

# Remedial Investigation / Interim Remedial Measures / Alternatives Analysis Report Work Plan

285-295 Niagara Street Site  
Buffalo, New York

Revised February 2012

0236-001-101

Prepared For:

285 Niagara Operating Co., LLC



Prepared By:



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**WORK PLAN  
FOR  
REMEDIAL INVESTIGATION/INTERIM  
REMEDIAL MEASURES/ALTERNATIVES  
ANALYSIS REPORT**

**285-295 NIAGARA STREET SITE  
BUFFALO, NEW YORK**

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# RI/IRM/AAR WORK PLAN

## 285-295 Niagara Street Site Buffalo, New York

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## 1.0 INTRODUCTION

This document presents the proposed scope of work and implementation procedures for completion of a Remedial Investigation (RI), Interim Remedial Measures (IRM), and Alternatives Analysis Report (AAR) at the 285-295 Niagara Street Site (Site), located at 285-295 Niagara Street, Buffalo, New York (see Figures 1 and 2).

The Applicant, 285 Niagara Operating Co., LLC, has elected to pursue cleanup and redevelopment of the Site under the New York State Brownfield Cleanup Program (BCP) and has entered into a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC).

The RI/IRM/AAR will be completed by TurnKey Environmental Restoration, LLC (TurnKey), in association with Benchmark Environmental Engineering & Science, PLLC (Benchmark), on behalf of the Applicant. The work will be completed in accordance with NYSDEC DER-10 guidelines.

### 1.1 Background

The Site consists of two adjoining parcels totaling approximately 0.68-acres, located at 285-295 Niagara Street in the City of Buffalo, Erie County, New York. The Site is currently improved with three buildings; Building #1 is located on the northern portion of the Site; Building #2 is located in the center of the Site; and Building #3 is located on the southern portion of the Site. Building #1 is planned for mixed-use residential and commercial redevelopment, and Buildings #2 and #3 are planned for demolition to allow for the redevelopment of Site.

The northern portion of the Site (295 Niagara St. parcel) was historically used as a carriage and bicycle manufacturing operation which included painting, varnishing and metal plating operations; and the southern portion of the Site (285 Niagara St. parcel) was an automobile filling station and car wash operation, including multiple underground storage tanks (USTs) and fuel dispensers. Based on the findings of previous investigations, the NYSDEC opened a spill file (No. 09-04123) for the Site, which is currently active; and known contamination on-Site will require remediation prior to redevelopment.

The planned redevelopment integrates both parcels of the Site into a larger mixed-use residential and commercial development which integrates multiple “green” elements,

including a geothermal heating system, green roof, passive cooling, and high-efficiency building materials.

## 1.2 Project Objectives

For sites entering the BCP at the point of investigation, NYSDEC requires completion of a RI/AAR. The primary objectives of the RI/AAR are to:

- Collect additional soil/fill, groundwater, and sub-slab vapor samples, under appropriate quality assurance/quality control criteria, to better delineate the nature and extent of contamination;
- Determine if the concentrations of constituents of concern in site soil, groundwater, and/or soil gas pose potential unacceptable risks to human health and the environment; and
- Provide the data needed to evaluate potential remedial measures and determine appropriate actions to address potential significant risks.

As part of the RI/IRM/AAR process, sampling data will be used to evaluate whether remedial alternatives can meet the objectives. The intended uses of these data dictate the confidence levels. Two data confidence levels will be employed in the RI: screening level data and definitive level data. In general, screening level confidence will apply to field measurements, including photoionization detector (PID) measurements, groundwater elevation measurements, and field analyses (i.e., pH, temperature, dissolved oxygen, specific conductivity, and turbidity). Definitive level confidence will apply to samples for chemical analysis. The applicability of these levels of data will be further specified in the Quality Assurance Project Plan (QAPP) in Section 5.0. Sampling and analytical acceptance and performance criteria such as precision, accuracy, representativeness, comparability, completeness, and sensitivity, are defined in the QAPP.

As part of the RI, IRMs will be completed to immediately address known environmental impacts related to past use of the Site. An IRM will quickly mitigate risks to public health and the environment. In general, IRM activities may include: excavation of petroleum and/or VOC-impacted soil; excavation of underground storage tanks (USTs), if encountered; implementation of a Soil/Fill Management Plan (SFMP) during redevelopment activities; and off-Site disposal and/or bio-treatment of impacted soil. This Work Plan

includes anticipated IRM activities based on current information and may be modified, subject to NYSDEC approval, immediately after the RI fieldwork is completed.

The Applicants intent is for the IRMs to substantially or completely constitute the final NYSDEC-approved remedy for the Site. The cleanup objectives employed during the IRM will be 6NYCRR Part 375 Restricted-Residential soil cleanup objectives (SCOs); however, the applicant may choose to remediate to a higher level of cleanup (e.g., unrestricted) during the course of remedial work. Details of anticipated IRM activities are included in Section 4.0

### **1.3 Project Organization and Responsibilities**

The Applicant, 285 Niagara Operating Co., LLC, has applied to the New York State BCP, and been accepted as a non-responsible party (volunteer) per ECL§27-1405. TurnKey, in association with Benchmark, will manage the brownfield cleanup on behalf of the Applicant. The NYSDEC Division of Environmental Remediation (Region 9), in consultation with the New York State Department of Health (NYSDOH) shall monitor the remedial actions to verify that the work is performed in accordance with the Brownfield Cleanup Agreement, the approved RI/IRM/AAR Work Plan, and NYSDEC DER-10 guidance (May 2010).

TurnKey personnel as well as subcontractors for this project have not been determined at this time. Once pricing is secured, subcontract agreements are in place, and a field schedule determined, resumes for the selected project team will be provided to the Department, if requested. TurnKey's Project Manager's résumé, however, has been included in Appendix A. The table below presents the planned project team.

<b>Company</b>	<b>Role</b>	<b>Name</b>	<b>Contact Information</b>
TurnKey	Project Manager	Mike Lesakowski	(716) 856-0635
TurnKey	Qualified Env. Prof.	TBD	(716) 856-0635
285 Niagara Operating Co., LLC	Facility Contact	Frederic LoFaso	TBD
TBD	Analytical Testing	TBD	TBD
TBD	Geoprobe Drilling Services	TBD	TBD
TBD	Drilling Services	TBD	TBD
TBD	Excavation Services	TBD	TBD
TBD	DUSR	TBD	TBD

## 2.0 SITE DESCRIPTION

### 2.1 General

The Site is comprised of two adjoining parcels totaling approximate 0.68-acres, located at 285-295 Niagara Street, in the City of Buffalo, Erie County, New York. The Site is bound by Niagara Street to the west, Fell Alley to the east, and commercial and residential properties to the north and south. The Site includes three separate buildings and associated gravel/asphalt parking areas (see Figure 2).

### 2.2 Site Topography and Drainage

The Site is generally flat lying with limited topographic features. The surface of the Site is covered with buildings, asphalt, and gravel. Precipitation (i.e., rain or melting snow) moves to the storm drains in the roadways via overland flow. Surface and shallow groundwater flow are likely impacted by various cycles of development and filling, as well as utility lines and foundations.

### 2.3 Geology and Hydrogeology

#### *2.3.1 Overburden*

The U.S. Department of Agriculture Soil Conservation Service soil survey map of Erie County (Ref. 2) describes the general soil type at the Site as a combination of Urban Land (Ud) and Urban Land-Collamer complex (UmA) which indicates level to gently sloping land with at least 40 percent of the soil surface covered by asphalt, concrete, buildings, or other impervious structures typical of an urban environment. The presence of overburden fill material is widespread and common throughout the City of Buffalo. The geology of the Site will be investigated as part of the RI activities.

#### *2.3.2 Bedrock*

Based on the bedrock geologic map of Erie County (Ref. 3), the Site is situated over the Onondaga Formation of the Middle Devonian Series. The Onondaga Formation is comprised of a varying texture from coarse to very finely crystalline with a dark gray to tan color and chert and fossils within. The unit has an approximate thickness of 110 to 160 feet. Structurally, the bedrock formations strike in an east-west direction and exhibit a regional

dip that approximates 40 feet per mile (3 to 5 degrees) toward the south and southwest. As a result of this dip, the older Onondaga limestone outcrops or subcrops north of the Hamilton Group. An intersecting, orthogonal pattern of fractures and joint sets are common throughout the bedrock strata. The surficial geomorphology of the bedrock strata was modified by period sub-aerial erosion and continental glaciation. Depth to and type of bedrock below the Site has not been determined by drilling.

### ***2.3.3 Hydrogeology***

The Site is located in the Erie-Niagara River Basin. In the Erie-Niagara Basin, the major areas of groundwater are within coarser overburden deposits and limestone and shale bedrock. Regional groundwater appears to flow west – southwest towards the Niagara River and Lake Erie. Localized on-Site groundwater flow will be confirmed during the RI.

## **2.4 Climate**

Western New York has a cold continental climate, with moisture from Lake Erie causing increased precipitation. Average annual precipitation is reportedly 40.5 inches and snowfall is 93.6 inches (Ref. 3) to the northern part of the watershed with over 150 inches per year falling on the southern portion of the watershed. Average monthly temperatures range from 24.5 degrees Fahrenheit in January to 70.8 degrees Fahrenheit in July (Ref. 3). The ground and lakes typically remain frozen from December to March. Winds are generally from the southwest (240 degrees) with a mean velocity of 10 miles per hour (Buffalo Airport, 1999).

## **2.5 Population and Land Use**

The City of Buffalo, encompassing 40 square miles, has a population of 276,059 (2006 US Census Bureau), a decrease of 5.7% from 2000 U.S. Census. The population density in the City is 7,206.3 people per square mile. The Site is located in Census Tract 71.02, in the area of the city zoned for commercial/residential.

Properties adjacent to the Site include commercial and residential properties. The surrounding land-use is mixed use, including commercial, residential and vacant.



## 2.6 Utilities and Groundwater Use

The subject property has access to all major public and private utilities, including potable water (Buffalo Water Authority), sanitary and storm sewers (Buffalo Sewer Authority), electric (National Grid), and natural gas (National Fuel Gas).

Groundwater at the Site is assigned Class “GA” by 6NYCRR Part 701.15. Currently, there are no deed restrictions on the use of groundwater at the Site; however, there are no groundwater supply wells on the property. Regionally, groundwater in the area has not been developed for industrial, agriculture, or public supply purposes. Municipal potable water service is provided on-site and off-site.

## 2.7 Wetlands and Floodplains

There are no State or Federal wetlands or floodplains located on the Site. Per the Erie County GIS On-Line Mapping System, Lake Erie and the Niagara River are located approximately 0.5-miles to the west of the site, A NYSDEC regulated freshwater wetland (BU-3) is located approximately 1.0-mile to the south of the site. Referenced wetlands and floodplains are shown on Figure 3.

## 2.8 Previous Investigations

A summary of the investigations that have occurred at the Site are presented below. These reports are attached in Appendix B.

### ***2.8.1 December 2009 – Off-Site Subsurface Investigation***

Nature’s Way Environmental Consultants and Contractors, Inc. (NWECC&C) conducted a limited subsurface investigation on a portion of the 295 Niagara Street parcel (identified as 305 within the letter-report), and the findings are summarized below.

- Elevated photoionization detector (PID) readings for volatile organic compounds (VOCs) were detected in multiple locations across the site, with readings as high as 1,460 ppm being detected. Elevated PID readings were noted in seven (7) out of nine (9) boring locations.

- Petroleum-impacted soil was detected on the 295 Niagara Street Parcel. As stated in the report, a significant area of contamination was detected on-parcel and will require remediation.

### ***2.8.2 October 2009 – Remedial Excavation Report***

Nature's Way Environmental Consultants and Contractors, Inc. (NWECC&C) conducted preliminary excavation activities on a portion of the 285 Niagara Street parcel. The findings of the report are summarized below.

- Removal activities included the excavation of former underground storage tanks and filling dispensers, and excavation of a portion of the contaminated soil/fill.
- Post-excavation soil samples show elevated VOCs exceeding NYSDEC CP-51 SCOs remain on-Site. NYSDEC Spill No. 0904123 was opened, and remains active for this portion of the Site.
- Contaminated groundwater was handled in association with the excavation, though no groundwater evaluation was conducted.

## **2.9 Primary Constituents of Potential Concern (COPCs)**

Based on findings to date, the Constituents of Potential Concern (COPCs) are presented by media below:

- ***Soil:*** VOCs, SVOCs and metals
- ***Groundwater and Sub-slab Vapor:*** VOCs

### 3.0 REMEDIAL INVESTIGATION SCOPE OF WORK

The Remedial Investigation scope of work is focused on defining the nature and extent of contamination on-site, identifying the source of contamination, defining chemical constituent migration pathways, qualitatively assessing human health and ecological risks (if necessary), and obtaining data of sufficient quantity and quality to perform the alternatives analysis report.

Field team personnel will collect environmental samples in accordance with the rationale and protocols described in the QAPP in Section 5. USEPA and NYSDEC-approved sample collection and handling techniques will be used. Samples for chemical analysis will be analyzed in accordance with USEPA SW-846 methodology with an equivalent Category B deliverable package to meet the definitive-level data requirements. Analytical results will be evaluated by a third-party data validation expert in accordance with provisions described in the QAPP.

During intrusive RI activities, a Community Air Monitoring Plan (CAMP) will be followed. The CAMP is consistent with the requirements for community air monitoring at remediation sites as established by the New York State Department of Health (NYSDOH) and NYSDEC. Accordingly, it follows procedures and practices outlined under NYSDEC's DER-10 (May 2010) Appendix 1A (NYSDOH's Generic Community Air Monitoring Plan) and Appendix 1B (Fugitive Dust and Particulate Monitoring).

### 3.1 Field Investigation Activities

#### *3.1.1 Soil/Fill Investigation*

A soil/fill investigation will be completed to evaluate whether additional impact exists beyond the limits of the planned IRM activities (see Section 4.0 below). The soil/fill investigation will include the advancement and characterization of twelve (12) soil borings. No surface soil samples will be collected as part of the RI, as the Site is covered by buildings and asphalt/gravel parking areas. The proposed RI sample locations are presented on Figure 4.

The sampling plan includes analysis of VOCs (plus tentatively identified compounds (TICs)), SVOCs (plus TICs), metals in all planned soil borings. As a requirement of the BCP, the soil/fill investigation will also include limited sampling for polychlorinated

biphenyls (PCBs), pesticides and herbicides to assess whether other potential contaminants exist within on-Site soil/fill at concentrations of concern.

The soil/fill investigation will employ direct-push drilling techniques. Each soil boring will be advanced to approximately 14-16 feet below ground surface (fbgs), or refusal. All soil samples will be field screened for the presence of VOCs using a field PID with a minimum IP of 11.47 eV, as a procedure for ensuring the health and safety of personnel at the Site, and to identify potential impacts, including chlorinated solvents, in soil samples for laboratory analysis. Upon reaching the completion depth of each boring, PID and visual/olfactory results will be reviewed. The sample interval identified as the most impacted (i.e., greatest PID scan result and/or evidence of visual/olfactory impact) will be selected for analysis. In the event that either the impacts are ubiquitous from grade to final depth or no impacts were identified, the native soils directly above water table will be selected for analysis. If the impacts are ubiquitous from grade to final depth or no impacts were identified and water is not encountered at a particular sample location, the sample interval will be selected based on the discretion of the field personnel. Furthermore, each differentiable fill material encountered will be sampled.

Soil samples will be collected using dedicated stainless steel sampling tools. Representative soil samples will be placed in pre-cleaned laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to TestAmerica, located in Amherst, New York, a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory. Each of the subsurface soil samples will be analyzed for Target Compound List (TCL) plus NYSDEC STARS List VOCs (plus TICs), TCL SVOCs (plus TICs) and Target Analyte List (TAL) metals, and a minimum of five soil samples will also be analyzed for, polychlorinated biphenyls (PCBs), pesticides and herbicides; including one sample of each type of differentiable fill material encountered. However, samples will not be analyzed for VOCs in the absence of elevated PID readings (i.e., sustained readings above 5 ppm) and visual/olfactory evidence of impacts.

### ***3.1.2 Groundwater Investigation***

Five (5) of the planned soil boring locations will be converted into groundwater monitoring wells, as shown on Figure 4. The monitoring wells will provide groundwater

flow and quality information. Monitoring well installation, well development, and groundwater sample collection details are discussed in the following sections.

#### ***3.1.2.1 Monitoring Well Installation***

After completion of the soil borings advancement, five (5) boring locations will be converted into groundwater-monitoring wells. Proposed groundwater monitoring well locations are shown on Figure 4. A direct-push drill rig capable of advancing hollow-stem augers will be employed to install 2-inch inside diameter (ID) monitoring wells. Each boring location will be advanced to approximately 14-16 fbg, or refusal, with a target minimum of 5 feet below the first encountered groundwater. All non-dedicated drilling tools and equipment will be decontaminated between boring locations using potable tap water and a phosphate-free detergent (e.g., Alconox).

Subsequent to boring completion, a 2-inch ID diameter flush-joint Schedule 40 PVC monitoring well will be installed at the boring locations. Each well will be constructed with a minimum 5-foot flush-joint Schedule 40 PVC, 0.010-inch machine slotted well screen. Each well screen and attached riser will be placed at the bottom of each borehole and a silica sand filter pack (size #0) will be installed from the base of the well to a maximum of 2 feet above the top of the screen. A bentonite chip seal will then be installed and allowed to hydrate sufficiently to mitigate the potential for downhole grout contamination. The newly installed monitoring wells will be completed with keyed-alike locks, a lockable J-plug, and a steel flush mounted road box.

#### ***3.1.2.2 Well Development***

After installation, but not within 24 hours, newly installed monitoring wells will be developed in accordance with TurnKey and NYSDEC protocols. Development of the monitoring wells will be accomplished with dedicated disposable polyethylene bailers via surge and purge methodology. Field parameters including pH, temperature, turbidity, dissolved oxygen and specific conductance will be measured periodically (i.e., every well volume or as necessary) during development. Field measurements will continue until they became relatively stable. Stability will be defined as variation between measurements of approximately 10 percent or less with no overall upward or downward trend in the measurements. A minimum of three well volumes will be evacuated from each monitoring well. Development water from the monitoring wells will be containerized and sampled for constituents of concern (COCs). Upon analytical approval, development water will either be

passed through a mobile granular-carbon treatment vessel, and discharged to the ground or, if necessary, disposed.

### ***3.1.2.3 Groundwater Sample Collection***

Prior to sample collection, static water levels will be measured and recorded from all on-Site monitoring wells. Following water level measurement, TurnKey personnel will purge and sample monitoring wells using either a peristaltic pump with dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures; or using a dedicated polyethylene bailer. Prior to sample collection, groundwater will be evacuated from each well at a low-flow rate (typically less than 0.1 L/min). Field measurements for pH, temperature, turbidity, dissolved oxygen, specific conductance and water level, as well as visual and olfactory field observations, will be periodically recorded and monitored for stabilization. Purging will be considered complete when pH, specific conductivity, dissolved oxygen and temperature stabilize and when turbidity measurements fall below 50 Nephelometric Turbidity Units (NTU), or become stable above 50 NTU. Stability is defined as variation between field measurements of 10 percent or less and no overall upward or downward trend in the measurements. Upon stabilization of field parameters, groundwater samples will be collected and analyzed as discussed below.

Sample collection methods that may be implemented during the RI include:

- **Peristaltic Pump with Dedicated Pump Tubing**

Wells less than 20 fbs will be purged and sampled using a peristaltic pump and dedicated pump tubing following low-flow (minimal drawdown) purge and sample collection procedure, as described above. However, the pump will not require decontamination because all components are dedicated to each monitoring well. In addition, groundwater samples collected for VOC analysis will not be sampled directly through the peristaltic pump due to potential degassing (i.e., loss of VOCs) of the groundwater sample. Instead, prior to collection of VOC samples, the pump will be turned off and the pressure on the flexible walled tubing within the pump head will be maintained in order to prevent water within the collection tubing from escaping. The tubing will be removed from the well and coiled to prevent any contact with the ground surface. Upon removal of the tubing and prior to re-activating the pump, the pump flow direction will be reversed. Upon pump re-activation, the pumping rate will be slowly increased; positively displacing groundwater within the tubing

allowing it to flow, without disturbance and degassing, into the appropriate VOC sample vials.

- **Polyethylene Disposable Bailer**

Wells of any depth (up to 100 fbg's) may be purged and sampled using a polyethylene disposable bailer via direct grab. In general, a bottom filling dedicated polyethylene bailer is attached to a length of dedicated hollow-braid polypropylene rope and lowered into the well smoothly and slowly as not to agitate the groundwater or damage the well. Purging continues until a predetermined volume of water has been removed (typically three well volumes) or to dryness. Measurements for pH, temperature, specific conductance, dissolved oxygen and turbidity are recorded following removal of each well volume. The well is purged until the readings for indicator parameters stabilize or the well is purged to dryness.

Prior to, and immediately following collection of groundwater samples, field measurements for pH, specific conductance, temperature, dissolved oxygen, turbidity and water level, as well as visual and olfactory field observations will be recorded. All collected groundwater samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to a NYSDOH-approved laboratory for analysis.

#### ***3.1.2.4 Groundwater Sample Analyses***

A total of five (5) groundwater samples will be collected and analyzed for TCL plus NYSDEC STARS list VOCs (plus TICs), TCL SVOCs (plus TICs), TAL Metals, PCBs, pesticides and herbicides in accordance with USEPA SW 846 methodology with equivalent NYSDEC Category B deliverables to allow for independent third-party data usability assessment.

#### ***3.1.3 Building #1 Interior Assessment***

An assessment of the basement (and/or lowest level floor) of Building #1 will be completed to inspect for features including floor drains, trenches, sumps to guide potential areas for investigation. Based on the findings of the interior assessment, the planned RI approach will be discussed with NYSDEC, including the location of planned interior soil borings and groundwater monitoring well. The internal soil borings and groundwater



monitoring well will be completed in accordance with Section 3.1.1 and 3.1.2 above, respectively.

### ***3.1.4 Sub-slab Vapor Assessment***

To evaluate the potential vapor intrusion into the existing Building #1, two (2) sub-slab vapor (SSV) samples, two interior ambient air samples, and one outdoor ambient air (i.e., background) sample will be collected. One duplicate SSV sample will be collected for each day of SSV sampling. The sampling will be completed in general conformance with the New York State Department of Health (NYSDOH) Soil Vapor Intrusion Guidance (October 2006) and TurnKey's *Ambient Air/Subslab Vapor Sampling* Field Operating Procedure (FOP 004.3 - see Appendix F). Soil vapor samples will be collected and sent to a NYSDOH-approved laboratory for analysis of USEPA TCL VOCs in accordance with USEPA Method TO-15.

#### ***3.1.4.1 Sub-slab Vapor Pre-Sample Assessment***

Prior to initiation of sub-slab vapor (SSV) sampling, a pre-sampling inspection will be performed prior to each sampling event to identify and minimize conditions that may interfere with the proposed testing. The inspection will evaluate the type of structure, floor layout, airflows and physical conditions of the building. This information, along with information on sources of potential indoor air contamination, will be identified on a building inventory form.

#### ***3.1.4.2 Sub-slab Vapor Sample Collection***

At each SSV sampling location, TurnKey personnel will drill a hole through the concrete slab using a hand-held hammer drill. Temporary subslab vapor probes and tubing will be utilized for the sample collection. Holes in the concrete slab will be filled and sealed after completion of the sampling event. Sub-slab vapor samples will be collected in the following manner:

- After installation of the probes, one to three volumes (i.e., the volume of the sample probe and tube) will be purged prior to collecting the samples to ensure samples collected are representative;
- The subslab vapor probes will be sealed to the surface with permagum grout, melted beeswax, putty, or other non-VOC containing and non-shrinking products for temporary installation;



- Flow rates for both purging and collecting will not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling;
- Subslab vapor sample canisters will be equipped with an eight-hour regulator to allow the sample to be collected over an approximate eight-hour period; and,
- Samples will be collected, using conventional sampling methods, in an appropriate container — one which meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzed by EPA Method TO-15), and is certified clean by the laboratory.

Concurrent with the subslab samples, indoor ambient air and outdoor air samples will be collected. Indoor ambient air samples will be collected adjacent to each sub-slab vapor location based upon accessibility within the building. One outdoor, field located air sample will also be collected from a ground level location upwind of the facility, as determined on the day of sub-slab vapor sampling field activities. Indoor and outdoor air sample canisters will also be equipped with an eight-hour regulator to allow the sample to be collected over the same approximate eight-hour period as the subslab vapor samples.

Each canister, with an initial pressure of approximately 50 millitorr (compared to 760 torr of pressure in the atmosphere at sea level), will be fitted with a sampling valve that uses a critical orifice and mass flow controller to regulate the air flow into the canister for the selected sampling period. The mass flow controller will maintain a relative constant air flow rate throughout the sampling period. All Summa canister valves will remain closed until the sample holes are complete and all of the canisters are in their respective positions. The valves will then be opened for the designated collection period. The building HVAC system will operate at normal capacity prior to and during the sample collection program.

#### ***3.1.4.3 Sub-slab Vapor Sample Analysis***

The Summa® canisters once filled will be transported under chain-of-custody command to Soil vapor samples will be collected and sent to a NYSDOH-approved laboratory for analysis of USEPA TCL VOCs in accordance with USEPA Method TO-15 as shown in Table 1. Field documentation of sub-slab vapor investigation sampling activities will be consistent with the NYSDOH guidance.

### ***3.1.5 Field Specific Quality Assurance/Quality Control Sampling***

In addition to the soil/fill, groundwater and sub-slab vapor samples described above, field-specific quality assurance/quality control (QA/QC) samples will be collected and analyzed to ensure the reliability of the generated data as described in the QAPP (see Section 5.0) and to support the required third-party data usability assessment effort. Site-specific QA/QC samples will include matrix spikes, matrix spike duplicates, blind duplicates, and trip blanks.

## **3.2 Investigation-Derived Waste Management**

During installation of the monitoring wells, excess soil cuttings will be containerized (e.g., 55-gallon drums), and sampled to determine if they can be utilized on-Site or require treatment or off-Site disposal. Groundwater from well development and purging will be passed through a mobile granular-carbon treatment vessel and discharged to the ground.

Drums will be labeled with regard to contents, origin, and date of generation using a paint stick marker on two sides and the top of each drum. The drums will be staged on-site pending soil analyses and remedial measures assessment.

## **3.3 Site Mapping**

A Site map will be developed during the field investigation. All sample points and relevant Site features will be located on the map. TurnKey will employ a Trimble GeoXT handheld GPS unit to identify the locations of all soil borings and newly installed wells relative to State planar grid coordinates. Monitoring well elevations will be measured by TurnKey's surveyor. An isopotential map showing the general direction of groundwater flow will be prepared based on water level measurements relative to USGS vertical datum. Maps will be provided with the RI report.

## 4.0 INTERIM REMEDIAL MEASURES

Following completion of the RI, an IRM will be completed to immediately address environmental concerns and to expedite the remedial and overall project schedule. This Work Plan includes anticipated IRM activities based on current information and may be modified, subject to NYSDEC approval, after the RI fieldwork is completed (see Figure 5). The IRM may address some or all of the following Site conditions as more fully defined in the RI:

- Demolition of the two existing buildings, including Building #2 (295 Niagara Street); and Building #3 (285 Niagara Street);
- Excavation of impacted soil within and immediately adjacent to the footprint of the two buildings; and,
- Implementation of a SFMP during remedial and redevelopment activities.

### 4.1 Utility Clearance

Prior to any intrusive activities, Dig Safely New York (Call 811) will be contacted by the site contractor a minimum of three business days in advance of the work and informed of the intent to perform excavation work at the Site. If underground utilities are present on the property and are anticipated to interfere with intrusive activities, the Applicant and the NYSDEC will be contacted to discuss mitigating measures.

### 4.2 Site Preparation

Prior to implementing IRM activities, pre-demolition permits, if required, will be obtained, surveys will be completed, and miscellaneous debris located within Buildings #2 and #3 will be removed and properly disposed. Any required permits will be provided to the NYSDEC prior to initiation of activities.

### 4.3 Waste Characterization

A waste characterization samples will be collected and analyzed prior to initiating excavation work. One composite sample will be collected from soil/fill where known

petroleum impacts are present. Pre-characterization of the soil will allow for direct loading and off-site transportation at the time of the impacted soil removal.

The waste characterization sample will be analyzed for TCL VOCs, TCL SVOCs, Resource Conservation and Recovery Act (RCRA) metals, PCBs, pesticides, herbicides, toxicity characteristic leaching procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, ignitability, corrosivity and reactivity. Based on the results of the waste characterization sampling, impacted soil will be managed according to all federal, State and local waste disposal regulations.

#### **4.4 Removal of Impacted Soils**

Immediately following demolition of Buildings #2 and #3, impacted soil/fill or other grossly contaminated media, as defined in 6 NYCRR Part 375-1.2(u), located beneath and immediately adjacent to the buildings will be excavated and transported off-site for disposal and/or biotreatment.

A PID and visual/olfactory observations will be used to screen soil/fill materials and assist in verifying removal of impacted soil/fill. All excavation work will be directed by an experienced TurnKey professional to remove impacted material. Lateral and vertical excavation will continue, as described above, until suspected source area soils and visually impacted soil/fill is removed, Part 375 Restricted-Residential SCOs are met, excavation has reached the property line, or NYSDEC agrees that no further excavation is required. Based on the findings of the RI and field observations, an evaluation to clean up the BCP Site to a less restrictive level (i.e., Residential or Unrestricted SCOs) may be conducted.

#### **4.5 Excavation Confirmation Sampling**

Post excavation confirmatory composite samples will be collected from the excavated areas. Sample locations from excavated areas will include samples from excavation sidewalls and bottom. A minimum of one sample per 30 linear feet of sidewall and one sample for each 900 square feet of excavation bottom will be collected.

Samples from the excavations will be analyzed for TCL plus NYSDEC STARS List VOCs, including TICs, in accordance with USEPA Methodology with an equivalent Category B deliverables package to facilitate data evaluation by a third-party validation expert. Expedited turnaround times will be requested for the analytical results to minimize

the time that the excavation(s) remains open. Additional analytical parameters may be analyzed from post-excavation confirmatory samples, based on the results of the RI and consultation with the Department.

#### **4.6 Groundwater Management**

Water removed from excavations and surface water run-in to excavations during the impacted soil removal will be handled on-site prior to discharge to the municipal sewer. In general, water removed from excavations will be stored/settled in a portable 20,000-gallon storage tank, and if deemed necessary, will be pumped through a bag or cartridge filter prior to treatment using granular activated carbon (GAC). Following completion of excavation work, settled solids remaining in the tank and spent filter bags will be disposed of off-site.

If the accumulated waters required treatment, the spent GAC will be characterized (TCLP VOC testing) and regenerated off-site, or disposed at a permitted disposal facility in accordance with applicable federal and state regulations. The storage tank will be decontaminated via pressure washing. TurnKey or the Site owner will coordinate with the City of Buffalo to obtain any necessary temporary sewer discharge permits.

#### **4.7 Excavation Backfill**

Following NYSDEC concurrence that the remedial excavation is complete, the excavation will be backfilled with approved backfill material. The backfill material will be placed into the excavation and compacted with the excavator/backhoe bucket in 2-foot lifts to match the existing grade of the Site and minimize settling. Alternatively, the applicant's redevelopment plans may require that select backfill be placed in accordance with certain geotechnical requirements (e.g., 95% of a standard Proctor test). Specific details regarding acceptable backfill materials, test requirements and handling is presented in the Soil-Fill Management Plan, included in Appendix E. Table 2 includes the chemical criteria for import of backfill material to the Site.

## 5.0 QUALITY ASSURANCE PROJECT PLAN

A Quality Assurance Project Plan (QAPP) has been prepared in support of the RI/IRM activities. The QAPP dictates implementation of the investigation tasks delineated in this Work Plan. A Sampling and Analysis Plan (SAP) identifying methods for sample collection, decontamination, handling, and shipping, is provided as below.

The QAPP will assure the accuracy and precision of data collection during the Site characterization and data interpretation periods. The QAPP identifies procedures for sample collection to mitigate the potential for cross-contamination, as well as analytical requirements necessary to allow for independent data validation. The QAPP has been prepared in accordance with USEPA's Requirements for Quality Assurance Project Plans for Environmental Data Operations; the EPA Region II CERCLA Quality Assurance Manual, and NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

### 5.1 Scope of the QAPP

This QAPP was prepared to provide quality assurance (QA) guidelines to be implemented during the RI/IRM activities. This document may be modified for subsequent phases of investigative work, as necessary. The QAPP provides:

- A means to communicate to the persons executing the various activities exactly what is to be done, by whom, and when.
- A culmination to the planning process that ensures that the program includes provisions for obtaining quality data (e.g., suitable methods of field operations).
- A historical record that documents the investigation in terms of the methods used, calibration standards and frequencies planned, and auditing planned.
- A document that can be used by the Project Manager's and QA Officer to assess if the activities planned are being implemented and their importance for accomplishing the goal of quality data.
- A plan to document and track project data and results.

- Detailed descriptions of the data documentation materials and procedures, project files, and tabular and graphical reports.

The QAPP is primarily concerned with the quality assurance and quality control aspects of the procedures involved in the collection, preservation, packaging, and transportation of samples; field testing; record keeping; data management; chain-of-custody procedures; laboratory analyses; and other necessary matters to assure that the investigation activities, once completed, will yield data whose integrity can be defended.

QA refers to the conduct of all planned and systematic actions necessary to perform satisfactorily all task-specific activities and to provide information and data confidence as a result of such activities. The QA for task-specific activities includes the development of procedures, auditing, monitoring and surveillance of the performance.

QC refers to the activity performed to determine if the work activities conform to the requirements. This includes activities such as inspections of the work activities in the field (e.g., verification that the items and materials installed conform to applicable codes and design specifications). QA is an overview monitoring of the performance of QC activities through audits rather than first time inspections.

## 5.2 QAPP Organization and Responsibility

The principal organizations involved in verifying achievement of data collection goals for the 285-295 Niagara Street Site include: the New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH), 285 Niagara Operating Co., LLC (Applicant), TurnKey Environmental Restoration, LLC (Volunteer's Consultant), the drilling subcontractor(s), the independent environmental laboratory, and the independent third party data validator. Roles, responsibilities, and required qualifications of these organizations are discussed in the following subsections. Resumes are included in Appendix A.

### 5.2.1 *NYSDEC and NYSDOH*

It is the responsibility of the New York State Department of Environmental Conservation (NYSDEC), in conjunction with the New York State Department of Health, to review the RI/IRM Work Plan and supporting documents, for completeness and conformance with the site-specific cleanup objectives and to make a decision to accept or



reject these documents based on this review. The NYSDEC also has the responsibility and authority to review and approve all QA documentation collected during brownfield cleanup construction and to confirm that the QA Plan was followed.

### ***5.2.2 Applicant***

285 Niagara Operating Co., LLC (“Applicant”) will be responsible for complying with the QA requirements as specified herein and for monitoring and controlling the quality of the Brownfield cleanup construction either directly or through their designated environmental consultant and/or legal counsel. The Applicants will also have the authority to select Remedial Action Contractor(s) to assist them in fulfilling these responsibilities. The designated Project Manager is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements.

### ***5.2.3 TurnKey Environmental Restoration, LLC***

TurnKey Environmental Restoration, LLC (TurnKey) is the prime consultant on this project and is responsible for the performance of all services required to implement each phase of the RI/IRM Work Plan, including, but not limited to, field operations, laboratory testing, data management, data analysis and reporting. Any one member of TurnKey’s staff may fill more than one of the identified project positions (e.g., field team leader and site safety and health officer). The various quality assurances, field, laboratory and management responsibilities of key project personnel are defined below.

- TurnKey Project Manager (PM): *Michael Lesakowski*

The TurnKey PM has the responsibility for ensuring that the project meets the Work Plan objectives. The PM will report directly to the Applicant Project Coordinator and the NYSDEC/NYSDOH Project Coordinators and is responsible for technical and project oversight. The PM will:

- o Define project objectives and develop a detailed work plan schedule.
- o Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task.
- o Acquire and apply technical and corporate resources as needed to assure performance within budget and schedule constraints.



- o Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product.
- o Review the work performed on each task to assure its quality, responsiveness, and timeliness.
- o Review and analyze overall task performance with respect to planned requirements and authorizations.
- o Review and approve all deliverables before their submission to NYSDEC.
- o Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product.
- o Ultimately be responsible for the preparation and quality of interim and final reports.
- o Represent the project team at meetings.

- TurnKey FTL/SSHO:

*Bryan Hann*

The Field Team Leader (FTL) has the responsibility for implementation of specific project tasks identified at the Site, and is responsible for the supervision of project field personnel, subconsultants, and subcontractors. The FTL reports directly to the Project Manager. The FTL will:

- o Define daily work activities.
- o Orient field staff concerning the project's special considerations.
- o Monitor and direct subcontractor personnel.
- o Review the work performed on each task to ensure its quality, responsiveness, and timeliness.
- o Assure that field activities, including sample collection and handling, are carried out in accordance with this QAPP.

For this project the FTL will also serve as the Site Safety and Health Officer (SSHO). As such, he is responsible for implementing the procedures and required components of the Site Health and Safety Plan (HASP), determining levels of protection needed during field tasks, controlling site entry/exit, briefing the field team and subcontractors on site-specific health and safety issues, and all other responsibilities as identified in the HASP.

### 5.3 Quality Assurance (QA) Responsibilities

The QA Officer will have direct access to corporate executive staff as necessary, to resolve any QA dispute, and is responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations and TurnKey policies, and NYSDEC requirements. The QA Officer has sufficient authority to stop work on the investigation as deemed necessary in the event of serious QA issues.

