
Date of accident: _____ Time of accident: _____ Time you began work today: _____

Witness name: _____ Telephone # _____
Email addresses if available _____
**Attach witness statement if possible*

**** Include (or forward to HR) all hospital and doctor paperwork. (i.e. hospital discharge papers; work release form; prescriptions)***

Please complete this block prior to submitting for other types of incidents and describe the incident and corrective actions in the space provided at the end of this report.

****Note- All near miss incidents are to be reported using the separate Near Miss Report Form.***

☐ Utility interruption ☐ Environmental ☐ Fire ☐ Other

☐ Community complaint ☐ Subcontractor
Subcontractor company name/contact info: _____

Subcontractor employee name: _____

Location of accident: _____

City _____ State __

Date of accident: _____ Time of accident: _____ Time you began work today: _____

DESCRIBE THE INCIDENT AND CONTRIBUTING FACTORS:

_____

CORRECTIVE MEASURES OR RECOMMENDED ACTIONS:

_____

***All information must be completed!**

EMPLOYEE INFORMATION

Apex employee name: _____ Apex employee ID # ____

Additional employee involved: _____

Apex office location: _____ Division #: __

Today's Date: _____

I certify that the information submitted by me is true and correct, and I understand that providing false information is grounds for disciplinary action up to and including termination of employment.

Any person who knowingly, and with intent to defraud, any insurance company, files a statement of claim containing any false information, or conceals, for the purpose of misleading, information concerning any fact material thereto, commits a fraudulent insurance act, which is a crime.

Sending this email meets the signature requirements for reporting.

Email to: incidents@apexcos.com

If you do not have access to email you may fax the incident report form to:

Manager, Corporate Health & Safety
Hal Heckman - hheckman@apexcos.com
Phone: 610-722-9050 x 216
Fax: 610-722-9010

Please note, the incident report form is the tool used to track and follow property damage claims, insurance claims, worker's compensation claims, statistical data required for report purposes, and the OSHA requirement for certain incidents.

Appendix G

Poisonous Plants & Animals

5.4.1 Biting / Stinging Insects

Personnel should be familiar with hazard identification, prevention and control as it relates to biting / stinging insects. Depending on what region of the country the project is located in, there are a variety of biting/stinging insect that may be encounter at project sites as listed below and described in the following subsections.

- Ticks
- Mosquitoes
- Wasps, bees and yellow jackets
- Scorpions
- Spiders
- Mites/chiggers

5.4.1.1 Ticks

Ticks can transmit serious illnesses to humans including Lyme disease, Rocky Mountain Spotted fever, babesiosis and ehrlichiosis. Individuals who work outdoors in heavily wooded or grassy areas have an increased risk for exposure to tick-borne illnesses. Be sure to check yourself and your co-workers for ticks when leaving the field. As a preventive measure, clear vegetation or hire a contractor to clear vegetation in areas where you will be spending a lot of time such as pump test locations, near field trailers and support zones, etc. You should also spray clothing and skin with repellants just before going into the field. Use Permethrin for the clothes and DEET for the skin. Tyvek suits or light-colored clothing are also helpful to spot ticks before they become attached to the body. You should also wear a hat. Wash clothes in high temperatures after working outdoors

If a tick has attached itself to your body, carefully grasp the tick as close to the skin as possible and pull straight out, without twisting. Place the tick in a closed container and save it just in case an infection results. A health care professional or local health department may want to examine the tick. Wash the bite area with soap and water.

Early Signs and Symptoms:
(3 to 32 days after tick bite)

- *Characteristic "bulls-eye" (red, circular) rash at the site of the tick bite. Most common sites are scalp, groin, and armpits.*
- *Fever*
- *Headache*
- *Fatigue (feeling tired)*
- *Muscle and joint pain*
- *Swollen glands*

Lyme Disease

Lyme disease is the most recognized of the tick-borne illnesses. The disease is transmitted by ticks who have fed on certain deer and mice. These ticks are found throughout the United States. The peak tick season is May through September. The areas of highest risk are the Northeast, Great Lakes Region, and an area in Northern California. Current scientific estimates indicate that the disease is transmitted after the tick has attached to the individual for 6 to 24 hours. Between 15 and 30 percent of the ticks are infected. The longer the tick is attached, the greater the probability of infection.

Later signs and symptoms of Lyme disease (six to nine months after tick bite) may include: weak facial muscles, stiff neck, irregular heartbeat, numbness, chills, loss of appetite, dizziness, persistent fatigue (feeling tired), and double vision.

Babesiosis

Signs and Symptoms:

- *Fever*
- *Chills*
- *Sweating (profuse)*
- *Fatigue (feeling tired)*
- *Dark-colored urine*
- *Nausea*
- *Abdominal pain*
- *Low blood count*

Babesiosis is transmitted by ticks that typically have been infected by rodents, cattle, or wild animals. These ticks are most commonly found in the Northeastern, Pacific Coast, and Upper Midwestern portions of the United States.

Ehrlichiosis

Ehrlichiosis is transmitted by deer ticks and the Lone Star tick. Peak cases are from May to July and October to December. The first known cases were described in 1987. Reported incidences have occurred in individuals over 40 years old. The most prevalent areas of the country are the Southern and Northeastern areas of the United States.

Individuals can become very sick, with up to 54 percent hospitalized.

Early Signs and Symptoms:
(5-11 days after bite)

- *Rapid onset fever*
- *Acute headache*
- *Non-specific rash (lower part of body)*
- *Shaking chills*
- *Generalized tired feeling*
- *Muscle and joint pain*
- *Cough*
- *Vomiting*

Rocky Mountain Spotted Fever

Another tick-borne illness transmitted by the American dog tick and the Rocky Mountain wood tick. The states with the highest incidence of the illness are North Carolina and Oklahoma. Fifty percent of the infections occur in the South-Atlantic region of the United States. The Pacific and West-South Central regions also have cases. More than 90 percent of the patients with Rocky Mountain Spotted Fever are infected between April and September.

Early Signs and Symptoms:
(3-4 days after bite)

- *Fever*
- *Nausea*
- *Severe headache*
- *Muscle pain*
- *Lack of appetite*

Later signs and symptoms of Rocky Mountain Spotted Fever may include rash on wrist, forearms and ankles, abdominal pain, join pain, and diarrhea.

Source: <http://www.osha.gov/SLTC/etools/sawmills/tick_borne.html#>, June 12, 2003

5.4.1.2 Mosquitoes

Mosquitoes are found all over the world, except in Antarctica. In the US, mosquitoes are mostly an annoyance but are responsible for West Nile Virus, The West Nile Virus is primarily a disease of birds. It is commonly found in Africa, West Asia, and the Middle East, but has also caused outbreaks in Europe. In humans, it can cause encephalitis, an infection of the brain. West Nile Virus is similar to the virus that causes St. Louis encephalitis, which for years has been found in the United States. West Nile had not been found in the United States before the late summer of 1999.

Symptoms of West Nile Virus

The incubation period, the time between an infectious bite and the onset of symptoms, is usually 5-15 days. Most people infected by the West Nile Virus have no symptoms at all, or experience something that feels like flu. Symptoms of “West Nile fever” may include fever, headache, achy muscles, and extreme tiredness, perhaps with skin rash and swollen lymph glands. In a fraction of cases, the fever leads to encephalitis, which is fatal in some cases or may cause neurologic after-effects.

Transmission of West Nile Virus

Humans get the West Nile Virus largely from the bite of mosquitoes. Although some 150 species of mosquitoes are found in the United States, the primary transmitter of West Nile is Culex pipiens. The female mosquito catches the virus when it bites an infected bird, and can then pass it along if it later bites a human. Humans do not get it from other humans or animals. Prevention strategies include the following:

- Empty standing water in buckets, plastic covers, or any other container where "wrigglers" and "tumblers" live.
- Use mosquito repellents when necessary and follow label directions and precautions closely.
- Use head nets, long sleeves and long pants if you venture into areas with high mosquito populations, such as salt marshes.
- If there is a mosquito-borne disease warning in effect, stay inside during the evening when mosquitoes are most active.

http://www.nsc.org/library/facts/westnile.htm

5.4.1.3 Wasps, Bees, Hornets and Yellow Jackets

Wasps, bees, hornets and yellow jackets are venomous insects whose stings produce a variety of symptoms ranging from minor pain and swelling to fatal allergic reactions. Honey bees have barbed stingers that usually remain in the sting. Honey bees can only sting once. Wasps do not have barbed stingers and can sting repeatedly. In general, wasps are more aggressive than honey bees. Africanized honey bees resemble our familiar European honey bees but are much more aggressive. Africanized bees are dangerous because their victims may be stung by thousands of bees sent out in defense of the hive. Africanized bees are NOT more poisonous than European bees and their stings are treated the same way as are the stings of European bees. To the naked eye, Africanized bees are indistinguishable from European bees.

Avoiding Stings: People are often stung by these insects while walking barefoot. Stepping on a bee results in a painful sting. Wasps and bees often fly into soft drink cans unnoticed resulting in painful stings of the lips, tongue and mouth. Bees are attracted to flowering plants caution should be used when working near flowering plants. Certain colors also appear to attract bees and wasps. Blue clothing in particular seems to be associated with more unprovoked stings. Threatening a hive by approaching too closely or by making loud noises or vibrations often results in multiple stings.

Special Precautions for Africanized bees: Africanized bees are much more aggressive in defending their hives than are European bees. When an Africanized bee stings, it marks its victim with a chemical marker that attracts other bees from the hive. Thus, if one threatens a hive of Africanized bees one can expect to be pursued by thousands of bees. These bees have been known to pursue people for long distances. It does not take much to make an Africanized bee feel threatened. Approaching too close to the hive or operating machinery that transmits vibration to the hive will provoke an attack. Africanized bees move their hives and produce new hives more frequently than do European bees, and they will start a hive in unusual sites: a park bench, a culvert, under a truck. A swarm of thousands of bees can start a hive in a new location in minutes.

The best defense against Africanized bees is caution. Be alert for signs that a hive has been started in your area. Increased bee activity may be a sign that there is a hive nearby. If you work with heavy equipment remember that the equipment's vibration may provoke an attack. If attacked, cover your face with your arms and run away from the hive or away from the direction from which the bees are attacking. The bees do not fly fast and most people can outrun them. If you were working with heavy machinery and the cabin of the vehicle is sealed then stay inside and drive out of the area. Don't drive toward unprotected co-workers. If the vehicle is unsealed, turn off the vehicle and run for indoor shelter. A car will also provide good shelter. Put the air conditioner in the car on high as cold air will slow the bees that will have pursued you into the car. If you see someone being attacked call 911. Direct the victim toward shelter, but don't approach them. Running into a swarm of Africanized bees is as dangerous as running into a burning building. Anyone who suffered a large number of stings needs to be seen by a physician immediately. Anyone who has 50 or more stings should receive treatment in an emergency room, as must anyone with severe symptoms such as difficulty breathing or loss of consciousness.

Effects of stings: Bee and wasp stings produce similar effects. There are three patterns of symptoms seen following stings.

1. Local Effects: These symptoms begin immediately after the sting. Typically, the area around the sting is pale and is surrounded by redness. The stinger may still be present. It looks like a little thorn or splinter. The pale area may quickly turn into a red welt. The sting is usually painful, but the pain usually improves in minutes. There may be a great deal of swelling. Swelling may be delayed for five or six hours after the sting. Usually hands and feet swell more than stings to the chest or abdomen. Local swelling, even dramatic swelling, is normal and not a sign of allergy. Swelling often takes 3-4 days to resolve. Bruising and itching often are associated with this swelling. Bee and wasp stings can become infected and therefore, all sting sites should be washed with soap and water. Signs of infection include a red streak running up the extremity, fever or any discharge from the sting. Infection requires prompt medical attention.

2. Allergic Reactions: Bee sting allergy produces sudden severe symptoms that usually occur within minutes following a sting. Signs of a severe reaction include flushing and anxiety which are almost always present. Facial swelling, especially around the lips and eyelids may be present. The victim may have difficulty breathing, feel as if the throat is closing, or may lose consciousness. These symptoms require emergency action. Telephone 911 to summon paramedics and help the victim to use a bee sting kit if one is available.

3. Toxic Reactions: Multiple bee stings can cause the above reactions, but also additional, unique problems. Shock may occur if the victim has suffered hundreds of stings. Delayed symptoms are common and range from nausea and vomiting, common after even a few stings, to destruction of red blood cells and kidney failure which occurs with large numbers of stings. Anyone who has suffered more than five stings should consult their doctor. Anyone who has suffered more than 50 stings needs emergency room care.

FIRST AID FOR STINGS: Many remedies recommended in the past have been shown to be useless, or to actually be dangerous.

DOs:

- DO remove the stinger if present. Scrape it out with a credit card or finger nail.
- DO wash stings with soap and water.
- DO apply an ice pack for five to fifteen minutes. Be careful not to freeze the skin.
- DO telephone 911 to summon paramedics if the victim is having an allergic reaction and use a bee sting kit as prescribed.
- DO treat swelling by elevating the swollen body part above the heart.

DO NOTs:

- DO NOT squeeze the sting, or rub mud into it. This increases the risk of infection.
- DO NOT apply meat tenderizer or baking soda. These don't help and can actually cause problems.
- DO NOT administer electrical shocks or drugs not prescribed for the patient.

http://health.ucsd.edu/poison/stinging.asp

5.4.1.4 Scorpions

Scorpions are commonly thought of as desert animals, but in fact, they occur in many other habitats as well, including grasslands and savannahs, deciduous forests, mountain pine forests, rain forests, and caves.

5.4.1.5 Spiders

Brown Recluse Spiders:

The brown recluse spider is one of six poisonous kinds of spiders in the United States. It is part of the arachnid family, which includes not just spiders, but ticks, mites, and scorpions, too. It has long, skinny legs and is about one-half inch long overall. Its entire body is brown, except for a dark mark in the shape of a violin on its head. Its poisonous relatives may be gray, orange, reddish-brown, or pale brown.

Brown recluse spiders are most commonly found in Midwestern and Southern states of the U.S., and they usually hang out in dark places. When they are outside, they like to spend time in piles of rocks, wood, or leaves. If they come inside, brown recluse spiders will go to dark closets, attics, or basements. They are non-aggressive and bite only when disturbed. A person who gets bitten by a brown recluse spider may not notice anything at first or only feel a little sting at first. After about four to eight hours, the sting will start to hurt a little more. It might look like a bruise or might form a blister surrounded by a bluish-purple area that turns black or brown and becomes crusty after a few days.

Black Widow Spiders:

The black widow spider is one of six poisonous kinds of spiders in the United States. Its body is about one-half inch long (smaller than a dime), and it has long legs. The black widow spider is shiny and black with a red-orange or yellow mark in the shape of an hourglass on its stomach.

Black widow spiders and their relatives can be found almost anywhere in the Western hemisphere of the world in damp and dark places. Their favorite places are wood piles, tree stumps, trash piles, storage sheds, fruit and vegetable gardens, in stone walls, and under rocks.

If they come inside, they will go to dark places like corners of closets, garages, or behind furniture. They are shy by nature and bite only when trapped, sat on, or accidentally touched.

A person who gets bitten by a black widow spider might not know it right away, since the bite can sometimes feel like a little pinprick. After 30 to 40 minutes, though, the area of the bite will swell and hurt a lot.

What You Should Do if Bitten By a Spider:

If you ever think that you've been bitten by a brown recluse or black widow spider, tell an adult immediately. It's important to get medical attention as soon as you can because the bites can make you extremely sick. With an adult's help, wash the bite well with soap and water. Then apply an ice pack to the bite to slow down the spread of the spider's venom. Try to elevate the area and keep it still to help prevent the spread of venom.

Signs and Symptoms:

- *Bite mark*
- *Swelling*
- *Pain*
- *Nausea and vomiting*
- *Difficulty breathing or swallowing*

If it's possible, catch and bring the spider to the doctor's office with you. Even though it's usually easy to identify brown recluse or black widows, you'll want to make sure of what kind of spider bit you. The spider can be killed first before you bring it with you; just be sure not to squish it so much that no one can tell what it is.

Treatment:

- Wash wound;
- Apply a cold pack;
- Get medical care to receive antivenin; and
- Call an Ambulance, dial 911 or your local emergency number, if necessary.

Source: <http://firstaid.eire.org/Bites.htm>, June 12, 2003

5.4.1.6 Mites/chiggers

Chiggers are the larvae of harvest mites and belong to the family Trombiculidae. Chiggers feed on low vegetation, but they need animals as a source of protein. Chiggers do not burrow into the skin; instead they attach themselves to the opening of a hair shaft and inject saliva into the skin. When on a person, chiggers go to areas where the skin is thin and moist: the ankles, wrists, thighs, groin or waist. The mite stays in this area until feeding is complete. This time span can be anywhere from one to four days. After feeding, the larvae drop back to the ground to complete their development. In some people, the initial bite can trigger an allergic response and a rash may appear on surrounding areas of skin. If you walk through a wooded or grassy area, it is possible to be attacked by chiggers. People get chiggers simply by the mites jumping onto the skin.

Methods of Prevention:

- If possible, avoid walking through low brush or woody areas.
- If you have to go into an area infested with chiggers, make sure all of your skin is covered with clothing.

Apply an insect repellent containing the substance dimethyl phthalate to areas of the body that are not covered by clothing. Also apply the repellent to areas where clothing overlaps such as the ankles. A tick repellent named Duranon is an effective method for keeping chiggers off of you. It should only be applied to your clothing. Avoid contact with your skin.

Methods of Treatment:

Some people have found that dog shampoo helps to dry up the lesions. The doctor can prescribe ointments for you to apply to the irritated skin. These ointments can dry up and heal the lesions that are present, but will not prevent new lesions from occurring.

For more information see also:

- <http://edis.ifas.ufl.edu/scripts/htmlgen.exe?DOCUMENT_IG085>
- <http://www.ag.ohio-state.edu/~ohioline/hyg-fact/2000/2100.html>
- <http://www.uky.edu/Agriculture/Entomology/entfacts/struct/ef630.htm>

5.4.2 Snakes and Other Animals

5.4.2.1 Snakes

Depending on what part of the country the project site is located in, there are a variety of snakes and other animals that can present a hazard. Some snakes are poisonous and can inject potentially lethal venom when they bite. Poisonous snakes in the United States include:

- Rattle snakes;
- Copperheads;
- Coral snakes; and
- Cottonmouths (also known as water moccasins).

All poisonous snakes have two (2) large fangs which are located in the upper front portion of the mouth. If the victim is bitten and the snake escapes before the identification can be made, the following signs should be noted:

- One to two punctures made by the hollow fangs.
- Pain following within 5 to 10 minutes accompanied by swelling and discoloration around the bite area. These symptoms will progress up the victim’s extremity. If the fang enters a vein or artery, these symptoms may not be present.

Seek medical attention IMMEDIATELY for any snake bites.

5.4.2.2 Other Animals

Hazards from other animals include bites from domesticated dogs, wild or stray dogs, raccoon, skunks, coyotes and others. Be especially aware of animal that are acting erratic or are frothing at the mouth as this can be a sign that animal has rabies. In some parts of the country, bears have been known to attack humans.

5.4.3 Poisonous Plants

Poisonous plants include poison ivy, western poison oak and poison sumac. Approximately 85 percent of the general population will develop an allergy if exposed to these plants. The sensitivity to the sap usually develops after several encounters with poison ivy, oak, or sumac. Poison ivy, western poison oak and poison sumac have poisonous sap (urushiol) in their roots, stems, leaves and fruits. The sap is released when the plant is bruised, making it easier to contact Rhus- dermatitis in the early spring and summer when the leaves are tender. Therefore, brushing against an intact plant will not cause a reaction. However, these plants are very fragile. Stems or leaves can be damaged by the wind, animals or insects. The sap (urushiol) may be deposited on the skin by direct contact with the plant or by contact with contaminated objects, such as clothing, shoes, tools, and animals.

Symptoms of exposure to poisonous plants include:

- Itching;
- Redness;
- Burning sensation;
- Swelling;
- Blisters; and/or
- Rash which may take up to 10 days to heal.

Prevention/Control of exposure to poisonous plants include:

- Wear long-sleeved shirts and long pants, tucked into boots. Wear cloth or leather gloves.
- Apply barrier creams to exposed skin.
- Educate workers on the identification of poison ivy, oak, and sumac plants.
- Educate workers on signs and symptoms of contact with poisonous ivy, oak, and sumac.
- Keep rubbing alcohol accessible. It removes the oily resin up to 30 minutes after exposure.

5.4.3.1 Poison Ivy

Poison ivy grows everywhere in United States except Hawaii and Alaska. In the East, Midwest, and the South, it grows as a vine. In the Northern and Western United States, it grows as a shrub. Each leaf has three leaflets. Leaves are green in the summer and red in the fall. In the late summer and fall, white berries may grow from the stems.

5.4.3.2 Poison Oak

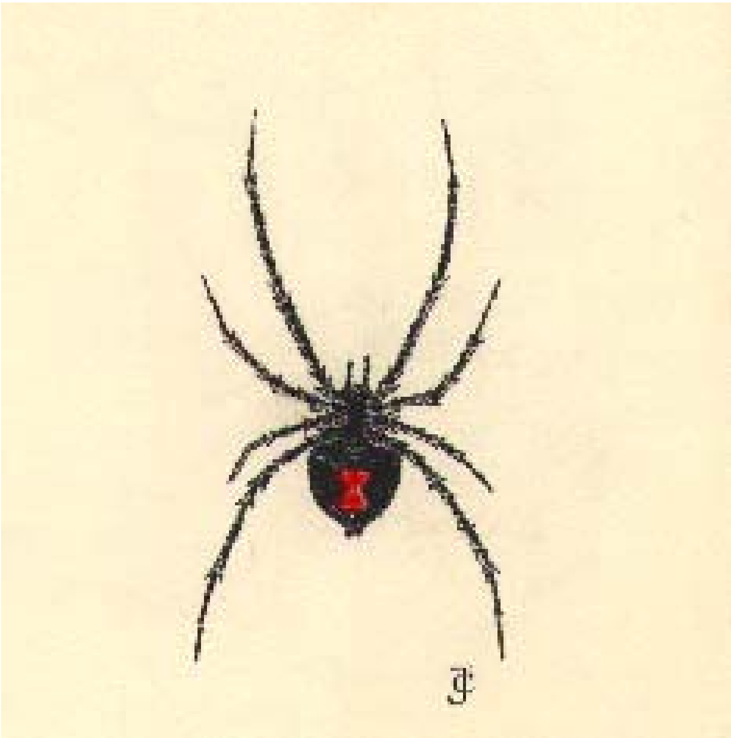
Oak-like fuzzy leaves in clusters of three. It has two distinct kinds: Eastern poison oak (New Jersey to Texas) grows as a low shrub. Western poison oak (Pacific Coast) grows to six-foot-tall clumps or vines up to 30 feet long. It may have clusters of yellow berries.

5.4.3.3 Poison Sumac

Grows in standing water in peat bogs in the Northeast and Midwest and in swampy areas in parts of the Southeast. Each leaf has clusters of seven to 13 smooth-edged leaflets. The plants can grow up to 15 feet tall. The leaves are orange in spring, green in summer and red, and orange or yellow in fall. There may be clumps of pale yellow or cream-colored berries.