- Project QA Officer:

*Lori E. Riker*

Specific function and duties include:

- o Performing QA audits on various phases of the field operations
- o Reviewing and approving QA plans and procedures
- o Providing QA technical assistance to project staff
- o Reporting on the adequacy, status, and effectiveness of the QA program on a regular basis to the Project Manager for technical operations
- o Responsible for assuring third party data review of all sample results from the analytical laboratory

### 5.4 Field Responsibilities

TurnKey field staff for this project is drawn from a pool of qualified resources. The Project Manager will use staff to gather and analyze data, and to prepare various task reports and support materials. All of the designated technical team members are experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

### 5.5 Quality Assurance Objectives for Measurement Data

The overall objectives and criteria for assuring quality for this effort are discussed below. This QAPP addresses how the acquisition and handling of samples and the review and reporting of data will be documented. The objectives of this QAPP are to address the following:

- The procedures to be used to collect, preserve, package, and transport groundwater samples.
- Field data collection.
- Record keeping.
- Data management.
- Chain-of-custody procedures.
- Precision, accuracy, completeness, representativeness, decision rules, comparability and level of quality control effort conformance for sample analysis and data management by TestAmerica under EPA analytical methods.

## 5.6 Level of QC Effort for Sample Parameters

Field blank, method blank, trip blank, field duplicate, laboratory duplicate, laboratory control, standard reference materials (SRM) and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling and analytical programs. QC samples are discussed below.

- Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field-sampling program. Field (equipment) blank samples are analyzed to check for procedural chemical constituents at the facility that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.
- Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures.
- Duplicate samples are analyzed to check for sampling and analytical reproducibility.
- MS/MSD and MS/Duplicate samples provide information about the effect of the sample matrix on the digestion and measurement methodology. Depending on site-specific circumstances, one MS/MSD or MS/Duplicate should be

collected for every 20 or fewer investigative samples to be analyzed for organic and inorganic chemicals of a given matrix (see Table 1).

The general level of QC effort will be one field (blind) duplicate and one field blank (when non-dedicated equipment is used) for every 20 or fewer investigative samples of a given matrix. Additional sample volume will also be provided to the laboratory to allow one site-specific MS/MSD or MS/Duplicate for every 20 or fewer investigative samples of a given matrix. One trip blank consisting of distilled, deionized water will be included along with each sample delivery group of aqueous VOC samples.

## 5.7 Sampling and Analysis Plan

The selection and rationale for the RI/IRM sampling program is discussed in the RI/IRM Work Plan. Methods and protocol to be used to collect environmental samples (i.e., soil, groundwater, and sub-slab vapor) for this investigation are described in the TurnKey Field Operating Procedures (FOPs) presented in Appendix F.

The number and types of environmental samples to be collected is summarized on Table 1. Sample parameter lists, holding times and sample container requirements are summarized on Table 3. The sampling program and related site activities are discussed below. To the extent allowed by existing physical conditions at the facility, sample collection efforts will adhere to the specific methods presented herein. If alternative sampling locations or procedures are implemented in response to facility specific constraints, each will be selected on the basis of meeting data objectives. Such alternatives will be approved by NYSDEC before implementation and subsequently documented for inclusion in the project file.

### 5.7.1 Custody Procedures

Sample custody is controlled and maintained through the chain-of-custody procedures. Chain of custody is the means by which the possession and handling of samples will be tracked from the source (field) to their final disposition, the laboratory. A sample is considered to be in a person's custody if it is in the person's possession or it is in the person's view after being in his or her possession or it was in that person's possession and that person has locked it in a vehicle or room. Sample containers will be cleaned and preserved at the laboratory before shipment to the Site. The following section and FOPs for

Sampling, Labeling, Storage, and Shipment, located in Appendix F, describe procedures for maintaining sample custody from the time samples are collected to the time they are received by the analytical laboratory.

### ***5.7.2 Sample Storage***

Samples are stored in secure limited-access areas. Walk-in coolers or refrigerators are maintained at 4°C,  $\pm$  2°C, or as required by the applicable regulatory program. The temperatures of all refrigerated storage areas are monitored and recorded a minimum of once per day. Deviations of temperature from the applicable range require corrective action, including moving samples to another storage location if necessary.

### ***5.7.3 Sample Custody***

Sample custody is defined by this document as when any of the following occur:

- It is in someone's actual possession.
- It is in someone's view after being in his or her physical possession.
- It was in someone's possession and then locked, sealed, or secured in a manner that prevents unsuspected tampering.
- It is placed in a designated and secured area.

Samples are removed from storage areas by the sample custodian or analysts and transported to secure laboratory areas for analysis. Access to the laboratory and sample storage areas is restricted to laboratory personnel and escorted visitors only; all areas of the laboratory are therefore considered secure. If required by the applicable regulatory program, internal chain-of-custody is documented in a log by the person moving the samples between laboratory and storage areas.

Laboratory documentation used to establish COC and sample identification may include the following:

- Field COC forms or other paperwork that arrives with the sample.
- The laboratory COC.

- Sample labels or tags are attached to each sample container.
- Sample custody seals.
- Sample preparation logs (i.e., extraction and digestion information) recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist.
- Sample analysis logs (e.g., metals, GC/MS, etc.) information recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist.
- Sample storage log (same as the laboratory COC).
- Sample disposition log, which documents sample disposal by a contracted waste disposal company.

#### ***5.7.4 Sample Tracking***

All samples are maintained in the appropriate coolers prior to and after analysis. The analysts remove and return their samples as needed. Samples that require internal COC are relinquished to the analysts by the sample custodians. The analyst and sample custodian must sign the original COC relinquishing custody of the samples from the sample custodian to the analyst. When the samples are returned, the analyst will sign the original COC returning sample custody to the sample custodian. Sample extracts are relinquished to the instrumentation analysts by the preparatory analysts. Each preparation department tracks internal COC through their logbooks/spreadsheets.

Any change in the sample during the time of custody will be noted on the COC (e.g., sample breakage or depletion).

### **5.8 Calibration Procedures and Frequency**

This section describes the calibration procedures and the frequency at which these procedures will be performed for both field and laboratory instruments.

#### ***5.8.1 Field Instrument Calibration***

Quantitative field data to be obtained during groundwater sampling include pH, turbidity, specific conductance, temperature, and depth to groundwater. Quantitative water

level measurements will be obtained with an electronic sounder or steel tape, which require no calibration. Quantitative field data to be obtained during soil sampling include screening for the presence of volatile organic constituents using a photoionization detector (PID).

FOPs located in Appendix F describe the field instruments used to monitor for these parameters and the calibration methods, standards, and frequency requirements for each instrument. Calibration results will be recorded on the appropriate field forms and in the Project Field Book.

## **5.9 Analytical Procedures**

Samples collected during this investigation field sampling activities will be analyzed by a NYSDOH-approved laboratory..

### ***5.9.1 Field Analytical Procedures***

Field procedures for collecting and preserving groundwater and soil samples are described in FOPs located in Appendix F. A summary of the FOPs is presented on Table 4.

## **5.10 Data Usability Evaluation**

Data usability evaluation procedures shall be performed for both field and laboratory operations as described below.

### ***5.10.1 Procedures Used to Evaluate Field Data Usability***

Procedures to validate field data for this project will be facilitated by adherence to the FOPs identified in Appendix F. The performance of all field activities, calibration checks on all field instruments at the beginning of each day of use, manual checks of field calculations, checking for transcription errors and review of field log books is the responsibility of the Field Team Leader.

### ***5.10.2 Procedures Used to Evaluate Laboratory Data Usability***

Data evaluation will be performed by the third party data validator using the most current methods and quality control criteria from the USEPA's Contract Laboratory Program (CLP) *National Functional Guidelines for Organic Data Review*, and Contract Laboratory Program, *National Functional Guidelines for Inorganic Data Review*. The data review guidance will

be used only to the extent that it is applicable to the SW-846 methods; SW-846 methodologies will be followed primarily and given preference over CLP when differences occur. Also, results of blanks, surrogate spikes, MS/MSDs, and laboratory control samples will be reviewed/evaluated by the data validator. All sample analytical data for each sample matrix shall be evaluated. The third party data validation expert will also evaluate the overall completeness of the data package. Completeness checks will be administered on all data to determine whether deliverables specified in this QAPP are present. The reviewer will determine whether all required items are present and request copies of missing deliverables.



## 6.0 INVESTIGATION SUPPORT DOCUMENTS

### 6.1 Health and Safety Protocols

TurnKey Environmental Restoration has prepared a Site-Specific Health and Safety Plan (HASP) for use by our employees in accordance with 40 CFR 300.150 of the NCP and 29 CFR 1910.120. The HASP, provided in Appendix C, includes the following site-specific information:

- A hazard assessment.
- Training requirements.
- Definition of exclusion, contaminant reduction, and other work zones.
- Monitoring procedures for site operations.
- Safety procedures.
- Personal protective clothing and equipment requirements for various field operations.
- Disposal and decontamination procedures.

The HASP also includes a contingency plan that addresses potential site-specific emergencies, and a Community Air Monitoring Plan that describes required particulate and vapor monitoring to protect the neighboring community during intrusive site investigation and remediation activities.

Health and safety activities will be monitored throughout the field investigation and IRM. A member of the field team will be designated to serve as the on-site Health and Safety Officer throughout the field program. This person will report directly to the Project Manager and the Corporate Health and Safety Coordinator. The HASP will be subject to revision as necessary, based on new information that is discovered during the field investigation and/or remedial activities.

#### ***6.1.1 Community Air Monitoring***

Real-time community air monitoring will be performed during IRM activities at the Site. A CAMP is included within TurnKey's HASP (see Appendix C). Particulate and VOC monitoring will be performed along the downwind perimeter of the work area during subgrade excavation, grading and soil/fill handling activities in accordance with this plan.

The CAMP is consistent with the requirements for community air monitoring at remediation sites as established by the New York State Department of Health (NYSDOH) and NYSDEC. Accordingly, it follows procedures and practices outlined under NYSDEC's DER-10 (May 2010) Appendix 1A (NYSDOH's Generic Community Air Monitoring Plan) and Appendix 1B (Fugitive Dust and Particulate Monitoring).

## 6.2 Soil/Fill Management Plan (SFMP)

The purpose of the Soil/Fill Management Plan (SFMP) is to protect both the environment and human health during redevelopment and post-development maintenance activities of the Site, subsequent to completion of Brownfield cleanup activities. The SFMP will be modified/expanded as appropriate based on the results of the RI. The SFMP is included in Appendix E.

While an assessment of surface and subsurface soil/fill and groundwater at the Site will be performed during the RI, subsurface information is never 100 percent complete or accurate, especially on a large Site with a long and diverse manufacturing history. As such, it is not unreasonable to anticipate the possibility that some quantity of subsurface soil/fill contamination may be encountered after completion of the Brownfield cleanup. In particular, soil/fill contamination may be encountered during post-development activities such as utility maintenance.

Compliance with the SFMP is required to properly manage subsurface soil contamination. The SFMP was developed and incorporated into this Work Plan with the express purpose of addressing unknown subsurface contamination if and when encountered. The SFMP also facilitates the transfer of responsibilities with property ownership, which is why the SFMP is a separate, standalone document.

This SFMP provides protocols for the proper handling of Site soil/fill during development activities, including:

- Excavation, grading, sampling and handling of site soils.
- Acceptability of soils/fill from off-site sources for backfill or subgrade fill.
- Erosion and dust control measures.
- Access controls.
- Health and safety procedures for subsurface construction work and the protection of the surrounding community.

### 6.3 Citizen Participation Activities

NYSDEC will coordinate and lead community relations throughout the course of the project. TurnKey will support NYSDEC's community relations activities, as necessary. A Citizen Participation Plan will be prepared by TurnKey and submitted to NYSDEC under separate cover. The Citizen Participation Plan will follow NYSDEC's Citizen Participation Plans template for Brownfield Cleanup Program sites entering the BCP at the point of site investigation.

## 7.0 REPORTING AND SCHEDULE

Upon completion of the RI and IRM fieldwork, a comprehensive RI/AAR/IRM report will be completed summarizing the RI and IRM tasks completed as described below.

### 7.1 Remedial Investigation Reporting

The RI section of the RI/AAR/IRM report will include the following information and documentation, consistent with the NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

- Introduction and background;
- A description of the site and the investigation areas;
- A description of the field procedures and methods used during the RI;
- A discussion of the nature and rationale for any significant variances from the scope of work described in this RI Work Plan;
- The data obtained during the RI and historical data considered by TurnKey to be of useable quality. This will include geochemical data, field measurements, etc;
- Comparative criteria that may be used to calculate cleanup levels during the alternatives analysis report (AAR) process, such as NYSDEC Soil Cleanup Objectives and other pertinent regulatory standards or criteria;
- A discussion of contaminant fate and transport. This will provide a description of the hydrologic parameters of the Site, and an evaluation of the lateral and vertical movement of groundwater;
- Conclusions regarding the extent and character of environmental impact in the media being investigated;
- The conclusions of the qualitative human health and environmental risk assessments, including any recommendations for more detailed assessments, if applicable; and
- Supporting materials for RI data. These will include boring logs, monitoring well construction diagrams, laboratory analytical reports, and similar information.

In addition, TurnKey will require third-party data review by a qualified, independent data validation expert. Specifically, a Data Usability Summary Report (DUSR) will be prepared, with appropriate data qualifiers added to the results. The DUSR will follow NYSDEC format per the NYSDEC's September 1997 DUSR guidelines and May 2010 DER-10 guidance. The DUSR and any necessary qualifications to the data will be appended to the RI report.

## 7.2 IRM Reporting

A TurnKey scientist or engineer will be on-site on a full-time basis to document IRM activities. Such documentation will include, at minimum, daily reports of IRM activities, community air monitoring results, photographs and sketches.

### 7.2.1 Construction Monitoring

Standard daily reporting procedures will include preparation of a daily report and, when appropriate, problem identification and corrective measures reports. Appendix D contains sample project documentation forms. Information that may be included on the daily report form includes:

- Processes and locations of construction under way;
- Equipment and personnel working in the area, including subcontractors;
- Number and type of truckloads of soil/fill removed from the site;
- A description of off-site materials received;
- Approximate verification sampling locations (sketches) and sample designations.

The completed reports will be available on-site and will be submitted to the NYSDEC as part of the Final Engineering Report. The NYSDEC will be promptly notified of problems requiring modifications to this Work Plan prior to proceeding or completion of the construction item.

Photo documentation of the IRM activities will be prepared by TurnKey throughout the duration of the project as necessary to convey typical work activities and whenever changed conditions or special circumstances arise.

### **7.2.2 IRM Construction Closeout**

A summary of the IRM construction will be included in the RI/IRM/AAR report submitted to the NYSDEC, with full details of the IRM activities included in the Final Engineering Report. At a minimum, the IRM section of the report will include:

- A Site or area planimetric map showing the parcel(s) remediated;
- A map showing the lateral limits of excavation;
- Summaries of unit quantities, including: volume of soil/fill excavated; disposition of excavated soil/fill and collected ground/surface water; volume/type/source of backfill; and volume of ground/surface water pumped and treated;
- Planimetric map showing location of all verification and other sampling locations with sample identification labels/codes;
- Tabular comparison of verification and other sample analytical results to SCOs. An explanation shall be provided for all results exceeding acceptance criteria; and
- Text describing that the excavation activities were performed in accordance with this Work Plan.

### **7.3 Alternatives Analysis Report**

An alternatives analysis report (AAR) is typically developed to provide a forum for evaluating and selecting a recommended remedial approach, in accordance with DER-10. However, the planned IRM may effectively remove contaminants from the Site. If additional contamination is discovered during RI site characterization activities, the AAR may need to evaluate additional remedial measures beyond the IRM activities. If the IRM effectively removes site contaminants, the AAR will evaluate the IRM as the final remedy.

A list of remedial action objectives will be developed based on findings of the RI and IRM and the requirement for the selected remedial measures to be protective of human health and the environment under the proposed future use scenario. Proposed soil cleanup objectives (SCOs) for the property will also be presented based on the proposed future use of the Site. SCOs will be based on published standards, criteria, and guidance (SCGs) and other NYSDEC and NYSDOH-accepted values.

Based on the remedial action objectives and SCOs, volumes and areas of media potentially requiring additional remediation will be calculated. General response actions will then be delineated to address each of the site problem areas. These response actions will form the foundation for the development and screening of applicable remedial alternatives against the following criteria as described in 6NYCRR 375-1.10:

- Overall Protection of Human Health and the Environment
- Compliance with Standards, Criteria, & Guidance (SCGs)
- Long-term Effectiveness & Permanence
- Reduction of Toxicity, Mobility, or Volume
- Short-term Effectiveness
- Implementability
- Cost

In addition, the criteria of community acceptance will be considered based on public comments on the AAR and proposed remedial action. Following the screening of alternatives, a comparative analysis will be performed against the above criteria. The comparative analysis will allow for better understanding of the relative advantages and disadvantages of each of the alternatives, and will facilitate identification of a recommended remedial approach.

## 8.0 PROJECT SCHEDULE

A tentative project schedule for the major tasks to be performed in support of the RI/AAR/IRM is presented as Figure 6.



## 9.0 REFERENCES

1. New York State Department of Environmental Conservation. *DER-10; Technical Guidance for Site Investigation and Remediation*. May 2010.
2. United States Department of Agriculture (USDA), Soil Conservation Service. *Soil Survey of Erie County, New York*. December 1986.
3. National Oceanic & Atmospheric Administration (NOAA) Satellites and Information. Data Tables through 2000.
4. Nature's Way Environmental Consultants and Contractors, Inc. *Off-Site Subsurface Investigation, NYSDEC Spill #0904123, 305 Niagara Street Parcel [295 Niagara Street Site], Buffalo, New York*. December 2009.
5. Nature's Way Environmental Consultants and Contractors, Inc. *Remedial Excavation Report, 285 Niagara Street parcel, Buffalo, New York*. October 2009.
6. U.S. Environmental Protection Agency. *Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5)*. October 1998.
7. U.S. Environmental Protection Agency, Region II. *CERCLA Quality Assurance Manual, Revision I*. October 1989.
8. U.S. Environmental Protection Agency, *Methods for Chemical Analysis of Water and Wastes*, EPA 600/4-70-020. 1983b.
9. U.S. Environmental Protection Agency. National Functional Guidelines for Organic Data Review (EPA-540/R-94-012), 1994a.
10. U.S. Environmental Protection Agency. National Functional Guidelines for Inorganic Data Review (EPA-540/R-94-013), 1994b.

# TABLES



**TABLE 1**  
**SAMPLING AND ANALYSIS PLAN**  
**RI/IRM/AAR WORK PLAN**  
**285-295 NIAGARA STREET SITE**  
**BUFFALO, NEW YORK**

Matrix	Parameter	No. Samples	Estimated Number of QC Samples				Total <sup>4</sup>
			Trip Blank <sup>2</sup>	Matrix Spike <sup>3</sup>	MS Duplicate <sup>3</sup>	Blind Duplicate <sup>3</sup>	
Remedial Investigation <sup>1</sup>							
Subsurface Soil/Fill	TCL + STARS VOCs (plus TICs)	18		1	1	1	21
	TCL SVOCs (plus TICs)	18		1	1	1	21
	TAL Metals	7		1	1	1	10
	PCBs	7		1	1	1	10
	Pesticides	7		1	1	1	10
	Herbicides	7		1	1	1	10
Groundwater	TCL + STARS VOCs (plus TICs)	5	1	1	1	1	9
	TCL SVOCs (plus TICs)	5		1	1	1	8
	TAL Metals	5		1	1	1	8
	PCBs	5		1	1	1	8
	Pesticides	5		1	1	1	8
	Herbicides	5		1	1	1	8
	Field Parameters: DO, pH, Turbidity, Conductance, Temperature	5					5
SSVI	TCL VOCs (TO-15)	5				1	6
Interim Remedial Measures <sup>1</sup>							
Post-Excavation Samples	TCL + STARS VOCs (plus TICs)	20		1	1	1	23
	TCL SVOCs (plus TICs)	TBD					TBD
Soil Characterization Sampling							
Soil Characterization Sampling	TCLP VOCs	1					1
	TCLP SVOCs	1					1
	TCLP Metals	1					1
	TCL + STARS VOCs	1					1
	TCL SVOCs	1					1
	TAL Metals	1					1
	Total PCBs	1					1
	Hazardous Characterisitics						
	Ignitability	1					1
	Reactivity	1					1
	Corrosivity	1					1

**Notes:**

- Analyses will be performed via USEPA SW-846 methodology w/ equivalent Category B deliverables package.
- Trip blanks will be submitted to the laboratory each day aqueous volatile organic samples are collected.
- Blind duplicate and MS/MSD samples will be collected at a frequency of 1 per 20 samples collected.
- Dedicated sampling equipment will be used for groundwater and soil/fill sample collection; therefore, an equipment blank is not required.



**TABLE 2**  
**RI/IRM/AAR Work Plan**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>Volatile Organic Compounds (mg/Kg)</b>		
1,1,1-Trichloroethane	0.68	0.68
1,1-Dichloroethane	0.27	0.27
1,1-Dichloroethene	0.33	0.33
1,2-Dichlorobenzene	1.1	1.1
1,2-Dichloroethane	0.02	0.02
1,2-Dichloroethene(cis)	0.25	0.25
1,2-Dichloroethene(trans)	0.19	0.19
1,3-Dichlorobenzene	2.4	2.4
1,4-Dichlorobenzene	1.8	1.8
1,4-Dioxane	0.1	0.1
Acetone	0.05	0.05
Benzene	0.06	0.06
Butylbenzene	12	12
Carbon tetrachloride	0.76	0.76
Chlorobenzene	1.1	1.1
Chloroform	0.37	0.37
Ethylbenzene	1	1
Hexachlorobenzene	0.33	1.2
Methyl ethyl ketone	0.12	0.12
Methyl tert-butyl ether	0.93	0.93
Methylene chloride	0.05	0.05
Propylbenzene-n	3.9	3.9
Sec-Butylbenzene	11	11
Tert-Butylbenzene	5.9	5.9
Tetrachloroethene	1.3	1.3
Toluene	0.7	0.7
Trichloroethene	0.47	0.47



**TABLE 2**  
**RI/IRM/AAR Work Plan**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>Volatile Organic Compounds (mg/Kg)</b>		
Trimethylbenzene-1,2,4	3.6	3.6
Trimethylbenzene-1,3,5	8.4	8.4
Vinyl chloride	0.02	0.02
Xylene (mixed)	1.6	1.6
<b>Semi-Volatile Organic Compounds (mg/Kg)</b>		
Acenaphthene	98	98
Acenaphthylene	100	100
Anthracene	100	100
Benzo(a)anthracene	1	1
Benzo(a)pyrene	1	1
Benzo(b)fluoranthene	1	1
Benzo(g,h,i)perylene	100	100
Benzo(k)fluoranthene	1	1.7
Chrysene	1	1
Dibenz(a,h)anthracene	0.33	0.33
Fluoranthene	100	100
Fluorene	100	100
Indeno(1,2,3-cd)pyrene	0.5	0.5
m-Cresol(s)	0.33	0.33
Naphthalene	12	12
o-Cresol(s)	0.33	0.33
p-Cresol(s)	0.33	0.33
Pentachlorophenol	0.8	0.8
Phenanthrene	100	100
Phenol	0.33	0.33
Pyrene	100	100



**TABLE 2**  
**RI/IRM/AAR Work Plan**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>Metals (mg/Kg)</b>		
Arsenic	16	16
Barium	350	400
Beryllium	14	47
Cadmium	2.5	4.3
Chromium, Hexavalent <sup>1</sup>	19	19
Chromium, Trivalent <sup>1</sup>	36	180
Copper	270	270
Cyanide	27	27
Lead	400	400
Manganese	2000	2000
Mercury (total)	0.73	0.73
Nickel	130	130
Selenium	4	4
Silver	8.3	8.3
Zinc	2200	2480
<b>PCBs/Pesticides (mg/Kg)</b>		
2,4,5-TP Acid (Silvex)	3.8	3.8
4,4'-DDE	1.8	8.9
4,4'-DDT	1.7	7.9
4,4'-DDD	2.6	13
Aldrin	0.019	0.097
Alpha-BHC	0.02	0.02
Beta-BHC	0.072	0.09
Chlordane (alpha)	0.91	2.9
Delta-BHC	0.25	0.25
Dibenzofuran	14	59
Dieldrin	0.039	0.1
Endosulfan I	4.8	24



**TABLE 2**  
**RI/IRM/AAR Work Plan**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>PCBs/Pesticides (mg/Kg)</b>		
Endosulfan II	4.8	24
Endosulfan sulfate	4.8	24
Endrin	0.06	0.06
Heptachlor	0.38	0.38
Lindane	0.1	0.1
Polychlorinated biphenyls	1	1

**Notes:**

1. The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.



**TABLE 3**

**SAMPLE CONTAINER, VOLUME, PRESERVATION &  
HOLDING TIME REQUIREMENTS**

**285-295 Niagara Street Site**

**Buffalo, New York**

<b>Matrix</b>	<b>Parameter <sup>1</sup></b>	<b>Method <sup>1</sup></b>	<b>Container Type</b>	<b>Minimum Volume</b>	<b>Preservation (Cool to 2-4 °C for all samples)</b>	<b>Holding Time from Sample Date</b>
Soil/Sediment	TCL + STARS VOCs	8260B	WMG	16 oz.	Cool to 2-4 °C, Zero Headspace	14 days
	TCL SVOCs	8270C	WMG	16 oz.	Cool to 2-4 °C	14 days extrac./40 days
	TAL Metals	6010B	WMG	4 oz.	Cool to 2-4 °C	6 months/Hg 28 days
	Pesticides	8081	WMG	8oz	Cool to 2-4 °C	14 days extrac./40 days
	Herbicides	8151	WMG	8oz	Cool to 2-4 °C	14 days extrac./40 days
	PCBs	8082	WMG	4 oz.	Cool to 2-4 °C	14 days extrac./40 days
Groundwater	TCL + STARS VOCs	8260B	glass vial	3 - 4 oz.	HCl to pH<2, Zero Headspace, Cool to 2-4 °C	14 days
	TCL SVOCs	8270C	amber glass	1000 ml	Cool to 2-4 °C	7 days extrac/40 days
	TAL Metals	6010B	plastic	600 ml	HNO <sub>3</sub> to pH<2, Cool to 2-4 °C	6 months/Hg 28 days
	PCBs	8082	amber glass	1000 ml	Cool to 2-4 °C	7 days extrac/40 days
Air/Soil Vapor	TCL VOCs	TO-15	Summa Cannister	6 liters	None	Analyze within 14 days of sample date of collection

**References:**

1. Test Methods for Evaluating Solid Wastes, USEPA SW-846, Update III, 1991.

**Notes:**

1. EPA-approved methods published in Reference 1 above may be used. The list of analytes, laboratory method and the method detection limit for each parameter are included in Tables 1 and 2 of the QAPP.

**Acronyms:**

VOCs = Volatile Organic Compounds  
SVOCs = Semi-Volatile Organic Compounds  
TCL = Target Compound List  
TAL = Target Analyte List  
WMG = Wide Mouth Glass





**TABLE 4**

**SUMMARY OF FIELD OPERATING PROCEDURES**

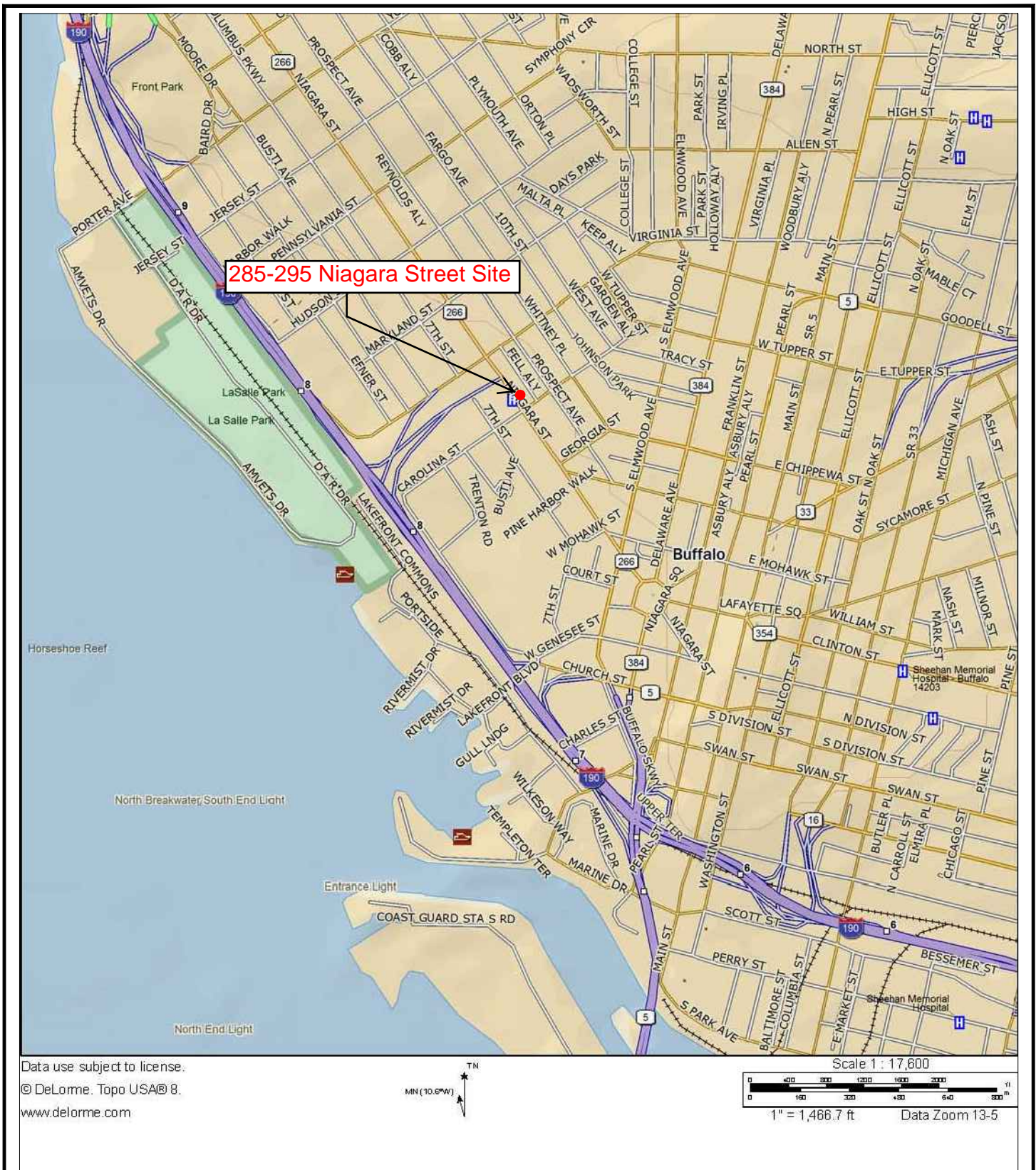
**285-295 Niagara Street Site**

**Buffalo, New York**

<b>TurnKey FOP No.</b>	<b>Procedure</b>
001.1	Abandonment of Borehole Procedures
004.3	Ambient Air/Subslab Vapor Sample Collection Procedure
007.0	Calibration and Maintenance of Portable Dissolved Oxygen Meter
008.0	Calibration and Maintenance of Portable Field pH/Eh Meter
009.0	Calibration and Maintenance of Portable Field Turbidity Meter
011.0	Calibration and Maintenance of Portable Photoionization Detector
012.0	Calibration and Maintenance of Portable Specific Conductance Meter
015.0	Documentation Requirements for Drilling and Well Installation
017.0	Drill Site Selection Procedure
018.0	Drilling and Excavation Equipment Decontamination Procedures
021.0	Establishing Horizontal and Vertical Control
022.0	Groundwater Level Measurement
024.0	Groundwater Sample Collection Procedures
026.1	Hollow Stem Auger (HSA) Drilling Procedures
031.1	Low Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedure
032.1	Management of Investigation-Derived Waste (IDW)
033.0	Monitoring Well Construction for Hollow Stem Auger Boreholes
036.0	Monitoring Well Development Procedures
046.0	Sample Labeling, Storage and Shipment Procedures
047.0	Screening of Soil Samples for Organic Vapors During Drilling Activities
054.0	Soil Description Procedures Using The USCS
063.2	Surface and Subsurface Soil Sampling Procedures
073.1	Real-Time Air Monitoring During Intrusive Activities
076.0	"Before Going Into the Field" Procedure
078.0	Geoprobe Drilling Procedure
084.0	Calibration and Maintenance of Portable Particulate Meter