Spiders

Black Widow



Brown Recluse

First Aid - Spiders

- Wash wound
- Apply a cold pack
- Get medical care to receive antivenin
- Call an Ambulance, dial 911 or your local emergency number, if necessary

Stinging Insects

Killer bees and honey bees

Killer Bees are slightly smaller than the European honey bee, but only an expert can tell them apart

Wasps

Stinging Insects (cont'd)

Hornets

Yellow Jackets

First Aid – Stinging Insects

DOs:

- DO remove the stinger if present. Scrape it out with a credit card or finger nail.
- DO wash stings with soap and water.
- DO apply an ice pack for five to fifteen minutes. Be careful not to freeze the skin.
- DO telephone 911 to summon paramedics if the victim is having an allergic reaction and use a bee sting kit as prescribed.
- DO treat swelling by elevating the swollen body part above the heart.

DO NOTs:

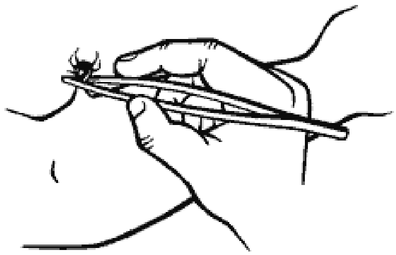
- DO NOT squeeze the sting, or rub mud into it. This increases the risk of infection.
- DO NOT apply meat tenderizer or baking soda. These don't help and can actually cause problems.
- DO NOT administer electrical shocks or drugs not prescribed for the patient.

Ticks

Lyme Disease Symptoms:

- Arthritis
- Muscle pain
- Brain and nerve disorders that are severe, chronic and disabling
- Flu-like ailments
- Migrating joint aches
- Lymph node swelling
- Neck and headaches
- Malaise
- Fever
- Muscle aches

•Characteristic bulls-eye rash around bite site



First Aid – Ticks

- Avoid handling ticks with uncovered fingers; use tweezers or commercial tools designed for removal. If index finger and thumb must be used, protect them with rubber gloves, plastic or even a paper towel.

- Place the tips of tweezers or edges of other removal devices around the area where the mouthparts enter the skin.

- With a steady slow motion, pull the tick away from the skin or slide the removal device along the skin. Do not jerk, crush, squeeze or puncture the tick.

- After removal, place the tick directly into a sealable container. Disinfect the area around the bite site using standard procedures.

- Medical professionals advise keeping the tick alive for a month in case symptoms of a tick-borne disease develop. Place it in a labeled, sealed bag or vial with lightly moistened paper towel then store at refrigerator temperature.

Poisonous Snakes

Rattle snake

Copper head

Poisonous Snakes

Water Moccasin

(Cottonmouth)

Coral Snake

First Aid – Poisonous Snakes

- Remain calm – Don’t move
- Allow bite to bleed freely for 15 – 30 Seconds
- Wash wound
- Keep bitten part still, and lower than the heart
- Call an Ambulance, dial 911 or your local emergency number

Poisonous Plants

Poison Ivy

Poison Sumac

Poison Oak

First Aid – Poisonous Plants

- Wear long-sleeved shirts and long pants, tucked into boots. Wear cloth or leather gloves.
- Apply barrier creams to exposed skin.
- Educate workers on the identification of poison ivy, oak, and sumac plants.
- Educate workers on signs and symptoms of contact with poisonous ivy, oak, and sumac
- Cleansing with an ordinary soap within 6 hours after the initial exposure has proven to be effective. Repeat the cleaning with the soap 3 times. There are also alcohol-based wipes that help remove the oils. Wash all clothes and shoes also because the oils can remain on these.

First Aid – Poisonous Plants (cont'd)

- For the itching, your physician may recommend over-the-counter creams, such as calamine lotion or bathing in Aveeno bath. Sometimes, your physician will prescribe a medication by mouth for the itching.
- If the blisters and rash are on the face, near the genitals, or all over the body, your physician should be notified. After a thorough history and physical, your physician may prescribe a steroid cream or injection to help with the swelling and itching.

Resources

• Apex Human Resources	(301) 417-0200
• Apex Health and Safety Officer	(484) 256-6960
• Poison Control Hotline	(800) 222-1222
• USEPA Hotline	(800) 424-9346
All Regions Search:	http://www.epa.gov/epahome/aboutepa.htm#regiontext
• Centers for Disease Control (CDC)	(800) 311-3435
• Emergency Snake Hotline	(718) 430-6494
• U.S. Public Health Service	http://www.hhs.gov
• U.S. Fish & Wildlife	http://offices.fws.gov/phone.html
• U.S. Army Corps of Engineers	http://www.usace.army.mil
• OSHA – All Regions	http://www.osha.gov/html/RAmap.html

Appendix H

Site Preparation

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION				
MINIMUM PPE REQUIREMENTS: Level D (Safety Glasses and Steel-Toe Boots)				
Principle Steps	**Potential Safety/Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
Clearing, Grubbing	Struck By/ Against Heavy Equipment	Use reflective warning vests when exposed to vehicular traffic Isolate equipment swing areas Make eye contact with operators before approaching equipment Understand and review hand signals	Warning vests, Hard hat, safety glasses	
	Slips, Trips, Falls	Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	Observe proper lifting techniques Obey sensible lifting limits (60 lb. maximum per person manual lifting) Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Eye Injuries	Wear face shield, goggles when operating powered clearing / grubbing equipment	Face shield, goggles,	
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects Maintain all hand and power tools in a safe condition Keep guards in place during use Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation	Leather gloves, reinforced palms, steel-toe work boots	
	Insect/ Snake Bites	Review injury potential and types of snakes with workers Avoid insect nests areas, likely habitats of snakes outside work areas Emphasize The Buddy System where such injury potential exists Use insect repellent, wear PPE to protect against sting/bite injuries Check for ticks upon exiting for wooded areas. Notify Health and Safety Representative of any known allergies.	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers, leather work gloves, inspect repellant	

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION				
MINIMUM PPE REQUIREMENTS: Level D (Safety Glasses and Steel-Toe Boots)				
Principle Steps	**Potential Safety/Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
Clearing/Grubbing	Contact Dermatitis	Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants Identify and review poisonous plants with workers	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers, leather work gloves	
	Operations of power clearing tools (chain saws, brush saws...)	Wear eye, face, hand & hearing protection when operating power clearing equipment Shut-off / idle power tools walking between work areas Store flammable liquids in well ventilated areas, away from work areas Shut off equipment during re-fueling Prohibit smoking while operating clearing equipment Provide ABC (or equivalent) fire extinguishers for all work	Face shield, goggles, cloth gloves, ear plugs, hard hat, steel-toe work boots	
	Operation of chippers	Lockout/target/de-energize any electrical circuits on chippers before clearing/maintenance Identify staging area for debris Keep chipper approach free of ground debris Follow all precautions for operation of power cleaning tools	Faceshield/goggles, earplugs, hardhat, steel-toe work boots	
	High Noise Levels	Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	Sound Level Meter/ Noise Dosimeter
	High/Low Ambient Temperature	Monitor for Heat/Cold stress Provide fluids to prevent worker dehydration	Clothing appropriate for temperature.	
Grading	Struck By/ Against Heavy Equipment	Use reflective vests worn when exposed to vehicular traffic Isolate equipment swing areas Make eye contact with operators before approaching equipment Understand and review hand signals	Warning vests, hard hat, safety glasses	
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects Maintain all hand and power tools in a safe condition Keep guards in place during use	Leather gloves, re-enforced palms, steel-toe work boots	

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION

MINIMIUM PPE REQUIREMENTS: Level D (Safety Glasses and Steel-Toe Boots)

Principle Steps	Potential Safety/Hazards	Hazard Control Measures	Personal Protective Equipment	Air Monitoring Devices
Grading	Insect/ Snake Bites	Review injury potential and types of snakes with workers Avoid insect nests areas, likely habitats of snakes outside work areas Emphasize The Buddy System where such injury potential exists Use insect repellant, wear PPE to protect against sting/bite injuries.	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers, leather work gloves	
	Contact Dermatitis	Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants Identify and review poisonous plants with workers	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers, leather work gloves	
	High Noise Levels	Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	Sound Level Meter/Noise Dosimeter
	High/Low Ambient Temperature	Monitor for Heat/Cold stress Provide fluids to prevent worker dehydration	Clothing appropriate for the temperature.	
Equipment/ Facility Set-up	Slips, Trips, Falls	Clear walkways work areas of equipment, tools, vegetation, excavated material and debris Mark, identify, or barricade other obstructions		
	Handling Heavy Objects	Observe proper lifting techniques Obey sensible lifting limits (60 lb. maximum per person manual lifting) Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Sharp Objects	Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects Maintain all hand and power tools in a safe condition Keep guards in place during use	Leather gloves, reinforced palm	

ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION				
MINIMUM PPE REQUIREMENTS: Level D (Safety Glasses and Steel-Toe Boots)				
Principle Steps	**Potential Safety/Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
Equipment/ Facility Set-up	Electrical Shock	De-energize or shut off utility lines at their source before work begins Use double insulated or properly grounded electric power-operated tools Maintain tools in a safe condition Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters Use qualified electricians to hook up electrical circuits Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation Cover or elevate electric wire or flexible cord passing through work areas to protect from damage Keep all plugs and receptacles out of water Use approved water-proof, weather-proof type if exposure to moisture is likely Inspect all electrical power circuits prior to commencing work Follow Lockout-Tagout procedures		
	High Noise Levels	Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	Sound Level Meter/ Noise Dosimeter
	High/Low Ambient Temperature	Monitor for Heat/Cold stress Provide fluids to prevent worker dehydration	Clothing appropriate for the temperature	

EQUIPEMENT TO BE USED	INSPECTION REQUIREMENTS	TRAINING REQUIREMENTS
	• Daily equipment inspections •	• Review SSHP with all site personnel • Review site specific AHA with all task personnel

ACTIVITY HAZARD ANALYSIS FOR SITE RESTORATION				
MINIMUM PPE REQUIREMENTS: Level D (Safety Glasses, Steel-Toe Boots)				
Principal Steps	**Potential Safety/Health Hazards**	**Hazard Control Measures**	**Personal Protective Equipment**	**Air Monitoring Devices**
Site Restoration	Struck By/Against Heavy Equipment, Protruding Objects	Use reflective vests when exposed to vehicular traffic Avoid equipment swing areas Make eye contact with operators before approaching equipment Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times Understand and review hand signals	Warning vests, Hard hat, Safety glasses	
	Slips, Trips, Falls	Clear, walkways of equipment, tools, debris, other materials Mark, identify, or barricade other obstructions		
	High Noise Levels	Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)	Ear plugs	Sound Level Meter/ Noise Dosimeter
	Handling Heavy Objects	Observe proper lifting techniques Obey sensible lifting limits (60 lb per person for manual lifting) Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads		
	Contact Dermatitis	Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants Identify and review poisonous plants with workers	Tyvek coveralls, duct tape bottom of coveralls to boots, leather work gloves	
	High/Low Ambient Temperature	Monitor for Heat/Cold stress Provide fluids to prevent worker dehydration	Proper clothing for temperature	

EQUIPMENT TO BE USED	INSPECTON REQUIREMENTS	TRAINING REQUIREMENTS
	• Daily equipment documented inspections	• Review AHA with task personnel

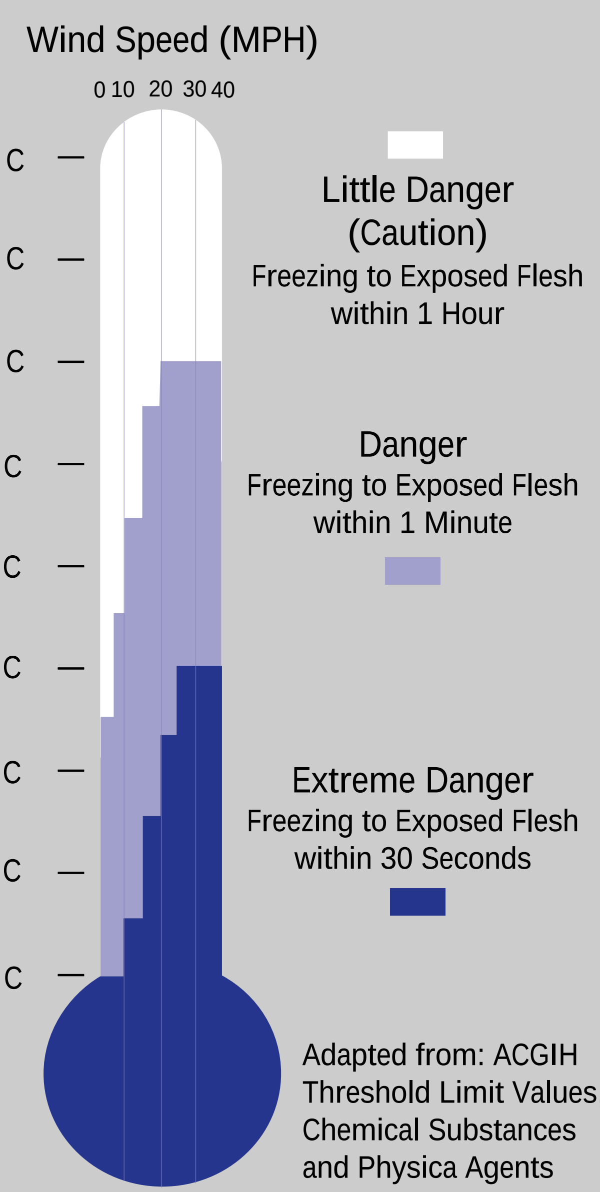
Appendix I

Cold Stress Guidelines

THE COLD STRESS EQUATION

LOW TEMPERATURE + WIND SPEED + WETNESS = INJURIES & ILLNESS

When the body is unable to warm itself, serious cold-related illnesses and injuries may occur, and permanent tissue damage and death may result. **Hypothermia** can occur when *land temperatures* are **above** freezing or *water temperatures* are below 98.6°F/37°C. Cold-related illnesses can slowly overcome a person who has been chilled by low temperatures, brisk winds, or wet clothing.



Adapted from: ACGIH Threshold Limit Values, Chemical Substances and Physica Agents Biohazard Indices, 1998-1999.

U.S. Department of Labor
Occupational Safety and Health Administration

OSHA 3156
1998

FROST BITE

What Happens to the Body:

FREEZING IN DEEP LAYERS OF SKIN AND TISSUE; PALE, WAXY-WHITE SKIN COLOR; SKIN BECOMES HARD and NUMB; USUALLY AFFECTS THE FINGERS, HANDS, TOES, FEET, EARS, and NOSE.

What Should Be Done: (land temperatures)

- Move the person to a warm dry area. Don't leave the person alone.
- Remove any wet or tight clothing that may cut off blood flow to the affected area.
- **DO NOT** rub the affected area, because rubbing causes damage to the skin and tissue.
- **Gently** place the affected area in a warm (105°F) water bath and monitor the water temperature to **slowly** warm the tissue. Don't pour warm water directly on the affected area because it will warm the tissue too fast causing tissue damage. Warming takes about 25-40 minutes.
- After the affected area has been warmed, it may become puffy and blister. The affected area may have a burning feeling or numbness. When normal feeling, movement, and skin color have returned, the affected area should be dried and wrapped to keep it warm. **Note:** If there is a chance the affected area may get cold again, do not warm the skin. If the skin is warmed and then becomes cold again, it will cause severe tissue damage.
- Seek medical attention as soon as possible.

HYPOTHERMIA - (Medical Emergency)

What Happens to the Body:

NORMAL BODY TEMPERATURE (98.6° F/37°C) DROPS TO OR BELOW 95°F (35° C); FATIGUE OR DROWSINESS; UNCONTROLLED SHIVERING; COOL BLUISH SKIN; SLURRED SPEECH; CLUMSY MOVEMENTS; IRRITABLE, IRRATIONAL OR CONFUSED BEHAVIOR.

What Should Be Done: (land temperatures)

- Call for emergency help (i.e., Ambulance or Call 911).
- Move the person to a warm, dry area. Don't leave the person alone. Remove any wet clothing and replace with warm, dry clothing or wrap the person in blankets.
- Have the person drink warm, sweet drinks (sugar water or sports-type drinks) if they are alert. **Avoid drinks with caffeine** (coffee, tea, or hot chocolate) or alcohol.
- Have the person move their arms and legs to create muscle heat. If they are unable to do this, place warm bottles or hot packs in the arm pits, groin, neck, and head areas. **DO NOT** rub the person's body or place them in warm water bath. This may stop their heart.

What Should Be Done: (water temperatures)

- Call for emergency help (Ambulance or Call 911). Body heat is lost up to 25 times faster in water.
- **DO NOT** remove any clothing. Button, buckle, zip, and tighten any collars, cuffs, shoes, and hoods because the layer of trapped water closest to the body provides a layer of insulation that slows the loss of heat. Keep the head out of the water and put on a hat or hood.
- Get out of the water as quickly as possible or climb on anything floating. **DO NOT** attempt to swim unless a floating object or another person can be reached because swimming or other physical activity uses the body's heat and reduces survival time by about 50 percent.
- If getting out of the water is not possible, wait quietly and conserve body heat by folding arms across the chest, keeping thighs together, bending knees, and crossing ankles. If another person is in the water, huddle together with chests held closely.

How to Protect Workers

- Recognize the environmental and workplace conditions that lead to potential cold-induced illnesses and injuries.
- Learn the signs and symptoms of cold-induced illnesses/injuries and what to do to help the worker.
- Train the workforce about cold-induced illnesses and injuries.
- Select proper clothing for cold, wet, and windy conditions. Layer clothing to adjust to changing environmental temperatures. Wear a hat and gloves, in addition to underwear that will keep water away from the skin (polypropylene).
- Take frequent short breaks in warm dry shelters to allow the body to warm up.
- Perform work during the warmest part of the day.
- Avoid exhaustion or fatigue because energy is needed to keep muscles warm.
- Use the buddy system (work in pairs).
- Drink warm, sweet beverages (sugar water, sports-type drinks). Avoid drinks with caffeine (coffee, tea, or hot chocolate) or alcohol.
- Eat warm, high-calorie foods like hot pasta dishes.

Workers Are at Increased Risk When…

- They have predisposing health conditions such as cardiovascular disease, diabetes, and hypertension.
- They take certain medication (check with your doctor, nurse, or pharmacy and ask if any medicines you are taking affect you while working in cold environments).
- They are in poor physical condition, have a poor diet, or are older.

Appendix J

Heat Stress Guidelines

OSHA QUICK CARD™

Protect Yourself

Heat Stress

When the body is unable to cool itself by sweating, several heat-induced illnesses such as heat stress or heat exhaustion and the more severe heat stroke can occur, and can result in death.

Factors Leading to Heat Stress

High temperature and humidity; direct sun or heat; limited air movement; physical exertion; poor physical condition; some medicines; and inadequate tolerance for hot workplaces.

Symptoms of Heat Exhaustion

- Headaches, dizziness, lightheadedness or fainting.
- Weakness and moist skin.
- Mood changes such as irritability or confusion.
- Upset stomach or vomiting.

Symptoms of Heat Stroke

- Dry, hot skin with no sweating.
- Mental confusion or losing consciousness.
- Seizures or convulsions.

Preventing Heat Stress

- Know signs/symptoms of heat-related illnesses; monitor yourself and coworkers.
- Block out direct sun or other heat sources.
- Use cooling fans/air-conditioning; rest regularly.
- Drink lots of water; about 1 cup every 15 minutes.
- Wear lightweight, light colored, loose-fitting clothes.
- Avoid alcohol, caffeinated drinks, or heavy meals.

What to Do for Heat-Related Illness

- Call 911 (or local emergency number) at once.

While waiting for help to arrive:

- Move the worker to a cool, shaded area.
- Loosen or remove heavy clothing.
- Provide cool drinking water.
- Fan and mist the person with water.

For more complete information:

OSHA Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA

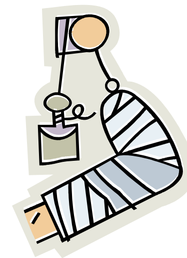
OSHA 3154-07R-06

Appendix K

Accident Prevention

SAFETY BULLETIN 21

Accident Prevention



Is one of your workers an accident waiting to happen? Certain unsafe behaviors and attitudes are signs someone might be headed toward an accident. Look out for these warning signs of an accident-prone worker:

- The worker is in a hurry - acting faster than s/he is thinking.
- The employee is running on emotion rather than thinking about what s/he is doing. S/he is angry, frustrated or even elated.
- Fatigue is making the worker inattentive.
- The worker is distracted by stress concerning problems at work or off the job.
- Distractions from other activities in the work area or interruptions by co-workers are interfering with performing safety routines.
- Getting too comfortable and casual with a repeated task causes the worker to become careless.
- Being overly confident or showing off can cause a worker to take chances.
- The worker takes shortcuts, such as adjusting machinery while it is in motion or under power.
- S/he uses equipment without waiting for training or authorization - jumping onto a forklift to quickly move something or borrowing a powered tool for a task.
- The worker resists rules about Personal Protective Equipment by using it incorrectly or removing it when you are not looking.
- The curious worker tries something - such as a chemical combination - just to see what happens.

Watch for the warnings of an accident waiting to happen. When you observe them, step in and get the worker back on track. Contact your Site Safety Officer, Project Manager, Regional Health and Safety Manager or Apex's Director, Corporate Health and Safety to address your concerns**.**

Appendix L

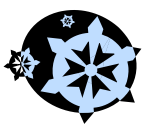
Slips, Trips and Falls

Safety Bulletin 25 - Slips, Trips, and Falls

Injuries while walking are common to all organizations and facilities. The walking areas (i.e., hallways, restrooms, lobbies, warehouses, cafeterias, parking lots) become problems in a variety of ways. The end result of allowing the hazards to exist is usually the same - an injured employee. Most of these accidents, which result in pain and suffering, can be prevented if all employees follow a few single precautions.

Listed below are some of the common causes for slips, trips, and falls and recommended corrective action:

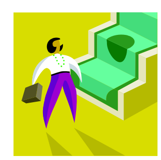
- ✓ Icy Walkways (snow, freezing rain, packed ice).
    - o *Corrective action*: Keep a stock of commercially sold de-icers such as rock salt and liquid ice melt for immediate treatment of slippery walkways and stairs and add sand to improve traction. Always have a snow shovel on hand as well.



        - Do not shovel snow if you have a history of heart problems. While shoveling, push snow in front of you. If you have to lift it, pick up small amounts and lift with your legs, not your back. Do not toss snow over your shoulder or to the side.

- ✓ Wet floors (spilled drinks, oily substances).
    - o *Corrective action*: Clean up spills immediately.
- ✓ Debris on floors (paper, candy wrappers, paper clips, rubber bands, paper).
    - o *Corrective Action*: Pick up loose material and dispose of in proper container.
- ✓ Construction materials/equipment in halls.
    - o *Corrective action*: Avoid construction areas; obey warning signs.