## FIGURES

**FIGURE 1**



2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635

## SITE VICINITY AND LOCATION MAP

RI/IRM/AAR WORK PLAN

285 - 295 NIAGARA STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

285 NIAGARA OPERATING CO., LLC

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: JGT





BASE MAP PER BING MAPS



APPROXIMATE PROPERTY BOUNDARY

NOT TO SCALE



2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: JGT

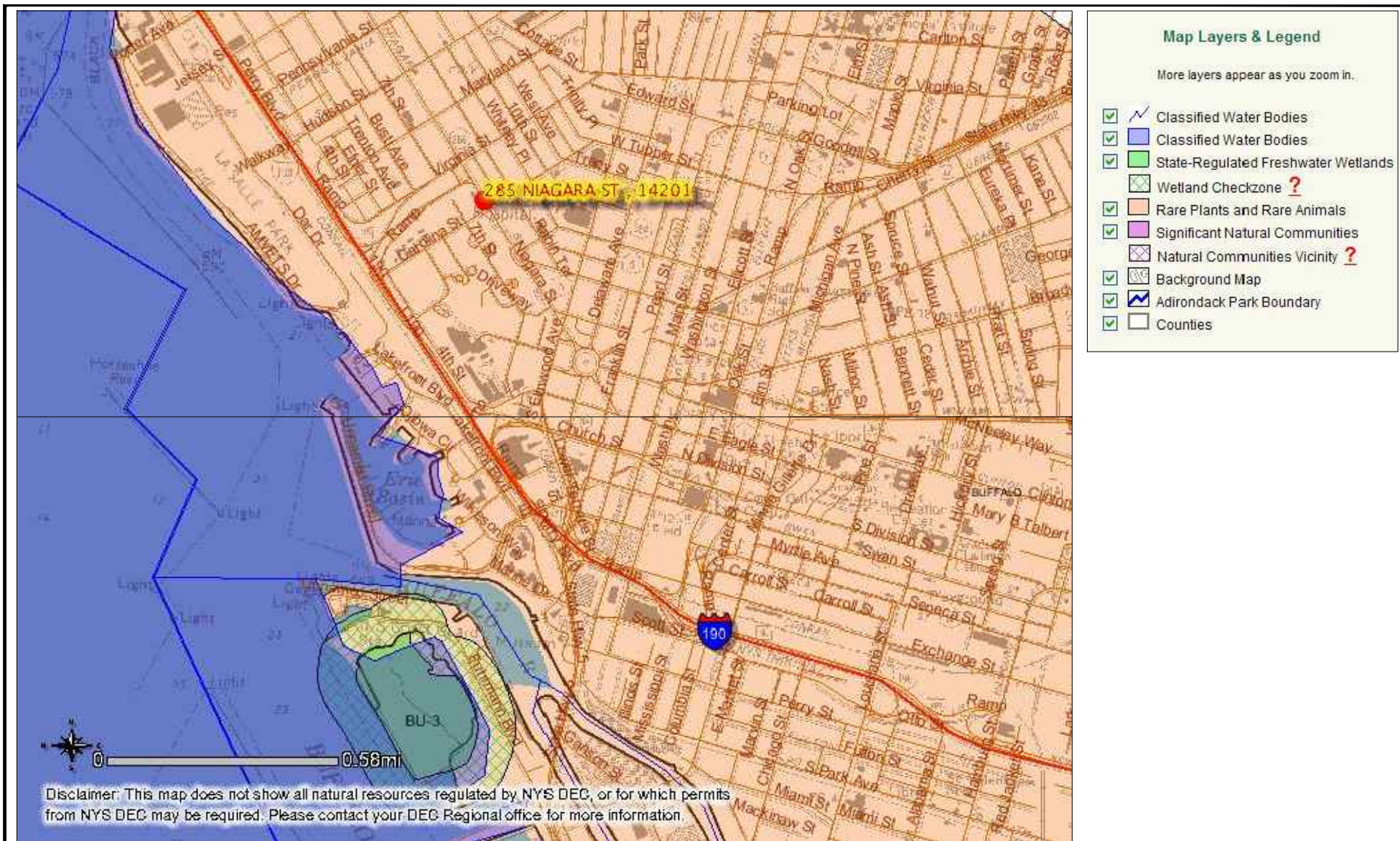
## SITE MAP

RI/IRM/AAR WORK PLAN  
285 - 295 NIAGARA STREET SITE

BUFFALO, NEW YORK  
PREPARED FOR  
285 NIAGARA OPERATING CO., LLC

FIGURE 2





2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635

## REGIONAL WETLANDS AND FLOODPLAINS

RI/IRM/AAR WORK PLAN  
285-295 NIAGARA STREET SITE

BUFFALO, NEW YORK  
PREPARED FOR  
285 NIAGARA OPERATING CO., LLC

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

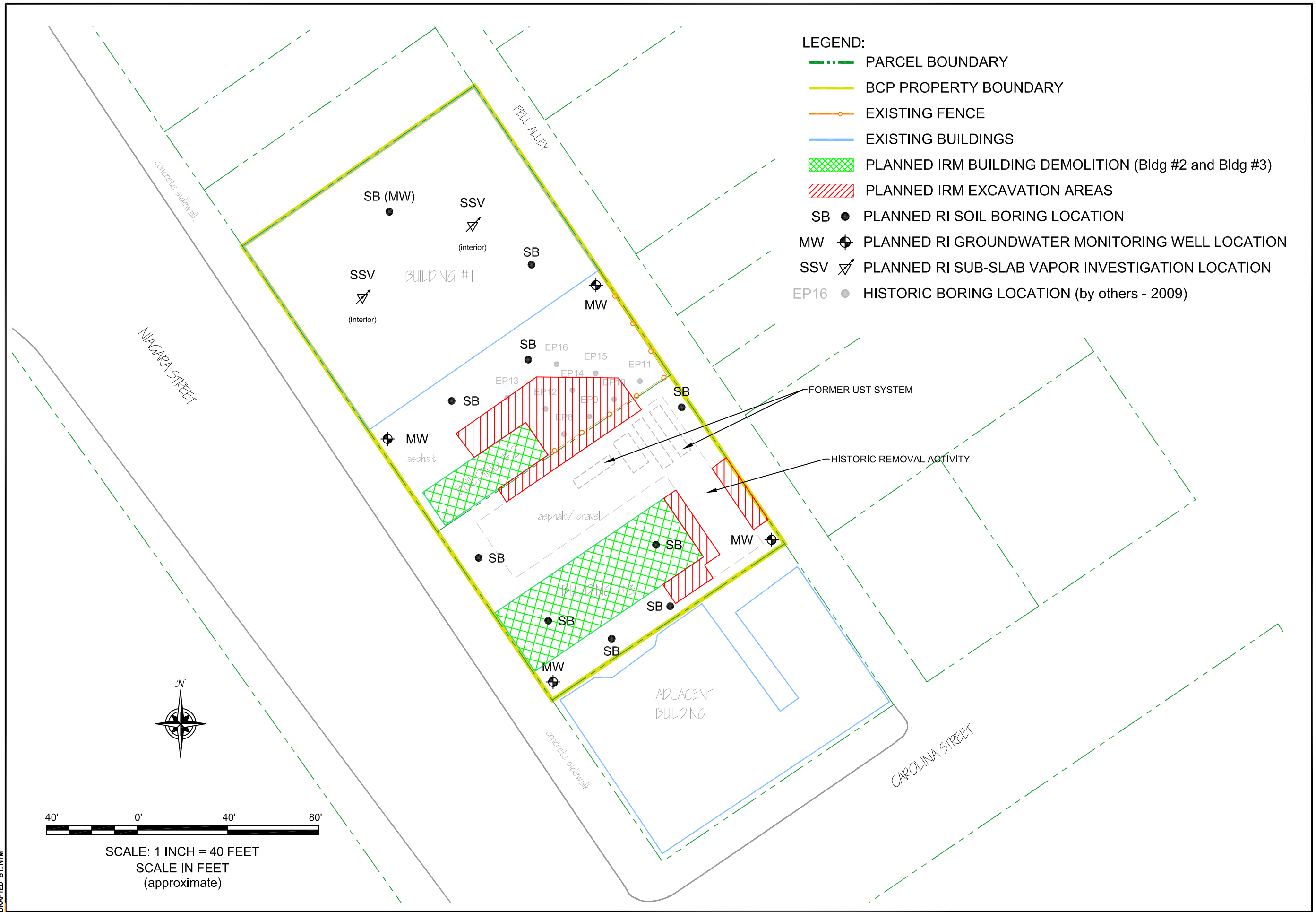
DRAFTED BY: JGT

FIGURE 3





DATE: FEBRUARY 2012  
DRAFTED BY: NTM



## PLANNED IRM ACTIVITIES

RI/IRM/AAR WORK PLAN  
285-295 NIAGARA STREET SITE  
BUFFALO, NEW YORK  
PREPARED FOR  
285 NIAGARA OPERATING CO., LLC

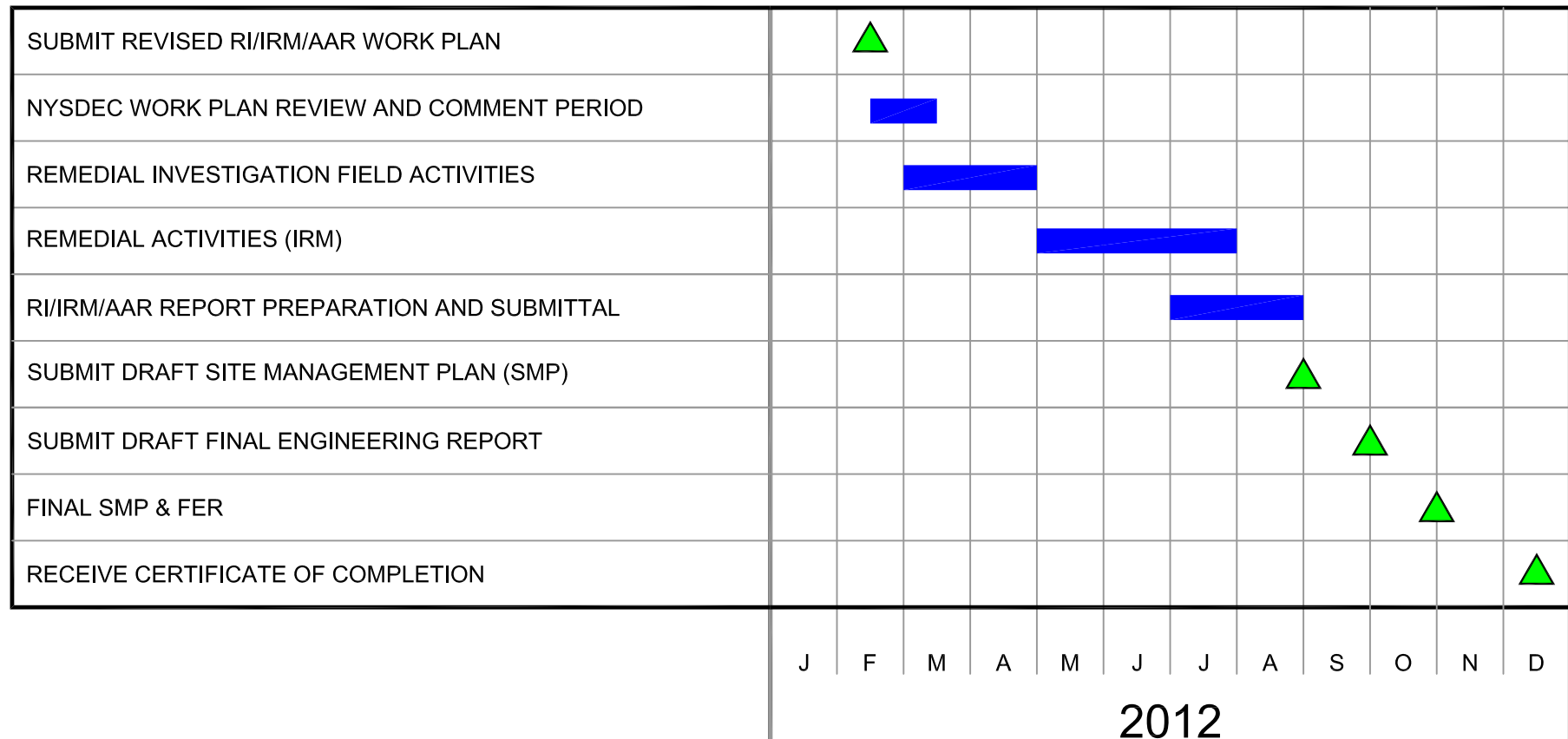
2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635



JOB NO.: 0236-001-101

FIGURE 5

### PROJECT TASKS:



2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: NTM

## PROJECT SCHEDULE

RI/IRM/AAR WORK PLAN  
285-295 NIAGARA STREET SITE

BUFFALO, NEW YORK  
PREPARED FOR  
285 NIAGARA OPERATING CO., LLC

## FIGURE 6



# APPENDIX A

## RESUMES

## **EDUCATION**

Master of Science (Environmental Engineering Science), University of Buffalo, 2008  
Bachelor of Science (Biology), State University of New York at Fredonia, 1994

## **REGISTRATION**

40-Hour OSHA Health and Safety Training  
Annual 8 Hour OSHA Refreshers  
ASTM Training for Commercial Property Transaction Due Diligence

## **SUMMARY OF EXPERIENCE**

Mr. Lesakowski has over 12 years experience in the environmental consulting field at numerous industrial, commercial and hazardous waste sites throughout the northeast United States. A summary of projects Mr. Lesakowski has been involved with include all aspects of New York Brownfield Cleanup Program projects, New York State Superfund Program projects, New York Petroleum Spills Department projects, over 1,000 Phase I Environmental Site Assessments and more than 200 Phase II Site Investigations associated with property acquisition and divestiture and numerous remediation projects ranging from simple underground storage tank (UST) removals to complex groundwater remediation programs. Mr. Lesakowski is proficient in vapor intrusion modeling of chlorinated solvent and petroleum volatile organic compound (VOC) impacted sites. Mr. Lesakowski also has project management and technical consulting experience on several multi-site portfolio environmental due diligence assignments, working with purchasers and lenders to facilitate multi-million dollar real estate transactions. Prior to joining Benchmark, Mr. Lesakowski was a principal in an environmental consulting firm with offices in New York, Pennsylvania, Ohio and Maryland. Mr. Lesakowski is currently managing ten New York Brownfield Cleanup Program sites and several New York Spill Sites. He has managed assessments, investigations and remediation projects on properties with a multitude of historic uses (e.g., petroleum storage terminals, gas stations, automobile dealerships, rail yards, foundries, drycleaners, steel manufacturing, metallurgical plants, metal plating operations, junk yards), media types (surface and subsurface soil, groundwater, sediments, soil vapor, indoor air, building materials) and contaminants (e.g, VOCs, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), heavy metals).

## **DETAILED EXPERIENCE**

May 2006 –present                      Project Manager, Benchmark Environmental Engineering and Science, PLLC

- Recently completed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for two former gasoline station and automotive repair facilities with significant soil and groundwater petroleum VOC impact. The remediation approach for both sites involves removal of abandoned underground storage tanks,

## **REPRESENTATIVE PROJECT EXPERIENCE (CONT.)**

**MICHAEL LESAKOWSKI**

product dispensers and piping, removal of in-ground hydraulic lifts, soil excavation, and extraction and treatment of impacted groundwater. Final Engineering Reports and Site Management Plans were approved by the NYSDEC in December 2009 and Certificates of Completion were also issued in December 2009.

- Currently managing a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program sites at two historic heavy industrial facilities in Niagara Falls, NY. The Remedial Investigations involve collecting over 100 surface and subsurface soil and sediment samples and installing and sampling groundwater monitoring wells on each approximate 15-acre parcel slated for future mixed used commercial and industrial development. IRMs include excavation of chromium-impacted, arsenic-impacted and SVOC-impacted soil in several areas of the Site, drum and tank removal, catch basin and sump cleaning, smoke stack deposits remediation, and chemical waste removal. Certificates of completion are anticipated in 2010.
- Currently managing a NYSDEC Brownfield Cleanup Program site formerly used as drycleaner in western New York with significant soil and groundwater chlorinated VOC impact. Soil was successfully remediated using soil vapor extraction (SVE) to unrestricted soil cleanup objectives (SCOs) and groundwater remediation involves in-situ treatment of impacted groundwater. An active sub-slab depressurization system design and installation is planned in the new building during construction.
- Managed a site assessment and site investigations for a portfolio of retail gasoline stations in western New York. Project tasks include a historical review to determine sites' histories, review of previous technical reports, soil and groundwater investigations and remediation cost estimating for site cleanups. This project also involves forensic analyses of soil and groundwater samples to estimate the relative time of historic spills to determine the liability and responsibility for remediation of historic petroleum spills on-site.
- Managed a Phase I/Phase II site investigations for the Buffalo Urban Development Corporation for two parcels in the City of Buffalo encompassing approximately 100-acres. The project involves Phase I ESAs to assess potential historic concerns in a historic heavy industrial area and subsequent soil and groundwater investigations to investigate subsurface environmental conditions.
- Managed a Remedial Investigation (RI) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for a small-arms shooting range with significant lead and semi-volatile organic compound (SVOC) impact. The RI involved collecting over 1,000 soil samples on 26-acre parcel slated for future mixed-use commercial and residential development. Bench-scale testing was completed to select a substrate to treat the characteristic hazardous soil to below toxicity characteristic leaching procedure (TCLP) thresholds. A Remedial Action Work Plan, which called for in-situ stabilization of characteristic hazardous soil and off-site disposal was prepared and approved by the NYSDEC. The remediation is planned for Spring 2010.
- Managed Site Remediation at a former drycleaner, bus garage and asphalt plant under the NYSDEC Brownfield Cleanup Program with significant chlorinated volatile organic compound (cVOC) impact.

## **REPRESENTATIVE PROJECT EXPERIENCE (CONT.)**

**MICHAEL LESAKOWSKI**

The remediation approach involved underground tank removal, in-ground hydraulic lift removal, hazardous soil excavation, and enhanced biodegradation of groundwater. The Site received its certificate of completion in December 2008. The Property is currently developed with an up-scale hotel. The project is highlighted on NYSDEC website as a Brownfield Success Story.

- Managed a Remedial Investigation (RI), Interim Remedial Measure (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for a former automotive repair facility with significant soil and groundwater chlorinated VOC impact. The remediation approach involved negotiated soil and groundwater cleanup objectives, limited soil excavation and enhanced biodegradation of groundwater. The Site received its certificate of completion in February 2008.
- Managed Remedial Investigation (RI), Interim Remedial Measure (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program at a former lumber yard with chromium impact in Niagara Falls, NY. The remediation approach involved excavation and off-Site disposal of hazardous and non-hazardous soil. The Site received its certificate of completion in December 2007.

December 2000 - April 2006

April 1999 - April 2000

EVP, Environmental Scientist, LCS, Inc., Buffalo, New York

- Managed the investigation of a former gasoline station and adjacent manufactured gas plant (MGP) as part of one of the largest Brownfield redevelopment projects in western New York. The project involves site redevelopment from a historic MGP site and adjacent gasoline station to a multi-million dollar commercial office complex. Acting on behalf of the developer (Duke Realty) and future tenant (HealthNow New York), preliminary investigations were completed to evaluate the nature and location of contaminants. Subsequent site investigation and remediation was completed via a Remedial Investigation (RI) and Interim Remedial Measures (IRM) under the New York State Brownfield Cleanup Program, saving months and significant cost. As a concurrent assignment, acted as a technical consultant to the developer and future tenant on negotiations and advisement on development of an environmental liability transfer arrangement between the purchaser/tenant (client), seller and a national remediation contractor.
- Managed investigation and remediation of former filling station and service station in western New York. Site investigations indicated that impacted soil and groundwater was present as a result of former gasoline and waste oil USTs and hydraulic lifts. Remedial work included removal of four USTs, two hydraulic lifts and 500 cubic yards of petroleum impacted soil.
- Managed investigation and remediation of a dry-cleaning facility located in central New York. Task included soil and groundwater sampling proximate the dry-cleaning facility (exterior) and within the dry-cleaner and adjacent tenants. Sub-slab and indoor air testing was also completed. Remedial work involved removal of hazardous soil, in-situ groundwater remediation via enhanced bioremediation and long-term monitoring.
- Senior project management/technical oversight of all investigation and remediation projects completed in New York, Pennsylvania, Maryland and Ohio.

## **REPRESENTATIVE PROJECT EXPERIENCE (CONT.)**

## **MICHAEL LESAKOWSKI**

- Managed due diligence activities as agent for a purchaser of 48 gasoline service stations in Illinois. Tasks included Phase I ESAs, compliance auditing of current UST systems to Illinois and USEPA regulations and remediation cost estimating for sites with known impacts and/or on-going remediation.
- Managed environmental consulting and due diligence activities for a purchaser of 182 gasoline service stations in Maryland, Virginia and Washington, DC. Tasks included Phase I ESAs, remediation cost estimating for sites with known impacts and/or on-going remediation and interfacing with the client's lenders to facilitate a \$110 million dollar real estate transaction.
- Played a key role in developing a liability transfer agreement for the transfer of a portfolio of gasoline stations with known petroleum impact. Tasks included oversight of remediation cost estimates and interfacing with the attorneys, insurance brokers, client and property sellers to develop and present the liability transfer arrangement.
- Managed investigation and remediation of former filling station and service station in Syracuse, New York. Site investigations indicated that impacted soil and groundwater was present as a result of former gasoline USTs. Remedial work included removal of 1,200 cubic yards of petroleum impacted soil in three areas of the site. Negotiated cleanup objectives allowed the site to be considered "inactive," and the NYSDEC did not further remedial action.
- Managed environmental due diligence, including Phase I/Phase II investigations of five active service stations in central and eastern upstate New York for a potential purchaser. Phase I ESAs indicated a history of gasoline stations on-site. In conjunction with the purchaser and seller, it was negotiated that a baseline assessment of soil and groundwater impact would be completed to establish responsibility for addressing contamination going forward. The purchaser was able to purchase the sites with no liability for historic petroleum spills on-site.
- Managed investigation and remediation of a former automobile dealership in Rochester, New York. Site investigations, completed with oversight of NYSDEC Spills division, indicated soil impact as a result of leaking gasoline, diesel and waste oil USTs and floor drain discharges. Remedial tasks included a removal of four USTs and associated pump dispensers, closing/sealing interior floor drains and excavation and off-site disposal of 1,500 cubic yards of impacted soil.
- Performed fieldwork at a 50-acre industrial park in western New York. Task included a soil boring and monitoring well installation program, development and sampling of monitoring wells and a hydraulic conductivity assessment. Subsequent remedial tasks included removal of six underground storage tanks and petroleum-impacted soil and a long-term groundwater monitoring plan.

## **REPRESENTATIVE PROJECT EXPERIENCE (CONT.)**

**MICHAEL LESAKOWSKI**

*April 2000 to December 2000*

*Environmental Scientist, GZA GeoEnvironmental, Buffalo, New York*

- Performed fieldwork and reporting for RI/FS of NYSDEC superfund site in Long Island, NY. Investigation activities at this former metal plating facility included soil investigation, monitoring well installation and groundwater sampling, hydraulic conductivity testing, and floor drain/cess pool investigation. IRM activities included closure of interior floor drains and removal of heavy metals impacted soil.
- Soil and groundwater investigation at a former dry-cleaning facility in Buffalo, New York. Site investigations included exterior and interior soil borings and monitoring well installations. The negotiated cleanup plan, based on future site use and the urban location of the site, allowed the site owner to address low-level groundwater impact via monitored natural attenuation and long-term monitoring.

## **APPENDIX B**

### **PREVIOUS INVESTIGATION (PROVIDED ELECTRONICALLY)**

October 26, 2009

**Remedial Excavation Report**

For:

**285 Niagara Street  
Buffalo, New York  
NYSDEC Spill #0904123**

Prepared for:

**Alden State Bank  
13216 Broadway  
PO Box 238  
Alden, NY 14004**

**&**

**Mr. Tom Johnson  
NYSDEC, Region 9  
Division of Environmental Remediation  
Bureau of Spill Response  
270 Michigan Ave.  
Buffalo, NY 14203-2999**

Prepared by:

**Nature's Way Environmental Consultants & Contractors, Inc.  
3553 Crittenden Road  
Crittenden, New York 14038**



**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

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- 2.0 Site Description/Conditions**
- 3.0 Objectives**
- 4.0 Methodology / Summary of Work**
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- 2 Excavation Limit Map with posted Total 8260 STARS Analytical Results

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- 2 City of Buffalo Permit
- 3 Disposal Documentation
- 4 Excavation Laboratory Analytical Reports

**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

**1.0 Introduction**

This report summarizes environmental remediation services performed by Nature's Way Environmental Consultants and Contractors, Inc. (NWECC&C) on the behalf of Alden State Bank, on a commercial parcel located at 285 Niagara Street, City of Buffalo, Erie County, New York. The subject property is currently vacant, and was apparently most recently operated as a car wash.

Site work was initiated in July 2009, to confirm or refute the presence of suspected historic petroleum underground storage tanks (UST) suggested by permit records obtained from the City of Buffalo. Three UST's and associated petroleum impacted soil were encountered and removed and disposed, as was a large volume of impacted soil. NWECC&C provided personnel and equipment to complete all site services, including documentation and coordination of daily activities, handling of groundwater and securing perimeter samples for confirmatory analysis. A site map depicting former tank locations and the extent of excavation in relation to key site features is included as Figure 1.

**2.0 Site Description/Conditions**

The subject property is located east side of Niagara St., north of its intersection with Carolina Street. A single commercial building (former car wash), occupies the central portion of the Site, with a narrow alley to the south and larger open (drive) areas to the north and east. A raised concrete structure later confirmed to be a base for a fuel dispensing pump island was located in the northeast section of the property, adjacent to the location of three gasoline underground storage tanks that were identified and removed.

**3.0 Objectives**

The objectives of this remedial effort were to determine whether historic petroleum underground storage tanks remained on the property, and if so to remove and dispose of all such tanks as well any associated petroleum impacted soil if encountered.

**4.0 Methodology/Summary of Work**

In anticipation of encountering tanks identified in permit records, a tank closure notification form was submitted to the Petroleum Bulk Storage division of NYSDEC and a tank removal permit was obtained from the City of Buffalo, copies of which are included as Appendix 1 and 2 respectively.

An excavator was employed to construct test pits in the northeast section of the property, where tanks were depicted on permit documents. In addition to visual and olfactory observations, an IonScience Phocheck+ Photo-Ionization Detector (PID), calibrated daily to a 100 ppm isobutylene standard, was used to screen soils disturbed during excavation to provide an objective basis for comparison of relative contaminant levels and assist in the determining the extent of excavation.

**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

**4.0 Methodology/Summary of Work (continued)**

The presence of soil exhibiting odors and visible staining characteristic of petroleum impact was discovered almost immediately upon initiation of excavation. NYSDEC was notified of this discovery and the above referenced Spill Number was assigned. Mr. Tom Johnson was the agency contact assigned to the site. Impacted soil was excavated and temporarily stockpiled on and covered with plastic sheeting pending disposal. Approval for disposal of soil generated at the site was later obtained at Modern Landfill, Inc, Model City, NY.

Three steel former gasoline UST's were encountered in this area; two with a volume of 4,000 gallons and one with a volume of 6,000 gallons, as shown on Figure 1. Each tank was emptied of liquid contents (water and a film of weathered gasoline), uncovered and removed from the ground. One 4,000 gallon and the 6,000 gallon tank were found to be partially filled with sand and or flowable fill. This material was dug out of the tanks and combined with impacted soil, as was solid material generated from tank cleaning. The tanks were then rendered inert, cut open, cleaned and disposed. Waste disposal documentation can be found in Appendix #3.

Impacted soil was encountered on all sides of the gasoline UST's to approximately 13.0' below grade. Following UST removal, excavation of impacted soil progressed westward to the former dispenser pump island and included removal of underground product lines. Excavation of impacted soil in the northeast section of the property extended to within approximately 5.0 feet of the chain link fence defining the boundary with the adjacent parcel to the north and 4.0 feet of the alley to the east. Due to site configuration and the extent of impact encountered, this portion of the excavation was backfilled before additional impacted soil removal was completed to the south and later to the west.

Petroleum impacted water that accumulated in the open excavations was removed via vacuum truck when necessary and disposed. Approximately 17,500 gallons of groundwater removed from the excavation and evacuated from the UST's was transported to Industrial Oil Tank Service, Inc. in Oriskany, NY for disposal, documentation of which is included as Appendix #3.

Ultimately, a significant portion of the accessible portion of the property was excavated to a depth of 12.0' - 13.0' below grade, the primary exception being the narrow drive/alley south of the site building. Excavation boundaries are depicted on the site map (Figure# 1). A total of 2,962 tons of soil was excavated and disposed at Modern Landfill, Model City, NY. Copies of the completed disposal application, landfill approval, manifests and weigh tickets are included as Appendix #3.

Following completion of excavation in each area, confirmatory samples of soils comprising the excavation perimeter were secured and analyzed, with results compared NYSDEC TAGM #4046 Guidance Values (Recommended Soil Cleanup Objectives). A total of seventeen samples, twelve sidewall and five bottom, were analyzed by Paradigm Environmental Services (Paradigm) for the presence of STARS List VOC's.

**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

**5.0 Excavation Analytical Results (Soil) STARS List VOC's**

Laboratory analytical results are summarized in comparison to Guidance Values in the table below, total STARS List VOC concentrations are posted on Figure 2, and copies of laboratory analytical report(s) included as Appendix 4.

One or more STARS List VOC's were identified in each of the seventeen samples analyzed, with eight samples having at least one compound reported at a concentration exceeding its respective Guidance Value. Results for the remaining nine samples were below Guidance Values for all STARS List VOC's.

More specifically, there were no STARS List VOC's identified above Guidance Values in three of the bottom samples, and the other two had only a single compound reported above applicable guidance, both at very low concentrations; total xylenes at 1,382 ppb in the bottom #3 sample, as compared to the Guidance Value of 1,200 ppb, and benzene in the bottom #4 sample at a concentration of 92.7 ppb as compared to the 70 ppb Guidance Value. Total VOC concentrations in bottom #3 and bottom #4, were 3,806 and 3,078 ppb respectively, well below the 10,000 ppb Guidance Value.

Six of twelve sidewall samples were reported to contain STARS List compounds at concentrations in excess of Guidance Values. From one to four individual compounds were reported at levels above guidance in each of the six samples, with total VOC concentrations for five of the six also exceeding the 10,000 ppb total VOC guidance. The most elevated contaminant levels were reported for samples from the southern portion of the excavation (southeast portion of the property), where the east wall #2 and west wall #3 samples were both reported to contain VOC concentrations of greater than 40,000 ppb. Significantly elevated total contaminant levels also were reported for two other samples from the same area (west wall #1 at 10,320 ppb and #2 at 22,400 ppb), as well as from one of the north wall samples (#3 at 32,848 ppb). A single contaminant (group) was reported above its Guidance Value in the east wall #1 sample: m&p xylene at a total VOC concentration of 8142 ppb as compared to the 1,200 ppb guidance.

In general, the group of compounds identified was consistent both between samples and with impact commonly observed in connection with impact from a release of gasoline.

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285 Niagara Street  
NYSDEC Spill # 0904123**

**8260 STARS List Analytical (Results in parts per billion)**

Parameter	Bottom 1	Bottom 2	Bottom 3	Bottom 4	Bottom 5	North Wall 1	North Wall 2	North Wall 3	South Wall 1	South Wall 2	South Wall 3	East Wall 1	East Wall 2	West Wall 1	West Wall 2	West Wall 3	West Wall 4	TAGM 4046 (ppb)
Benzene	<8.99	<8.48	<26.3	92.7	<9.14	<17.3	<123	<176	<80.4	<73.5	<7.5	<833	<141	<1750	<9050	<228	<9.71	70
n-butylbenzene	<44.9	<42.4	<131	<395	<45.7	<86.5	<617	<880	<402	<367	<37.5	<4170	<704	<8730	<45200	<1140	<48.6	10000
sec-Butylbenzene	<8.99	<8.48	<26.3	<78.9	<9.14	<17.3	<123	198	101	<73.5	<7.5	<833	295	<1750	<9050	306	<9.71	10000
tert-Butylbenzene	<22.5	<21.2	<65.7	<197	<22.8	<43.3	<309	<440	<201	<184	<18.7	<2080	<352	<4370	<22600	<570	<24.3	10000
Ethylbenzene	10.6	24.2	344	489	<9.14	<17.3	<123	1490	97.8	118	<7.5	<833	545	<1750	<9050	1270	<9.71	5500
n-Propylbenzene	<8.99	65	141	170	<9.14	<17.3	<123	1360	289	<73.5	<7.5	802	1510	<1750	<9050	2570	20	3700
Isopropylbenzene	<44.9	<42.4	<131	<395	<45.7	<86.5	<617	<880	<402	367	<37.5	<4170	<704	<8730	<45200	<1140	<48.6	2300
p-Isopropyltoluene	<44.9	<42.4	<131	<395	<45.7	<86.5	<617	<880	<402	<367	<37.5	<4170	<704	<8730	<45200	<1140	<48.6	10000
Naphthalene	<22.5	<21.2	87.6	<197	<22.8	285	1280	6020	885	1360	42.5	<2080	13900	<4370	<22600	5370	<24.3	10000
Toluene	13.8	<8.48	251	<78.9	<9.14	<17.3	<123	232	<80.4	376	<7.5	<833	<141	<1750	<9050	<228	<9.71	1500
1,2,4-Trimethylbenzene	51.6	660	1230	781	23.9	144	952	12000	2720	819	8.64	2730	17400	4810	12700	21400	180	10000
1,3,5-Trimethylbenzene	11	198	371	446	<9.14	66.1	519	3490	1470	182	<7.5	2220	4870	<1750	<9050	6930	44.1	3300
m&p xylene	59	212	1130	1100	<9.14	<17.3	<123	7220	536	549	<7.5	2290	3230	5510	9700	5650	13.9	1200*
o xylene	19.7	33	252	<78.9	<9.14	<17.3	<123	838	364	279	<7.5	<833	1200	<1750	<9050	2070	<9.71	
MTBE	<8.99	<8.48	<26.3	<78.9	<9.14	<17.3	<123	<176	<80.4	<73.5	<7.5	<833	<140	<1750	<9050	<228	<9.71	120
Total 8260 STARS	165.7	1192.2	3806.6	3078.7	23.9	495.1	2751	32848	6462.8	4050	51.14	8142	42950	10320	22400	45566	258	10000

BDL / <# - Below Laboratory Detection Limits  
 Bold = Exceed TAGM 4046 Guidance Value(s)  
 \* The Guidance Value of Mixed Xylenes is 1200 ppb

## 7.0 Summary

Records investigation resulted in identification of two permits relating to installation of underground storage tanks at the subject property. In response to this finding invasive site work was undertaken to confirm or refute the presence of such tanks. This work led to the discovery of three former gasoline underground storage tanks, all of which were removed along with associated product piping. Significant gasoline type impact to subsurface soils was found in connection with the UST's, product piping runs and dispensing pump-island. Impacted soil was excavated from all practically accessible areas of the site, with nearly 3,000 tons of impacted soil and more than 17,000 gallons of impacted water disposed.

Confirmatory soil samples secured from the bottom and sidewalls of the excavation were analyzed to document conditions with respect to regulated gasoline constituent compounds. Results of this testing confirmed that virtually all impacted soil has been removed from the excavation bottom, as these samples were reported to meet regulatory guidance for all but a single value in two samples. Although soil removal to the point where sidewall samples were shown to meet Guidance Values was achieved in the majority of the excavation, lateral excavation of impacted soil was limited by the presence of structures and property boundaries in

**Remedial Excavation Report  
285 Niagara Street  
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some areas, particularly in the southeastern and northwestern sections of the excavation, where impact at levels above applicable guidance remains.

Given the remaining presence of significantly impacted soils in interior areas of the site that are inaccessible and/or impractical to excavate, as well as in areas about the perimeter of the site, it was determined that additional work would be performed to better define the extent of impact beyond the limits of excavation. This work, consisting of investigation of subsurface soil conditions beyond the excavation boundaries with respect to the presence of volatile organic compounds such as those identified in confirmatory samples, has been initiated. It is anticipated that information derived from additional investigation, in combination with that contained in this report, will form the basis for determining the sites regulatory status.

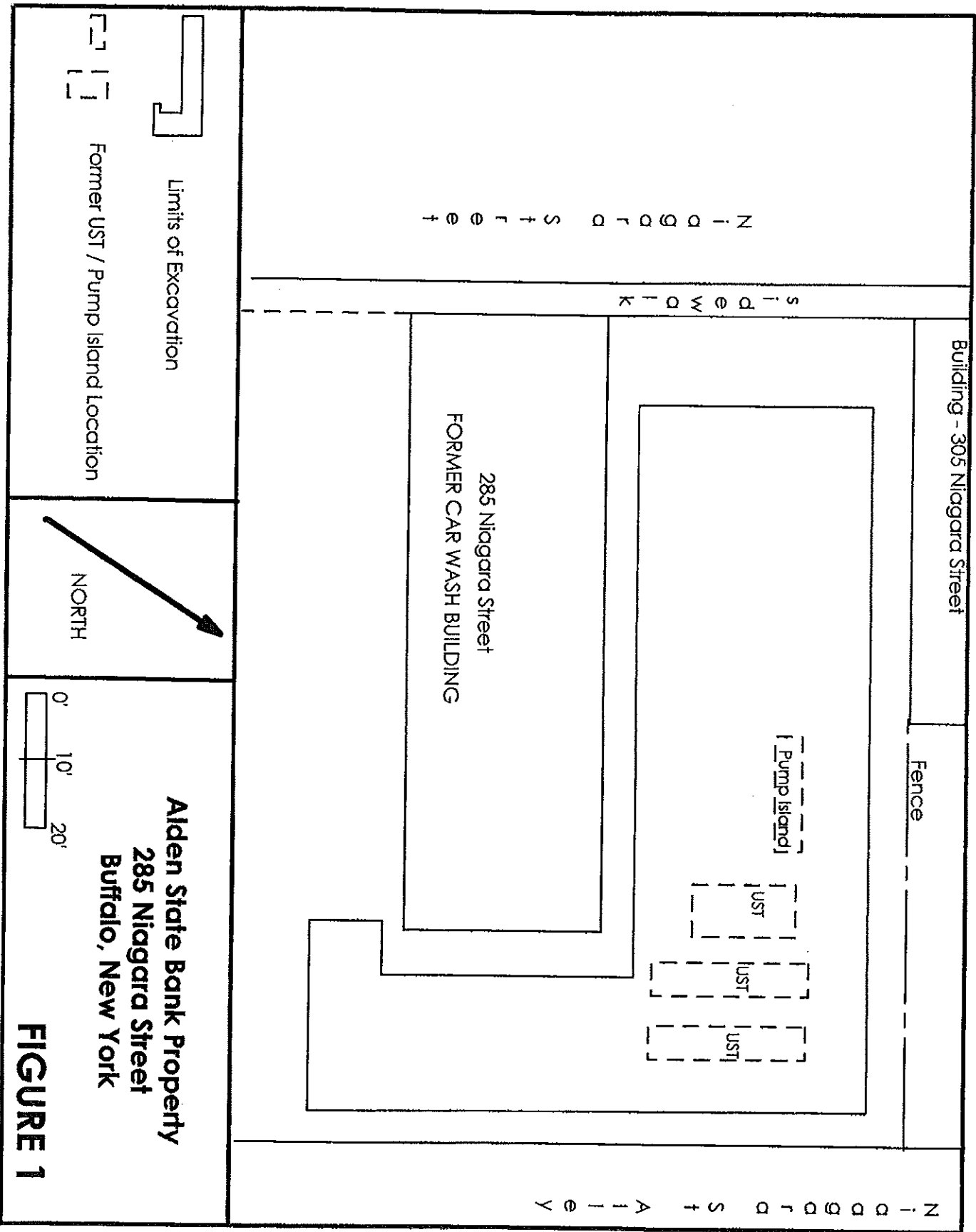
Respectfully,

Gregory J. Weber  
President

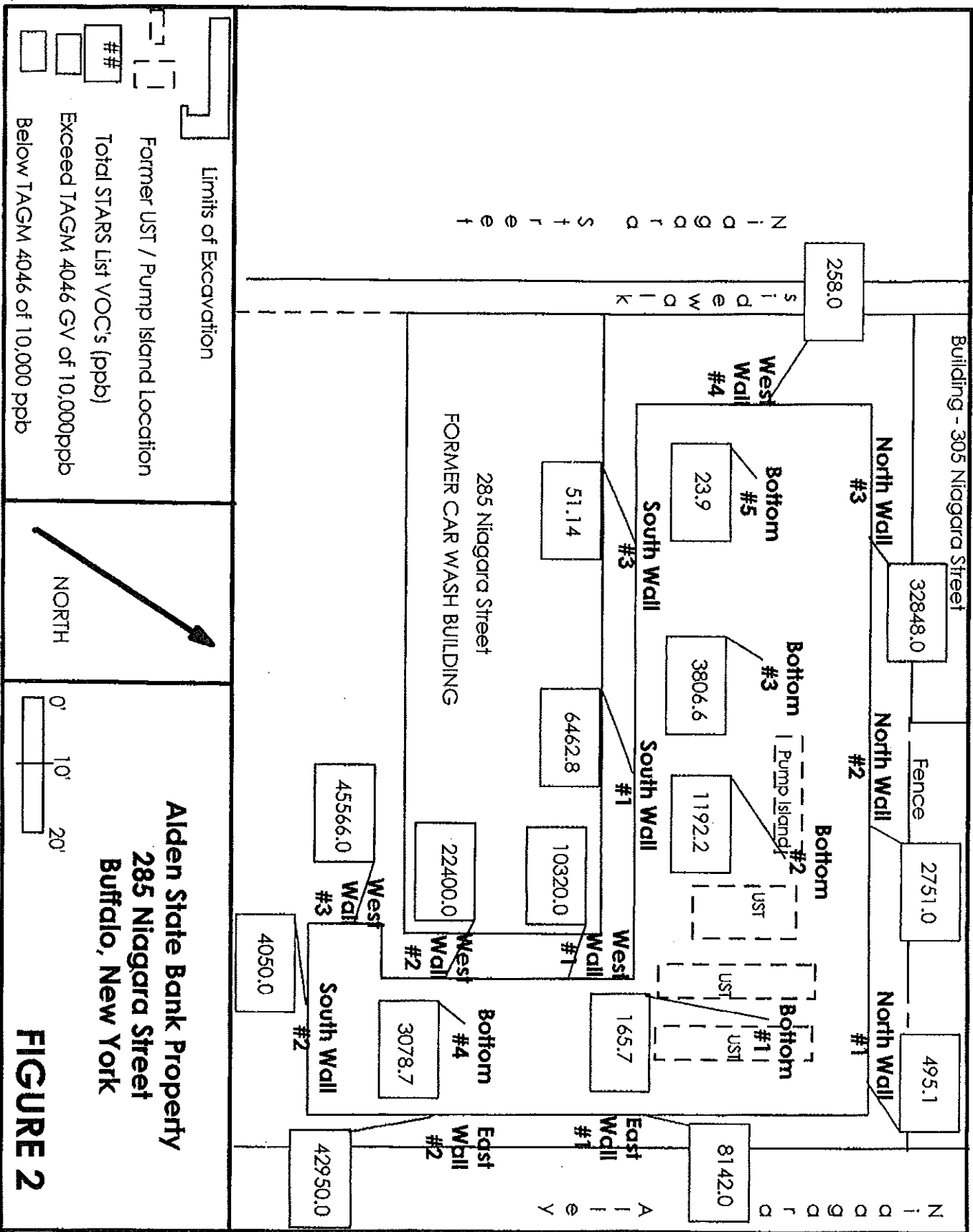
**Remedial Excavation Report  
285 Niagara Street  
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**Figures**

- 1 Site Map / Tank Location/Limits of Excavation Map
- 2 Excavation Limit Map with posted Total 8260 STARS Analytical Results







**FIGURE 2**

**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

**Appendices**

- 1 UST Closure Notification
- 2 City of Buffalo Permit
- 3 Disposal Documentation
- 4 Excavation Laboratory Analytical Reports

**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

**Appendix 1**

UST Closure Notification

Andrea 851-7220

TANK CLOSURE REPORT

May 6, 2007

PBS #

New York State Department of  
Environmental Conservation

ATTN: Petroleum Bulk Storage Section

Please be advised we will be closing tanks on Thurs. May 7<sup>th</sup> at the following location:

Site Name: 285 Niagara Street

Street: \_\_\_\_\_

City: Buffalo, NY

We will notify you if this schedule is changed.