- ✓ Loose/damaged flooring (tiles, carpet, edge strips).
    - o *Corrective action*: Call in a service request.
- ✓ Objects in path (power cords, furniture, equipment, and pallets).
    - o *Corrective action*: Avoid, remove where possible, notify supervision.
- ✓ Slippery shoe material (leather, plastic).
    - o *Corrective action*: Wear substantial, non-slippery sole and heel shoes.
- ✓ Ladders
    - o *Corrective action*: When using ladders, make sure the ladder is long enough for the job, and don't overreach.



- ✓ Slip and fall while ascending and descending stairs.
    - o *Corrective action*: Always use the hand rail and never carry items that require the use of both hands.

Even though each employee is responsible for wiping up liquids that he or she spills and keeping tools, boxes, cables, and other items out of the walkways, some of these hazards continue to exist. One should not blindly assume that walkways will be clear of hazards. To avoid slips, trips and falls, always be on the lookout for hazards that may be present in the walkway that you are using.

Appendix M

MSDS

PCE
Material Safety Data Sheet

MARTIN ASPHALT COMPANY

Manufacturer's Name: Martin Asphalt Company	Date: December, 2006
Telephone Number: 800-662-0987	Address: 300 Christy Place
For Emergency Assistance Call: (713) 941-4410	South Houston, TX 77587

NFPA HAZARD IDENTIFICATION	DEGREE OF HAZARD	HAZARD RATINGS
	HEALTH: 0 FIRE: 0 REACTIVITY: 0	0= LEAST 1= SLIGHT 2= MODERATE 3= HIGH 4= EXTREME

SECTION 1 - COMPONENT DATA	
PRODUCT NAME:	LVOC-1/PCE
COMMON NAME	BLENDED PETROLEUM HYDROCARBON
CHEMICAL NAME	BLENDED PETROLEUM HYDROCARBON

SECTION 2 - PHYSICAL DATA				
C.A.S. NUMBER:	MIXTURE (SEE DATA BELOW)			
BOILING POINT (F):	212^0f			
SPECIFIC GRAVITY (H20=1):	0.93			
MELTING POINT:	N.A. ^{0}f			
VAPOR PRESSURE:	17.535 (GAUGE)			
PERCENT VOLATILE:	0			
VAPOR DENSITY (AIR=1):	N/A			
EVAPORATIVE RATE (EE=1):	N/A			
SOLUBILITY IN WATER:	SOLUBLE			
APPEARANCE AND ODOR:	LIGHT BROWN LIQUID, FAINT PETROLEUM ODOR			
COMPONENT NAME/ CAS NO.	% MIN	% MAX	EXPOSURE LIMITS	UNITS
HEAVY PARAFFINIC DISTILLATE SOLVENT EXTRACT (HPDSE)/64742-04-7	50	70	OSHA PEL (OIL MIST) 8HR/TWA (OIL MIST)	5 mg/m3 0.2mg/m3
EMULSIFIER/ LISTED IN TSCA	0	10	ORAL LD50 (RATS)	<19g/kg

SECTION 3 - FIRE & EXPLOSION DATA	
FLASH POINT (^{O}F) & METHOD:	HPDSE: 410 / C.O.C.
FLAMMABILITY LIMITS:	LOWER: N.A. UPPER: N.A.
AUTO IGNITION TEMPERATURE (F):	UNKNOWN
EXTINGUISHING MEDIA	USE DRY CHEMICAL, FOAM OR CARBON DIOXIDE.
SPECIAL FIRE FIGHTING PROCEDURES	WATER MAY BE INEFFECTIVE BUT CAN BE USED TO COOL CONTAINERS EXPOSED TO HEAT OR FLAME. CAUTION SHOULD BE EXERCISED WHEN USING WATER OR FOAM AS FROTHING MAY OCCUR, ESPECIALLY IF SPRAYED INTO CONTAINERS OF HOT, BURNING LIQUID.
UNUSUAL FIRE AND EXPLOSIVE CONDITIONS	DENSE SMOKE MAY BE GENERATED WHILE BURNING. CARBON MONOXIDE, CARBON DIOXIDE AND OTHER OXIDES MAY BE GENERATED AS PRODUCTS OF COMBUSTION.

*NA=NOT APPLICABLE **ND=NOT DETERMINED

SECTION 4 - REACTIVITY DATA	
STABILITY: STABLE	CONDITIONS TO AVOID: NONE
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR	
INCOMPATIBILITY MATERIALS TO AVOID:	MAY REACT WITH STRONG OXIDIZING AGENTS
HAZARDOUS DECOMPOSITION PRODUCTS:	NONE

SECTION 5 - HEALTH HAZARD DATA	
SKIN CONTACT:	AVOID SKIN CONTACT, THIS PRODUCT MAY CAUSE SLIGHT SKIN IRRITATION UPON DIRECT CONTACT; BASED ON TESTING OF SIMILAR PRODUCTS AND/OR COMPONENTS. PROLONGED OR REPEATED CONTACT MAY RESULT IN CONTACT DERMATITIS WHICH MAY MAKE THE SKIN MORE SUSCEPTIBLE TO OTHER IRRITANTS, SENSITIZERS AND DISEASE. PROLONGED OR REPEATED CONTACT MAY RESULT IN OIL ACNE WHICH IS CHARACTERIZED BY BLACKHEADS WITH POSSIBLE SECONDARY INFECTION. CONSTITUENTS OF THIS PRODUCT HAVE BEEN ASSOCIATED WITH PHOTOSENSITIVITY AN ABNORMAL SENSITIVITY OF SKIN TO SUNLIGHT. SEE DATA HEALTH BELOW
EYE CONTACT:	THIS PRODUCT IS RELATIVELY NON-IRRITATING TO THE EYES UPON DIRECT CONTACT BASED ON TESTING OF SIMILAR PRODUCTS AND/OR COMPONENTS.
INHALATION:	THIS PRODUCT HAS A LOW VAPOR PRESSURE AND IS NOT EXPECTED TO PRESENT AN INHALATION HAZARD AT AMBIENT CONDITION. CAUTION SHOULD BE TAKEN TO PREVENT AEROSOLIZATION OR MISTING OF THIS PRODUCT. THE PERMISSIBLE EXPOSURE LIMIT (PEL) AND THRESHOLD LIMIT VALUE (TLV) FOR THIS PRODUCT AS OIL MIST IS 5 mg/m3 APPEAR TO BE WITHOUT SIGNIFICANT HEALTH RISK. THE SHORT-TERM EXPOSURE LIMIT FOR THIS PRODUCT AS AN OIL MIST IS 10 mg/m3.
INGESTION	DO NOT INGEST. THIS PRODUCT IS RELATIVELY NON- TOXIC BY INGESTION. THIS PRODUCT HAS LAXATIVE PROPERTIES AND MAY RESULT IN ABDOMINAL CRAMPS AND DIARRHEA. SEE HEALTH DATA BELOW.
HEALTH DATA	ON RARE OCCASIONS, PROLONGED AND REPEATED EXPOSURE TO OIL MIST POSES A RISK OF PULMONARY DISEASE SUCH AS CHRONIC LUNG INFLAMMATION. THIS CONDITION IS USUALLY ASYMPTOMATIC AS A RESULT OF REPEATED SMALL ASPIRATIONS. SHORTNESS OF BREATH AND COUGH ARE THE MOST COMMON SYMPTOMS. THE PETROLEUM OIL USED FOR THIS PRODUCT IS CLASSIFIED AS CARCINOGENIC BY THE INTERNATIONAL AGENCY FOR RESEARCH OF CANCER. TO MINIMIZE EXPOSURE, DO NOT SUBJECT EMULSION TO TEMPERATURES ABOVE 212ºF. TEMPERATURES IN THIS RANGE VOLATILIZE THE EMULSION.

SECTION 6 - EMERGENCY AND FIRST AID PROCEDURES	
EYE CONTACT	IMMEDIATELY FLUSH EYES WITH LARGE AMOUNTS OF WATER AND CONTINUE FLUSHING UNTIL IRRITATION SUBSIDES. IF MATERIAL IS HOT, TREAT FOR THERMAL BURNS AND TAKE VICTIM TO HOSPITAL IMMEDIATELY.
SKIN CONTACT	REMOVE CONTAMINATED CLOTHING. WASH CONTAMINATED AREA THOROUGHLY WITH SOAP AND WATER. IF REDNESS OR IRRITATION OCCURS, SEEK MEDICAL ATTENTION. IF MATERIAL IS HOT, SUBMERGE INJURED AREA IN COLD WATER. IF VICTIM IS SEVERLEY BURNED, REMOVE TO A HOSPITAL IMMEDIATELY.
INHALATION	THIS MATERIAL HAS A LOW VAPOR PRESSURE AND IS NOT EXPECTED TO PRESENT AN INHALATION EXPOSURE AT AMBIENT CONDITIONS.
INGESTION	DO NOT INDUCE VOMITING. SEEK MEDICAL ATTENTION.

*NA=NOT APPLICABLE **ND=NOT DETERMINED

SECTION 7 - PERSONAL HEALTH PROTECTION INFORMATION	
EYE PROTECTION	EYE PROTECTION IS NOT REQUIRED UNDER CONDITIONS OF NORMAL USE. IF MATERIAL IS HANDLED SUCH THAT IT COULD BE SPLASHED INTO EYES, WEAR PLASTIC FACE SHIELD OR SPLASH-PROOF SAFETY GOGGLES.
SKIN PROTECTION	NO SKIN PROTECTION IS REQUIRED FOR SINGLE SHORT DURATION EXPOSURES, USE IMPERVIOUS CLOTHING (BOOTS, GLOVES, APRONS, ETC.) OVER PARTS OF THE BODY SUBJECT TO EXPOSURE. IF HANDLING HOT MATERIAL, USE INSULATED PROTECTIVE CLOTHING (BOOTS, GLOVES, APRONS, ETC.) LAUNDER SOILED CLOTHES. PROPERLY DISPOSE OF CONTAMINATED LEATHER ARTICLES INCLUDING SHOES, WHICH CANNOT BE DECONTAMINATED.
RESPIRATORY PROTECTION	RESPIRATORY PROTECTION IS NOT REQUIRED UNDER CONDITIONS OF NORMAL USE. IF VAPOR OR MIST IS GENERATED WHEN THE MATERIAL IS HEATED OR HANDLED, USE AN ORGANIC VAPOR RESPIRATOR WITH A DUST AND MIST FILTER. ALL RESPIRATORS MUST BE NIOSH CERTIFIED. DO NOT USE COMPRESSED OXYGEN IN HYDROCARBON ATMOSPHERES.
VENTILATION	IF VAPOR OR MIST IS GENERATED WHEN THE MATERIAL IS HEATED OR HANDLED, ADEQUATE VENTILATION IN ACCORDANCE WITH GOOD ENGINEERING PRACTICE MUST BE PROVIDED TO MAINTAIN CONCENTRATIONS BELOW THE SPECIFIED EXPOSURE OR FLAMMABLE LIMITS.
OTHER	CONSUMPTION OF FOOD AND BEVERAGES SHOULD BE AVOIDED IN WORK AREAS WHERE HYDROCARBONS ARE PRESENT. ALWAYS WASH HANDS AND FACE WITH SOAP AND WATER BEFORE EATING, DRINKING, OR SMOKING.

SECTION 8 - SPILL, LEAK & DISPOSAL PROCEDURES	
STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	CONSULT HEALTH HAZARD DATA IN SECTION 5, PERSONAL HEALTH PROTECTION INFORMATION IN SECTION 7, FIRE & EXPLOSION DATA IN SECTION 3, AND REACTIVITY DATA IN SECTION 4. NOTIFY APPROPRIATE AUTHORITIES OF SPILL. CONTAIN SPILL IMMEDIATELY. DO NOT ALLOW SPILL TO ENTER SEWERS OR WATERCOURSES. REMOVE ALL SOURCES OF IGNITION. ABSORB WITH APPROPRIATE INERT MATERIAL SUCH AS SAND, CLAY, ETC. LARGE SPILLS MAY BE PICKED UP USING VACUUM PUMPS, SHOVELS, BUCKETS OR OTHER MEANS AND PLACED IN DRUMS OR OTHER SUITABLE CONTAINERS.
WASTE DISPOSAL METHOD	ALL DISPOSALS MUST COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS. THE MATERIAL, IF SPILLED OR DISCARDED, MAY BE A REGULATED WASTE. REFER TO STATE AND LOCAL REGULATIONS. CAUTION! IF REGULATED SOLVENTS ARE USED TO CLEAN UP SPILLED MATERIAL, THE RESULTING WASTE MIXTURE MAY BE REGULATED. DEPARTMENT OF TRANSPORTATION (DOT) REGULATIONS MAY APPLY FOR TRANSPORTING THIS MATERIAL WHEN SPILLED. WASTE MATERIAL MAY BE LANDFILLED OR INCINERATED AT AN APPROVED FACILITY. MATERIALS SHOULD BE RECYCLED IF POSSIBLE.

SECTION 9 - SPECIAL PRECAUTIONS/ADDITIONAL INFORMATION	
HANDLING AND STORAGE REQUIREMENTS	DO NOT TRANSFER TO UNMARKED CONTAINERS. STORE IN CLOSED CONTAINERS AWAY FROM HEAT, SPARKS, OPEN FLAME, OR OXIDIZING MATERIALS. THIS PRODUCT IS NOT CLASSIFIED AS HAZARDOUS UNDER DOT REGULATIONS. FIRE EXTINGUISHERS SHOULD BE KEPT READILY AVAILABLE. SEE NFPA 30 AND OSHA 1910.106 FLAMMABLE AND COMBUSTIBLE LIQUIDS.
ADDITIONAL INFORMATION	THIS PRODUCT IS NOT KNOWN TO CONTAIN ANY SARA TITLE III, SECTION 313 REPORTABLE CHEMICALS, AT OR GREATER THAN 1.0% (0.1% FOR CARCINOGENS) A COMPONENT OF THIS PRODUCT IS ON THE TOXIC SUBSTANCES CONTROL ACT (TSCA) INVENTORY.

*NA=NOT APPLICABLE **ND=NOT DETERMINED

(Fact Sheet Begins Next)

Act Now to Continue Receiving Information About This Site!

DEC's Division of Environmental Remediation (DER) now distributes information about contaminated sites *electronically by email*.

If you would like to continue to receive information about the contaminated site featured in this fact sheet:

You must sign up for the DER email listserv:

www.dec.ny.gov/chemical/61092.html

DER cannot register your email address - only the email address owner can do so. If you already have signed up for the listserv for the county in which the site is located, you need do nothing.

Why You Should Go "Paperless":

- ☑ Get site information faster and share it easily;
- ☑ Receive information about all sites in a chosen county - read what you want, delete the rest;
- ☑ It helps the environment and stretches your tax dollars.

If "paperless" is not an option for you, call or write to the DER project manager identified in this fact sheet. Indicate that you need to receive paper copies of fact sheets through the Postal Service. Include the site name in your correspondence. The option to receive paper is available to individuals only. Groups, organizations, businesses, and government entities are assumed to have email access.

FACT SHEET

Brownfield Cleanup Program

2002-2024 Cropsey Avenue Site
2002-2024 Cropsey Avenue
Brooklyn, NY 11214

SITE No. C224169
NYSDEC REGION 2

June 2015

Where to Find Information:

Project documents are available at the following location(s) to help the public stay informed.

New Utretch Branch Library
Attn: Tambe John
1743 86th Street
Brooklyn, NY 11214
Call for hours: (718) 236-4086

NYSDEC, Region 2 Office
47-40 21st Street
Long Island City, NY 11101
Call in advance: (718) 482-4900

Who to Contact:

Comments and questions are always welcome and should be directed as follows:

Project Related Questions
Manfred Magloire, Project Manager
NYSDEC, Region 2 Office
47-40 21st Street
Long Island City, NY 11101
(718) 482-4078
manfred.magloire@dec.ny.gov

Public Health questions:
Renata Ockerby
NYSDOH
Empire State Plaza
Corning Tower Room 1787
Albany, NY 12237
(518) 402-7860
beei@health.ny.gov

For additional information on the New York's Brownfield Cleanup Program, visit:
www.dec.ny.gov/chemical/8450.html

Draft Investigation Work Plan for Brownfield Site Available for Public Comment

The public is invited to comment on a draft work plan being reviewed by the New York State Department of Environmental Conservation (NYSDEC) to investigate the 2002-2024 Cropsey Avenue site (the "Site") located at 2002-2024 Cropsey Avenue, Brooklyn, NY. Please see the map for the site location. Documents related to the cleanup of this site can be found at the location(s) identified on the left-hand side of this page under "Where to Find Information."

Draft Investigation Work Plan: The draft investigation work plan, called a "Remedial Investigation Work Plan," was submitted to NYSDEC under New York's Brownfield Cleanup Program. The investigation will be performed by 2002 Cropsey Associates LLC (the "applicant") with oversight by NYSDEC and the New York State Department of Health (NYSDOH).

How to Comment: NYSDEC is accepting written comments about the draft investigation work plan for 30 days, from **June 23** through **July 22, 2015**. The proposed plan is available for public review at the location(s) identified on the left-hand side of this page under "Where to Find Information." Please submit comments to the NYSDEC project manager listed under Project Related Questions in the "Who to Contact" area on the left-hand side of this page.

Highlights of the Proposed Site Investigation: The investigation will define the nature and extent of contamination in soil, soil vapor, groundwater and any other parts of the environment that may be affected. Key components of the investigation work include:

- Installing and sampling soil borings to identify possible on-site sources of contamination;
- Collecting soil vapor, sub-slab soil vapor and indoor air samples to determine impacts both on-site and off-site, and, if necessary, to assist in the design of a soil vapor mitigation system; and
- Installing and sampling ground water wells to monitor impacts from areas of concern both on-site and off-site.

Next Steps: NYSDEC will consider public comments, revise the plan as necessary, and approve the work plan. NYSDOH must concur with the plan. After the work plan is approved, the activities detailed in the work plan will be implemented.

When the investigation is completed, a report will be prepared and submitted to the NYSDEC that summarizes the results. NYSDEC will review the report, make any necessary revisions and, if appropriate, approve the report.

BROWNFIELD CLEANUP PROGRAM

After the investigation, a cleanup plan, called a "Remedial Work Plan" will be developed and a Decision Document will be proposed. The cleanup plan will include an evaluation of the proposed site remedy, or recommend a no action or no further action alternative. The goal of the cleanup plan is to ensure the protection of public health and the environment. NYSDEC will present the proposed cleanup plan to the public for its review and comment during a 45-day comment period. NYSDEC will keep the public informed throughout the investigation and cleanup of the site.

Site Description: The approximately 0.344 acre Site is in an urban area at 2002-2024 Cropsey Avenue in the Gravesend neighborhood of Brooklyn. The Site is denoted as Block 6467, Lot 1 on the New York City Tax Map. The Site is bounded by Cropsey Avenue to the northeast; 20th Avenue to the northwest; a residential building with a subgrade parking to the southwest and Bay 25th Street to the southeast. A narrow, undeveloped strip of land extends along the entire southwest side of the building and lies between the Site and an adjoining apartment building. The Site was a vacant lot before 1950. A commercial building that included various retail stores was constructed at the site in 1950, including a dry cleaner. The building configuration and site use have been relatively unchanged since 1950. The dry cleaner has operated under various names including Michael's Cleaners and GLY Cleaners. Currently, the on-site dry cleaner, Gly Cleaners, operates as a drop-off only facility. The Site is currently active for commercial use, and consists of a single story, multi-unit retail building which contains a full basement.

Additional site details, including environmental and health assessment summaries, are available on NYSDEC's Environmental Site Remediation Database (by entering the Site ID, C224169) at:

http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=3

Brownfield Cleanup Program: New York's Brownfield Cleanup Program (BCP) encourages the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and redeveloped. These uses may include recreation, housing, business or other uses. A brownfield is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination.

For more information about the BCP, visit:
http://www.dec.ny.gov/chemical/8450.html

We encourage you to share this fact sheet with neighbors and tenants, and/or post this fact sheet in a prominent area of your building for others to see.

Receive Site Fact Sheets by Email

Have site information such as this fact sheet sent right to your email inbox. NYSDEC invites you to sign up with one or more contaminated sites county email listservs available at the following web page:

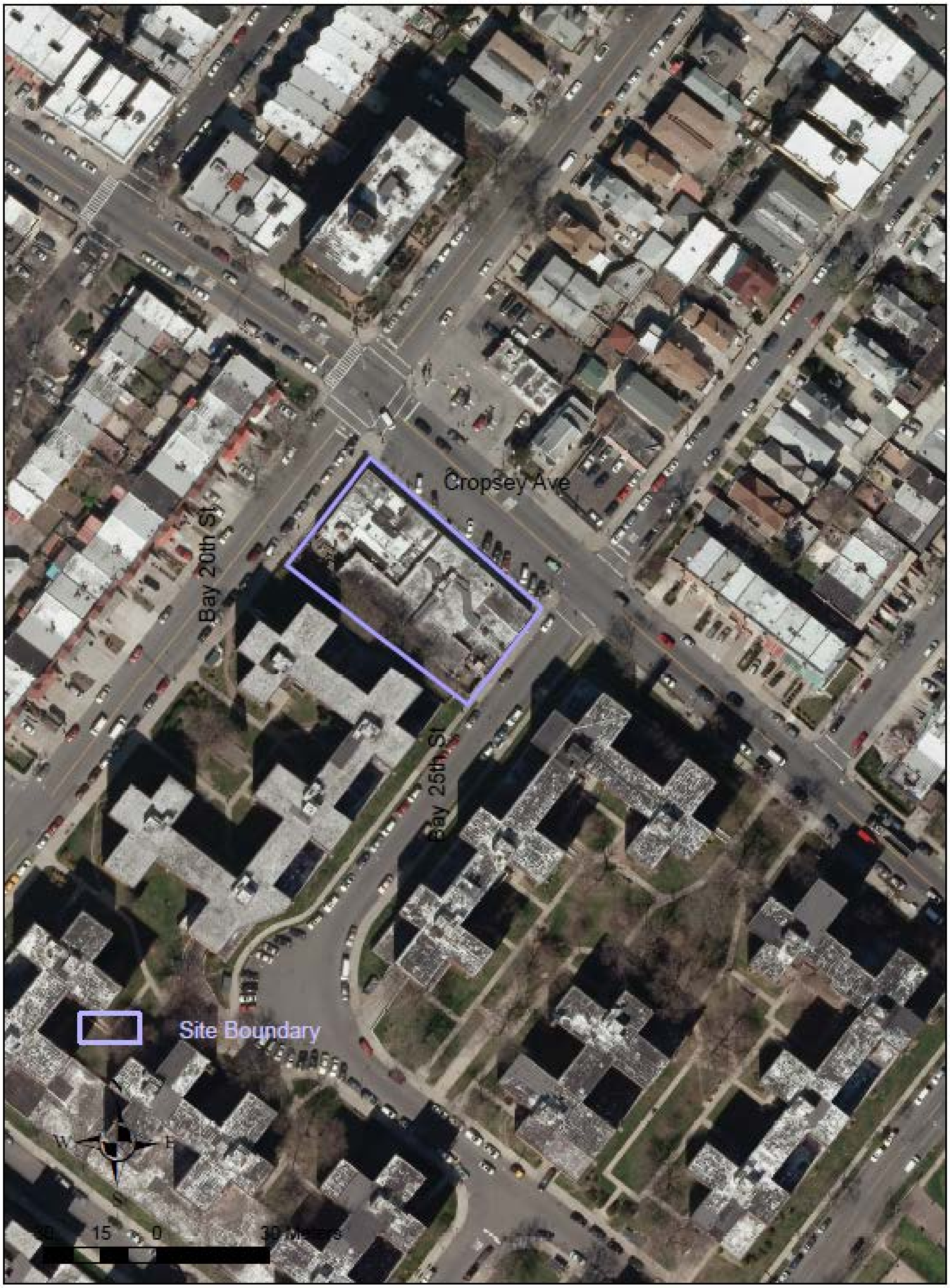
www.dec.ny.gov/chemical/61092.html

It's quick, it's free, and it will help keep you better informed. As a listserv member, you will periodically receive site-related information/ announcements for all contaminated sites in the county(ies) you select.