Tanks to be closed:	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5
Size: *	_____	_____	_____	_____	_____
Tank Type:	_____	_____	_____	_____	_____
Product:	_____	_____	_____	_____	_____
UST or AST:	_____	_____	_____	_____	_____
Removal or in place?	_____	_____	_____	_____	_____

Owner's Name: Alden State Bank Laboratory: Environmental Science Corp.  
Street: 13216 Broadway Street: P.O. Box 569  
City: Alden, NY City: Mt. Juliet, TN 37121-0569  
Phone: 716-937-3381 Phone: 1-800-767-5859

Contractor's Name: NATURE'S WAY ENVIRONMENTAL CONSULTANTS & CONTRACTORS, INC.

Street: 3553 CRITTENDEN ROAD, P.O. BOX 160

City: CRITTENDEN, NY 14038

Phone: (716) 937-6527 / FAX (716) 937-9360

Will new tanks be installed at this location? Yes ☒ No

Expected date of new installation \_\_\_\_\_

\* tanks are unknown @ this time - will advise once they are located & set to be removed.

*C. Savage*

**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

**Appendix 2**

City of Buffalo Permit



Byron W. Brown, Mayor  
Brian Reilly, Commissioner

# BUILDING PERMIT

Department of Economic Development,  
Permit & Inspection Services

... Building a Better Buffalo

Application Type: TANKS

**The person in charge of doing the work must contact the Inspector at 716-851-4949 or at the number listed below prior to starting any work.**

Application/Permit No.: **138929**

Issue Date: 05/05/2009

Location: **285 NIAGARA 14201**

Issued By: DIGEF

Owner: ALDEN STATE BANK  
PO BOX 238  
ALDEN, NY 14004

Fee(s): \$ 75.00

License No.: 207919

Contractor: NATURES WAY ENVIRO CONSUL. FLL

License Type: FLL

SBL No.: 1104400001015100

Value: \$10,000.00

Land Use: 434 - AUTOMATIC CAR WASH

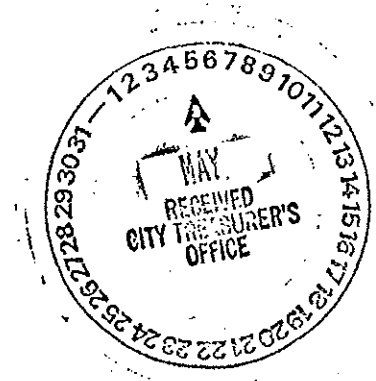
Plans: No

Census Tract: 71.02

Inspector: Dave Gilmour (716)851-4950

**Description of Work:** <REMOVE 1 2000 GAL AND 1 4000 GAL. AND POSSIBLY 1 MORE 4000 GAL. UNDERGROUND GASOLINE STORAGE TANKS FROM THE REAR OF LOT AS PER SCANNED SITE PLAN AND SURVEY.>

*City of Buffalo  
Fire Prevention  
Ken Rochalski  
851-5707*



*Mj*

Commissioner, Dept of Economic Development

*Thank you for investing in the City of Buffalo*

AND AS SHOWN ON APPLICATION NUMBERED ABOVE. WHICH APPLICATION IS MADE PART OF THIS PERMIT.

\*\*\* ALL GENERAL CONTRACTORS AND SUB-CONTRACTORS MUST CARRY A CITY LICENSE \*\*\*

THIS PERMIT IS VOID IF FOUND TO BE ISSUED IN VIOLATION OF ANY LAW OR ORDINANCE AND CONDITIONS STATED ABOVE.

**THIS PERMIT MUST BE DISPLAYED WHERE IT IS VISIBLE FROM THE STREET**

Signature of Contact/Contractor \_\_\_\_\_ Date: 05/05/2009

Apply for your next Building Permit Online at  
<http://www.city-buffalo.com>

**Remedial Excavation Report  
285 Niagara Street  
NYSDEC Spill # 0904123**

**Appendix 3**

**Disposal Documentation**



ENVIRONMENTAL CONSULTANTS & CONTRACTORS, INC.

CRITTENDEN  
(716) 937-6527

SYRACUSE  
(315) 668-1031

December 4, 2009

Mr. Tom Johnson  
NYSDEC Region 9  
Division of Environmental Remediation  
270 Michigan Ave.  
Buffalo, New York

- HC 12/7/09

Mr. Fred LoFaso  
Sienna Realty  
305 Niagara St.  
Buffalo, NY

} Emailed 12/4/09  
(+ R. Kennedy)

Mr. Steve Woodard  
Alden State Bank  
13216 Broadway  
Alden, New York

Re: Report of Findings  
Off-Site Subsurface Investigation  
NYSDEC Spill # 0904123  
Buffalo, Erie County

### Introduction

This report presents the findings of off-site subsurface investigation conducted by Nature's Way Environmental Consultants & Contractors, Inc. (NWECC), on behalf of Alden State Bank. This work was completed following remedial excavation of petroleum impacted soil discovered in connection with historic underground storage tanks on a vacant commercial property at 285 Niagara St., Buffalo, NY. Nearly 3,000 tons of petroleum impacted soil was removed, with excavation in some areas extending to within several feet of property boundaries and structures. Laboratory analysis of excavation perimeter samples indicated that petroleum constituent compounds were present in some areas at levels exceeding regulatory criteria, including at least a portion of the northwest boundary, adjacent to a parcel identified as 305 Niagara St.

### Objective & Scope of Work

The objective of this investigation was to determine the extent of impact beyond the northern boundary of remedial excavation, on the 305 Niagara St. parcel. This was accomplished by sampling, evaluation and analysis of subsurface soils.

A Simco 200 direct-push style drill rig was employed to advance soil borings and continuously sample the soil column encountered at each location to depths from 12' - 15' below ground surface (bgs). Samples were secured in 4.0' macro-core samplers with disposable acetate liners. At the completion of every sample interval, the macro-core samplers were decontaminated by washing and rinsing with a concentrated surfactant followed by a second rinse. Boring locations were mapped in relation to key site features, and all samples were examined and classified by a staff geologist.



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Report of Findings  
Off-Site Investigation  
Spill # 0904123

### **Objective & Scope of Work (Cont)**

As an objective means of comparison of contaminant concentrations, a representative sample from each 2.0' interval was jarred and set aside for at least fifteen minutes at room temperature, following which the sample jar headspace was screened with a Phocheck+1000 Photo-Ionization Detector (PID) to quantify relative concentrations of volatile organic compounds. Selected samples were submitted to Paradigm Environmental Services, Inc. and analyzed for the presence of NYSDEC STARS List volatile organic compounds (VOC's) by EPA Method 8260. Results of this test were compared with Recommended Soil Cleanup Objectives published in NYSDEC TAGM #4046. In addition, a single composite soil sample was analyzed for landfill and/or treatment compatibility parameters: Ignitability, TCLP Benzene and TCLP Lead. Results of this testing were received and confirmed the material in question was below hazardous thresholds for all parameters.

### **Findings**

The Soil Boring Location Map (Figure #1), depicts the locations of all sampling points as well the outline of the remedial excavation area and other site features. A total of nine earthprobe soil borings, designated EP8 through EP16, were completed in an asphalt paved drive/parking area on the subject property, adjacent to the area where UST's were encountered.

**Geologic Conditions:** With the exception of the north easternmost boring (EP11), undisturbed native soils consisting of clay and silt textured lake sediments were encountered within one foot of ground surface at all locations. Although no appreciable groundwater was observed, moist to wet soil conditions were present in most borings at depths near 4' bgs. Soil Boring Classification Logs (Appendix 1) were prepared for each sample location. These include geologic description of soils encountered as well as field observation and results of instrument screening.

**PID Screening:** Results of PID screening for all sample intervals from each soil boring are summarized in tabular format below, and the most elevated PID reading recorded at each sample location is posted on the Figure #1.

Elevated PID readings were recorded for one or more samples from a majority of the borings, with the most elevated readings for samples from locations closest to the property boundary. Evidence of impact, as measured by PID screening, decreased to the north. Readings approaching or exceeding 1,000 ppm were recorded for samples from two borings, EP8 and EP9, both located within several feet of the property boundary. These borings were also the two where elevated readings were observed at depths greater than ten feet. Significantly elevated readings were also recorded for samples from borings EP10, EP12 and EP14 adjacent to EP8 and EP9. There was almost no evidence of impact in any of the samples from EP11, EP15 and EP16, which appear to define much of the northern perimeter of impact.

page 3

Report of Findings  
Off-Site Investigation  
Spill # 0904123

PID Headspace Screening Results (ppm)

	EP 8	EP 9	EP 10	EP 11	EP 12	EP 13	EP 14	EP 15	EP 16
0.0'-2.0'	0	0	0	0	0	0	0	12	0
2.0'-4.0'	0	0	0	0	0	0	0	0	0
4.0'-6.0'	902	<b>962</b>	250	0	700	3.2	<b>387</b>	11	0
6.0'-8.0'	<b>1460</b>	82	<b>452</b>	0	425	<b>104</b>	124	<b>20</b>	0
8.0'-10.0'	507	305	229	0	149	49	277	7	0
10.0'-12.0'	497	127	7	0	14	4	16	0	0
12.0'-14.0'	160	30							0
14.0'-15.0'	1.2								

**Bolded** Interval = Highest PID Reading

**Laboratory Analysis:** Four soil samples were selected for laboratory analysis for STARS List VOC's. These included the 6'-8' bgs interval from borings EP10, EP13 and EP15, and the 4'-6' interval from EP14. Results of this testing are presented in comparison to NYSDEC Guidance Values in the Table below. Only one of the four samples was reported to contain STARS List compounds at a concentration exceeding a published Guidance Value. Although no individual compound was identified above its corresponding Guidance Value, the sample from EP14 was reported to contain a total (aggregate) contaminant concentration of 10,804 parts per billion, as compared to the 10,000 ppb Guidance Value. Two of the remaining samples, EP10 and EP13, were reported to contain five of fifteen STARS List compounds, but all at levels below Guidance Values, with total concentrations of 7,564 and 2,848 ppb respectively. There were no target compounds identified in the EP15 sample. Copies of laboratory reports are included as Appendix 2, and total VOC concentrations are posted on Figure #2.

STARS List VOC Analytical Results (results in ppb)

PID Reading (ppm):	EP 10 (6.0'-8.0') 452ppm	EP 13 (6.0'-8.0') 104ppm	EP 14 (4.0'-6.0') 387ppm	EP 15 (6.0'-8.0') 20ppm	TAGM Guidance Value (ppb)
Parameter					
Benzene	<283	<118	<132	<11.6	60
n-butylbenzene	<1410	<589	<661	<57.8	10000
sec-Butylbenzene	<283	<118	<132	<11.6	10000
tert-Butylbenzene	<706	<295	<331	<28.9	10000
Ethylbenzene	<283	159	488	<11.6	5500
n-Propylbenzene	396	208	696	<11.6	3700
Isopropylbenzene	<1410	<589	<661	<57.8	2300
p-Isopropyltoluene	<1410	<589	<661	<57.8	10000
Napthalene	1370	356	1260	<28.9	10000
Toluene	<283	<118	<132	<11.6	1500
1,2,4-Trimethylbenzene	4460	1650	6630	<11.6	10000
1,3,5-Trimethylbenzene	924	475	1480	<11.6	3300
m&p xylene	414	<118	250	<11.6	1200*
o xylene	<283	<118	<132	<11.6	
MTBE	<283	<118	<132	<11.6	120
Total 8260 STARS	7564	2848	<b>10804</b>	BDL	10000



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page 4

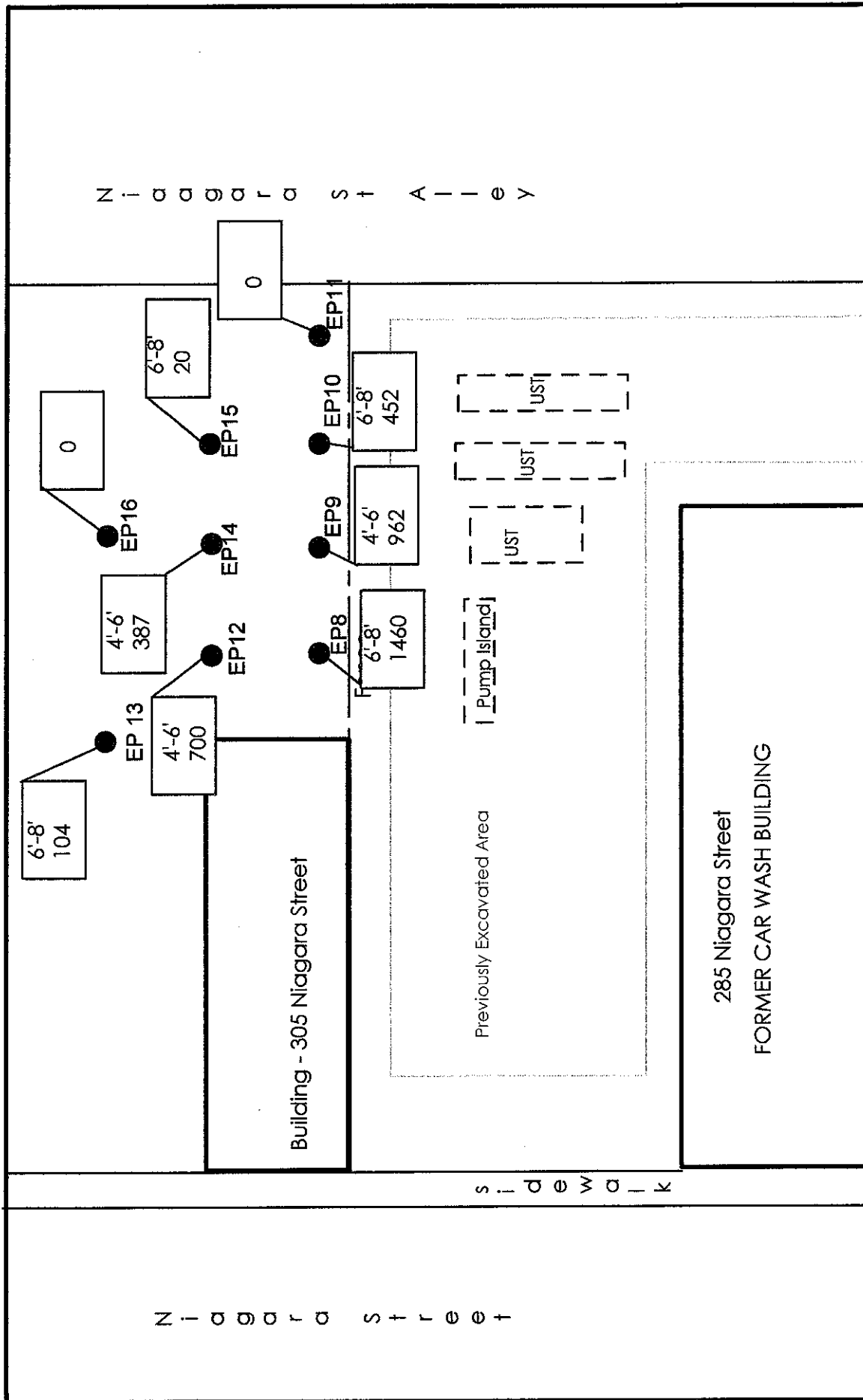
Report of Findings  
Off-Site Investigation  
Spill # 0904123

### Summary

Soil borings were advanced on the 305 Niagara St. parcel in an effort to determine whether petroleum impact associated with historic underground storage tanks on the adjacent site extended to that property. The presence of a significant area of soil exhibiting characteristics of petroleum contamination, as measured by field instrumentation and results of laboratory analysis, was confirmed. Soil samples from locations along the common property boundary exhibited the greatest evidence of impact across the widest depth range as quantified by PID screening. Analytical testing confirmed the presence of petroleum constituent compounds in subsurface samples and defined the boundaries of such impact with respect to regulatory guidance. Based on this data, the impacted area is an irregularly shaped area to the north and west of the recent remedial excavation, as shown on Figure 2. The area so defined on the 305 Niagara St. parcel encompasses a footprint of approximately 1,200 - 1,400 square feet. Significantly impacted soils were encountered beginning at depths of approximately 4' bgs and extending to roughly 12' bgs near the property boundary and 8'-10' bgs in the western portion of the affected area.

Respectfully,

  
Gregory J. Weber



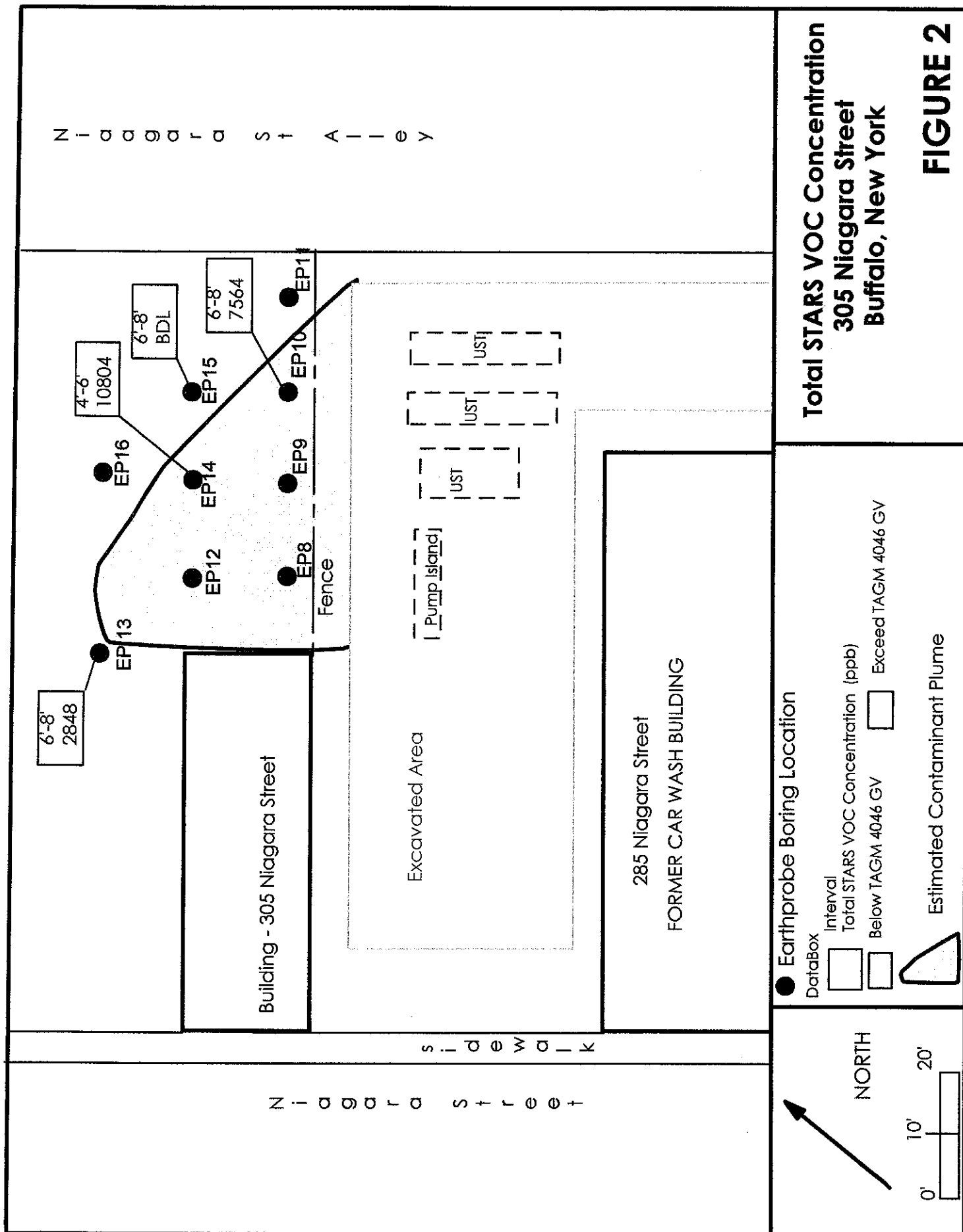
**Soil Boring Location**  
**305 Niagara Street**  
**Buffalo, New York**

**Earthprobe Boring Location**

☐ DataBox    ☐ Interval  
☐ PID Screening Reading (ppm)

☐ PID Reading <50ppm    ☐ PID Reading >50ppm

**FIGURE 1**



**Total STARS VOC Concentration**  
**305 Niagara Street**  
**Buffalo, New York**

**FIGURE 2**



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## **Appendix #1**

### Soil Boring Classification Logs

Hole Number: EP 8



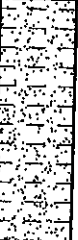






DATE: 10/26/09

ELEVATION: \_\_\_\_\_

PROJECT: Subsurface Investigation at the Property Located at 305 Niagara Street

PREPARED FOR: Alden State Bank  
BORING LOCATION:



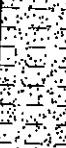





BORING LOCATION: Alder State Bank

SN	0/ 6	6/ 12	12/ 18	18/ 24	N	OVM	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
1						0		Blacktop	0.3	Blacktop to 0.3 foot over slag gravel fill to 0.8 foot over silty lake sediment to 4.0 feet over coarse silty lake sediment to end of boring
								Slag gravel fill	0.8	
2						0		Moist, brown (CLAYEY-SILT) with little clay, thinly laminated with very thin coarse silt lenses and occasional nearly vertical gray desiccation cracks	2.0'	
3						902		Extremely moist, brown (SILT) with trace very fine size sand, thinly bedded	4.0	2.0'
4						1460				2.0'
5						507				2.0'
6						497				2.0'
						160				2.0'
						112				1.0'
								Boring Completed at 15.0 feet	15.0	

LOGGED BY: Dale M. Gramza / Senior Geologist

PAGE 1 of 1

DATE: 10/26/09 Hole Number: EP 9 ELEVATION: \_\_\_\_\_  
 PROJECT: Subsurface Investigation at the Property Located at 305 Niagara Street  
Adjacent to and North of 285 Niagara Street, Buffalo, New York  
 PREPARED FOR: \_\_\_\_\_  
 BORING LOCATION: Alden State Bank

0	SN	0/ 6	6/ 12	12/ 18	18/ 24	N	OVM	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
	1						0		Blacktop	0.3	Blacktop to 0.3 foot over slag gravel fill to 0.7 foot over silty tending toward clayey lake sediment to 4.0 feet over coarse silty lake sediment to end of boring
									Slag gravel fill	0.7	
	2						0		Moist, faintly mottled, brown (CLAYEY-SILT) with little to some clay, thinly laminated with very thin coarse silt lenses and occasional nearly vertical gray desiccation cracks	2.0'	
	3						962		Extremely moist to wet, brown (SILT) with trace very fine size sand, thinly bedded	4.0	2.0'
5											
	4						82				2.0'
	5						305				2.0'
10	6						127				2.0'
							30				2.0'










Hole Number: EP 10DATE: 10/26/09

ELEVATION: \_\_\_\_\_

PROJECT: Subsurface Investigation at the Property Located at 305 Niagara Street  
Adjacent to and North of 285 Niagara Street, Buffalo, New YorkPREPARED FOR: Alden State Bank

BORING LOCATION: \_\_\_\_\_

0	SN	0/ 6	6/ 12	12/ 18	18/ 24	N	OVM	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS
0	1						0		Blacktop pavement 0.2	1.7'	Blacktop pavement to 0.2 foot over gravel fill to 0.8 foot over silty lake sediment to 4.0 feet over coarse silty lake sediment to 5.5 feet over clayey lake sediment to end of boring
									Gravel fill 0.8		
							0		Moist, brown (CLAYEY-SILT) with little to some clay, blocky soil structure	1.9'	
	2										
							250		Extremely moist to wet, brown (SILT) with trace very fine size sand, thinly bedded 4.0	2.0'	Moist, brown (CLAYEY-SILT) with some clay, thinly laminated with very thin coarse silt lenses
5											
	3										
							452		Moist, brown (CLAYEY-SILT) with some clay, thinly laminated with very thin coarse silt lenses 5.5	2.0'	
	4										Boring Completed at 12.0 feet
							229			2.0'	
	5										
10							7			2.0'	
	6										Boring Completed at 12.0 feet
15											Boring Completed at 12.0 feet
20											Boring Completed at 12.0 feet

LOGGED BY: Dale M. Gramza / Senior GeologistPAGE 1 of 1



EP 12

10/26/09

ELEVATION:

## Subsurface Investigation at the Property Located at 305 Niagara Street

Adjacent to and North of 285 Niagara Street, Buffalo, New York

Alden State Bank

**BORING LOCATION:**

[illegible]

Hole Number: EP 13


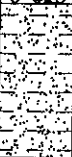




DATE: 10/26/09

ELEVATION: \_\_\_\_\_

PROJECT: Subsurface Investigation at the Property Located at 305 Niagara Street  
Adjacent to and North of 285 Niagara Street, Buffalo, New York

PREPARED FOR: Alden State Bank

BORING LOCATION: \_\_\_\_\_

	SN	0/ 6	6/ 12	12/ 18	18/ 24	N	OVM	LITH	DESCRIPTION AND CLASSIFICATION	REC	COMMENTS	
0	1						0		Blacktop pavement Gravel and slag fill	0.2 1.6'	Blacktop pavement to 0.2 foot over gravel fill to 2.0 feet over silty lake sediment to 4.0 feet over coarse silty lake sediment to end of boring	
									Moist, brown (CLAYEY-SILT) with little clay, thinly laminated with very thin coarse silt lenses and nearly vertical gray desiccation cracks	2.0 1.7'		
	2						0					
							3.2		Extremely moist to wet, brown (SILT) with trace very fine size sand, thinly bedded	4.0 2.0'		
5												
	3						3.2					
	4						104			2.0'		
	5						49			2.0'		
10												
	6						4			2.0'		

LOGGED BY: Dale M. Gramza / Senior Geologist

EP 14

10/26/09

ELEVATION:

## Subsurface Investigation at the Property Located at 305 Niagara Street

Adjacent to and North of 285 Niagara Street, Buffalo, New York

Alden State Bank

**BORING LOCATION:**

[illegible]

EP 15

10/26/09

ELEVATION:

## Subsurface Investigation at the Property Located at 305 Niagara Street

Adjacent to and North of 285 Niagara Street, Buffalo, New York

PREPARED FOR:

Alden State Bank

BORING LOCATION:

[illegible]

LOGGED BY: Dale M. Gramza / Senior Geologist

PAGE 1 of 1

EP 16

10/26/09

ELEVATION:

## Subsurface Investigation at the Property Located at 305 Niagara Street

Adjacent to and North of 285 Niagara Street, Buffalo, New York

Alden State Bank

**BORING LOCATION:**

20

LOGGED BY: Dale M. Gramza / Senior Geologist

PAGE 1 of 1



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## **Appendix #2**

### Laboratory Analytical Results





**PARADIGM**  
ENVIRONMENTAL SERVICES, INC.

## Analytical Report Cover Page

### NWEC&C

For Lab Project # 09-4111  
Issued November 9, 2009  
This report contains a total of 6 pages

The reported results relate only to the samples as they have been received by the laboratory.

Any noncompliant QC parameters having impact on the data are flagged or documented on the final report.

All soil/sludge samples have been reported on a dry weight basis, unless qualified "reported as received". Other solids are reported as received.

Each page of this document is part of a multipage report. This document may not be reproduced except in its entirety, without the prior consent of Paradigm Environmental Services, Inc.

The Chain of Custody provides additional information, including compliance with sample condition requirements upon receipt. Sample condition requirements are defined under the 2003 NELAC Standard, sections 5.5.8.3.1 and 5.5.8.3.2.

NYSDOH ELAP does not certify for all parameters. Paradigm Environmental Services or the indicated subcontracted laboratory does hold certification for all analytes where certification is offered by ELAP unless otherwise specified.

Data qualifiers are used, when necessary, to provide additional information about the data. This information may be communicated as a flag or as text at the bottom of the report. Please refer to the following list of frequently used data flags and their meaning:

**"ND"** = analyzed for but not detected.

**"E"** = Result has been estimated, calibration limit exceeded.

**"D"** = Duplicate results outside QC limits. May indicate a non-homogenous matrix.

**"M"** = Matrix spike recoveries outside QC limits. Matrix bias indicated.

**"B"** = Method blank contained trace levels of analyte. Refer to included method blank report.



ENVIRONMENTAL SERVICES, INC. 179 Lake Avenue Rochester, New York 14608 (585) 647 - 2530 FAX (585) 647 - 3311

### Volatile STARS Analysis Report for Soils/Solids/Sludges

Client: NWEC&C

Client Job Site:	Alden State Park	Lab Project Number:	09-4111
	285 Niagara Street Buffalo, NY	Lab Sample Number:	12383
Client Job Number:	N/A		
Field Location:	Ep 10 6' - 8'	Date Sampled:	10/26/2009
Field ID Number:	N/A	Date Received:	11/02/2009
Sample Type:	Soil	Date Analyzed:	11/06/2009

Aromatics	Results in ug / Kg
Benzene	ND< 283
n-Butylbenzene	ND< 1,410
sec-Butylbenzene	ND< 283
tert-Butylbenzene	ND< 706
Ethylbenzene	ND< 283
n-Propylbenzene	396
Isopropylbenzene	ND< 1,410
p-Isopropyltoluene	ND< 1,410
Naphthalene	1,370
Toluene	ND< 283
1,2,4-Trimethylbenzene	4,460
1,3,5-Trimethylbenzene	924
m,p-Xylene	414
o-Xylene	ND< 283
<b>Miscellaneous</b>	
Methyl tert-butyl Ether	ND< 283

ELAP Number 10958

Method: EPA 8260B

Data File: V70178.D

Comments: ND denotes Non Detect  
ug / Kg = microgram per Kilogram

Signature: \_\_\_\_\_

*Bruce Hoogesteger*  
Bruce Hoogesteger: Technical Director

This report is part of a multipage document and should only be evaluated in its entirety. Chain of Custody provides additional information, including compliance with sample condition requirements upon receipt.

094111V1.XLS

**Volatile STARS Analysis Report for Soils/Solids/Sludges**Client: **NWEC&C**

Client Job Site:	Alden State Park	Lab Project Number:	09-4111
	285 Niagara Street Buffalo, NY	Lab Sample Number:	12384
Client Job Number:	N/A		
Field Location:	Ep 13 6'-8'	Date Sampled:	10/26/2009
Field ID Number:	N/A	Date Received:	11/02/2009
Sample Type:	Soil	Date Analyzed:	11/06/2009

Aromatics	Results in ug / Kg
Benzene	ND< 118
n-Butylbenzene	ND< 589
sec-Butylbenzene	ND< 118
tert-Butylbenzene	ND< 295
Ethylbenzene	159
n-Propylbenzene	208
Isopropylbenzene	ND< 589
p-Isopropyltoluene	ND< 589
Naphthalene	356
Toluene	ND< 118
1,2,4-Trimethylbenzene	1,650
1,3,5-Trimethylbenzene	475
m,p-Xylene	ND< 118
o-Xylene	ND< 118
<b>Miscellaneous</b>	
Methyl tert-butyl Ether	ND< 118

ELAP Number 10958

Method: EPA 8260B

Data File: V70179.D

Comments: ND denotes Non Detect  
ug / Kg = microgram per Kilogram

Signature: \_\_\_\_\_

Bruce Hoogesteger: Technical Director

**Volatile STARS Analysis Report for Soils/Solids/Sludges**Client: **NWEC&C**

Client Job Site:	Alden State Park	Lab Project Number:	09-4111
	285 Niagara Street Buffalo, NY	Lab Sample Number:	12385
Client Job Number:	N/A		
Field Location:	Ep 14 4'-6'	Date Sampled:	10/26/2009
Field ID Number:	N/A	Date Received:	11/02/2009
Sample Type:	Soil	Date Analyzed:	11/06/2009

Aromatics	Results in ug / Kg
Benzene	ND< 132
n-Butylbenzene	ND< 661
sec-Butylbenzene	ND< 132
tert-Butylbenzene	ND< 331
Ethylbenzene	488
n-Propylbenzene	696
Isopropylbenzene	ND< 661
p-Isopropyltoluene	ND< 661
Naphthalene	1,260
Toluene	ND< 132
1,2,4-Trimethylbenzene	6,630
1,3,5-Trimethylbenzene	1,480
m,p-Xylene	250
o-Xylene	ND< 132
<b>Miscellaneous</b>	
Methyl tert-butyl Ether	ND< 132

ELAP Number 10958

Method: EPA 8260B

Data File: V70182.D

Comments: ND denotes Non Detect  
ug / Kg = microgram per Kilogram

Signature:

  
Bruce Hoogesteger: Technical Director

**Volatile STARS Analysis Report for Soils/Solids/Sludges**Client: **NWEC&C**

Client Job Site: Alden State Park  
285 Niagara Street Buffalo, NY  
Client Job Number: N/A  
Field Location: Ep 15 6'-8'  
Field ID Number: N/A  
Sample Type: Soil

Lab Project Number: 09-4111  
Lab Sample Number: 12386  
Date Sampled: 10/26/2009  
Date Received: 11/02/2009  
Date Analyzed: 11/06/2009

Aromatics	Results in ug / Kg
Benzene	ND< 11.6
n-Butylbenzene	ND< 57.8
sec-Butylbenzene	ND< 11.6
tert-Butylbenzene	ND< 28.9
Ethylbenzene	ND< 11.6
n-Propylbenzene	ND< 11.6
Isopropylbenzene	ND< 57.8
p-Isopropyltoluene	ND< 57.8
Naphthalene	ND< 28.9
Toluene	ND< 11.6
1,2,4-Trimethylbenzene	ND< 11.6
1,3,5-Trimethylbenzene	ND< 11.6
m,p-Xylene	ND< 11.6
o-Xylene	ND< 11.6
<b>Miscellaneous</b>	
Methyl tert-butyl Ether	ND< 11.6

ELAP Number 10958

Method: EPA 8260B

Data File: V70183.D

Comments: ND denotes Non Detect  
ug / Kg = microgram per Kilogram

Signature:

*Bruce Hoogesteger*  
Bruce Hoogesteger: Technical Director

# CHAIN OF CUSTODY

**PARADIGM**  
LABORATORY SERVICES, INC.

<b>REPORT TO:</b>		<b>INVOICE TO:</b>	
COMPANY: <b>NWEC DC</b>	COMPANY: <b>Same</b>	LAB PROJECT #	CLIENT PROJECT #
ADDRESS: <b>3553 Catherine Rd</b>	ADDRESS:	<b>09-4111</b>	
CITY: <b>Cattaraugus</b>	CITY:	STATE: <b>NY</b>	TURNAROUND TIME: (WORKING DAYS)
PHONE: <b>716 937 6524</b>	PHONE:	ZIP: <b>14803</b>	
FAX: <b>716 937 9360</b>	FAX:		
ATTN: <b>Debra Manger</b>	ATTN:		

PROJECT NAME/SITE NAME: **ROSEN STATE PARK**  
**285 Niagara Street Rd**  
 COMMENTS: **See**

REQUESTED ANALYSIS													PARADIGM LAB SAMPLE NUMBER					
DATE	TIME	COMPOSITE	G R A B	SAMPLE LOCATION/FIELD ID	M A T R I X	C O N T A I N E R	REMARKS						1	2	3	4	5	6
10/26/09		✓		EP 10 6'-8'	Soil	1												12383
1		✓		EP 13 6'-8'	Soil	1												12384
3		✓		EP 14 4'-6	Soil	1												12385
4		✓		EP 15 6-8	Soil	1												12386
5																		
6																		
7																		
8																		
9																		
10																		

Sample Condition: Per NELAC/ELAP 210/241/242/243/244

Receipt Parameter	Container Type:	Y	✓	N	□
Comments:	Preservation:	N/A	Y	□	N
Comments:	Holding Time:		Y	✓	N
Comments:	Temperature:	6°C iced	Y	✓	N

Signature: **Debra Manger** Date/Time: **10/20/09**  
 Relinquished By: **[Signature]** Date/Time: **11/2/09**  
 Received By: **[Signature]** Date/Time: **11/2/09**  
 Received @ Lab By: **Elizabeth A. Honch** Date/Time: **11/2/09 1645**

Total Cost:  P.I.F.

## APPENDIX C

### SITE-SPECIFIC HEALTH AND SAFETY PLAN

---

**SITE HEALTH AND SAFETY PLAN**  
**for**  
**BROWNFIELD CLEANUP PROGRAM**  
**RI/IRM ACTIVITIES**

**285-295 NIAGARA STREET SITE**  
**BUFFALO, NEW YORK**

---

October 2011

0236-001-101

Prepared for:

**285 NIAGARA OPERATING CO., LLC**



**285-295 NIAGARA STREET SITE  
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES**

**ACKNOWLEDGEMENT**

**Plan Reviewed by (initial):**

Corporate Health and Safety Director: \_\_\_\_\_ Thomas H. Forbes, P.E. \_\_\_\_\_

Project Manager: \_\_\_\_\_ Michael Lesakowski \_\_\_\_\_

Designated Site Safety and Health Officer: \_\_\_\_\_ Bryan C. Hann \_\_\_\_\_

**Acknowledgement:**

I acknowledge that I have reviewed the information contained in this site-specific Health and Safety Plan, and understand the hazards associated with performance of the field activities described herein. I agree to comply with the requirements of this plan.

NAME (PRINT)	SIGNATURE	DATE
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

**285-295 NIAGARA STREET SITE  
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES**

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**285-295 NIAGARA STREET SITE  
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES**

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**285-295 NIAGARA STREET SITE  
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES**

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## 1.0 INTRODUCTION

### 1.1 General

In accordance with OSHA requirements contained in 29 CFR 1910.120, this Health and Safety Plan (HASP) describes the specific health and safety practices and procedures to be employed by TurnKey Environmental Restoration, LLC and Benchmark Environmental Engineering & Science, PLLC employees (referred to jointly hereafter as “TurnKey-Benchmark”) during Remedial Investigation (RI) and Interim Remedial Measures (IRM) activities at the 285-295 Niagara Street Site (Site) located in the City of Buffalo, Erie County, New York. This HASP presents procedures for TurnKey-Benchmark employees who will be involved with RI/IRM field activities; it does not cover the activities of other contractors, subcontractors or other individuals on the Site. These firms will be required to develop and enforce their own HASPs as discussed in Section 2.0. TurnKey-Benchmark accepts no responsibility for the health and safety of contractor, subcontractor or other personnel.

This HASP presents information on known Site health and safety hazards using available historical information, and identifies the equipment, materials and procedures that will be used to eliminate or control these hazards. Environmental monitoring will be performed during the course of field activities to provide real-time data for on-going assessment of potential hazards.

### 1.2 Background

The Site consists of two adjoining parcels totaling approximately 0.68-acres, located at 285-295 Niagara Street in the City of Buffalo, Erie County, New York. The Site is currently improved with three buildings; Building #1 is located on the northern portion of the Site; Building #2 is located in the center of the Site; and Building #3 is located on the southern portion of the Site. Building #1 is planned for mixed-use residential and commercial redevelopment, and Buildings #2 and #3 are planned for demolition to allow for the redevelopment of Site.

The northern portion of the Site (295 Niagara St. parcel) was historically used as a carriage and bicycle manufacturing operation which included painting, varnishing and metal plating operations; and the southern portion of the Site (285 Niagara St. parcel) was an automobile filling station and car wash operation, including multiple underground storage

tanks (USTs) and fuel dispensers. Based on the findings of previous investigations, the NYSDEC opened a spill file (No. 09-04123) for the Site, which is currently active; and known contamination on-Site will require remediation prior to redevelopment.

### 1.3 Known and Suspected Environmental Conditions

Previous investigations have shown that the former use of the site as a filling station and car wash operation have impacted that Site, which will require remediation prior to redevelopment. The findings of the previous investigation included:

- Historic underground storage tanks (UST's) and filling dispensers located on site.
- Contaminated soil/fill encountered on Site.
- Post-excavation soil samples show elevated volatile organic compounds (VOCs) exceeding NYSDEC CP-51 Soil Cleanup Objectives (SCOs) remain on-Site. NYSDEC Spill No. 0904123 was opened, and remains active for this portion of the Site. Contaminated groundwater was handled in association with the excavation.
- Elevated photoionization detector (PID) readings for volatile organic compounds (VOCs) were detected in multiple locations across the site, with readings as high as 1,460 ppm being detected. Elevated PID readings were noted in seven (7) out of nine (9) boring locations.
- Petroleum-impacted soil was detected on the 295 Niagara Street Parcel. As stated in the report, a significant area of contamination was detected on-parcel and will require remediation.

The RI will be performed in support of the BCP to determine the nature and extent of impacts from these known and suspect environmental conditions on this parcel. As part of the RI, an IRM will be completed to immediately address known environmental impacts related to past use of the Site as an automobile dealership and service facility. An IRM will quickly mitigate risks to public health and the environment attributable to petroleum contamination at the Site. Impacted soil will be removed and impacted groundwater (if encountered) will be extracted and treated during the IRM.

## 1.4 Parameters of Interest

Based on the previous investigations, constituents of potential concern (COPCs) in soil and, potentially groundwater, at the Site include:

- **Volatile Organic Compounds (VOCs)** – VOCs present at elevated concentration may include petroleum-related VOCs, such as n-, tert-, and sec-butylbenzene, 1,2,4- and 1,3,5-trimethylbenzene, isopropylbenzene, benzene, ethylbenzene, toluene, xylenes (BTEX), and methyl tert-butyl ether (MTBE).
- **Semi-Volatile Organic Compounds (SVOCs)** – SVOCs present at elevated concentrations may include polycyclic aromatic hydrocarbons (PAHs), which are byproducts of incomplete combustion and impurities in petroleum products.

## 1.5 Overview of RI/IRM Activities

TurnKey-Benchmark personnel will be on-site to observe and perform RI and IRM activities. The field activities to be completed as part of the RI and IRM are described below.

### Remedial Investigation Activities

1. **Subsurface Soil Sampling:** TurnKey-Benchmark will advance fourteen (14) soil borings and collect one subsurface soil sample from each boring for the purpose of determining the nature and extent of potential COPC impacts.
2. **Monitoring Well Installation/Development and Sampling:** TurnKey-Benchmark will observe the installation of five (5) on-Site groundwater monitoring wells, develop the wells, and collect groundwater samples for the purpose of determining the nature and extent of potential COPC impacts.
3. **Subslab Vapor Sampling:** TurnKey-Benchmark will advance sample points into the sub-slab of Building #1 and collect subslab vapor, ambient indoor air, and ambient outdoor air samples for the purpose of determining the nature and extent of potential COPC impacts.

### Potential IRM Activities

1. **Demolition of Existing Structures:** The remediation contractor will demolish to grade, two existing structures (i.e., Buildings #2 and #3).

2. **Soil Excavation:** The remediation contractor would perform soil excavation activities.
3. **Verification Sampling:** The remediation contractor, in association with TurnKey-Benchmark, will collect soil samples from the sidewalls and bottom of the excavations using a backhoe to verify that cleanup objectives have been met.
4. **Backfilling:** The remediation contractor would coordinate and perform backfilling activities.
5. **Groundwater and Surface Management:** The remediation contractor would direct groundwater/surface water collection during soil excavation activities and coordinate disposal of the collected water.



## 2.0 ORGANIZATIONAL STRUCTURE

This section of the HASP describes the lines of authority, responsibility and communication as they pertain to health and safety functions at the Site. The purpose of this chapter is to identify the personnel who impact the development and implementation of the HASP and to describe their roles and responsibilities. This chapter also identifies other contractors and subcontractors involved in work operations and establish the lines of communications among them for health and safety matters. The organizational structure described in this chapter is consistent with the requirements of 29 CFR 1910.120(b)(2). This section will be reviewed by the Project Manager and updated as necessary to reflect the current organizational structure at this Site.

### 2.1 Roles and Responsibilities

All Turnkey-Benchmark personnel on the Site must comply with the minimum requirements of this HASP. The specific responsibilities and authority of management, safety and health, and other personnel on this Site are detailed in the following paragraphs.

#### 2.1.1 Corporate Health and Safety Director

The TurnKey-Benchmark Corporate Health and Safety Director is ***Mr. Thomas H. Forbes, P.E.*** The Corporate Health and Safety Director responsible for developing and implementing the Health and Safety program and policies for Benchmark Environmental Engineering & Science, PLLC and TurnKey Environmental Restoration, LLC, and consulting with corporate management to ensure adequate resources are available to properly implement these programs and policies. The Corporate Health and Safety Director coordinates TurnKey-Benchmark's Health and Safety training and medical monitoring programs and assists project management and field staff in developing site-specific health and safety plans.

#### 2.1.2 Project Manager

The Project Manager for this Site is ***Mr. Michael Lesakowski.*** The Project Manager has the responsibility and authority to direct all TurnKey-Benchmark work operations at the Site. The Project Manager coordinates safety and health functions with the Site Safety and Health Officer, and bears ultimate responsibility for proper implementation

of this HASP. He may delegate authority to expedite and facilitate any application of the program, including modifications to the overall project approach as necessary to circumvent unsafe work conditions. Specific duties of the Project Manager include:

- Preparing and coordinating the Site work plan.
- Providing TurnKey-Benchmark workers with work assignments and overseeing their performance.
- Coordinating health and safety efforts with the Site Safety and Health Officer (SSHO).
- Reviewing the emergency response coordination plan to assure its effectiveness.
- Serving as the primary liaison with Site contractors and the property owner.

### 2.1.3 Site Safety and Health Officer

The Site Safety and Health Officer (SSHO) for this Site is **Mr. Bryan C. Hann**. The qualified alternate SSHO is **Mr. Nathan Munley**. The SSHO reports to the Project Manager. The SSHO is on-site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SSHO are:

- Managing the safety and health functions for TurnKey-Benchmark personnel on the Site.
- Serving as the point of contact for safety and health matters.
- Ensuring that TurnKey-Benchmark field personnel working on the Site have received proper training (per 29 CFR Part 1910.120(e)), that they have obtained medical clearance to wear respiratory protection (per 29 CFR Part 1910.134), and that they are properly trained in the selection, use and maintenance of personal protective equipment, including qualitative respirator fit testing.
- Performing or overseeing Site monitoring as required by the HASP.
- Assisting in the preparation and review of the HASP.

- Maintaining site-specific safety and health records as described in this HASP.
- Coordinating with the Project Manager, Site Workers, and Contractor's SSHO as necessary for safety and health efforts.

#### **2.1.4 Site Workers**

Site workers are responsible for: complying with this HASP or a more stringent HASP, if appropriate (i.e., Contractor and Subcontractor's HASP); using proper PPE; reporting unsafe acts and conditions to the SSHO; and following the safety and health instructions of the Project Manager and SSHO.

#### **2.1.5 Other Site Personnel**

Other Site personnel who will have health and safety responsibilities will include the Drilling Contractor, who will be responsible for developing, implementing and enforcing a Health and Safety Plan equally stringent or more stringent than TurnKey-Benchmark's HASP. TurnKey-Benchmark assumes no responsibility for the health and safety of anyone outside its direct employ. Each Contractor's HASP shall cover all non-TurnKey/Benchmark Site personnel. Each Contractor shall assign a SSHO who will coordinate with TurnKey-Benchmark's SSHO as necessary to ensure effective lines of communication and consistency between contingency plans.

In addition to TurnKey-Benchmark and Contractor personnel, other individuals who may have responsibilities in the work zone include subcontractors and governmental agencies performing Site inspection work (i.e., the New York State Department of Environmental Conservation). The Contractor shall be responsible for ensuring that these individuals have received OSHA-required training (29 CFR 1910.120(e)), including initial, refresher and site-specific training, and shall be responsible for the safety and health of these individuals while they are on-site.

### 3.0 HAZARD EVALUATION

Due to the presence of certain contaminants at the Site, the possibility exists that workers will be exposed to hazardous substances during field activities. The principal points of exposure would be through direct contact with and incidental ingestion of soil, and through the inhalation of contaminated particles or vapors. Other points of exposure may include direct contact with groundwater. In addition, the use of drilling and/or medium to large-sized construction equipment (e.g., excavator) will also present conditions for potential physical injury to workers. Further, since work will be performed outdoors, the potential exists for heat/cold stress to impact workers, especially those wearing protective equipment and clothing. Adherence to the medical evaluations, worker training relative to chemical hazards, safe work practices, proper personal protection, environmental monitoring, establishment work zones and Site control, appropriate decontamination procedures and contingency planning outlined herein will reduce the potential for chemical exposures and physical injuries.

#### 3.1 Chemical Hazards

As discussed in Section 1.3, historic activities have potentially resulted in impacts to Site soils, groundwater, and subslab vapors. Visual and olfactory observations, as well as elevated PID readings, indicate a potential VOC impact to Site soil. In addition to VOCs, soil and groundwater may be impacted by SVOCs (PAHs) due to historic use as a car wash and gasoline filling station. Table 1 lists exposure limits for airborne concentrations of the COPCs identified in Section 1.4 of this HASP. Brief descriptions of the toxicology of the prevalent COPCs and related health and safety guidance and criteria are provided below.

- **1,2,4-Trimethylbenzene (CAS #95-63-6)** is a common gasoline additive. Acute exposure predominantly results in skin irritation and inhalation causes chemical pneumonitis. Symptoms include headache, dizziness, fatigue, muscular weakness, drowsiness.
- **1,3,5-Trimethylbenzene (CAS #108-67-8)** is a colorless, odorless flammable liquid. The substance is irritating to the eyes, the skin and the respiratory tract. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.

- **Isopropylbenzene (CAS #98-82-8)** is a colorless, gasoline-like odor flammable liquid. Acute exposure typically results in irritation of the eyes, mucous membranes and upper respiratory tract. Can be absorbed through the skin. Possible central nervous system depressant. Symptoms may include irritation, dizziness, nausea, lack of coordination and narcosis.
- **N-Propylbenzene (CAS #103-65-1)** is a colorless to pale yellow flammable liquid. Inhalation or contact may irritate or burn skin and eyes. In case fire, smoke-vapor may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation.
- **Ethylbenzene (CAS #100-41-4)** is a component of automobile gasoline. Over-exposure may cause kidney, skin liver and/or respiratory disease. Signs of exposure may include dermatitis, irritation of the eyes and mucus membranes, headache. Narcosis and coma may result in more severe cases.
- **Toluene (CAS #108-88-3)** is a common component of paint thinners and automobile fuel. Acute exposure predominantly results in central nervous system depression. Symptoms include headache, dizziness, fatigue, muscular weakness, drowsiness, and coordination loss. Repeated exposures may cause removal of lipids from the skin, resulting in dry, fissured dermatitis.
- **Xylenes (o, m, and p) (CAS #95-47-6, 108-38-3, and 106-42-3)** are colorless, flammable liquids present in paint thinners and fuels. Acute exposure may cause central nervous system depression, resulting in headache, dizziness, fatigue, muscular weakness, drowsiness, and coordination loss. Repeated exposures may also cause removal of lipids from the skin, producing dry, fissured dermatitis. Exposure of high concentrations of vapor may cause eye irritation and damage, as well as irritation of the mucus membranes.
- **Polycyclic Aromatic Hydrocarbons (PAHs)** are formed as a result of the pyrolysis and incomplete combustion of organic matter such as fossil fuel. PAH aerosols formed during the combustion process disperse throughout the atmosphere, resulting in the deposition of PAH condensate in soil, water and on vegetation. In addition, several products formed from petroleum processing operations (e.g., roofing materials and asphalt) also contain elevated levels of PAHs. Hence, these compounds are widely dispersed in the environment. PAHs are characterized by a molecular structure containing three or more fused, unsaturated carbon rings. Seven of the PAHs are classified by USEPA as probable human carcinogens (USEPA Class B2). These are: benzo(a)pyrene; benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; dibenzo(a,h)anthracene; and indeno(1,2,3-cd)pyrene. The primary route of

exposure to PAHs is through incidental ingestion and inhalation of contaminated particulates. PAHs are characterized by an organic odor, and exist as oily liquids in pure form. Acute exposure symptoms may include acne-type blemishes in areas of the skin exposed to sunlight.

With respect to the anticipated RI/IRM activities discussed in Section 1.5, possible routes of exposure to the above-mentioned contaminants are presented in Table 2. The use of proper respiratory equipment, as outlined in Section 7.0 of this HASP, will minimize the potential for exposure to airborne contamination. Exposure to contaminants through dermal and other routes will also be minimized through the use of protective clothing (Section 7.0), safe work practices (Section 6.0), and proper decontamination procedures (Section 12.0).

### **3.2 Physical Hazards**

RI/IRM field activities at the 285-295 Niagara Street Site may present the following physical hazards:

- The potential for physical injury during heavy construction equipment use, such as backhoes, excavators and drilling equipment.
- The potential for heat/cold stress to employees during the summer/winter months (see Section 10.0).
- The potential for slip and fall injuries due to rough, uneven terrain and/or open excavations.

These hazards represent only some of the possible means of injury that may be present during RI/IRM operations and sampling activities at the Site. Since it is impossible to list all potential sources of injury, it shall be the responsibility of each individual to exercise proper care and caution during all phases of the work.

## 4.0 TRAINING

### 4.1 Site Workers

All personnel performing RI/IRM activities at the Site (such as, but not limited to, equipment operators, general laborers, and drillers) and who may be exposed to hazardous substances, health hazards, or safety hazards and their supervisors/managers responsible for the Site shall receive training in accordance with 29 CFR 1910.120(e) before they are permitted to engage in operations in the exclusion zone or contaminant reduction zone. This training includes an initial 40-hour Hazardous Waste Site Worker Protection Course, an 8-hour Annual Refresher Course subsequent to the initial 40-hour training, and 3 days of actual field experience under the direct supervision of a trained, experienced supervisor. Additional site-specific training shall also be provided by the SSHO prior to the start of field activities. A description of topics to be covered by this training is provided below.

#### 4.1.1 Initial and Refresher Training

Initial and refresher training is conducted by a qualified instructor as specified under OSHA 29 CFR 1910.120(e)(5), and is specifically designed to meet the requirements of OSHA 29 CFR 1910.120(e)(3) and 1910.120(e)(8). The training covers, as a minimum, the following topics:

- OSHA HAZWOPER regulations.
- Site safety and hazard recognition, including chemical and physical hazards.
- Medical monitoring requirements.
- Air monitoring, permissible exposure limits, and respiratory protection level classifications.
- Appropriate use of personal protective equipment (PPE), including chemical compatibility and respiratory equipment selection and use.
- Work practices to minimize risk.
- Work zones and Site control.

- Safe use of engineering controls and equipment.
- Decontamination procedures.
- Emergency response and escape.
- Confined space entry procedures.
- Heat and cold stress monitoring.
- Elements of a Health and Safety Plan.
- Spill containment.

Initial training also incorporates workshops for PPE and respiratory equipment use (Levels A, B and C), and respirator fit testing. Records and certification received from the course instructor documenting each employee's successful completion of the training identified above are maintained on file at TurnKey-Benchmark's Buffalo, NY office. Contractors and Subcontractors are required to provide similar documentation of training for all their personnel who will be involved in on-site work activities.

Any employee who has not been certified as having received health and safety training in conformance with 29 CFR 1910.120(e) is prohibited from working in the exclusion and contamination reduction zones, or to engage in any on-site work activities that may involve exposure to hazardous substances or wastes.

#### **4.1.2 Site Training**

Site workers are given a copy of the HASP and provided a site-specific briefing prior to the commencement of work to ensure that employees are familiar with the HASP and the information and requirements it contains. The Site briefing shall be provided by the SSHO prior to initiating field activities and shall include:

- Names of personnel and alternates responsible for Site safety and health.
- Safety, health and other hazards present on the Site.
- The site lay-out including work zones and places of refuge.



- The emergency communications system and emergency evacuation procedures.
- Use of PPE.
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on the site.
- Medical surveillance, including recognition of symptoms and signs of over-exposure as described in Chapter 5 of this HASP.
- Decontamination procedures as detailed in Chapter 12 of this HASP.
- The emergency response plan as detailed in Chapter 15 of this HASP.
- Confined space entry procedures, if required, as detailed in Chapter 13 of this HASP.
- The spill containment program as detailed in Chapter 9 of this HASP.
- Site control as detailed in Chapter 11 of this HASP.

Supplemental health and safety briefings will also be conducted by the SSHO on an as-needed basis during the course of the work. Supplemental briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during ongoing Site characterization and analysis. Conditions for which the SSHO may schedule additional briefings include, but are not limited to: a change in Site conditions (e.g., based on monitoring results); changes in the work schedule/plan; newly discovered hazards; and safety incidents occurring during Site work.

## **4.2 Supervisor Training**

On-site safety and health personnel who are directly responsible for or who supervise the safety and health of workers engaged in hazardous waste operations (i.e., SSHO) shall receive, in addition to the appropriate level of worker training described in Section 4.1, above, 8 additional hours of specialized supervisory training, in compliance with 29 CFR 1910.120(e)(4).

### **4.3 Emergency Response Training**

Emergency response training is addressed in Appendix A of this HASP, Emergency Response Plan.

### **4.4 Site Visitors**

Each Contractor's SSHO will provide a site-specific briefing to all Site visitors and other non-TurnKey/Benchmark personnel who enter the Site beyond the Site entry point. The site-specific briefing will provide information about Site hazards, the Site layout including work zones and places of refuge, the emergency communications system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

Site visitors will not be permitted to enter the exclusion zone or contaminant reduction zones unless they have received the level of training required for Site workers as described in Section 4.1.

## 5.0 MEDICAL MONITORING

Medical monitoring examinations are provided to TurnKey-Benchmark employees as stipulated under 29 CFR Part 1910.120(f). These exams include initial employment, annual and employment termination physicals for all TurnKey-Benchmark employees involved in hazardous waste site field operations. Post-exposure examinations are also provided for employees who may have been injured, received a health impairment, or developed signs or symptoms of over-exposure to hazardous substances or were accidentally exposed to substances at concentrations above the permissible exposure limits without necessary personal protective equipment. Such exams are performed as soon as possible following development of symptoms or the known exposure event.

Medical evaluations are performed by Health Works, an occupational health care provider under contract with TurnKey-Benchmark. Health Works is located in Seneca Square Plaza, 1900 Ridge Road, West Seneca, New York 14224. The facility can be reached at (716) 823-5050 to schedule routine appointments or post-exposure examinations.

Medical evaluations are conducted according to the TurnKey-Benchmark Medical Monitoring Program and include an evaluation of the workers' ability to use respiratory protective equipment. The examinations include:

- Occupational/medical history review.
- Physical exam, including vital sign measurement.
- Spirometry testing.
- Eyesight testing.
- Audio testing (minimum baseline and exit, annual for employees routinely exposed to greater than 85db).
- EKG (for employees >40 yrs age or as medical conditions dictate).
- Chest X-ray (baseline and exit, and every 5 years).
- Blood biochemistry (including blood count, white cell differential count, serum multiplastic screening).
- Medical certification of physical requirements (i.e., sight, musculoskeletal,

cardiovascular) for safe job performance and to wear respiratory protection equipment.

The purpose of the medical evaluation is to determine an employee's fitness for duty on hazardous waste sites; and to establish baseline medical data.

In conformance with OSHA regulations, TurnKey-Benchmark will maintain and preserve medical records for a period of 30 years following termination of employment. Employees are provided a copy of the physician's post-exam report, and have access to their medical records and analyses.

## 6.0 SAFE WORK PRACTICES

All TurnKey-Benchmark employees shall conform to the following safe work practices during all on-site work activities conducted within the exclusion and contamination reduction zones:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth contact is strictly prohibited.
- The hands and face must be thoroughly washed upon leaving the work area and prior to engaging in any activity indicated above.
- Respiratory protective equipment and clothing must be worn by all personnel entering the Site as required by the HASP or as modified by the Site safety officer. Excessive facial hair (i.e., beards, long mustaches or sideburns) that interferes with the satisfactory respirator-to-face seal is prohibited.
- Contact with surfaces/materials either suspected or known to be contaminated will be avoided to minimize the potential for transfer to personnel, cross contamination and need for decontamination.
- Medicine and alcohol can synergize the effects of exposure to toxic chemicals. Due to possible contraindications, use of prescribed drugs should be reviewed with the TurnKey-Benchmark occupational physician. Alcoholic beverage and illegal drug intake are strictly forbidden during the workday.
- All personnel shall be familiar with standard operating safety procedures and additional instructions contained in this Health and Safety Plan.
- On-site personnel shall use the “buddy” system. No one may work alone (i.e., out of earshot or visual contact with other workers) in the exclusion zone.
- Personnel and equipment in the contaminated area shall be minimized, consistent with effective Site operations.
- All employees have the obligation to immediately report and if possible, correct unsafe work conditions.
- Use of contact lenses on-site will not be permitted. Spectacle kits for insertion into full-face respirators will be provided for TurnKey-Benchmark employees, as requested and required.

The recommended specific safety practices for working around the contractor's equipment (e.g., backhoes, bulldozers, excavators, drill rigs etc.) are as follows:

- Although the Contractor and subcontractors are responsible for their equipment and safe operation of the Site, TurnKey-Benchmark personnel are also responsible for their own safety.
- Subsurface work will not be initiated without first clearing underground utility services.
- Heavy equipment should not be operated within 20 feet of overhead wires. This distance may be increased if windy conditions are anticipated or if lines carry high voltage. The Site should also be sufficiently clear to ensure the project staff can move around the heavy machinery safely.
- Care should be taken to avoid overhead wires when moving heavy-equipment from location to location.
- Hard hats, safety boots and safety glasses should be worn at all times in the vicinity of heavy equipment. Hearing protection is also recommended.
- The work Site should be kept neat. This will prevent personnel from tripping and will allow for fast emergency exit from the Site.
- Proper lighting must be provided when working at night.
- Construction activities should be discontinued during an electrical storm or severe weather conditions.
- The presence of combustible gases should be checked before igniting any open flame.
- Personnel shall stand upwind of any construction operation when not immediately involved in sampling/logging/observing activities.
- Personnel will not approach the edge of an unsecured trench/excavation closer than 2 feet.

## 7.0 PERSONAL PROTECTIVE EQUIPMENT

### 7.1 Equipment Selection

Personal protective equipment (PPE) will be donned when work activities may result in exposure to physical or chemical hazards beyond acceptable limits, and when such exposure can be mitigated through appropriate PPE. The selection of PPE will be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the Site, the task-specific conditions and duration, and the hazards and potential hazards identified at the Site.

Equipment designed to protect the body against contact with known or suspect chemical hazards are grouped into four categories according to the degree of protection afforded. These categories designated A through D consistent with United States Environmental Protection Agency (USEPA) Level of Protection designation, are:

- **Level A:** Should be selected when the highest level of respiratory, skin and eye protection is needed.
- **Level B:** Should be selected when the highest level of respiratory protection is needed, but a lesser level of skin protection is required. Level B protection is the minimum level recommended on initial Site entries until the hazards have been further defined by on-site studies. Level B (or Level A) is also necessary for oxygen-deficient atmospheres.
- **Level C:** Should be selected when the types of airborne substances are known, the concentrations have been measured and the criteria for using air-purifying respirators are met. In atmospheres where no airborne contaminants are present, Level C provides dermal protection only.
- **Level D:** Should not be worn on any Site with elevated respiratory or skin hazards. This is generally a work uniform providing minimal protection.

OSHA requires the use of certain PPE under conditions where an immediate danger to life and health (IDLH) may be present. Specifically, OSHA 29 CFR 1910.120(g)(3)(iii) requires use of a positive pressure self-contained breathing apparatus, or positive pressure air-line respirator equipped with an escape air supply when chemical exposure levels present a substantial possibility of immediate serious injury, illness or death, or impair the ability to

escape. Similarly, OSHA 29 CFR 1910.120(g)(3)(iv) requires donning totally-encapsulating chemical protective suits (with a protection level equivalent to Level A protection) in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate serious illness, injury or death, or impair the ability to escape.

In situations where the types of chemicals, concentrations, and possibilities of contact are unknown, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be further characterized. The individual components of clothing and equipment must be assembled into a full protective ensemble to protect the worker from site-specific hazards, while at the same time minimizing hazards and drawbacks of the personal protective gear itself. Ensemble components are detailed below for levels A/B, C, and D protection.

## **7.2 Protection Ensembles**

### **7.2.1 Level A/B Protection Ensemble**

Level A/B ensembles include similar respiratory protection, however Level A provides a higher degree of dermal protection than Level B. Use of Level A over Level B is determined by: comparing the concentrations of identified substances in the air with skin toxicity data, and assessing the effect of the substance (by its measured air concentrations or splash potential) on the small area of the head and neck unprotected by Level B clothing.

The recommended PPE for level A/B is:

- Pressure-demand, full-face piece self-contained breathing apparatus (MSHA/-NIOSH approved) or pressure-demand supplied-air respirator with escape self-contained breathing apparatus (SCBA).
- Chemical-resistant clothing. For Level A, clothing consists of totally-encapsulating chemical resistant suit. Level B incorporates hooded one-or two-piece chemical splash suit.
- Inner and outer chemical resistant gloves.
- Chemical-resistant safety boots/shoes.
- Hardhat.



### 7.2.2 Level C Protection Ensemble

Level C protection is distinguished from Level B by the equipment used to protect the respiratory system, assuming the same type of chemical-resistant clothing is used. The main selection criterion for Level C is that conditions permit wearing an air-purifying device. The device (when required) must be an air-purifying respirator (MSHA/NIOSH approved) equipped with filter cartridges. Cartridges must be able to remove the substances encountered. Respiratory protection will be used only with proper fitting, training and the approval of a qualified individual. In addition, an air-purifying respirator can be used only if: oxygen content of the atmosphere is at least 19.5% in volume; substances are identified and concentrations measured; substances have adequate warning properties; the individual passes a qualitative fit-test for the mask; and an appropriate cartridge/canister is used, and its service limit concentration is not exceeded.

Recommended PPE for Level C conditions includes:

- Full-face piece, air-purifying respirator equipped with MSHA and NIOSH approved organic vapor/acid gas/dust/mist combination cartridges or as designated by the SSHO.
- Chemical-resistant clothing (hooded, one or two-piece chemical splash suit or disposable chemical-resistant one-piece suit).
- Inner and outer chemical-resistant gloves.
- Chemical-resistant safety boots/shoes.
- Hardhat.

An air-monitoring program is part of all response operations when atmospheric contamination is known or suspected. It is particularly important that the air be monitored thoroughly when personnel are wearing air-purifying respirators. Continual surveillance using direct-reading instruments is needed to detect any changes in air quality necessitating a higher level of respiratory protection.

### 7.2.3 Level D Protection Ensemble

As indicated above, Level D protection is primarily a work uniform. It can be worn in areas where only boots can be contaminated, where there are no inhalable toxic substances

and where the atmospheric contains at least 19.5% oxygen.

Recommended PPE for Level D includes:

- Coveralls.
- Safety boots/shoes.
- Safety glasses or chemical splash goggles.
- Hardhat.
- Optional gloves; escape mask; face shield.

#### **7.2.4 Recommended Level of Protection for Site Tasks**

Based upon current information regarding both the contaminants suspected to be present at the Site and the various tasks that are included in the remedial activities, the minimum required levels of protection for these tasks shall be as identified in Table 3.

## 8.0 EXPOSURE MONITORING

### 8.1 General

Based on the results of historic sample analysis and the nature of the proposed work activities at the Site, the possibility exist that organic vapors and/or particulates may be released to the air during intrusive construction activities. Ambient breathing zone concentrations may at times, exceed the permissible exposure limits (PELs) established by OSHA for the individual compounds (see Table 1), in which case respiratory protection will be required. Respiratory and dermal protection may be modified (upgraded or downgraded) by the SSHO based upon real-time field monitoring data.

#### 8.1.1 On-Site Work Zone Monitoring

TurnKey-Benchmark personnel will conduct routine, real-time air monitoring during all intrusive construction phases such as excavation, backfilling, drilling, etc. The work area will be monitored at regular intervals using a photo-ionization detector (PID), combustible gas meter and a particulate meter. Observed values will be recorded and maintained as part of the permanent field record.

Additional air monitoring measurements may be made by TurnKey-Benchmark personnel to verify field conditions during subcontractor oversight activities. Monitoring instruments will be protected from surface contamination during use. Additional monitoring instruments may be added if the situations or conditions change. Monitoring instruments will be calibrated in accordance with manufacturer's instructions before use.

#### 8.1.2 Off-Site Community Air Monitoring

In addition to on-site monitoring within the work zone(s), monitoring at the down-wind portion of the Site perimeter will be conducted. This will provide a real-time method for determination of vapor and/or particulate releases to the surrounding community as a result of ground intrusive investigation work.

Ground intrusive activities are defined in the Generic Community Air Monitoring Plan and attached as Appendix C. Ground intrusive activities include soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells. Non-intrusive activities include the collection of soil and sediment samples or the

collection of groundwater samples from existing wells. Continuous monitoring is required for ground intrusive activities and periodic monitoring is required for non-intrusive activities. Periodic monitoring consists of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring while bailing a well, and taking a reading prior to leaving a sampling location. This may be upgraded to continuous if the sampling location is in close proximity to individuals not involved in the Site activity (i.e., on a curb of a busy street). The action levels below will be used during periodic monitoring.

## 8.2 Monitoring Action Levels

### 8.2.1 On-Site Work Zone Action Levels

The PID, or other appropriate instrument(s), will be used by TurnKey-Benchmark personnel to monitor organic vapor concentrations as specified in this HASP. Combustible gas will be monitored with the “combustible gas” option on the combustible gas meter or other appropriate instrument(s). In addition, fugitive dust/particulate concentrations will be monitored during major soil intrusion (viz., well/boring installation) using a real-time particulate monitor as specified in this plan. In the absence of such monitoring, appropriate respiratory protection for particulates shall be donned. Sustained readings obtained in the breathing zone may be interpreted (with regard to other Site conditions) as follows for TurnKey-Benchmark personnel:

- Total atmospheric concentrations of unidentified vapors or gases ranging from 0 to 1 ppm above background on the PID) - Continue operations under Level D (see Appendix A).
- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings from >1 ppm to 5 ppm above background on the PID (vapors not suspected of containing high levels of chemicals toxic to the skin) - Continue operations under Level C (see Appendix A).
- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings of >5 ppm to 50 ppm above background on the PID - Continue operations under Level B (see Attachment 1), re-evaluate and alter (if possible) construction methods to achieve lower vapor concentrations.

- Total atmospheric concentrations of unidentified vapors or gases above 50 ppm on the PID - Discontinue operations and exit the work zone immediately.

The particulate monitor will be used to monitor respirable dust concentrations during all intrusive activities and during handling of Site soil/fill. Action levels based on the instrument readings shall be as follows:

- Less than 50 mg/m<sup>3</sup> - Continue field operations.
- 50-150 mg/m<sup>3</sup> - Don dust/particulate mask or equivalent
- Greater than 150 mg/m<sup>3</sup> - Don dust/particulate mask or equivalent. Initiate engineering controls to reduce respirable dust concentration (viz., wetting of excavated soils or tools at discretion of Site Health and Safety Officer).

Readings from the field equipment will be recorded and documented on the appropriate Project Field Forms. All instruments will be calibrated before use on a daily basis and the procedure will be documented on the appropriate Project Field Forms.

## 8.2.2 Community Air Monitoring Action Levels

In addition to the action levels prescribed in Section 8.2.1 for TurnKey-Benchmark personnel on-site, the following criteria shall also be adhered to for the protection of downwind receptors consistent with NYSDOH requirements (Appendix C):

### o **ORGANIC VAPOR PERIMETER MONITORING:**

- If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone exceeds 5 ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the sustained organic vapor decreases below 5 ppm over background, work activities can resume with continued monitoring.
- If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone are greater than 5 ppm over background but less than 25 ppm for the 15-minute average, activities can resume provided that: the organic vapor level 200 feet downwind of the working site or half the distance to the nearest off-site residential or commercial structure, whichever

is less, but in no case less than 20 feet, is below 5 ppm over background; and more frequent intervals of monitoring, as directed by the Site Health and Safety Officer, are conducted.

- If the sustained organic vapor level is above 25 ppm at the perimeter of the exclusion zone for the 15-minute average, the Site Health and Safety Officer must be notified and work activities shut down. The Site Health and Safety Officer will determine when re-entry of the exclusion zone is possible and will implement downwind air monitoring to ensure vapor emissions do not impact the nearest off-site residential or commercial structure at levels exceeding those specified in the ***Organic Vapor Contingency Monitoring Plan*** below. All readings will be recorded and will be available for New York State Department of Environmental Conservation (DEC) and Department of Health (DOH) personnel to review.

o **ORGANIC VAPOR CONTINGENCY MONITORING PLAN:**

- If the sustained organic vapor level is greater than 5 ppm over background 200 feet downwind from the work area or half the distance to the nearest off-site residential or commercial property, whichever is less, all work activities must be halted.
- If, following the cessation of the work activities or as the result of an emergency, sustained organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest off-site residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest off-site residential or commercial structure (20-foot zone).
- If efforts to abate the emission source are unsuccessful and if sustained organic vapor levels approach or exceed 5 ppm above background within the 20-foot zone for more than 30 minutes, or are sustained at levels greater than 10 ppm above background for longer than one minute, then the ***Major Vapor Emission Response Plan*** (see below) will automatically be placed into effect.

o **MAJOR VAPOR EMISSION RESPONSE PLAN:**

Upon activation, the following activities will be undertaken:

1. All Emergency Response Contacts as listed in this Health and Safety Plan and the Emergency Response Plan (Appendix A) will be advised.

2. The local police authorities will immediately be contacted by the Site Health and Safety Officer and advised of the situation.
3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two sustained successive readings below action levels are measured, air monitoring may be halted or modified by the Site Health and Safety Officer.