Note: Please disregard if you already have signed up and received this fact sheet electronically.

BROWNFIELD CLEANUP PROGRAM

Figure 1 – Site Location Map



（下页为情况简介）

现在就采取行动继续接收

有关该场地的信息！

纽约州环保局环境修复处现通过*电子邮件*发布有关污染场地的信息。

如果您想继续收到有关该污染场地的信息：

您必须注册环境修复处电子邮件群发服务：

www.dec.ny.gov/chemical/61092.html

环境修复处不能注册您的电子邮件地址 –

只有电子邮件主人可以注册。如果您已经在

该场地所在县注册了群发服务，则无需再注册。

为什么要"无纸化"：

- ✓ 获取场地信息快捷，方便分享；
- ✓ 接收关于您选定的所在县的所有的场地信息 – 阅读您想要的，删除其余的；
- ✓ 有助环境，充分利用您交的税款。

如果您无法"无纸化"， 请打电话或写信给这个情况简介指定的项目经理。告知他您需要通过邮政服务收到书面文件。在您的信件中请明确提供场地名称。书面文件只提供给个人。其它团体、组织、企业和政府机构均应有电子邮件。

纽约州环境保护局

<u>信息查询：</u>

项目文件可在以下地点获得，以帮助公众随时了解。

New Utretch Branch Library
Attn: Tambe John
1743 86th Street
Brooklyn, NY 11214
Call for hours: (718) 236-4086

NYSDEC, Region 2 Office
47-40 21st Street
Long Island City, NY 11101
Call in advance: (718) 482-4900

<u>联系人:</u>

如有问题和意见，欢迎与如下人员联系：

Project Related Questions
Manfred Magloire, Project Manager
NYSDEC, Region 2 Office
47-40 21st Street
Long Island City, NY 11101
(718) 482-4078
manfred.magloire@dec.ny.gov

Public Health questions:
Renata Ockerby
NYSDOH
Empire State Plaza
Corning Tower Room 1787
Albany, NY 12237
(518) 402-7860
beei@health.ny.gov

关于纽约州棕地治理项目的更多信息，请访问：
www.dec.ny.gov/chemical/8450.html

情 况 简 介

棕地治理项目

2015年6月

2002-2024 克罗波西大道场地
2002-2024 克罗波西大道
纽约州布鲁克林市　邮编:11214

场地编号 C224169
纽约州环境保护局，二区办事处

棕地调查工作计划草案
征询公众意见

纽约州环境保护局(NYSDEC)邀请公众就其正在进行审查的，位于纽约州布鲁克林市2002-2024克罗波西大道的，2002-2024克罗波西大道场地（以下简称“场地")工作计划草案提出意见。场地位置请参阅地图。场地治理相关文件可在本页左边“信息查询”指定地点获得。

调查工作计划草案：调查工作计划草案，称为“修复调查工作计划”,是作为棕地治理项目提交给纽约州环境保护局的。调查工作将由 2002 克罗波西有限责任公司（下称“申请人”）在纽约州环境保护局和纽约州卫生局(NYSDOH)监督下执行。

意见征集方式：纽约州环境保护局将于**2015年6月23日-7月22日**30天内接受有关调查工作计划草案的书面意见。调查计划草案供公众审查，并可在本页左边“信息查询”指定地点获得。请将意见提交给纽约州环境保护局列在本页左侧"项目相关问题" "联系人"栏目中的项目经理。

场地调查计划重点：调查将确定土壤、土壤蒸汽、地下水及任何其他可能影响的环境组成的污染性质和程度。调查工作的主要部分包括：

- 安装钻孔和土壤采样,以确定可能的场地污染源；
- 收集土壤蒸汽、地下土壤蒸汽和室内空气样本，确定对场地内外的影响，并且如果必要的话,协助土壤蒸气减缓系统的设计；以及
- 安装地下水井和取样,监测场地领域内外所受的影响。

接下来的步骤：纽约州环境保护局会考虑公众意见,必要时修改计划,并且适时批准工作计划。纽约州卫生局必须同意该计划。工作计划得到批准之后，其中详述的活动将予以实施。

调查完成后,汇总结果的报告将编制并提交给纽约州环境保护局。纽约州环境保护局将审查报告并作出必要的修改，若适当则批准报告。

BROWNFIELD CLEANUP PROGRAM

调查之后,将制定治理计划-所谓的“修复工作计划”和制定决策文件。治理计划将包括补救措施的评估, 或是建议选择不采取行动或不采取进一步行动。治理计划的目标是确保公众健康和对环境的保护。纽约州环境保护局将提供45天的评议期由公众对治理计划进行审查和提出意见。 纽约州环境保护局将会通告公众,保持公众对整个场地调查和治理过程的了解。

场地描述: 场地大约占地0.344英亩，在布鲁克林市格雷夫森德附近的市区2002-2024克罗波西大道。该场地在纽约市税收地图上列为6467区， 地块1。该场地东北以克罗波西大道为界,西北为第20大道; 西南比邻有地下停车的住宅建筑,东南以25湾街为界。一条狭窄的未开发的土地沿着西南边建筑物延伸于整个场地, 介于场地和相邻公寓楼之间。1950年以前, 该场地是一块空地。1950年, 一幢商业建筑, 包括各种零售店和一家干洗店, 在这里建成。该建筑的配置和场地使用1950年以来相对没有改变。干洗店的运营名称有不同，包括迈克尔干洗店和GLY干洗店。GLY干洗店目前只是作为一个收货设施。目前, 该场地有活跃的商业用途, 为一层多单元零售建筑, 含一个完整的地下室。

场地的其他详细情况, 包括环境和卫生评估总结, 可在纽约州环境保护局的环境场地修复数据库查询（通过输入场地编号, C224169):

http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=3

棕地清理项目: 纽约棕地治理项目(BCP)鼓励自愿治理污染的土地-称为“棕地”,使之可以重新使用和开发。其用途包括娱乐、住宅、商业或其他用途。棕地是指任何难以重新使用和开发的地产, 因其潜在的污染。

有关纽约棕地治理项目的更多信息，请访问：

http://www.dec.ny.gov/chemical/8450.html

我们鼓励大家与邻居和租户分享这个情况简介，并在您的建筑显著位置张贴供大家观阅。

通过电子邮件接收场地情况简介

如要场地情况简介信息发送到您的电子邮箱, 纽约州环境保护局诚邀您注册一个或多个污染场地县级电子邮件群发服务, 网址：

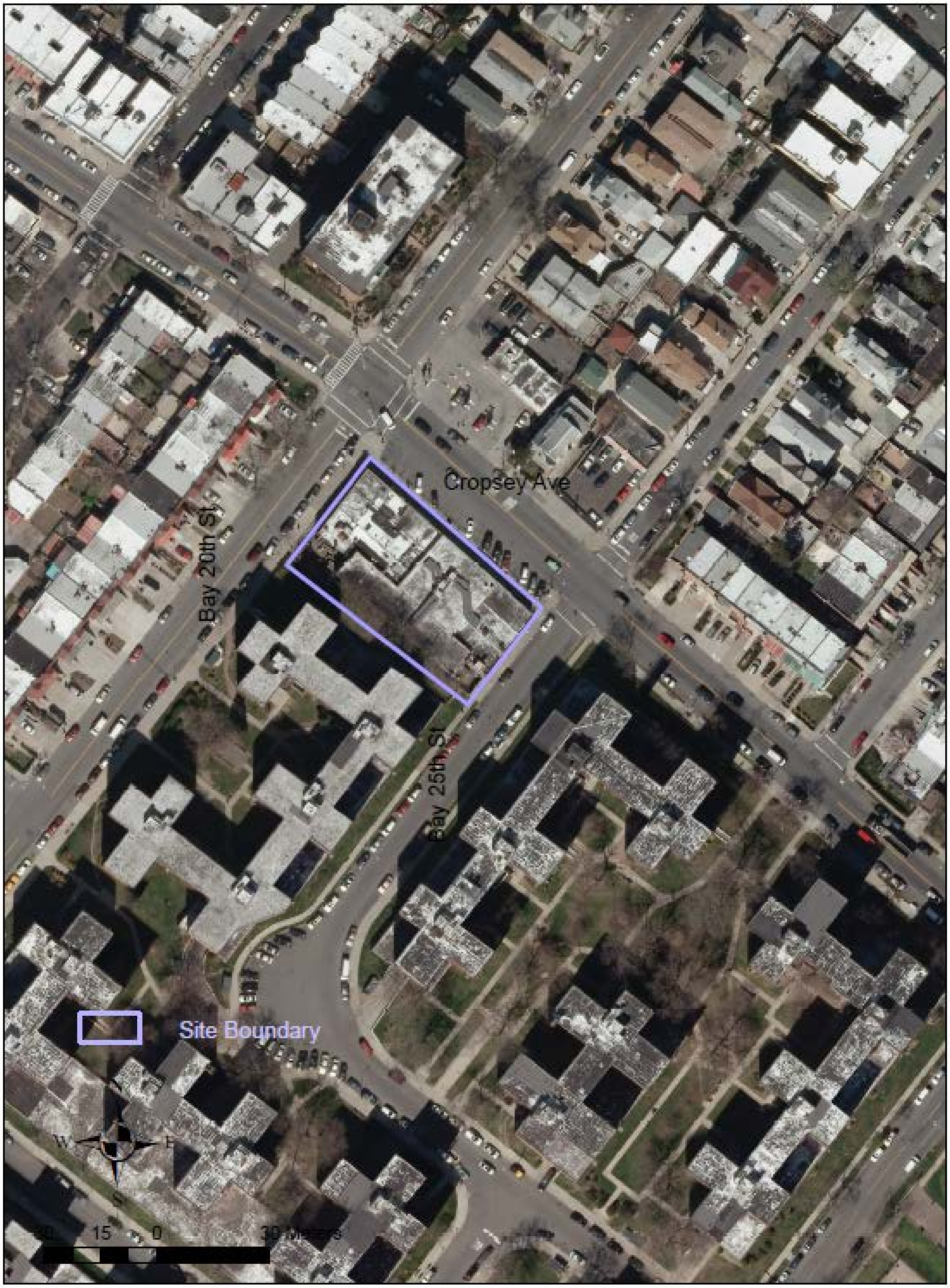
www.dec.ny.gov/chemical/61092.html

速度快、免费、帮助您持续获悉。作为一个群发会员, 您将定期收到您所选择的县的所有受污染场地的相关信息/公告。

注：如果您已经注册并收到电子邮件, 请忽略此条。

棕 地 治 理 项 目

图 1-场地方位图



فیکٹ شیٹ اگلے صفحے پر دستیاب ھے

اس سائٹ کے بارے میں معلومات حاصل کرنا جاری رکھنے کے لیے ابھی عمل کریں

ادارہ برائے ماحولیاتی تحفظ کے ماحولیاتی ریمیڈییشن ڈویژن (ڈی- ای- آر) آپ کو ای میل کے ذریعے آلود شدہ جگہوں کے بارے میں معلومات فراہمم کرے گا-