The following personnel are to be notified in the listed sequence in the event that a Major Vapor Emission Plan is activated:

Responsible Person	Contact	Phone Number
SSHO	Police	911
SSHO	State Emergency Response Hotline	(800) 457-7362

Additional emergency numbers are listed in the Emergency Response Plan included as Appendix A.

o **EXPLOSIVE VAPORS:**

- Sustained atmospheric concentrations of greater than 10% LEL in the work area - Initiate combustible gas monitoring at the downwind portion of the Site perimeter.
- Sustained atmospheric concentrations of greater than 10% LEL at the downwind Site perimeter – Halt work and contact local Fire Department.

o **AIRBORNE PARTICULATE COMMUNITY AIR MONITORING**

Respirable (PM-10) particulate monitoring will be performed on a continuous basis at the upwind and downwind perimeter of the exclusion zone. The monitoring will be performed using real-time monitoring equipment capable of measuring PM-10 and integrating over a period of 15-minutes for comparison to the airborne particulate action levels. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities. All readings will be recorded and will be available for NYSDEC and NYSDOH review. Readings will be interpreted as follows:

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{ug}/\text{m}^3$ ) greater than the background (upwind perimeter) reading 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 provided that the downwind PM-10 particulate levels do not exceed 150  $\text{ug}/\text{m}^3$  above the upwind level and that visible dust is not migrating from the work area.
- If, after implementation of dust suppression techniques downwind PM-10 levels are greater than 150  $\text{ug}/\text{m}^3$  above the upwind level, work activities must be stopped and dust suppression controls re-evaluated. Work can resume provided that supplemental dust suppression measures and/or other controls are successful in reducing the downwind PM-10 particulate concentration to within 150  $\text{ug}/\text{m}^3$  of the upwind level and in preventing visible dust migration.

Pertinent emergency response information including the telephone number of the Fire Department is included in the Emergency Response Plan (Appendix A).



## 9.0 SPILL RELEASE/RESPONSE

This chapter of the HASP describes the potential for and procedures related to spills or releases of known or suspected petroleum and/or hazardous substances on the Site. The purpose of this Section of the HASP is to plan appropriate response, control, counter-measures and reporting, consistent with OSHA requirements in 29 CFR 1910.120(b)(4)(ii)(J) and (j)(1)(viii). The spill containment program addresses the following elements:

- Potential hazardous material spills and available controls.
- Initial notification and evaluation.
- Spill response.
- Post-spill evaluation.

### 9.1 Potential Spills and Available Controls

An evaluation was conducted to determine the potential for hazardous material and oil/petroleum spills at this Site. For the purpose of this evaluation, hazardous materials posing a significant spill potential are considered to be:

- CERCLA Hazardous Substances as identified in 40 CFR Part 302, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).
- Extremely Hazardous Substances as identified in 40 CFR Part 355, Appendix A, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).
- Hazardous Chemicals as defined under Section 311(e) of the Emergency Planning and Community Right-To-Know Act of 1986, where such chemicals are present or will be stored in excess of 10,000 lbs.
- Toxic Chemicals as defined in 40 CFR Part 372, where such chemicals are present or will be stored in excess of 10,000 lbs.
- Chemicals regulated under 6NYCRR Part 597, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).

Oil/petroleum products are considered to pose a significant spill potential whenever the following situations occur:

- The potential for a “harmful quantity” of oil (including petroleum and non-petroleum-based fuels and lubricants) to reach navigable waters of the U.S. exists (40 CFR Part 112.4). Harmful quantities are considered by USEPA to be volumes that could form a visible sheen on the water or violate applicable water quality standards.
- The potential for any amount of petroleum to reach any waters of NY State, including groundwater, exists. Petroleum, as defined by NY State in 6NYCRR Part 612, is a petroleum-based heat source, energy source, or engine lubricant/maintenance fluid.
- The potential for any release, to soil or water, of petroleum from a bulk storage facility regulated under 6NYCRR Part 612. A regulated petroleum storage facility is defined by NY State as a site having stationary tank(s) and intra-facility piping, fixtures and related equipment with an aggregate storage volume of 1,100 gallons or greater.

The evaluation indicates that, based on Site history and decommissioning records, a hazardous material spill and/or a petroleum product spill is not likely to occur during RI/IRM efforts.

## **9.2 Initial Spill Notification and Evaluation**

Any worker who discovers a hazardous substance or oil/petroleum spill will immediately notify the Project Manager and SSHO. The worker will, to the best of his/her ability, report the material involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, if any, and any associated injuries. The Emergency Response Plan presented in Attachment H2 of this HASP will immediately be implemented if an emergency release has occurred.

Following initial report of a spill, the Project Manager will make an evaluation as to whether the release exceeds RQ levels. If an RQ level is exceeded, the Project Manager will notify the Site owner and NYSDEC at 1-800-457-7362 within 2 hours of spill discovery. The Project Manager will also determine what additional agencies (e.g., USEPA) are to be contacted regarding the release, and will follow-up with written reports as required by the applicable regulations.

### 9.3 Spill Response

For all spill situations, the following general response guidelines will apply:

- Only those personnel involved in overseeing or performing containment operations will be allowed within the spill area. If necessary, the area will be roped, ribboned, or otherwise blocked off to prevent unauthorized access.
- Appropriate PPE, as specified by the SSHO, will be donned before entering the spill area.
- Ignition points will be extinguished/removed if fire or explosion hazards exist.
- Surrounding reactive materials will be removed.
- Drains or drainage in the spill area will be blocked to prevent inflow of spilled materials or applied materials.

For minor spills, the Contractor will maintain a Spill Control and Containment Kit in the Field Office or other readily accessible storage location. The kit will consist of, at a minimum, a 50 lb. bag of “speedy dry” granular absorbent material, absorbent pads, shovels, empty 5-gallon pails and an empty open-top 55-gallon drum. Spilled materials will be absorbed, and shoveled into a 55-gallon drum for proper disposal (NYSDEC approval will be secured for on-site treatment of the impacted soils/absorbent materials, if applicable). Impacted soils will be hand-excavated to the point that no visible signs of contamination remains, and will be drummed with the absorbent.

In the event of a major release or a release that threatens surface water, a spill response contractor will be called to the Site. The response contractor may use heavy equipment (e.g., excavator, backhoe, etc.) to berm the soils surrounding the spill Site or create diversion trenching to mitigate overland migration or release to navigable waters. Where feasible, pumps will be used to transfer free liquid to storage containers. Spill control/cleanup contractors in the Western New York area that may be contacted for assistance include:

- The Environmental Service Group of NY, Inc.: (716) 695-6720
- Environmental Products and Services, Inc.: (716) 447-4700
- Op-Tech: (716) 873-7680

## **9.4 Post-Spill Evaluation**

If a reportable quantity of hazardous material or oil/petroleum is spilled as determined by the Project Manager, a written report will be prepared as indicated in Section 9.2. The report will identify the root cause of the spill, type and amount of material released, date/time of release, response actions, agencies notified and/or involved in cleanup, and procedures to be implemented to avoid repeat incidents. In addition, all re-useable spill cleanup and containment materials will be decontaminated, and spill kit supplies/disposable items will be replenished.

## 10.0 HEAT/COLD STRESS MONITORING

Since some of the work activities at the Site will be scheduled for both the summer and winter months, measures will be taken to minimize heat/cold stress to TurnKey-Benchmark employees. The Site Safety and Health Officer and/or his or her designee will be responsible for monitoring TurnKey-Benchmark field personnel for symptoms of heat/cold stress.

### 10.1 Heat Stress Monitoring

Personal protective equipment may place an employee at risk of developing heat stress, a common and potentially serious illnesses often encountered at construction, landfill, waste disposal, industrial or other unsheltered sites. The potential for heat stress is dependent on a number of factors, including environmental conditions, clothing, workload, physical conditioning and age. Personal protective equipment may severely reduce the body's normal ability to maintain temperature equilibrium (via evaporation and convection), and require increased energy expenditure due to its bulk and weight.

Proper training and preventive measures will mitigate the potential for serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion, that person may be predisposed to additional heat related illness. To avoid heat stress, the following steps should be taken:

- Adjust work schedules.
- Modify work/rest schedules according to monitoring requirements.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat (i.e., eight fluid ounces must be ingested for approximately every 1 lb of weight lost). The normal thirst

mechanism is not sensitive enough to ensure that enough water will be consumed to replace lost perspiration. When heavy sweating occurs, workers should be encouraged to drink more.

- Train workers to recognize the symptoms of heat related illness.

### **Heat-Related Illness - Symptoms:**

- Heat rash may result from continuous exposure to heat or humid air.
- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include: muscle spasms; pain in the hands, feet and abdomen.
- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include: pale, cool, moist skin; heavy sweating; dizziness; nausea; fainting.
- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are: red, hot, usually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

The monitoring of personnel wearing protective clothing should commence when the ambient temperature is 70 degrees Fahrenheit or above. For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism.

- Heart rate may be measured by the radial pulse for 30 seconds as early as possible in the resting period. The rate at the beginning of the rest period should not exceed 100 beats per minute. If the rate is higher, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest periods stay the same. If the pulse rate is 100 beats per minute at the beginning of the next rest period, the following work cycle should be further shortened by 33%.
- Body temperature may be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature at the beginning of the rest period

should not exceed 99.6 degrees Fahrenheit. If it does, the next work period should be shortened by 10 minutes (or 33%), while the length of the rest period remains the same. However, if the oral temperature exceeds 99.6 degrees Fahrenheit at the beginning of the next period, the work cycle may be further shortened by 33%. Oral temperature should be measured at the end of the rest period to make sure that it has dropped below 99.6 degrees Fahrenheit. No TurnKey-Benchmark employee will be permitted to continue wearing semi-permeable or impermeable garments when his/her oral temperature exceeds 100.6 degrees Fahrenheit.

## 10.2 Cold Stress Monitoring

Exposure to cold conditions may result in frostbite or hypothermia, each of which progresses in stages as shown below.

- **Frostbite** occurs when body tissue (usually on the extremities) begins to freeze. The three states of frostbite are:
  - 1) **Frost nip** - This is the first stage of the freezing process. It is characterized by a whitened area of skin, along with a slight burning or painful sensation. Treatment consists of removing the victim from the cold conditions, removal of boots and gloves, soaking the injured part in warm water (102 to 108 degrees Fahrenheit) and drinking a warm beverage. Do not rub skin to generate friction/ heat.
  - 2) **Superficial Frostbite** - This is the second stage of the freezing process. It is characterized by a whitish gray area of tissue, which will be firm to the touch but will yield little pain. The treatment is identical for Frost nip.
  - 3) **Deep Frostbite** - In this final stage of the freezing process the affected tissue will be cold, numb and hard and will yield little to no pain. Treatment is identical to that for Frost nip.
- **Hypothermia** is a serious cold stress condition occurring when the body loses heat at a rate faster than it is produced. If untreated, hypothermia may be fatal. The stages of hypothermia may not be clearly defined or visible at first, but generally include:
  - 1) Shivering
  - 2) Apathy (i.e., a change to an indifferent or uncaring mood)

- 3) Unconsciousness
- 4) Bodily freezing

Employees exhibiting signs of hypothermia should be treated by medical professionals. Steps that can be taken while awaiting help include:

- 1) Remove the victim from the cold environment and remove wet or frozen clothing. (Do this carefully as frostbite may have started.)
- 2) Perform active re-warming with hot liquids for drinking (Note: do not give the victim any liquid containing alcohol or caffeine) and a warm water bath (102 to 108 degrees Fahrenheit).
- 3) Perform passive re-warming with a blanket or jacket wrapped around the victim.

In any potential cold stress situation, it is the responsibility of the Site Health and Safety Officer to encourage the following:

- Education of workers to recognize the symptoms of frostbite and hypothermia.
- Workers should dress warmly, with more layers of thin clothing as opposed to one thick layer.
- Personnel should remain active and keep moving.
- Personnel should be allowed to take shelter in a heated areas, as necessary.
- Personnel should drink warm liquids (no caffeine or alcohol if hypothermia has set in).
- For monitoring the body's recuperation from excess cold, oral temperature recordings should occur:
  - At the Site Safety Technicians discretion when suspicion is based on changes in a worker's performance or mental status.
  - At a workers request.
  - As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind chill less than 20 degrees Fahrenheit or wind chill



less than 30 degrees Fahrenheit with precipitation).

- As a screening measure, whenever anyone worker on-site develops hypothermia.

Any person developing moderate hypothermia (a core body temperature of 92 degrees Fahrenheit) will not be allowed to return to work for 48 hours without the recommendation of a qualified medical doctor.

## 11.0 WORK ZONES AND SITE CONTROL

Work zones around the areas designated for construction activities will be established on a daily basis and communicated to all employees and other Site users by the SSHO. It shall be each Contractor's Site Safety and Health Officer's responsibility to ensure that all Site workers are aware of the work zone boundaries and to enforce proper procedures in each area. The zones will include:

- Exclusion Zone ("Hot Zone") - The area where contaminated materials may be exposed, excavated or handled and all areas where contaminated equipment or personnel may travel. Flagging tape will delineate the zone. All personnel entering the Exclusion Zone must wear the prescribed level of personal protective equipment identified in Section 7.
- Contamination Reduction Zone - The zone where decontamination of personnel and equipment takes place. Any potentially contaminated clothing, equipment and samples must remain in the Contamination Reduction Zone until decontaminated.
- Support Zone - The part of the site that is considered non-contaminated or "clean." Support equipment will be located in this zone, and personnel may wear normal work clothes within this zone.

In the absence of other task-specific work zone boundaries established by the SSHO, the following boundaries will apply to all investigation and construction activities involving disruption or handling of Site soils or groundwater:

- Exclusion Zone: 50 foot radius from the outer limit of the sampling/construction activity.
- Contaminant Reduction Zone: 100 foot radius from the outer limit of the sampling/construction activity.
- Support Zone: Areas outside the Contaminant Reduction Zone.

Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be strictly controlled by the SSHO. Only personnel who are essential to the

completion of the task will be allowed access to these areas and only if they are wearing the prescribed level of protection. Entrance of all personnel must be approved by the SSHO.

The SSHO will maintain a Health and Safety Logbook containing the names of TurnKey-Benchmark workers and their level of protection. The zone boundaries may be changed by the SSHO as environmental conditions warrant, and to respond to the necessary changes in work locations on-site.

## 12.0 DECONTAMINATION

### 12.1 Decontamination for TurnKey-Benchmark Employees

The degree of decontamination required is a function of a particular task and the environment within which it occurs. The following decontamination procedure will remain flexible, thereby allowing the decontamination crew to respond appropriately to the changing environmental conditions that may arise at the Site. All TurnKey-Benchmark personnel on-site shall follow the procedure below, or the Contractor's procedure (if applicable), whichever is more stringent.

**Station 1 - Equipment Drop:** Deposit visibly contaminated (if any) re-useable equipment used in the contamination reduction and exclusion zones (tools, containers, monitoring instruments, radios, clipboards, etc.) on plastic sheeting.

**Station 2 - Boots and Gloves Wash and Rinse:** Scrub outer boots and outer gloves. Deposit tape and gloves in waste disposal container.

**Station 3 - Tape, Outer Boot and Glove Removal:** Remove tape, outer boots and gloves. Deposit tape and gloves in waste disposal container.

**Station 4 - Canister or Mask Change:** If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot cover donned, and worker returns to duty.

**Station 5 - Outer Garment/Face Piece Removal:** Protective suit removed and deposited in separate container provided by Contractor. Face piece or goggles are removed if used. Avoid touching face with fingers. Face piece and/or goggles deposited on plastic sheet. Hard hat removed and placed on plastic sheet.

**Station 6 - Inner Glove Removal:** Inner gloves are the last personal protective equipment to be removed. Avoid touching the outside of the gloves with bare fingers. Dispose of these gloves in waste disposal container.

Following PPE removal, personnel shall wash hands, face and forearms with absorbent wipes. If field activities proceed for duration of 6 consecutive months or longer, shower facilities will be provided for worker use in accordance with OSHA 29 CFR 1910.120(n).

## 12.2 Decontamination for Medical Emergencies

In the event of a minor, non-life threatening injury, personnel should follow the decontamination procedures as defined, and then administer first-aid.

In the event of a major injury or other serious medical concern (e.g., heat stroke), immediate first-aid is to be administered and the victim transported to the hospital in lieu of further decontamination efforts unless exposure to a Site contaminant would be considered “Immediately Dangerous to Life or Health.”

## 12.3 Decontamination of Field Equipment

The Contractor in accordance with his approved Health and Safety Plan in the Contamination Reduction Zone will conduct decontamination of heavy equipment. As a minimum, this will include manually removing heavy soil contamination, followed by steam cleaning on an impermeable pad.

TurnKey-Benchmark personnel will conduct decontamination of all tools used for sample collection purposes. It is expected that all tools will be constructed of nonporous, nonabsorbent materials (i.e., metal), which will aid in the decontamination effort. Any tool or part of a tool made of porous, absorbent material (i.e., wood) will be placed into suitable containers and prepared for disposal.

Decontamination of bailers, split-spoons, spatula knives, and other tools used for environmental sampling and examination shall be as follows:

- Disassemble the equipment
- Water wash to remove all visible foreign matter.
- Wash with detergent.
- Rinse all parts with distilled-deionized water.
- Allow to air dry.
- Wrap all parts in aluminum foil or polyethylene.

### 13.0 CONFINED SPACE ENTRY

OSHA 29 CFR 1910.146 identifies a confined space as a space that is large enough and so configured that an employee can physically enter and do assigned work, has limited or restricted means for entry and exit, and is not intended for continuous employee occupancy. Confined spaces include, but are not limited to, trenches, storage tanks, process vessels, pits, sewers, tunnels, underground utility vaults, pipelines, sumps, wells, and excavations.

Confined space entry by TurnKey-Benchmark employees is not anticipated to be necessary to complete the RI/IRM activities identified in Section 2.0. In the event that the scope of work changes or confined space entry appears necessary, the Project Manager will be consulted to determine if feasible engineering alternatives to confined space entry can be implemented. If confined space entry by TurnKey-Benchmark employees cannot be avoided through reasonable engineering measures, task-specific confined space entry procedures will be developed and a confined-space entry permit will be issued through TurnKey-Benchmark's corporate Health and Safety Director. TurnKey-Benchmark employees shall not enter a confined space without these procedures and permits in place.

## **14.0 FIRE PREVENTION AND PROTECTION**

### **14.1 General Approach**

Recommended practices and standards of the National Fire Protection Association (NFPA) and other applicable regulations will be followed in the development and application of Project Fire Protection Programs. When required by regulatory authorities, the project management will prepare and submit a Fire Protection Plan for the approval of the contracting officers, authorized representative or other designated official. Essential considerations for the Fire Protection Plan will include:

- Proper Site preparation and safe storage of combustible and flammable materials.
- Availability of coordination with private and public fire authorities.
- Adequate job-site fire protection and inspections for fire prevention.
- Adequate indoctrination and training of employees.

### **14.2 Equipment and Requirements**

Fire extinguishers will be provided by each Contractor and are required on all heavy equipment and in each field trailer. Fire extinguishers will be inspected, serviced, and maintained in accordance with the manufacturer's instructions. As a minimum, all extinguishers shall be checked monthly and weighed semi-annually, and recharged if necessary. Recharge or replacement shall be mandatory immediately after each use.

### **14.3 Flammable and Combustible Substances**

All storage, handling or use of flammable and combustible substances will be under the supervision of qualified persons. All tanks, containers and pumping equipment, whether portable or stationary, used for the storage and handling of flammable and combustible liquids, will meet the recommendations of the National Fire Protection Association.

### **14.4 Hot Work**

If the scope of work necessitates welding or blowtorch operation, the hot work permit presented in Appendix B will be completed by the SSHO and reviewed/issued by the Project Manager.

## **15.0 EMERGENCY INFORMATION**

In accordance with OSHA 29 CFR Part 1910, an Emergency Response Plan is attached to this HASP as Appendix A. The hospital route map is presented within Appendix A as Figure 1.



## 16.0 REFERENCES

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

# TABLES



**TABLE 1**  
**TOXICITY DATA FOR CONSTITUENTS OF POTENTIAL CONCERN**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Synonyms	CAS No.	Code	Concentration Limits <sup>1</sup>		
				PEL	TLV	IDLH
Volatile Organic Compounds (VOCs): ppm						
Benzene	Benzol, Phenyl hydride	71-43-2	Ca	1	0.5	500
Ethylbenzene	Ethylbenzol, Phenylethane	100-41-4	none	100	100	800
Methy Tert-Butyl Ether	MTBE	1634-04-4	none	--	50	--
Toluene	Methyl benzene, Methyl benzol	108-88-3	C-300	200	50	500
Xylene, Total	o-, m-, p-isomers	1330-20-7	none	100	100	900
Semi-volatile Organic Compounds (SVOCs) <sup>2</sup> : ppm						
Acenaphthene	none	83-32-9	none	--	--	--
Acenaphthylene	none	208-96-8	none	--	--	--
Anthracene	none	120-12-7	none	--	--	--
Benzo(a)anthracene	none	56-55-3	none	--	--	--
Benzo(a)pyrene	none	50-32-8	none	--	--	--
Benzo(b)fluoranthene	none	205-99-2	none	--	--	--
Benzo(ghi)perylene	none	191-24-2	none	--	--	--
Benzo(k)fluoranthene	none	207-08-9	none	--	--	--
Chrysene	none	218 01 9	none	--	--	--
Dibenzo(a,h)anthracene	none	53-70-3	none	--	--	--
Fluoranthene	none	206-44-0	none	--	--	--
Fluorene	none	86-73-7	none	--	--	--
Indeno(1,2,3-cd)pyrene	none	193-39-5	none	--	--	--
Naphthalene	Naphthalin, Tar camphor, White tar	91-20-3	none	10	10	250
Phenanthrene	none	85-01-8	none	--	--	--
Pyrene	none	129-00-0	none	--	--	--
Inorganic Compounds: mg/m <sup>2</sup>						
Lead	none	7439-92-1	none	0.05	0.15	100

Notes:

1. Concentration limits as reported by NIOSH Pocket Guide to Chemical Hazards, February 2004 (NIOSH Publication No. 97-140, fourth printing with chages and updates.
2. "--" = concentration limit not available; exposure should be minimized to the extent feasible through appropriate engineering controls & PPE.

Explanation:

Ca = NIOSH considers constituent to be a potential occupational carcinogen.

C-## = Ceiling Level equals the maximum exposure concentration allowable during the work day.

IDLH = Immediately Dangerous to Life or Health.

ND indicates that an IDLH has not as yet been determined.

TLV = Threshold Limit Value, established by American Conference of Industrial Hygienists (ACGIH), equals the maximum exposure concentration allowable for 8 hours/day @ 40 ho

TLVs are the amounts of chemicals in the air that almost all healthy adult workers are predicted to be able to tolerate without adverse effects. There are three types.

TLV-TWA (TLV-Time-Weighted Average) which is averaged over the normal eight-hour day/forty-hour work week. (Most TLVs.)

TLV-C or Ceiling limits are the concentration that should not be exceeded during any part of the working exposure.

Unless the initials "STEL" or "C" appear in the Code column, the TLV value should be considered to be the eight-hour TLV-TWA.

PEL = Permissible Exposure Limit, established by OSHA, equals the maximum exposure concentration allowable for 8 hours per day @ 40 hours per week



**TABLE 2**

**POTENTIAL ROUTES OF EXPOSURE TO THE  
CONSTITUENTS OF POTENTIAL CONCERN**

**285-295 Niagara Street Site  
Buffalo, New York**

<b>Activity <sup>1</sup></b>	<b>Direct Contact with Soil/Fill</b>	<b>Inhalation of Vapors or Dust</b>	<b>Direct Contact with Groundwater</b>
<b>Remedial Investigation Tasks</b>			
1. Subsurface Soil Sampling	<b>x</b>	<b>x</b>	
2. Monitoring Well Installation/Development and Sampling	<b>x</b>	<b>x</b>	<b>x</b>
3. Subslab Vapor Sampling	<b>x</b>	<b>x</b>	
<b>Interim Remedial Measures Tasks</b>			
1. Soil Excavation	<b>x</b>	<b>x</b>	
2. Backfilling	<b>x</b>	<b>x</b>	
3. Verification Sampling	<b>x</b>	<b>x</b>	
4. Groundwater and Surface Water Management	<b>x</b>		<b>x</b>

Notes:

1. Activity as described in Section 1.5 of the Health and Safety Plan.



**TABLE 3**

**REQUIRED LEVELS OF PROTECTION  
FOR RI/IRM TASKS**

**285-295 Niagara Street Site  
Buffalo, New York**

Activity	Respiratory Protection <sup>1</sup>	Clothing	Gloves <sup>2</sup>	Boots <sup>2,3</sup>	Other Required PPE/Modifications <sup>2,4</sup>
<b>Remedial Investigation Tasks</b>					
1. Subsurface Soil Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
2. Monitoring Well Installation/Development and Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	SGSS
3. Subslab Vapor Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
<b>Interim Remedial Measures Tasks</b>					
1. Soil Excavation	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
2. Backfilling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
3. Verification Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
4. Groundwater and Surface Water Management	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS

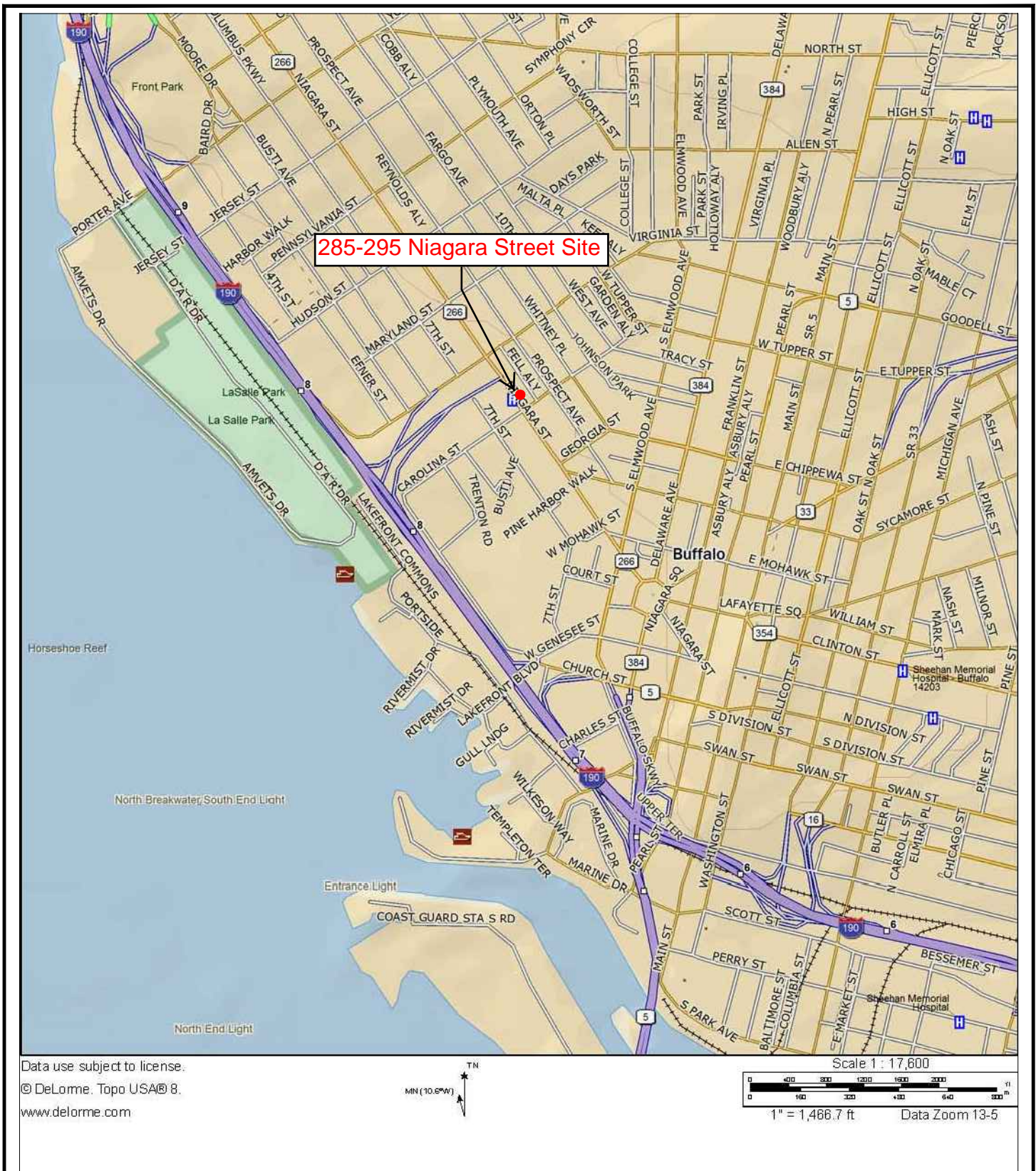
**Notes:**

1. Respiratory equipment shall conform to guidelines presented in Section 7.0 of this HASP. The Level C requirement is an air-purifying respirator equipped with organic compound/acid gas/dust cartridge.
2. HH = hardhat; L = Latex; L/N = latex inner glove, nitrile outer glove; N = Nitrile; S = Saranex; SG = safety glasses; SGSS = safety glasses with sideshields; STSS = steel toe safety shoes.
3. Latex outer boot (or approved overboot) required whenever contact with contaminated materials may occur. SSHO may downgrade to STSS (steel-toed safety shoes) if contact will be limited to cover/replacement soils.
4. Dust masks shall be donned as directed by the SSHO (site safety and health officer) or site safety technician whenever potentially contaminated airborne particulates (i.e., dust) are present in significant amounts in the breathing zone. Goggles may be substituted with safety glasses w/side-shields whenever contact with contaminated liquids is not anticipated.

# FIGURES



**FIGURE 1**



2558 HAMBURG TURNPIKE  
 SUITE 300  
 BUFFALO, NY 14218  
 (716) 856-0635

## SITE VICINITY AND LOCATION MAP

285 - 295 NIAGARA STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

285 NIAGARA OPERATING CO., LLC

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: JGT





BASE MAP PER BING MAPS



APPROXIMATE PROPERTY BOUNDARY

NOT TO SCALE



2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: JGT

## SITE MAP

285 - 295 NIAGARA STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

285 NIAGARA OPERATING CO., LLC

FIGURE 2



# **ATTACHMENT A**

## **EMERGENCY RESPONSE PLAN**

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**EMERGENCY RESPONSE PLAN**  
**for**  
**BROWNFIELD CLEANUP PROGRAM**  
**RI/IRM ACTIVITIES**

**285-295 NIAGARA STREET SITE**  
**BUFFALO, NEW YORK**

---

Revised February 2012

0236-001-101

Prepared for:

**285 NIAGARA OPERATING CO., LLC**

285-295 NIAGARA STREET SITE  
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES  
APPENDIX A: EMERGENCY RESPONSE PLAN

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Figure 1	Hospital Route Map
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## **1.0 GENERAL**

This report presents the site-specific Emergency Response Plan (ERP) referenced in the Site Health and Safety Plan (HASP) prepared for Remedial Investigation (RI) and Interim Remedial Measures (IRM) activities at the 285-295 Niagara Street Site in Buffalo, New York. This appendix of the HASP describes potential emergencies that may occur at the Site; procedures for responding to those emergencies; roles and responsibilities during emergency response; and training all workers must receive in order to follow emergency procedures. This ERP also describes the provisions this Site has made to coordinate its emergency response planning with other contractors on-site and with off-site emergency response organizations.

This ERP is consistent with the requirements of 29 CFR 1910.120(l) and provides the following site-specific information:

- Pre-emergency planning.
- Personnel roles, lines of authority, and communication.
- Emergency recognition and prevention.
- Safe distances and places of refuge.
- Evacuation routes and procedures.
- Decontamination procedures.
- Emergency medical treatment and first aid.
- Emergency alerting and response procedures.
- Critique of response and follow-up.
- Emergency personal protective equipment (PPE) and equipment.

## 2.0 PRE-EMERGENCY PLANNING

This Site has been evaluated for potential emergency occurrences, based on site hazards, the required work tasks, the site topography, and prevailing weather conditions. The results of that evaluation indicate the potential for the following site emergencies to occur at the locations indicated.

Type of Emergency:

1. Medical, due to physical injury

Source of Emergency:

1. Slip/trip/fall

Location of Source:

1. Non-specific

### 3.0 ON-SITE EMERGENCY RESPONSE EQUIPMENT

Emergency procedures may require specialized equipment to facilitate worker rescue, contamination control and reduction, or post-emergency clean up. Emergency response equipment available on the Site is listed below. The equipment inventory and storage locations are based on the potential emergencies described above. This equipment inventory is designed to meet on-site emergency response needs and any specialized equipment needs that off-site responders might require because of the hazards at this Site but not ordinarily stocked.

Any additional personal protective equipment (PPE) required and stocked for emergency response is also listed in below. During an emergency, the Emergency Response Coordinator (ERC) is responsible for specifying the level of PPE required for emergency response. At a minimum, PPE used by emergency responders will comply with Section 7.0, Personal Protective Equipment, of this HASP. Emergency response equipment is inspected at regular intervals and maintained in good working order. The equipment inventory is replenished as necessary to maintain response capabilities.

Emergency Equipment	Quantity	Location
First Aid Kit	1	Site Vehicle
Chemical Fire Extinguisher	2 (minimum)	All heavy equipment and Site Vehicle

Emergency PPE	Quantity	Location
Full-face respirator	1 for each worker	Site Vehicle
Chemical-resistant suits	4 (minimum)	Site Vehicle

## 4.0 EMERGENCY PLANNING MAPS

An area-specific map of the Site will be developed on a daily basis during performance of field activities. The map will be marked to identify critical on-site emergency planning information, including: emergency evacuation routes, a place of refuge, an assembly point, and the locations of key site emergency equipment. Site zone boundaries will be shown to alert responders to known areas of contamination. There are no major topographical features, however the direction of prevailing winds/weather conditions that could affect emergency response planning are also marked on the map. The map will be posted at site-designated place of refuge and inside the TurnKey personnel field vehicle.

## 5.0 EMERGENCY CONTACTS

The following identifies the emergency contacts for this ERP.

### Emergency Telephone Numbers:

**Project Manager: *Michael Lesakowski***

Work: (716) 856-0599

Mobile: (716) 818-3954

**Corporate Health and Safety Director: *Thomas H. Forbes***

Work: (716) 856-0599

Mobile: (716) 864-1730

**Site Safety and Health Officer (SSHO): *Bryan C. Hann***

Work: (716) 856-0635

Mobile: (716) 870-1165

**Alternate SSHO: *Nathan Munley***

Work: (716) 856-0635

Mobile: (716) 289-1072

<b>BUFFALO GENERAL HOSPITAL (ER):</b>	(716) 859-5600
<b>FIRE:</b>	911
<b>AMBULANCE:</b>	911
<b>BUFFALO POLICE:</b>	911
<b>STATE EMERGENCY RESPONSE HOTLINE:</b>	(800) 457-7362
<b>NATIONAL RESPONSE HOTLINE:</b>	(800) 424-8802
<b>NYSDOH:</b>	(716) 847-4385
<b>NYSDEC:</b>	(716) 851-7220
<b>NYSDEC 24-HOUR SPILL HOTLINE:</b>	(800) 457-7252

### The Site location is:

285-295 Niagara Street

Buffalo, New York 14201

Site Phone Number: (Insert Cell Phone or Field Trailer): \_\_\_\_\_



## 6.0 EMERGENCY ALERTING & EVACUATION

Internal emergency communication systems are used to alert workers to danger, convey safety information, and maintain site control. Any effective system can be employed. Two-way radio headsets or field telephones are often used when work teams are far from the command post. Hand signals and air-horn blasts are also commonly used. Every system must have a backup. It shall be the responsibility of each contractor's Site Health and Safety Officer to ensure all personnel entering the site understand an adequate method of internal communication. Unless all personnel are otherwise informed, the following signals shall be used.

- 1) Emergency signals by portable air horn, siren, or whistle: two short blasts, personal injury; continuous blast, emergency requiring site excavation.
- 2) Visual signals: hand gripping throat, out of air/cannot breathe; hands on top of head, need assistance; thumbs up, affirmative/ everything is OK; thumbs down, no/negative; grip partner's wrist or waist, leave area immediately.

If evacuation notice is given, site workers leave the worksite with their respective buddies, if possible, by way of the nearest exit. Emergency decontamination procedures detailed in Section 12.0 of the HASP are followed to the extent practical without compromising the safety and health of site personnel. The evacuation routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by rehearsals and inputs from emergency response organizations. Wind direction indicators are located so that workers can determine a safe up wind or cross wind evacuation route and assembly area if not informed by the emergency response coordinator at the time the evacuation alarm sounds. Since work conditions and work zones within the site may be changing on daily basis, it shall be the responsibility of the construction Site Health and Safety Officer to review evacuation routes and procedures as necessary and to inform all TurnKey-Benchmark workers of any changes.

Personnel exiting the site will gather at a designated assembly point. To determine that everyone has successfully exited the site, personnel will be accounted for at the assembly

HEALTH & SAFETY PLAN  
APPENDIX A: EMERGENCY RESPONSE PLAN

site. If any worker cannot be accounted for, notification is given to the SSHO (***Bryan Hann*** or ***Nathan Munley***) so that appropriate action can be initiated. Contractors and subcontractors on this site have coordinated their emergency response plans to ensure that these plans are compatible and that source(s) of potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

## **7.0 EXTREME WEATHER CONDITIONS**

In the event of adverse weather conditions, the Site Safety and Health Officer in conjunction with the Contractor's SSHO will determine if engineering operations can continue without sacrificing the health and safety of site personnel. Items to be considered prior to determining if work should continue include but are not limited to:

- Potential for heat/cold stress.
- Weather-related construction hazards (e.g., flooding or wet conditions producing undermining of structures or sheeting, high wind threats, etc).
- Limited visibility.
- Potential for electrical storms.
- Limited site access/egress (e.g., due to heavy snow)

## 8.0 EMERGENCY MEDICAL TREATMENT & FIRST AID

### **Personnel Exposure:**

The following general guidelines will be employed in instances where health impacts threaten to occur acute exposure is realized:

- **Skin Contact:** Use copious amounts of soap and water. Wash/rinse affected area for at least 15 minutes. Decontaminate and provide medical attention. Eyewash stations will be provided on site. If necessary, transport to Buffalo General Hospital.
- **Inhalation:** Move to fresh air and, if necessary, transport to Hospital.
- **Ingestion:** Decontaminate and transport to Hospital.

### **Personal Injury:**

Minor first-aid will be applied on-site as deemed necessary. In the event of a life threatening injury, the individual should be transported to Hospital via ambulance. The Site Health and Safety Officer will supply available chemical specific information to appropriate medical personnel as requested.

First aid kits will conform to Red Cross and other applicable good health standards, and shall consist of a weatherproof container with individually sealed packages for each type of item. First aid kits will be fully equipped before being sent out on each job and will be checked weekly by the SSHO to ensure that the expended items are replaced.

### **Directions to Buffalo General Hospital (see Figure 1):**

The following directions describe the best route from the Site to Buffalo General Hospital:

- Travel southeast along Niagara Street (0.4 miles)
- Turn left on S. Elmwood Avenue (0.5 miles)
- Turn right onto W. Tupper Street (0.3 miles)
- Turn left onto Main Street (0.5 miles)
- Turn right onto High Street (0.2 miles)
- Hospital on the left (100 High Street)

## 9.0 EMERGENCY RESPONSE CRITIQUE & RECORD KEEPING

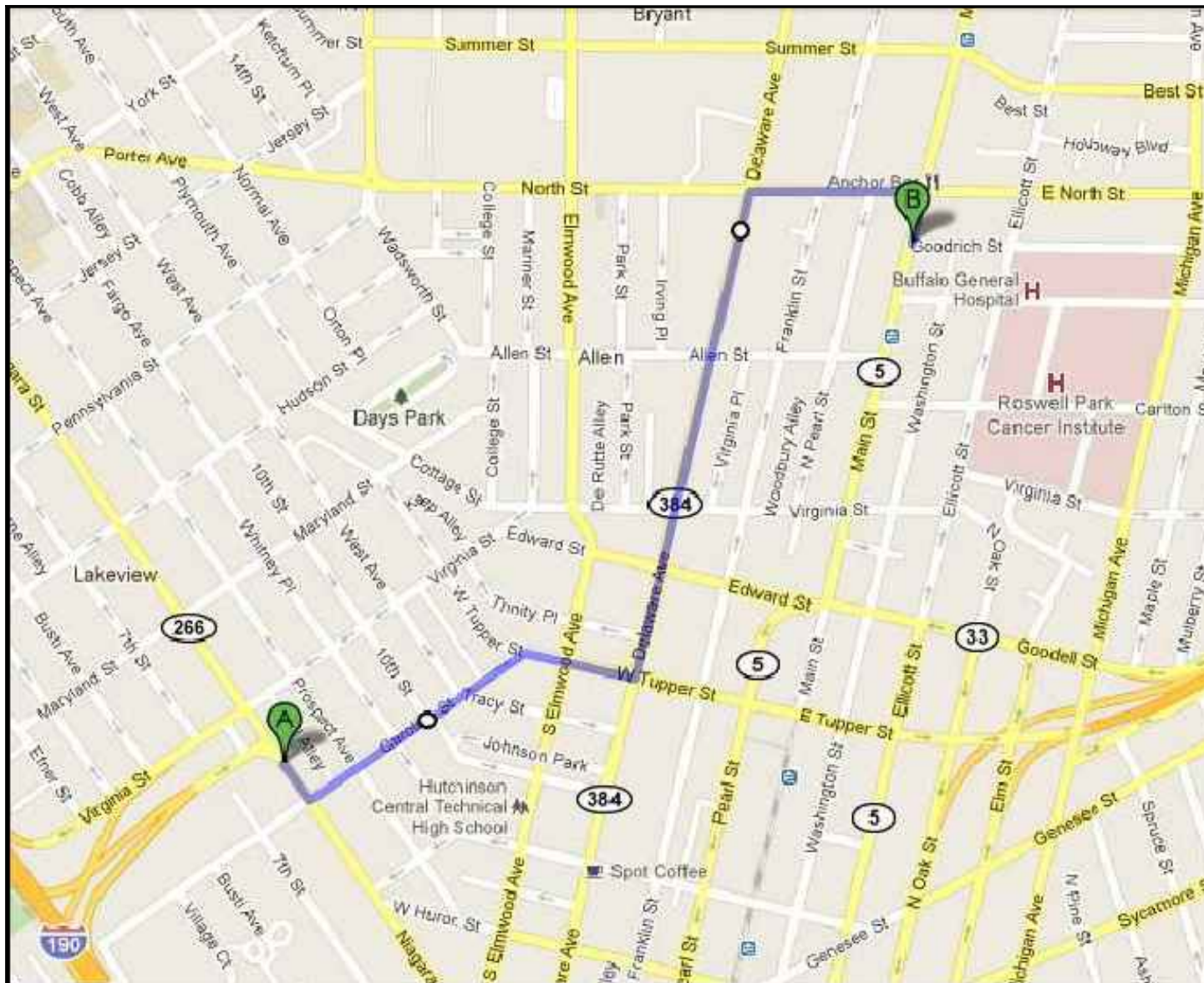
Following an emergency, the SSHO and Project Manager shall review the effectiveness of this Emergency Response Plan (ERP) in addressing notification, control and evacuation requirements. Updates and modifications to this ERP shall be made accordingly. It shall be the responsibility of each contractor to establish and assure adequate records of the following:

- Occupational injuries and illnesses.
- Accident investigations.
- Reports to insurance carrier or State compensation agencies.
- Reports required by the client.
- Records and reports required by local, state, federal and/or international agencies.
- Property or equipment damage.
- Third party injury or damage claims.
- Environmental testing logs.
- Explosive and hazardous substances inventories and records.
- Records of inspections and citations.
- Safety training.

## 10.0 EMERGENCY RESPONSE TRAINING

All persons who enter the worksite, including visitors, shall receive a site-specific briefing about anticipated emergency situations and the emergency procedures by the SSHO. Where this site relies on off-site organizations for emergency response, the training of personnel in those off-site organizations has been evaluated and is deemed adequate for response to this site.

# FIGURES



2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: JGT

## HOSPITAL ROUTE MAP

EMERGENCY RESPONSE PLAN

285 - 295 NIAGARA STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

285 NIAGARA OPERATING CO., LLC

FIGURE 1



# **ATTACHMENT B**

## **HOT WORK PERMIT FORM**



# HOT WORK PERMIT

## PART 1 - INFORMATION

Issue Date:

Date Work to be Performed: Start:

Finish (permit terminated):

Performed By:

Work Area:

Object to be Worked On:

## PART 2 - APPROVAL

(for 1, 2 or 3: mark Yes, No or NA)\*

Will working be on or in:

Finish (permit terminated):

- |  |     |    |
|--|-----|----|
| 1. Metal partition, wall, ceiling covered by combustible material? | yes | no |
| 2. Pipes, in contact with combustible material?                    | yes | no |
| 3. Explosive area?   | yes | no |

\* = If any of these conditions exist (marked "yes"), a permit will not be issued without being reviewed and approved by Thomas H. Forbes (Corporate Health and Safety Director). Required Signature below.

## PART 3 - REQUIRED CONDITIONS\*\*

(Check all conditions that must be met)

PROTECTIVE ACTION		PROTECTIVE EQUIPMENT	
<input type="checkbox"/>	Specific Risk Assessment Required	<input type="checkbox"/>	Goggles/visor/welding screen
<input type="checkbox"/>	Fire or spark barrier	<input type="checkbox"/>	Apron/fireproof clothing
<input type="checkbox"/>	Cover hot surfaces	<input type="checkbox"/>	Welding gloves/gauntlets/other:
<input type="checkbox"/>	Move movable fire hazards, specifically	<input type="checkbox"/>	Wellintons/Knee pads
<input type="checkbox"/>	Erect screen on barrier	<input type="checkbox"/>	Ear protection: Ear muffs/Ear plugs
<input type="checkbox"/>	Restrict Access	<input type="checkbox"/>	B.A.: SCBA/Long Breather
<input type="checkbox"/>	Wet the ground	<input type="checkbox"/>	Respirator: Type:
<input type="checkbox"/>	Ensure adequate ventilation	<input type="checkbox"/>	Cartridge:
<input type="checkbox"/>	Provide adequate supports	<input type="checkbox"/>	Local Exhaust Ventilation
<input type="checkbox"/>	Cover exposed drain/floor or wall cracks	<input type="checkbox"/>	Extinguisher/Fire blanket
<input type="checkbox"/>	Fire watch (must remain on duty during duration of permit)	<input type="checkbox"/>	Personal flammable gas monitor
<input type="checkbox"/>	Issue additional permit(s):	<input type="checkbox"/>	

Other precautions:

\*\* Permit will not be issued until these conditions are met.

## SIGNATURES

Originating Employee:

Date:

Project Manager:

Date:

Part 2 Approval:

Date:

# **ATTACHMENT C**

## **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 ( $\text{mcg}/\text{m}^3$ ) 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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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

## **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 (PM<sub>10</sub>) with the following minimum performance standards:
  - (a) Objects to be measured: Dust, mists or aerosols;
  - (b) Measurement Ranges: 0.001 to 400 mg/m<sup>3</sup> (1 to 400,000 :ug/m<sup>3</sup>);
  - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m<sup>3</sup> for one second averaging; and +/- 1.5 g/m<sup>3</sup> 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/m<sup>3</sup>, 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/m<sup>3</sup> (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/m<sup>3</sup>, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m<sup>3</sup> 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/m<sup>3</sup> 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 PM<sub>10</sub> 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/m<sup>3</sup> 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 D

### PROJECT DOCUMENTATION FORMS



DAILY LOG	DATE			
	REPORT NO.			
	PAGE	OF		

Date: \_\_\_\_\_

## CORRECTIVE MEASURES REPORT

Project: \_\_\_\_\_

Job No: \_\_\_\_\_

### **WEATHER CONDITIONS:**

Location: \_\_\_\_\_

Ambient Air Temp. - A.M.: \_\_\_\_\_

CQA Monitor(s): \_\_\_\_\_

Ambient Air Temp. - P.M.: \_\_\_\_\_

Client: \_\_\_\_\_

Wind Direction: \_\_\_\_\_

Contractor: \_\_\_\_\_

Wind Speed: \_\_\_\_\_

Contractor's Supervisor: \_\_\_\_\_

Precipitation: \_\_\_\_\_

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesting Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer: \_\_\_\_\_

Project Manager: \_\_\_\_\_

Signed:

\_\_\_\_\_  
CQA Representative



## INSPECTOR'S DAILY REPORT

CONTRACTOR					
CLIENT				DATE:	
LOCATION			DAY		JOB NO.
WEATHER		TEMP	° F	START	END

### WORK PERFORMED:

#### CONTRACTOR ACTIVITIES:

*[PUT CONTRACTOR ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES PERFORMED, BY WHOM, LOCATION OF LANDFILL ETC.]*

#### TURNKEY ACTIVITIES:

*[PUT ENGINEER ACTIVITIES HERE, BE SPECIFIC. TYPE OF EQUIPMENT, ACTIVITIES AND TESTING PERFORMED, SAMPLES COLLECTED, BY WHOM, LOCATION OF LANDFILL ETC.]*

TEST PERFORMED		QA PERSONNEL SIGNATURE			
PICTURES TAKEN	none	REPORT NO.			
VISITORS	none	SHEET	1	OF	



## INSPECTOR'S DAILY REPORT

CONTRACTOR					
CLIENT				DATE:	
LOCATION				DAY	
WEATHER		TEMP	° F	START	
				END	



## INSPECTOR'S DAILY REPORT

### MEETINGS HELD & RESULTS:

--

### CONTRACTOR'S WORK FORCE AND EQUIPMENT

DESCRIPTION	H	#	DESCRIPTION	H	#	DESCRIPTION	H	#	DESCRIPTION	H	#
Field Engineer						Equipment			Front Loader    Ton		
Superintendent			Ironworker			Generators			Bulldozer		
						Welding Equip.			DJ Dump truck		
Laborer-Foreman			Carpenter						Water Truck		
Laborer									Backhoe		
Operating Engineer			Concrete Finisher						Excavator		
						Roller			Pad foot roller		
Carpenter						Paving Equipment					
						Air Compressor					

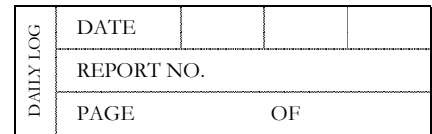
### REMARKS:

--

### REFERENCES TO OTHER FORMS:

--

SAMPLES COLLECTED:					
SAMPLE NUMBER					
APPROX. LOCATION OF STOCKPILE					
NO. OF STOCKPILE					
DATE OF COLLECTION					
CLIMATOLOGIC CONDITIONS					
FIELD OBSERVATION				SHEET	OF



## PROBLEM IDENTIFICATION REPORT

**WEATHER CONDITIONS:**

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

# APPENDIX E

## SOIL-FILL MANAGEMENT PLAN

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# **SOIL/FILL MANAGEMENT PLAN**

for the

**285-295 NIAGARA STREET SITE**

**BUFFALO, NEW YORK**

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revised February 2012

0236-001-101

Prepared for:

**285 Niagara Operating Co., LLC**



# SOIL/FILL MANAGEMENT PLAN

## 285-295 Niagara Street Site

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# **SOIL/FILL MANAGEMENT PLAN**

## **285-295 Niagara Street Site**

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## 1.0 INTRODUCTION

### 1.1 Background and History

The Site consists of two adjoining parcels totaling approximately 0.68-acres, located at 285-295 Niagara Street in the City of Buffalo, Erie County, New York. The Site is currently improved with three buildings; Building #1 is located on the northern portion of the Site; Building #2 is located in the center of the Site; and Building #3 is located on the southern portion of the Site. Building #1 is planned for mixed-use residential and commercial redevelopment, and Buildings #2 and #3 are planned for demolition to allow for the redevelopment of Site.

The northern portion of the Site (295 Niagara St. parcel) was historically used as a carriage and bicycle manufacturing operation which included painting, varnishing and metal plating operations; and the southern portion of the Site (285 Niagara St. parcel) was an automobile filling station and car wash operation, including multiple underground storage tanks (USTs) and fuel dispensers. Based on the findings of previous investigations, the NYSDEC opened a spill file (No. 09-04123) for the Site, which is currently active; and known contamination on-Site will require remediation prior to redevelopment.

### 1.2 Previous Environmental Investigations

A summary of the investigations that have occurred at the Site are presented below.

#### ***1.2.1 December 2009 – Off-Site Subsurface Investigation***

Nature's Way Environmental Consultants and Contractors, Inc. (NWECC&C) conducted a limited subsurface investigation on a portion of the 295 Niagara Street parcel (identified as 305 within the letter-report), and the findings are summarized below.

- Elevated photoionization detector (PID) readings for volatile organic compounds (VOCs) were detected in multiple locations across the site, with readings as high as 1,460 ppm being detected. Elevated PID readings were noted in seven (7) out of nine (9) boring locations.

- Petroleum-impacted soil was detected on the 295 Niagara Street Parcel. As stated in the report, a significant area of contamination was detected on-parcel and will require remediation.

### ***1.2.2 October 2009 – Remedial Excavation Report***

Nature's Way Environmental Consultants and Contractors, Inc. (NWECC&C) conducted preliminary excavation activities on a portion of the 285 Niagara Street parcel. The findings of the report are summarized below.

- Removal activities included the excavation of former underground storage tanks and filling dispensers, and excavation of a portion of the contaminated soil/fill.
- Post-excavation soil samples show elevated VOCs exceeding NYSDEC CP-51 SCOs remain on-Site. NYSDEC Spill No. 0904123 was opened, and remains active for this portion of the Site.
- Contaminated groundwater was handled in association with the excavation, though no groundwater evaluation was conducted.

## **1.3 Purpose and Scope**

The purpose of this Soil/Fill Management Plan (SFMP) is to protect both the environment and human health during redevelopment of the Site and subsequent to completion of Brownfield Cleanup activities. While assessments of surface and subsurface soil/fill and groundwater at the Site will be performed during the RI, subsurface information is never 100 percent complete or accurate, especially on a site with a long and diverse history. As such, it is not unreasonable to anticipate the possibility that some quantity of impacted subsurface soil/fill may be encountered following completion of the IRM and Brownfield cleanup activities. In particular, soil/fill impacts may be encountered during development activities such as infrastructure construction (i.e., roads, waterline, sewers, electric, cable, etc.) or foundation excavation and site grading. The SFMP will be modified/expanded as appropriate based on the results of the RI and IRM.

Compliance with this SFMP is required to properly manage any impacted subsurface soil/fill encountered during redevelopment activities at the Site. This SFMP was developed with the express purpose of addressing unknown subsurface impacts if and when

encountered. The SFMP also facilitates the transfer of responsibilities with property ownership.

This SFMP provides protocols for development and post-development activities. Items discussed herein include:

- Excavation, grading, sampling and handling of Site soils.
- Acceptability of soil/fill from off-site sources for backfill or sub-grade fill.
- Erosion and dust control measures.
- Fencing and other access controls.
- Health and safety procedures for subsurface construction work and the protection of the surrounding community.
- Acceptability and placement of final cover.

#### **1.4 Soil/Fill Management Program Responsibility**

The property owner(s) or responsible entity will be responsible for all monitoring, implementation, and reporting requirements of this Plan. The property owner(s) will not perform, contract, nor permit their employees, agents, or assigns to perform any excavations or disturbance of Site soils, except as delineated in this Plan. The property owner(s) or responsible entity will be responsible for proper notification and reporting to regulatory agencies (i.e., NYSDEC Region 9, Division of Environmental Remediation and NYS Department of Health) prior to and following construction activities. The NYSDEC may provide periodic construction oversight and monitoring during construction activities to verify that the requirements of this SFMP are adhered to.

#### **1.5 Notification and Reporting Requirements**

The NYSDEC must be notified that subgrade activities are being initiated a minimum of five working days in advance of construction. The property owner(s) or other responsible entity shall complete and submit to the NYSDEC an annual report certifying that: the institutional controls put in place are still in place, have not been altered and are still effective and the conditions at the Site are fully protective of public health and the environment. If sub-grade excavation activities are completed during the year covered by the Annual Report,

the Site owner shall include a certification that all work was performed in conformance with the SFMP.

## 2.0 SOIL/FILL MANAGEMENT

### 2.1 Excavation and Handling of On-Site Soil/Fill

An environmental professional with experience in environmental site investigations and the New York State Brownfield Cleanup Program will inspect soil/fill excavations or disturbances (e.g., when using heavy equipment to disturb more than 10 cubic yards) on behalf of the subject property owner. The soil/fill will be inspected for staining or discoloration, and will be field screened for the presence of volatile organic compounds (VOCs) with a photoionization detector (PID). The PID detector will be calibrated as per the manufacturer's requirements. Sampling and analyses to verify excavation limits and analysis for disposal purposes will be in accordance with the protocols delineated in Section 2.3.

Excavation of impacted soil/fill will continue horizontally until visually impacted materials are removed to the satisfaction of the environmental professional and the NYSDEC representative, but will not extend beyond the Site boundaries. All excavation work will be directed by an experienced engineer or scientist to remove all visually-impacted material.

Impacted material will either be direct loaded, placed in roll-off containers or be stockpiled on plastic sheeting in an area away from the primary work activities and then sampled to determine whether it is subject to special disposal/reuse requirements<sup>1</sup>. The length of time soil can be stockpiled should be limited to 90 days due to potential hazardous waste storage requirement concerns.

Sampling and analyses to verify excavation limits and analysis for disposal purposes will be in accordance with the protocols identified in Section 2.3.

---

<sup>1</sup> The presence of subsurface construction and demolition debris, such as brick, concrete, wood, miscellaneous metal products, etc. does not necessitate stockpiling in accordance with this SFMP.

## 2.2 Backfill Material

### 2.2.1 Use Criteria

Material used to backfill excavations or to increase site grades or elevations may be comprised of on-Site soil/fill and demolition material including brick and concrete, or off-Site soil/fill. Backfill materials used on-Site must meet the following criteria:

- Excavated on-Site soil/fill with no evidence of visible or olfactory evidence of contamination that has been tested to meet the criteria on Table 1, in accordance with DER-10, Table 5.4(e)4;
- On-Site demolition material proposed for reuse on-site will be sampled and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval.
- Off-site soil will originate from known sources having no evidence of disposal or releases of hazardous substances, hazardous, toxic or radioactive wastes, or petroleum, which has been tested in accordance with DER10, 5.4(e)10, or at a reduced frequency if agreeable to the Department;
- All off-site sources of soil/fill to be used as backfill must be tested in accordance with the Sampling and Analytical Protocol (Section 2.3), and found to contain concentrations less than criteria listed in Table 1 – Criteria for Use of Off-Site Soil; and,
- No materials meeting the definitions of a solid waste as defined in 6NYCRR, Part 360-1.2(a), and/or grossly contaminated as defined in 6 NYCRR Part 375-1.2(u), shall be used as backfill.

### 2.2.2 On-Site Source Sampling Requirements

If on-Site soil is to be used as a source of backfill, then it must be tested to meet the criteria identified on Table 1. In association with the results of the RI, a minimum of one sample will be collected for each 250 cubic yards (CY) up to 1,000 CY of material to be reused. If more than 1,000 CY of on-Site material and all samples of the first 1,000 CY meet the criteria listed in Table 1, the sample collection may be reduced to one sample for each additional 1,000 CY of on-Site source backfill.



Discrete grab samples will be collected for VOC analysis source is required. For all other analyses, a minimum of three grab samples will be collected per composite sample. Approximately equal aliquots of the grab samples will be composited in the field using a stainless steel trowel and bowl. The trowel and bowl shall be decontaminated with a non-phosphate detergent (i.e., Alconox®) and potable water wash solution followed by a distilled water rinse between sampling locations. The soil/fill samples will be analyzed in accordance with USEPA SW-846 Methodology by a NYSDOH ELAP-certified laboratory.

### ***2.2.3 Borrow Source Sampling Requirements***

If an off-site soil/fill borrow source is of unknown origin or originates from a commercial, industrial or urban site, then it must be tested to meet the criteria identified on Table 1, in accordance with DER-10, 5.4(e)10. A tiered approach based on the volume of borrow source material imported will be used to determine the frequency of characterization sampling. A minimum of one sample will be collected for each 250 CY up to 1,000 CY of material excavated. If more than 1,000 CY of borrow source material from the same general vicinity is utilized and all samples of the first 1,000 CY meet the criteria listed in Table 1, the sample collection frequency may be reduced to one sample for each additional 1,000 CY of borrow source material from the same general vicinity, up to 5,000 CY. For borrow sources greater than 5,000 CY, sampling frequency may be reduced to one sample per 5,000 CY, provided all earlier samples met Table 1 criteria.

If an off-site soil/fill borrow source is of known origin, NYSDEC would be involved in the decision as to whether the source is in fact known and acceptable for use and whether sampling of the source is required.

Grab samples will be collected for VOC analysis. For all other analyses, a minimum of four grab samples will be collected per composite sample. Approximately equal aliquots of the grab samples will be composited in the field using a stainless steel trowel and bowl. The trowel and bowl shall be decontaminated with a non-phosphate detergent (i.e., Alconox®) and potable water wash solution followed by a distilled water rinse between sampling locations. The soil/fill samples will be analyzed in accordance with USEPA SW-846 Methodology by a NYSDOH ELAP-certified laboratory.

## 2.3 Sampling and Analysis Protocol

Excavated soil/fill that is deemed unacceptable for on-Site reuse and is designated for off-site disposal shall be sampled in accordance with the requirements of the off-site disposal facility and the appropriate regulatory authorities. In addition, the resulting excavation following removal of impacted soil/fill will require verification sampling and analysis to determine the limits of impact. Both characterization and verification sampling and analysis are discussed in the following sections.

### ***2.3.1 Impacted Soil/Fill Characterization***

The following procedure represents a suggested method for determining requirements for impacted soil/fill designated for off-site disposal, recycling, and/or biotreatment. The sampling procedures, frequency and parameter list must be coordinated with the off-site disposal facility prior to undertaking characterization work. Excavated soil/fill should be separately stockpiled from any on-Site excavated material which may be re-used.

The samples will be analyzed by a NYSDOH ELAP-certified laboratory for Toxicity Characteristic Leaching Procedure (TCLP) method to determine the appropriate off-site disposal method. Parameters to be analyzed for by TCLP protocol (i.e. VOCs, SVOCs, PCB, etc.) will be determined by the potential off-site disposal facility. If TCLP hazardous waste characteristic values are exceeded, the soil/fill will be disposed of in a permitted hazardous waste disposal facility, or treated to render non-hazardous prior to disposal. If TCLP analytical results are below hazardous waste characteristic values, the soil/fill will be disposed of off-site in a permitted sanitary landfill, and/or recycled at a permitted biotreatment facility.

### ***2.3.2 Verification Sampling***

Verification sampling will be performed on the excavation sidewalls and bottom of the excavation after lateral and vertical excavation limits have been achieved and visibly impacted soil/fill has been removed. In general, one sidewall sample will be collected for each 30 linear feet of excavation sidewall and one sample will be collected from the bottom of the excavation for each 900 square feet of excavation bottom. The samples will be collected by retrieving a discrete sample from across the excavation face. The backhoe

bucket will be used to assist in sample collection and avoid the need for confined space entry. For excavations having lengths greater than 30 feet, an additional discrete sample will be collected for each additional 30 feet of excavation length. Verification sampling analytical protocols will be determined based on the areas of concern as follows:

- Gasoline tank areas: TCL plus STARS List VOCs, TAL metals
- Diesel and fuel oil tank areas: TCL plus STARS List VOCs, TCL SVOCs, TAL metals, TCL PCBs
- Former transformer areas: TCL PCBs
- Other impacted areas: TCL VOCs, TCL SVOCs, TAL metals, TCL PCBs (as appropriate based on RI data)

A Category B deliverables package will be requested to facilitate data evaluation by a third-party validation expert.

## 2.4 Fluids Management

All liquids to be removed from the site, including excavation dewatering, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, and monitoring well purge and development fluids will not be recharged back to the land surface or subsurface of the site without a written request to the Department seeking permission to discharge.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

### 3.0 COMMUNITY AIR MONITORING PLAN

The New York State Department of Health's Generic Community Air Monitoring Plan requires monitoring for volatile organic compounds and particulates. As detailed in Appendix A, the following criteria shall also be adhered to for the protection of the nearby community.

#### 3.1 Organic Vapor Community Air Monitoring

Community air monitoring for organic vapors will be performed at the downwind perimeter of the exclusion zone on a continuous basis during intrusive activities performed outdoors that may be reasonably expected to potentially release organic vapors, or when sustained readings are detected in the work zone (i.e., proximate to the source of the intrusive activity). Otherwise, the monitoring will be performed on an hourly basis. A photoionization detector or other equipment will be suitable to the types of contaminants known or suspected to be present will be used, and will be capable of calculating 15-minute running average concentrations. All air monitoring equipment will be calibrated at least daily and an upwind concentration will be taken at least daily to establish background conditions. The 15-minute average concentrations will be compared to the levels specified below.

- If the 15-minute ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone exceeds 5 ppm above background, work activities will be halted and monitoring continued. If the organic vapor decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If the ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone persists at levels above 5 ppm over background but less than 25 ppm, activities must be halted, the source of vapors identified, corrective actions to abate the emissions taken, and monitoring continued. After these steps, work activities can resume provided that: the organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest off-site potential receptor or residential or commercial structure, whichever is less - but in no case less than 20 feet - is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the exclusion zone, work activities must be shut down and the following activities will be performed:

- All Emergency Response Contacts as listed in the HASP and the Emergency Response Plan (Attachment A to the HASP) will be advised.
- The local police authorities will immediately be contacted by the Site Health and Safety Officer and advised of the situation.
- Air monitoring will be continued at 1/2 the distance from the exclusion zone to the nearest receptor.

All readings will be recorded and will be available for NYSDEC and NYSDOH personnel to review.

#### **Explosive Vapor Community Air Monitoring**

Explosive vapor community air monitoring will be performed at the downwind perimeter of the site on a continuous basis whenever sustained atmospheric concentrations of greater than 10% of the LEL are recorded in the exclusion zone. If sustained atmospheric concentrations of greater than 10% LEL are recorded at the downwind site perimeter, the local Fire Department will be contacted (see Section 2.5.1 of the SMP for phone number).

#### **Airborne Particulate Community Air Monitoring**

Respirable (PM-10) particulate monitoring will be performed on a continuous basis at the upwind and downwind perimeter of the exclusion zone. The monitoring will be performed using real-time monitoring equipment capable of measuring PM-10 and integrating over a period of 15-minutes for comparison to the airborne particulate action levels. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities. All readings will be recorded and will be available for NYSDEC and NYSDOH review. Readings will be interpreted as follows:

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\text{ug}/\text{m}^3$ ) greater than the background (upwind perimeter) reading 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 provided that the downwind PM-10 particulate levels do not exceed  $150 \text{ ug}/\text{m}^3$  above the upwind level and that visible dust is not migrating from the work area.

If, after implementation of dust suppression techniques downwind PM-10 levels are greater than 150 ug/m<sup>3</sup> above the upwind level, work activities must be stopped and dust suppression controls re-evaluated. Work can resume provided that supplemental dust suppression measures and/or other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 ug/m<sup>3</sup> of the upwind level and in preventing visible dust migration.

The location of air sampling station(s) will be based on generally prevailing wind conditions and may/will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and downwind monitoring station.

### 3.2 Dust Control Plan

Particulate monitoring will be performed at the Site during subgrade excavation, grading, and handling activities in accordance with the *NYSDEC's DER-10 (May 2010) Appendix 1A (NYSDOH's Generic Community Air Monitoring Plan) and Appendix 1B (Fugitive Dust and Particulate Monitoring)*.

Dust suppression techniques will be employed as necessary to mitigate fugitive dust from non-vegetated or disturbed soil/fill during intrusive activities.

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Hauling materials in properly tarped containers or vehicles.
- Covering or proof-rolling excavated areas and materials after excavation activity ceases.
- Reducing the excavation size and/or number of excavations.

## 4.0 REFERENCES

1. Nature's Way Environmental Consultants and Contractors, Inc. *Off-Site Subsurface Investigation, NYSDEC Spill #0904123, 305 Niagara Street Parcel [295 Niagara Street Site], Buffalo, New York.* December 2009.
2. Nature's Way Environmental Consultants and Contractors, Inc. *Remedial Excavation Report, 285 Niagara Street parcel, Buffalo, New York.* October 2009.
3. New York State Department of Environmental Conservation. *DER-10; Technical Guidance for Site Investigation and Remediation.* May 2010.

## TABLES





**TABLE 1**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>Volatile Organic Compounds (mg/Kg)</b>		
1,1,1-Trichloroethane	0.68	0.68
1,1-Dichloroethane	0.27	0.27
1,1-Dichloroethene	0.33	0.33
1,2-Dichlorobenzene	1.1	1.1
1,2-Dichloroethane	0.02	0.02
1,2-Dichloroethene(cis)	0.25	0.25
1,2-Dichloroethene(trans)	0.19	0.19
1,3-Dichlorobenzene	2.4	2.4
1,4-Dichlorobenzene	1.8	1.8
1,4-Dioxane	0.1	0.1
Acetone	0.05	0.05
Benzene	0.06	0.06
Butylbenzene	12	12
Carbon tetrachloride	0.76	0.76
Chlorobenzene	1.1	1.1
Chloroform	0.37	0.37
Ethylbenzene	1	1
Hexachlorobenzene	0.33	1.2
Methyl ethyl ketone	0.12	0.12
Methyl tert-butyl ether	0.93	0.93
Methylene chloride	0.05	0.05
Propylbenzene-n	3.9	3.9
Sec-Butylbenzene	11	11
Tert-Butylbenzene	5.9	5.9
Tetrachloroethene	1.3	1.3
Toluene	0.7	0.7
Trichloroethene	0.47	0.47



**TABLE 1**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>Volatile Organic Compounds (mg/Kg)</b>		
Trimethylbenzene-1,2,4	3.6	3.6
Trimethylbenzene-1,3,5	8.4	8.4
Vinyl chloride	0.02	0.02
Xylene (mixed)	1.6	1.6
<b>Semi-Volatile Organic Compounds (mg/Kg)</b>		
Acenaphthene	98	98
Acenaphthylene	100	100
Anthracene	100	100
Benzo(a)anthracene	1	1
Benzo(a)pyrene	1	1
Benzo(b)fluoranthene	1	1
Benzo(g,h,i)perylene	100	100
Benzo(k)fluoranthene	1	1.7
Chrysene	1	1
Dibenz(a,h)anthracene	0.33	0.33
Fluoranthene	100	100
Fluorene	100	100
Indeno(1,2,3-cd)pyrene	0.5	0.5
m-Cresol(s)	0.33	0.33
Naphthalene	12	12
o-Cresol(s)	0.33	0.33
p-Cresol(s)	0.33	0.33
Pentachlorophenol	0.8	0.8
Phenanthrene	100	100
Phenol	0.33	0.33
Pyrene	100	100



**TABLE 1**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>Metals (mg/Kg)</b>		
Arsenic	16	16
Barium	350	400
Beryllium	14	47
Cadmium	2.5	4.3
Chromium, Hexavalent <sup>1</sup>	19	19
Chromium, Trivalent <sup>1</sup>	36	180
Copper	270	270
Cyanide	27	27
Lead	400	400
Manganese	2000	2000
Mercury (total)	0.73	0.73
Nickel	130	130
Selenium	4	4
Silver	8.3	8.3
Zinc	2200	2480
<b>PCBs/Pesticides (mg/Kg)</b>		
2,4,5-TP Acid (Silvex)	3.8	3.8
4,4'-DDE	1.8	8.9
4,4'-DDT	1.7	7.9
4,4'-DDD	2.6	13
Aldrin	0.019	0.097
Alpha-BHC	0.02	0.02
Beta-BHC	0.072	0.09
Chlordane (alpha)	0.91	2.9
Delta-BHC	0.25	0.25
Dibenzofuran	14	59
Dieldrin	0.039	0.1
Endosulfan I	4.8	24



**TABLE 1**  
**Criteria for Imported Soil-Fill**  
**285-295 Niagara Street Site**  
**Buffalo, New York**

Parameter	Allowable Concentration of Imported Soil/Fill (Residential)	Allowable Concentration of Imported Soil/Fill (Restricted Residential)
<b>PCBs/Pesticides (mg/Kg)</b>		
Endosulfan II	4.8	24
Endosulfan sulfate	4.8	24
Endrin	0.06	0.06
Heptachlor	0.38	0.38
Lindane	0.1	0.1
Polychlorinated biphenyls	1	1

**Notes:**

1. The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.
2. Values per DER-10 Appendix 5 for Residential and Restricted-Residential Use.

## FIGURES

**FIGURE 1**



2558 HAMBURG TURNPIKE  
 SUITE 300  
 BUFFALO, NY 14218  
 (716) 856-0635

## SITE VICINITY AND LOCATION MAP

285 - 295 NIAGARA STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

285 NIAGARA OPERATING CO., LLC

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: JGT





BASE MAP PER BING MAPS



APPROXIMATE PROPERTY BOUNDARY

NOT TO SCALE



2558 HAMBURG TURNPIKE  
SUITE 300  
BUFFALO, NY 14218  
(716) 856-0635

PROJECT NO.: 0236-001-101

DATE: FEBRUARY 2012

DRAFTED BY: JGT

## SITE MAP

285 - 295 NIAGARA STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

285 NIAGARA OPERATING CO., LLC

FIGURE 2

## **APPENDIX A**

**NYSDOH/NYSDEC  
GENERIC COMMUNITY AIR MONITORING PLAN  
&  
FUGITIVE DUST**



**Appendix A1**  
**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 ( $\text{mcg}/\text{m}^3$ ) 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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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  $150 \text{ mcg}/\text{m}^3$  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

## **Appendix A2**

### **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 (PM<sub>10</sub>) with the following minimum performance standards:
  - (a) Objects to be measured: Dust, mists or aerosols;
  - (b) Measurement Ranges: 0.001 to 400 mg/m<sup>3</sup> (1 to 400,000 :ug/m<sup>3</sup>);
  - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m<sup>3</sup> for one second averaging; and +/- 1.5 g/m<sup>3</sup> 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/m<sup>3</sup>, 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/m<sup>3</sup> (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/m<sup>3</sup>, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m<sup>3</sup> 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/m<sup>3</sup> 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 PM<sub>10</sub> 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/m<sup>3</sup> 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

## FIELD OPERATING PROCEDURES (PROVIDED ELECTRONICALLY)



# FIELD OPERATING PROCEDURES

## Abandonment of Borehole Procedures

**ABANDONMENT OF BOREHOLE PROCEDURE**

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**PURPOSE**

Soil borings that are not completed as monitoring wells will be plugged by filling the holes with a cement/bentonite grout. Field staff will calculate the borehole volume and compare it to the final installed volume of grout to evaluate whether bridging or loss to the formation has occurred. These calculations and the actual volume placed will be noted on the Boring Log.

**PROCEDURE**

1. Determine most suitable seal materials. Grout specifications generally have mixture ratios as follows:

Grout Slurry Composition (% Weight)

1.5 to 3.0%	-	Bentonite (Quick Gel)
40 to 60 %	-	Cement (Portland Type I)
40 to 60 %	-	Potable Water

2. Calculate the volume of the borehole base on the bit or auger head diameter plus 10% and determine the volume of grout to be emplaced. Generally, the total mixed volume is the borehole volume plus 20%.
3. Identify the equipment to be used for the preparation and mixing of the grout. Ensure the volume of the tanks to be used for mixing has been measured adequately. Document these volumes on the Well Abandonment/Decommissioning Log (sample attached).
4. Identify the source of the water to be used for the grout and determine its suitability for use. In particular, water with high sulfate, or chloride levels or heated water should not be used. These types of waters can cause operational difficulties or modify the set-up for the grout.