اگر آپ اس فیکٹ شیٹ میں بیان کیے ہوئے آلود شدہ جگہوں کے بارے میں مسلسل معلومات حاصل کرنا چاہتے ہیں تو ضروری ہے کہ آّپ اپنا ای میل ڈی- ای- آر کے ای میل لسٹسرو میں شامل کریں:
[.html61092http://www.dec.ny.gov/chemical/](http://www.dec.ny.gov/chemical/61092.html)

اگر آپ نے پہلے اپنا ای میل ڈی- ای- آر کے ای میل لسٹسرو میں شامل کیا ہے تاکہ آپ کو اس کاونٹی جہاں پر کام کی جگہ واقع ہے کے بارے میں معلومات ملے تو دوبارہ سے ای میل فراہم کرنے کی زحمت نہ کریں-

ای میل کے فوائد:

- آپ کو کام کی جگہ کے بارے میں فوری معلومات موصول ہوں گی اور آپ اس کو آسانی سے دوسروں تک بھیج سکتے ہیں-
- اپنے منتخب شدہ کاونٹی میں ضروری معلومات حاصل کریں اور غیر ضروری معلومات کو حذف کریں-
- اس کے ساتھ یہ ماحول کو صاف رکھنے میں مدد دیتی ہے اور آپکے ٹیکس ڈالرز بچاتی ہے

اگر آپ کے لیے ای میل کے ذریعے معلومات حاصل کرنا ممکن نہیں ہو تو ڈی- ای- آر کے پروجیکٹ مینیجرکو اس بارے میں لکھیں یا کال کریں- پروجیکٹ مینیجر کی انفارمیشن فیکٹ شیٹ میں دستیاب ہے- اس بات کی نشاندہی ضرور کریں کہ آپ کو فیکٹ شیٹ پوسٹل سروس کے ذریعے بھیجی جائے- اپنے خط و کتابت میں کام کی جگہ کا نام ضرور لکھیں- **ڈاک کے ذریعے معلومات حاصل کرنا صرف انفرادی سطح پر فراہم کیا جائے گا جبکہ گروپس، تنظیمیں، کاروباری اداروں اور حکومتی اداروں کو ای میل فراہم کرنا ہوگا-**

NEW YORK STATE | Department of Environmental Conservation

فیکٹ شیٹ
براؤن فیلڈ صفائی پروگرام

2024-2002 کراپسی ایوینیو بروکلین، نیویارک
سائٹID C-224169
نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ – ریجن 2
جون 2015

عارضی تحقیقاتی منصوبہ عوامی رائے کے لئے دستیاب ہے۔

نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ نے 2024-2002 کراپسی ایوینیو بروکلین نیویارک میں واقع جگہ کی تحقیقات کے لئے عوام کو عارضی تحقیقاتی منصوبے پر رائے دینے کے لیے مدعو کیا ہے۔ برائے مہربانی کام کی جگہ اور معلومات کے لئے آخری صفحہ پر نقشے کو رجوع کریں اور دیگر مزید دستاویزات حاصل کرنے کے لئے دیے گئے پتوں پر رجوع کریں۔

عارضی تحقیقاتی منصوبہ:

عارضی تحقیقاتی منصوبہ، جس کو " تحقیقاتی منصوبہ برائے انسدادی نقصانات " کے طور پر بھی جانا جاتا ہے۔ اس عارضی تحقیقاتی منصوبہ کو نیویارک براؤن فیلڈ صفائی منصوبہ کے تحت نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ کو پیش کیا گیا تھا۔ یہ تحقیق کراپسی ایسوسیٹ ایل ایل سی کرے گا اور جس کی نگرانی نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ اور محکمہ صحت نیو یارک اسٹیٹ بھی کریگا۔

رائے دینے کا طریقہ:

نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ فروری سے مارچ 2015 تک تیس دنوں کے لئے 23 جون - 22 جولائی 2015 منصوبہ بندی کے بارے میں رائے قبول کر رہا ہے۔ مجوزہ منصوبہ عوامی جائزے کے لئے ان جگہوں پر دستیاب ہے۔

نیو اٹریچ برانچ لائبریری
Attn: Tambe John
1743 86th Street
Brooklyn, NY 11214
Call for hours: (718) 236-4086

نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ – ریجن 2
47-40 21st Street
Long Island City, NY 11101
Call in advance: (718) 482-4900

اس منصوبے کے بارے میں اپنے سوالات نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ کے پروجیکٹ مینیجرکو ارسال کریں۔

پراجیکٹ سے متعلق سوالات

Manfred Magloire, Project Manager
NYSDEC, Region 2 Office
47-40 21st Street
Long Island City, NY 11101
(718) 482-4078
manfred.magloire@dec.ny.gov

پبلک ہیلتھ سے متعلق سوالات

Renata Ockerby
NYSDOH
Empire State Plaza
Corning Tower Room 1787
Albany, NY 12237
(518) 402-7860
govbeei@health.ny.

مجوزہ تحقیقاتی جگہ کے اہم نکات:

مجوزہ تحقیق ظاہر کرے گی کہ مٹی میں کس قسم کے اور کتنی مقدار میں آبی بخارات موجود ھیں۔ یہ تحقیق مٹی میں نمی، زیر زمین پانی میں آلودگی اور دوسرے ماحولیاتی اثرات کی وضاحت کرے گا۔

اس تحقیق کے اہم نکات یہ ہیں۔
- کام کی جگہ پر آلودگی کی ممکنہ موجودگی معلوم کرنے کے لئے بورنگ نصب کرنا، مٹی کے نمونے حاصل کرنا اور مٹی میں آلودگی کا تعین کرنا۔
- کام کی جگہ اور گردونواح میں مٹی میں نمی اور آبی بخارات ، زمین کی ذیلی سطح سے مٹی کے نمونے حاصل کرنا تاکہ مٹی میں موجود آبی بخارات کے اثرات کا موقع پراور لیبارٹری میں تجزیہ اور روک تھام کیا جا سکے۔
- کنوئیں نصب کرنا، نمونے حاصل کرنا اور کام کی جگہ اور گردونواح کے اثرات کو جانچنا۔

اگلہ مرحلہ:

نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ عوام کی رائے پر غور کرے گی اور ضروری ہوا تو تجاویز کے مطابق منصوبہ بنا کر منظور کریگی۔ محکمہ صحت نیویارک اسٹیٹ بھی رپورٹ کا جائزہ لے گی اور اگر موزوں سمجھے تو منصوبہ میں ردوبدل کر کے رپورٹ منظور کر لے گی۔
ان تحقیقات کے مکمل ہونے کے بعد ایک صفائی کا منصوبہ تیار کیا جائے گا۔ جو صفائی کے کام کا طریقہ کہلائے گا۔ ان تحقیقات سے منظور شدہ دستاویز تیار کی جائے گی اور مجوزہ کام کی جگہ پر صفائی کا تجزیہ بھی کیا جائے گا۔ صفائی منصوبہ کا مقصد عوامی صحت اور ماحولیات کو یقینی بنانا ہے۔ نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ مجوزہ صفائی منصوبہ عوام کو نظرثانی کے لئے پینتالیس دن کی مدت مقرر کی گئی ہے۔ نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ عوام کو ان تمام تحقیقات کے دوران باخبر رکھے گی اور کام کی جگہ اور صفائی کے کام کی آگاہی دے گی۔

کام کی جگہ کی تفصیل:

تقریبا 0.344 ایکڑ زمین جو کہ شہری علاقہ اور جو بروکلین کے 2002-2024 کراپسی ایوینیو گریوسینڈ کے مضافات میں واقع ہے۔ اس جگہ کو بلاک6467،لاٹ 1 نیویارک سٹی ٹیکس کے نقشہ میں وقف ظاہر کیا ہے۔ اس جگہ کے شمال مشرق میں کراپسی ایوینیو۔ شمال مغرب میں 20 ایوینیو۔ جنوب مغرب میں ایک رہایشی عمارت جس میں زیر زمین پارکنگ بھی ہے۔ اور جنوب مشرق کی طرف
Bay 25th اسٹریٹ واقع ہے۔ اس عمارت کے جنوب مغرب میں ایک غیر آباد پتلی زمین کا ٹکڑا اس رہایشی عمارت اور کام کی جگہ کے درمیان واقع ہے۔ یہ جگہ 1950 سے پہلے ایک خالی زمین تھی-1950 میں اس جگہ ایک تجارتی عمارت بنی جس میں مختلف پرچون کی دکانیں اور ایک کپڑوں کی صفاي کی دکان تھی۔ اس عمارت کی ساخت اور استعمال بغیر کسی ردوبدل کے اسی طرح چلی آ رہی ہے۔ کپڑوں کی صفائی والی دکان مختلف ناموں سے چلتی رہی۔ جیسے مایکل کلینرز اور جی ایل وائے کلینرز۔ آج کل یہ عمارت تجارتی مقاصد کے لئے استعمال ہو رہی ہے۔ اس میں کئی پرچون دکانیں اور ایک تہہ خانہ بھی ہے۔
اس جگہ کی ماحولیات اور صحت کی نگہداشت کی تفصیلات بھی شامل ہے۔ مزید تفصیلات جاننے کے لئے نیویارک اسٹیٹ ڈیپارٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ کے اس ماحولیاتی سائٹ ریمیڈیشن ڈیٹابیس میں ڈالیں۔
(ID C-224169) http://www.dec.ny.gov/cfmx/extapps/derexternal/index.cfm?pageid=3

براؤن فیلڈ صفائی پروگرام

جون 2015 حقائق نامہ

یہ پروگرام آلودہ زمینوں کو دوبارہ استعمال میں لانے کی ترغیب دیتا ہے۔ جیسے رہایشی، تجارتی یا کوي اور استعمال۔ براؤن فیلڈ ایک ایسی زمین ہے جو زیادہ آلودہ ہونے کی وجہ سے دوبارہ استعمال میں نہیں لایا جا سکتا۔ براؤن فیلڈ صفائی پروگرام کی مزید معلومات کے لئے اس ویب سائٹ پر رجوع کریں۔
http://www.dec.ny.gov/chemical/8450.html

ہم آپ کی حوصلہ افزائی چاہتے ہیں۔ تاکہ اپ یہ معاومات اپنے ہمسایوں تک پہنچا دیں یا ایک موذوں جگہ پر آویذاں کریں تاکہ مستنسد رہے۔

ای میل کے زریعے سایٹ کے بارے میں معاومات حاصل کریں۔ نیویارک سٹیٹ ڈیپادٹمنٹ کا ادارہ برائے ماحولیاتی تحفظ آپ کو داوت دیتی ہے کہ نیچے دیے گے ویب سایٹ پر اور آلودہ شدہ جگحوں کے بارے میں ای میل کے ذریعے جانیں۔ اپنی ای میل اس ویب سایٹ پر شامل کریں تاکہ اپکو مفت اور مکمل آگحی مل سکے۔ ای میل فراہم کرنے پر آپ کو کام کی جگہ اور کاؤنٹی کے اور آلودہ زمینوں کے بارے میں معلومات دی جائے گی۔
نوٹ: آگر آپ نے پہلے ہی اپنا ای میل اس ویب سائٹ پر شامل کیا ہے اور اگر آپ کو معلومات وقفے وقفے سے ملتی ہیں تو دوبارہ سے ای میل فراہم کرنے کی زحمت نہ کریں۔

چترا 1 - سائٹ مقام کا نقشہ