**ABANDONMENT OF BOREHOLE PROCEDURE**

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5. Identify the equipment to be used for emplacing the grout. Ensure that the pump to be used has adequate pressure to enable complete return to surface.
6. Identify the volumes to be pumped at each stage or in total if only one stage is to be used.
7. Prepare the borehole abandonment plan and discuss the plan and activities with the drilling contractor prior to beginning any mixing activities.
8. Begin mixing the grout to be emplaced.
9. Record the type and amount of materials used during the mixing operation. Ensure the ratios are within specifications tolerance.
10. Begin pumping the grout through the return line bypass system to confirm all pump and surface fittings are secure.
11. Initiate downhole pumping from the bottom of the borehole. Record the times and volumes emplaced on the Well Abandonment/Decommissioning Log (sample attached).
12. Document the return circulation of grout. This may be facilitated by using a colored dye or other tagging method if a mudded borehole condition exists prior to grout injection.
13. Identify what procedures will be used for grouting in the upper 3 feet. When casing exists in the borehole, decisions are required as to the timing for removal and final disposition of the casing. Generally, it will not be removed prior to grouting because of the potential for difficult access and loss of circulation in the upper soil or rock layers. Accordingly, when cement return is achieved at surface, the casing is commonly removed and the borehole is topped off with grout or soils. If casing removal is not possible or not desired, the casing left in place should be cut off at a depth of 5 feet or greater below ground surface. If casing is not present during grouting, the grout level in the borehole is topped off after the rods or tremie pipe is removed.

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## FOP 001.1

### ABANDONMENT OF BOREHOLE PROCEDURE

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14. Clear and clean the surface near the borehole.
15. The uppermost five feet of the borehole at the land surface should be filled with material physically similar to the natural soils. The surface of the borehole should be restored to the condition of the area surrounding the borehole. For example, concrete or asphalt will be patched with concrete or asphalt of the same type and thickness, grassed areas will be seeded, and topsoil will be used in other areas. All solid waste materials generated during the decommissioning process must be disposed of properly.
16. A follow-up check at each site should be made within one week to 10 days of completion. It should be noted that on occasion, the grout and/or surface material may settle over several days. If settling occurs, additional material physically similar to surrounding materials (i.e., asphalt, concrete, or soil) must be used to match the existing grade.
17. Document borehole and/or well/piezometer decommissioning activities on a Well Abandonment/Decommissioning Log (sample attached).

#### ATTACHMENTS

Well Abandonment/Decommissioning Log (sample)

#### REFERENCES

ASTM D 5299: *Guide for Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities.*

NYSDEC, July 1988, *Drilling and Monitoring Well Installation Guidance Manual.*

NYSDEC, November 2009, *CP-43: Groundwater Monitoring Well Decommissioning Policy.*

Driscoll, F.G., 1987, *Groundwater and Wells*, Johnson Division, St. Paul, Minnesota, 1089 p.







# FIELD OPERATING PROCEDURES

## Ambient Air/Subslab Vapor Summa Canister Sample Collection Procedure

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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**BACKGROUND**

In October 2006, the New York State Department of Health (NYSDOH) finalized their vapor intrusion guidance document entitled “Guidance for Evaluating Soil Vapor Intrusion in the State of New York.” ([www.health.state.ny.us/nysdoh/gas/svi\\_guidance/](http://www.health.state.ny.us/nysdoh/gas/svi_guidance/)), which has been guiding NYSDOH and New York State Department of Environmental Conservation (NYSDEC) decisions concerning the need for subslab vapor mitigation at sites undergoing investigation, cleanup and monitoring under formal NY State remedial programs (e.g., Brownfield Cleanup Program sites, Inactive Hazardous Waste Site Remediation Program sites, etc.). The guidance presents two soil vapor/indoor air matrices to assist in interpreting subslab and ambient air data (i.e., “Matrix 1” and “Matrix 2”). As of June 2007, six compounds have been assigned to these two matrices as follows:

<b>Volatile Chemical</b>	<b>Soil Vapor / Indoor Air Matrix</b>
Carbon tetrachloride	Matrix 1
1,1-Dichloroethene	Matrix 2
cis-1,2-Dichloroethene	Matrix 2
Tetrachloroethene	Matrix 2
1,1,1-Trichloroethane	Matrix 2
Trichloroethene	Matrix 1
Vinyl chloride	Matrix 1

Additional matrices will be developed when a chemical's toxicological properties, background concentrations, or analytical capabilities suggest that major revisions are needed. Both matrices are attached as Figures 1 and 2.

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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**PURPOSE**

This procedure delineates the scope of additional investigation at a building on the project site to determine if volatile organic compounds (VOCs) detected in groundwater and/or soil near the building are intruding into the building airspace or have the potential, in sufficient concentrations, to adversely impact indoor air quality. This ambient air/subslab vapor monitoring procedure follows the NYSDOH Final Soil Vapor Intrusion Guidance (October 2006) as well as USEPA Methods TO-14 and TO-15, for volatile organic compounds (VOCs) using Summa passive canisters.

**SURVEYS AND PRE-SAMPLING BUILDING PREPARATION**

A pre-sampling inspection should be performed prior to each sampling event to identify and minimize conditions that may interfere with the proposed testing. The inspection should evaluate the type of structure, floor layout, airflows and physical conditions of the building(s) being studied. This information, along with information on sources of potential indoor air contamination, should be identified on a building inventory form. An example of the building inventory form is attached. Items to be included in the building inventory include the following:

- Construction characteristics, including foundation cracks and utility penetrations or other openings that may serve as preferential pathways for vapor intrusion;
- Presence of an attached garage;
- Recent renovations or maintenance to the building (e.g., fresh paint, new carpet or furniture);
- Mechanical equipment that can affect pressure gradients (e.g., heating systems, clothes dryers or exhaust fans);

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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- Use or storage of petroleum products (e.g., fuel containers, gasoline operated equipment and unvented kerosene heaters); and
- Recent use of petroleum-based finishes or products containing volatile chemicals.

Each room on the floor of the building being tested and on lower floors, if possible, should be inspected. This is important because even products stored in another area of a building can affect the air of the room being tested.

The presence and description of odors (e.g., solvent, moldy) and portable vapor monitoring equipment readings (e.g., PIDs, ppb RAE, Jerome Mercury Vapor Analyzer, etc.) should be noted and used to help evaluate potential sources. This includes taking readings near products stored or used in the building.

Potential interference from products or activities releasing volatile chemicals may need to be controlled. Removing the source from the indoor environment prior to testing is the most effective means of reducing interference. Ensuring that containers are tightly sealed may be acceptable. When testing for volatile organic compounds, containers should be tested with portable vapor monitoring equipment to determine whether compounds are leaking. The inability to eliminate potential interference may be justification for not testing, especially when testing for similar compounds at low levels. The investigator should consider the possibility that chemicals may adsorb onto porous materials and may take time to dissipate.

In some cases, the goal of the testing is to evaluate the impact from products used or stored in the building (e.g., pesticide misapplications, school renovation projects). If the goal of the testing is to determine whether products are an indoor volatile chemical contaminant source, the removing these sources does not apply.

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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Once interfering conditions are corrected (if applicable), ventilation may be needed prior to sampling to eliminate residual contamination in the indoor air. If ventilation is appropriate, it should be completed 24 hours or more prior to the scheduled sampling time. Where applicable, ventilation can be accomplished by operating the building's HVAC system to maximize outside air intake. Opening windows and doors, and operating exhaust fans may also help or may be needed if the building has no HVAC system.

Air samples are sometimes designed to represent typical exposure in a mechanically ventilated building and the operation of HVAC systems during sampling should be noted on the building inventory form (see attached sample). In general, the building's HVAC system should be operating under normal conditions. Unnecessary building ventilation should be avoided within 24 hours prior to and during sampling. During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time.

Depending upon the goal of the indoor air sampling, some situations may warrant deviation from the above protocol regarding building ventilation. In such cases, building conditions and sampling efforts should be understood and noted within the framework and scope of the investigation.

To avoid potential interferences and dilution effects, every effort should be made to avoid the following for 24 hours prior to sampling:

- Opening any windows, fireplace dampers, openings or vents;
- Operating ventilation fans unless special arrangements are made;
- Smoking in the building;
- Painting;
- Using a wood stove, fireplace or other auxiliary heating equipment (e.g., kerosene heater);
- Operating or storing automobile in an attached garage;



**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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- Allowing containers of gasoline or oil to remain within the house or garage area, except for fuel oil tanks;
- Cleaning, waxing or polishing furniture, floors or other woodwork with petroleum- or oil-based products;
- Using air fresheners, scented candles or odor eliminators;
- Engaging in any hobbies that use materials containing volatile chemicals;
- Using cosmetics including hairspray, nail polish, nail polish removers, perfume/cologne, etc.;
- Lawn mowing, paving with asphalt, or snow blowing;
- Applying pesticides; and
- Using building repair or maintenance products, such as caulk or roofing tar.

**PRODUCT INVENTORY**

The primary objective of the product inventory is to identify potential air sampling interference by characterizing the occurrence and use of chemicals and products throughout the building, keeping in mind the goal of the investigation and site-specific contaminants of concern. For example, it is not necessary to provide detailed information for each individual container of like items. However, it is necessary to indicate that "20 bottles of perfume" or "12 cans of latex paint" were present with containers in good condition. This information is used to help formulate an indoor environment profile.

An inventory should be provided for each room on the floor of the building being tested and on lower floors, if possible. This is important because even products stored in another area of a building can affect the air of the room being tested.

The presence and description of odors (e.g., solvent, moldy) and portable vapor monitoring equipment readings (e.g., PIDs, ppb RAE, Jerome Mercury Vapor Analyzer, etc.) should be noted and used to help evaluate potential sources. This includes taking readings near

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products stored or used in the building. Products in buildings should be inventoried every time air is tested to provide an accurate assessment of the potential contribution of volatile chemicals. If available, chemical ingredients of interest (e.g., analyte list) should be recorded for each product. If the ingredients are not listed on the label, record the product's exact and full name, and the manufacturer's name, address and telephone number, if available. In some cases, Material Safety Data Sheets (MSDS) may be useful for identifying confounding sources of volatile chemicals in air. Adequately documented photographs of the products and their labeled ingredients can supplement the inventory and facilitate recording the information.

**SAMPLE LOCATIONS**

The following are types of samples that are collected to investigate the soil vapor intrusion pathway:

- Subsurface vapor samples:
  - *Soil vapor* samples (i.e., soil vapor samples not beneath the foundation or slab of a building) and
  - *Sub-slab vapor* samples (i.e., soil vapor samples immediately beneath the foundation or slab of a building);
- Indoor air samples; and
- Outdoor air samples.

The types of samples that should be collected depend upon the specific objective(s) of the sampling, as described below.

- Soil vapor  
Soil vapor samples are collected to determine whether this environmental medium is contaminated, characterize the nature and extent of contamination, and identify possible sources of the contamination. Soil vapor sampling results are used when evaluating the following:
  - The potential for *current* human exposures;

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- The potential for *future* human exposures (e.g., should a building be constructed); and
- The effectiveness of measures implemented to remediate contaminated subsurface vapors.

■ Sub-slab vapor

Sub-slab vapor samples are collected to characterize the nature and extent of soil vapor contamination immediately beneath a building with a basement foundation and/or a slab-on-grade. Sub-slab vapor sampling results are used when evaluating the following:

- *Current* human exposures;
- The potential for *future* human exposures (e.g., if the structural integrity of the building changes or the use of the building changes); and
- Site-specific attenuation factors (i.e., the ratio of indoor air to sub-slab vapor concentrations).

Sub-slab vapor samples are collected after soil vapor characterization and/or other environmental sampling (e.g., soil and groundwater characterization) indicate a need. Subslab samples are typically collected concurrently with indoor and outdoor air samples. However, outside of the heating season, sub-slab vapor samples may be collected independently depending on the sampling objective (e.g., characterize the extent of subsurface vapor contamination outside of the heating season to develop a more comprehensive, focused investigation plan for the heating season).

■ Indoor air

Indoor air samples are collected to characterize exposures to air within a building, including those with earthen floors and crawlspaces. Indoor air sampling results are used when evaluating the following:

- *Current* human exposures;
- The potential for *future* exposures (e.g., if a currently vacant building should become occupied); and
- Site-specific attenuation factors (e.g., the ratio of indoor air to sub-slab vapor concentrations).

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Indoor air samples are collected after subsurface vapor characterization and other environmental sampling (e.g., soil and groundwater characterization) indicate a need. When indoor air samples are collected, concurrent sub-slab vapor and outdoor air samples are collected to evaluate the indoor air results appropriately. However, indoor air and outdoor air samples, without sub-slab vapor samples, may be collected when confirming the effectiveness of a mitigation system.

In addition, site-specific situations may warrant collecting indoor air samples prior to characterizing subsurface vapors and/or without concurrent sub-slab sampling due to a need to examine immediate inhalation hazards. Examples of such situations may include, but are not limited to, the following:

- In response to a spill event when there is a need to qualitatively and/or quantitatively characterize the contamination;
- If high readings are obtained in a building when screening with field equipment (e.g., a photoionization detector (PID), an organic vapor analyzer, or an explosimeter) and the source is unknown;
- If significant odors are present and the source needs to be characterized; or
- If groundwater beneath the building is contaminated, the building is prone to groundwater intrusion or flooding (e.g., sump pit overflows), and subsurface vapor sampling is not feasible.

■ Outdoor air

Outdoor air samples are collected to characterize site-specific background outdoor air conditions. These samples must be collected simultaneously with indoor air samples. They may also be collected concurrently with soil vapor samples. Outdoor air sampling results are primarily used when evaluating the extent to which outdoor sources may be influencing indoor air quality. They may also be used in the evaluation of soil vapor results (i.e., to identify potential outdoor air interferences associated with the infiltration of outdoor air into the sampling apparatus while the soil vapor sample was collected).

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**SOIL VAPOR SAMPLE COLLECTION**

Soil vapor probe installations (see Figure 3 attached) may be permanent, semi-permanent or temporary. In general, permanent installations are preferred for data consistency reasons. Soil implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any construction protocol:

- Soil vapor probes should be installed using direct push technology or, if necessary to attain the desired depth, using an auger;
- Porous backfill material (e.g., glass beads or coarse sand) should be used to create a sampling zone 1 to 2 feet in length;
- Soil vapor probes should be fitted with inert tubing (e.g., polyethylene, stainless steel, or Teflon®) of the appropriate size (typically 1/8 inch to 1/4 inch diameter) and of laboratory or food grade quality to the surface;
- Soil vapor probes should be sealed above the sampling zone with a bentonite slurry for a minimum distance of 3 feet to prevent outdoor air infiltration and the remainder of the borehole backfilled with clean material;
- For multiple probe depths, the borehole should be grouted with bentonite between probes to create discrete sampling zones; and
- For permanent installations, a protective casing should be set around the top of the probe tubing and grouted in place to the top of bentonite to minimize infiltration of water or outdoor air, as well as to prevent accidental damage.

Soil vapor samples should be collected in the same manner at all locations to minimize possible discrepancies. The following procedures should be included in any sampling protocol:

- At least 24 hours after the installation of permanent probes and shortly after the installation of temporary probes, one to three implant volumes (i.e., the volume of

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the sample probe and tube) must be purged prior to collecting the samples to ensure samples collected are representative;

- Flow rates for both purging and collecting must not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling;
- Samples must be collected, using conventional sampling methods, in an appropriate container — one which meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory;
- Sample size depends upon the volume of sample required to achieve minimum reporting limit requirements; and
- A tracer gas (e.g., helium, butane, or sulfur hexafluoride) must be used when collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring) (discussed later in this procedure). Once verified, continued use of the tracer gas may be reconsidered.

When soil vapor samples are collected, the following actions should be taken to document local conditions during sampling that may influence interpretation of the results:

- If sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified;
- Outdoor plot sketches should be drawn that include the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor ambient air sample locations (if applicable), and compass orientation (north);
- Weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed and direction) should be noted for the past 24 to 48 hours; and

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- Any pertinent observations should be recorded, such as odors and readings from field instrumentation.

The field sampling team must maintain a sample log sheet summarizing the following:

- Sample identification,
- Date and time of sample collection,
- Sampling depth,
- Identity of samplers,
- Sampling methods and devices,
- Purge volumes,
- Volume of soil vapor extracted,
- If canisters used, the vacuum before and after samples collected,
- Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
- Chain of custody protocols and records used to track samples from sampling point to analysis.

**SUB-SLAB VAPOR SAMPLE COLLECTION**

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. Prior to installation of the sub-slab vapor probe, the building floor should be inspected and any penetrations (cracks, floor drains, utility perforations, sumps, etc.) should be noted and recorded. Probes should be installed at locations where the potential for ambient air infiltration via floor penetrations is minimal.

Sub-slab vapor probe installations (see Figure 4 attached) may be permanent, semi-permanent or temporary. Sub-slab implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any construction protocol:

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- Permanent recessed probes must be constructed with brass or stainless steel tubing and fittings;
- Temporary probes must be constructed with polyethylene or Teflon® tubing of laboratory or food grade quality;
- Tubing should not extend further than 2 inches into the sub-slab material;
- Coarse sand or glass beads should be added to cover about 1 inch of the probe tip for permanent installations; and
- The soil vapor probe should be sealed to the surface with permagum grout, melted beeswax, putty or other non-VOC-containing and non-shrinking products for temporary installations or cement for permanent installations.

Sub-slab vapor samples should be collected in the following manner:

- After installation of the probes, one to three volumes (i.e., the volume of the sample probe and tube) must be purged prior to collecting the samples to ensure samples collected are representative;
- Flow rates for both purging and collecting must not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling; and
- Samples must be collected, using conventional sampling methods, in an appropriate container — one which meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory;
- Sample size depends upon the volume of sample required to achieve minimum reporting limit requirements [Section 2.9 of the Guidance], the flow rate, and the sampling duration; and
- Ideally, samples should be collected over the same period of time as concurrent indoor and outdoor air samples.

When sub-slab vapor samples are collected, the following actions should be taken to document conditions during sampling and ultimately to aid in the interpretation of the sampling results:



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- If sampling within a commercial or industrial building, uses of volatile chemicals in commercial or industrial processes and/or during building maintenance, should be identified;
- The use of heating or air conditioning systems during sampling should be noted;
- Floor plan sketches should be drawn that include the floor layout with sample locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system air supply and return registers, compass orientation (north), and any other pertinent information should be completed;
- If possible, photographs should accompany floor plan sketches;
- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sample locations (if applicable), compass orientation (north), footings that create separate foundation sections, and paved areas;
- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., heating system active and windows closed) should be reported;
- Smoke tubes or other devices should be used to confirm pressure relationships and air flow patterns, especially between floor levels and between suspected contaminant sources and other areas; and
- Any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppb RAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

The field sampling team must maintain a sample log sheet summarizing the following:

- Sample identification,
- Date and time of sample collection,
- Sampling depth,
- Identity of samplers,
- Sampling methods and devices,
- Soil vapor purge volumes,
- Volume of soil vapor extracted,
- If canisters used, the vacuum before and after samples collected,
- Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and

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- Chain of custody protocols and records used to track samples from sampling point to analysis.

The following describes the subslab air sampling procedure:

1. Canisters will be supplied by the laboratory that will be conducting the analysis.
2. Sampling will take place in accordance with the project work plan sufficiently spaced to allow locations to be modified, if necessary.
3. The number of Summa canisters required as well as the flow rate of the constant differential low volume flow controllers will be supplied by the laboratory in accordance with the project work plan.
4. The sampling program will consist of concurrently collecting and analyzing one sub-slab vapor sample and one indoor ambient air sample (discussed in the next section). Sample locations should be selected based on the likelihood for potential continuous human occupancy during the workday (i.e., due to the size of the areas and available infrastructure), and to account for the possibility of varying foundation depths in different areas of the building. In addition, sample locations typically are based upon the results of a subsurface investigation (i.e., soil gas survey or boring advancement) conducted prior to air sample collection activities. Canisters are typically placed in areas where the highest concentrations of soil gas were observed. Indoor air sample locations preferably should be selected near the middle of the sampled room, well away from the edges where dilution is more likely to occur.
5. Collect at least one outdoor ambient air sample from a location on the building roof or designated background area of the site positioned away from building ventilation system equipment on the highest portion of the building roof or site. See the Outdoor Ambient Air Sampling Procedure section in this procedure.
6. Field personnel should assure conservative sampling conditions prior to and throughout the sampling event. The building should be closed (windows and doors shut) and existing building ventilation systems should be turned off 12

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to 24 hours before the air sampling is scheduled to begin as well as during sample collection. Any air-handling units that may induce large pressure gradients (i.e., exhaust fans, HVAC units etc.) should also be turned off.

7. Any activity being conducted by current building tenants involving volatile organic compounds, such as the use of lacquer thinner and cleaning solvents, prior to and/or during air sampling activities should be noted in the Project Field Book. These activities have the potential to bias the analytical results.
8. At each location, drill an approximately  $\frac{3}{4}$ -inch diameter hole through the concrete slab (typically 6-8 inches thick) using a hand-held hammer drill.
9. Measure and record the concrete thickness in the Project Field Book.
10. Insert polyethylene or Teflon® tubing of laboratory or food grade quality into the drilled hole and no further than 2 inches into the subslab material.
11. Seal the tubing with an appropriately sized volatile organic compound-free stopper (i.e., permagum grout, melted beeswax, putty, or other non-VOC-containing and non-shrinking product) into the concrete core hole and secure in-place making sure the fit is very snug. Supplement any visible gaps between the stopper and concrete slab with a VOC-free sealant, such as beeswax or bentonite slurry.
12. Run the tubing assembly through a shroud (plastic pail, cardboard box, or garbage bag) creating a tight seal with the surface making sure not to disturb the seal around the tubing penetration.
13. Enrich the atmosphere of the shroud with helium. Measure and record the helium concentration within the shroud.
14. Purge approximately 1 to 3 tubing volumes (i.e., the volume of the sample probe and tube) using a hand pump (or similar approved device) to ensure the collection of a representative sample.

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15. Flow rates for both purging and sample collection must not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling.
16. Use a portable monitoring device to analyze a sample of soil vapor for the tracer **prior to and after** sampling for the compounds of concern. Note that the tracer gas samples can be collected via syringe, Tedlar bag etc. They need not be collected in Summa® canisters or minicans.
17. If concentrations greater than 10% of tracer gas are observed either prior to and/or after sampling, the probe seal should be enhanced to reduce the infiltration of outdoor air. Following enhancement of the seal, repeat steps 14 through 17 above until purged concentrations are less than 10% of the tracer gas within the shroud.
18. Following tubing purge and adequate seal integrity testing via helium tracer gas, immediately attach a 6-liter Summa Canister fitted with a 24-hour regulator (or approved other duration) to the opposite end of the tubing. Concurrent with each subslab sample location, prepare an indoor ambient air sample by staging a second Summa Canister on a ladder (approximately 2 to 5-feet above the floor) adjacent to the sub-slab sample location.
19. All Summa Canister valves should remain closed until all subslab borings are complete and all of the canisters in their respective positions.
20. Open the valves to all of the canisters for the required collection period (i.e., 24-hours).
21. Following sample collection, close and cap each canister valve.
22. Collect all Summa Canisters and ship, under chain-of-custody command to an approved analytical laboratory for VOC analysis in accordance with USEPA Method TO-14 or TO-15.
23. Repair all concrete openings with a cement patch.

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24. Analytical results submitted by the laboratory should be reported as concentrations of each VOC at each location, typically in parts per billion by volume (ppbv).

**INDOOR AIR SAMPLE COLLECTION**

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. If possible, prior to collecting indoor samples, a pre-sampling inspection, discussed earlier in this procedure, should be performed to evaluate the physical layout and conditions of the building being investigated, to identify conditions that may affect or interfere with the proposed sampling, and to prepare the building for sampling.

In general, indoor air samples should be collected in the following manner:

- Sampling duration should reflect the exposure scenario being evaluated without compromising the detection limit or sample collection flow rate (e.g., an 8 hour sample from a workplace with a single shift versus a 24 hour sample from a workplace with multiple shifts). To ensure that air is representative of the locations sampled and to avoid undue influence from sampling personnel, samples should be collected for at least 1 hour. If the goal of the sampling is to represent average concentrations over longer periods, then longer duration sampling periods may be appropriate. Typically, 24 hour samples are collected from residential settings;
- Personnel should avoid lingering in the immediate area of the sampling device while samples are being collected;
- Sample flow rates must conform to the specifications in the sample collection method and, if possible, should be consistent with the flow rates for concurrent outdoor air and sub-slab samples; and
- Samples must be collected, using conventional sampling methods, in an appropriate container — one which meets the objectives of the sampling (e.g.,

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investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory.

At sites with tetrachloroethene contamination, passive air monitors that are specifically analyzed for tetrachloroethene (i.e., "perc badges") are commonly used to collect indoor and outdoor air samples. If site characterization activities indicate that degradation products of tetrachloroethene also represent a vapor intrusion concern, perc badges may be used to indicate the likelihood of vapor intrusion (i.e., by using tetrachloroethene as a surrogate) followed, as needed, by more comprehensive sampling and laboratory analyses to quantify both tetrachloroethene and its degradation products. Perc badge samples ideally should be collected over a twenty-four hour period, but for no less than eight hours.

The following actions should be taken to document conditions during indoor air sampling and ultimately to aid in the interpretation of the sampling results:

- A product inventory survey must be completed (discussed earlier);
- The use of heating or air conditioning systems during sampling should be noted;
- Floor plan sketches should be drawn that include the floor layout with sample locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system supply and return registers, compass orientation (north), and any other pertinent information should be completed;
- If possible, photographs should accompany floor plan sketches;
- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sample locations (if applicable), compass orientation (north), footings that create separate foundation sections, and paved areas;

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- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., heating system active and windows closed) should be reported;
- Smoke tubes or other devices should be used to confirm pressure relationships and air flow patterns, especially between floor levels and between suspected contaminant sources and other areas; and
- Any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppb RAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

The field sampling team must maintain a sample log sheet summarizing the following:

- Sample identification,
- Date and time of sample collection,
- Sampling height,
- Identity of samplers,
- Sampling methods and devices,
- Depending upon the method, volume of air sampled,
- If canisters used, the vacuum before and after samples collected,
- Chain of custody protocols and records used to track samples from sampling point to analysis.

The following describes the indoor air sampling procedure:

1. Canisters will be supplied by the laboratory that will be conducting the analysis.
2. Sampling will take place in accordance with the project work plan sufficiently spaced to allow locations to be modified, if necessary.
3. The number of Summa canisters required as well as the flow rate of the constant differential low volume flow controllers will be supplied by the

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laboratory in accordance with the project work plan. Indoor air sampling typically requires the continuous collection of samples over a 24-hour period.

4. The sampling program will consist of concurrently collecting and analyzing one sub-slab vapor sample and one indoor ambient air sample. Sample locations should be selected based on the likelihood for potential continuous human occupancy during the workday (i.e., due to the size of the areas and available infrastructure), and to account for the possibility of varying foundation depths in different areas of the building. In addition, sample locations typically are based upon the results of a subsurface investigation (i.e., soil gas survey or boring advancement) conducted prior to air sample collection activities. Canisters are typically placed in areas where the highest concentrations of soil gas were observed. Indoor air sample locations preferably should be selected near the middle of the sampled room, well away from the edges where dilution is more likely to occur.
5. Collect at least one outdoor ambient air sample from a location on the building roof or designated background area of the site positioned away from building ventilation system equipment on the highest portion of the building roof or site. See the Outdoor Ambient Air Sampling Procedure presented in this procedure.
6. Field personnel should assure conservative sampling conditions prior to and throughout the sampling event. The building should be closed (windows and doors shut) and existing building ventilation systems should be turned off 12 to 24 hours before the air sampling is scheduled to begin as well as during sample collection. Any air-handling units that may induce large pressure gradients (i.e., exhaust fans, HVAC units etc.) should also be turned off.
7. Any activity being conducted by current building tenants involving volatile organic compounds, such as the use of lacquer thinner and cleaning solvents, prior to and/or during air sampling activities should be noted in the Project Field Book. These activities have the potential to bias the analytical results.



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8. Concurrent with each subslab sample location, prepare an indoor ambient air sample by staging a second Summa Canister on a ladder (approximately 2 to 5-feet above the floor) adjacent to the sub-slab sample location.
9. All Summa Canister valves should remain closed until all subslab borings are complete and all of the canisters in their respective positions.
10. Open the valves to all of the canisters for the required collection period (i.e., 24-hours).
11. Following sample collection, close and cap each canister valve.
12. Collect all Summa Canisters and ship, under chain-of-custody command to an approved analytical laboratory for VOC analysis in accordance with USEPA Method TO-14 or TO-15.
13. Analytical results submitted by the laboratory should be reported as concentrations of each VOC at each location, typically in parts per billion by volume (ppbv).

**OUTDOOR AIR SAMPLE COLLECTION**

Outdoor air samples must be collected simultaneously with indoor air samples and may be collected concurrently with subsurface vapor samples. Outdoor air samples must be collected in the same manner as indoor samples.

The following actions should be taken to document conditions during outdoor air sampling and ultimately to aid in the interpretation of the sampling results:

- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sample locations (if applicable), the location of potential interferences (e.g., gasoline stations, factories, lawn movers, etc.), compass orientation (north), footings that create separate foundation sections, and paved areas;

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- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and
- Any pertinent observations, such as odors, readings from field instrumentation, and significant activities in the vicinity (e.g., operation of heavy equipment or dry cleaners) should be recorded.

The following describes the outdoor air sampling procedure:

1. Canisters will be supplied by the laboratory that will be conducting the analysis.
2. Sampling will take place in accordance with the project work plan sufficiently spaced to allow locations to be modified, if necessary.
3. The number of Summa canisters required as well as the flow rate of the constant differential low volume flow controllers will be supplied by the laboratory in accordance with the project work plan.
4. Sample locations typically are collected upwind of the facility.
5. Place canisters on the ground, with a clear plastic sheet beneath to prevent contamination. Locate the sampling inlet approximately 18-inches above the ground surface.
6. Sample collection should take place on warm, dry days. If rain or high humidity conditions develop during sampling, the sampling event should be suspended. Temperature, barometric pressure and wind speed should be monitored during the sampling event, for use in analysis of the results.
7. The combination of sampling location, height and meteorological conditions will assure that sampling will measure VOCs at their highest concentrations.
8. Air samples will be analyzed by Gas Chromatography/Mass Spectroscopy (GC/MS) in accordance with EPA Method TO-14 or TO-15.

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9. Analytical results will be reported as concentrations of each VOC at each location during each sampling event, typically in parts per billion by volume (ppbv).

**TRACER GAS**

When collecting soil vapor samples as part of a vapor intrusion evaluation, a tracer gas serves as a quality assurance/quality control device to verify the integrity of the soil vapor probe seal. Without the use of a tracer, there is no way to verify that a soil vapor sample has not been diluted by surface air.

Depending on the nature of the contaminants of concern, a number of different compounds can be used as a tracer. Typically, sulfur hexafluoride (SF<sub>6</sub>) or helium are used as tracers because they are readily available, have low toxicity, and can be monitored with portable measurement devices. Butane and propane (or other gases) could also be used as a tracer in some situations. The protocol for using a tracer gas is straightforward: simply enrich the atmosphere in the immediate vicinity of the area where the probe intersects the ground surface with the tracer gas, and measure a vapor sample from the probe for the presence of high concentrations (> 10%) of the tracer. A cardboard box, a plastic pail, or even a garbage bag can serve to keep the tracer gas in contact with the probe during the testing.

There are two basic approaches to testing for the tracer gas:

- Include the tracer gas in the list of target analytes reported by the laboratory; or
- Use a portable monitoring device to analyze a sample of soil vapor for the tracer prior to and after sampling for the compounds of concern. (Note that the tracer gas samples can be collected via syringe, Tedlar bag etc. They need not be collected in Summa® canisters or minicans.)

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The advantage of the second approach is that the real time tracer sampling results can be used to confirm the integrity of the probe seals prior to formal sample collection. Figure 5 (attached) depicts common methods for using tracer gas. In each of the examples, a, b and c, the tracer gas is released in the enclosure prior to initially purging the sample point. Care should be taken to avoid excessive purging prior to sample collection. Care should also be taken to prevent pressure build-up in the enclosure during introduction of the tracer gas. Inspection of the installed sample probe, specifically noting the integrity of the surface seal and the porosity of the soil in which the probe is installed, will help to determine the tracer gas setup. Figure 5(a) may be most effective at preventing tracer gas infiltration, however, it may not be required in some situations depending on site-specific conditions. Figures 5(b) and 5(c) may be sufficient for probes installed in tight soils with well-constructed surface seals. In all cases, the same tracer gas application should be used for all probes at any given site.

Because minor leakage around the probe seal should not materially affect the usability of the soil vapor sampling results, the mere presence of the tracer gas in the sample should not be a cause for alarm. Consequently, portable field monitoring devices with detection limits in the low ppm range are more than adequate for screening samples for the tracer. If high concentrations ( $> 10\%$ ) of tracer gas are observed in a sample, the probe seal should be enhanced to reduce the infiltration of ambient air.

During the initial stages of a soil vapor sampling program, tracer gas samples should be collected at each of the sampling probes. If the results of the initial samples indicate that the probe seals are adequate, the project manager can consider reducing the number of locations at which tracer gas samples are employed. At a minimum, at least 10% of the subsequent samples should be supported with tracer gas analyses. When using permanent soil vapor probes as part of a long-term monitoring program, annual testing of the probe integrity is recommended.

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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**QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)**

Extreme care should be taken during all aspects of sample collection to ensure that sampling error is minimized and high quality data are obtained. The sampling team members should avoid actions (e.g., fueling vehicles, using permanent marking pens, and wearing freshly dry-cleaned clothing or personal fragrances), which can cause sample interference in the field. Appropriate QA/QC protocols must be followed for sample collection and laboratory analysis, such as use of certified clean sample devices, meeting sample holding times and temperatures, sample accession, chain of custody, etc. Samples should be delivered to the analytical laboratory as soon as possible after collection. In addition, laboratory accession procedures must be followed including field documentation (sample collection information and locations), chain of custody, field blanks, field sample duplicates and laboratory duplicates, as appropriate.

Some methods require collecting samples in duplicate (e.g., indoor air sampling using passive sampling devices for tetrachloroethene) to assess errors. Duplicate and/or split samples should be collected in accordance with the requirements of the sampling and analytical methods being implemented.

For certain regulatory programs, a Data Usability Summary Report (DUSR) may be required to determine whether or not the data, as presented, meets the site or project specific criteria for data quality and data use. This requirement may dictate the level of QC and the category of data deliverable to request from the laboratory. Guidance on preparing a DUSR is available by contacting the NYSDEC's Division of Environmental Remediation.

New York State Public Health Law requires laboratories analyzing environmental samples collected from within New York State to have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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combinations. If ELAP certification is not currently required for an analyte (e.g., trichloroethene), the analysis should be performed by a laboratory that has ELAP certification for similar compounds in air and uses analytical methods with detection limits similar to background (e.g., tetrachloroethene via EPA Method TO-15).

The work plan must state that all samples that will be used to make decisions on appropriate actions to address exposures and environmental contamination will be analyzed by an ELAP-certified laboratory. If known, the name of the laboratory should also be provided. Similarly, the name of the laboratory that was used must be included in the report of the sampling results. For samples collected and tested in the field for screening purposes by using field testing technology, the qualifications of the field technician must be documented in the work plan.

**DECISION MATRICES (FIGURES 1 AND 2)**

The considerations in assigning a chemical to a matrix include the following:

- Human health risks, including such factors as a chemical's ability to cause cancer, reproductive, developmental, liver, kidney, nervous system, immune system or other effects, in animals and humans and the doses that may cause those effects;
- The data gaps in its toxicologic database;
- Background concentrations of volatile chemicals in indoor air [Section 3.2.4]; and
- Analytical capabilities currently available.

To use the matrices accurately as a tool in the decision-making process, the following must be noted:

- The matrices are generic. As such, it may be necessary to modify recommended actions to accommodate building-specific conditions (e.g., dirt floor in basement,

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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crawl spaces, etc.) and/or site-specific conditions (e.g., proximity of building to identified subsurface contamination) for the protection of public health. Additionally, actions more conservative than those specified within the matrix may be implemented at any time. For example, the decision to implement more conservative actions may be based on a comparison of the costs associated with resampling or monitoring to the costs associated with installation and monitoring of a mitigation system.

- Indoor air concentrations detected in samples collected from the building's basement or, if the building has a slab-on-grade foundation, from the building's lowest occupied living space should be used.
- Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude the need to investigate possible sources of vapor contamination, nor does it preclude the need to remediate contaminated soil vapors or the source of soil vapor contamination.
- When current exposures are attributed to sources other than vapor intrusion, the agencies must be provided documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix and to support assessment and follow-up by the agencies.

**RECOMMENDED ACTIONS**

Actions recommended in the matrix are based on the relationship between sub-slab vapor concentrations and corresponding indoor air concentrations. They are intended to address both potential and current human exposures and include the following:

- *No further action*  
When the volatile chemical is not detected in the indoor air sample and the concentration detected in the corresponding sub-slab vapor sample is not expected to substantially affect indoor air quality.

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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- *Take reasonable and practical actions to identify source(s) and reduce exposures*  
The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Therefore, steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile chemical-containing products in places where people do not spend much time, such as a garage or shed).
- *Monitor*  
Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, is needed to determine whether concentrations in the indoor air or sub-slab vapor have changed. Monitoring may also be needed to determine whether existing building conditions (e.g., positive pressure HVAC systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined on a site-specific and building specific basis, taking into account applicable environmental data and building operating conditions.
- *Mitigate*  
Mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion. Methods to mitigate exposures related to soil vapor intrusion are described in Section 4 of the Guidance.

**TIME OF YEAR**

Sub-slab vapor samples and, unless there is an immediate need for sampling, indoor air samples are typically collected during the heating season because soil vapor intrusion is more likely to occur when a building's heating system is in operation and air is being drawn into the building. In general, heating systems are expected to be operating routinely from November 15th to March 31st throughout the state. However, this timeframe may vary depending on factors, such as the location of the site (e.g., upstate versus downstate) and the weather conditions for a particular year.



**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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A vapor intrusion investigation may also be conducted outside of the heating season. However, the results may not be used to rule out exposures. For example, results indicating "no further action" or "monitoring required" must be verified during the heating season to ensure these actions are protective during the heating season as well.

**SAMPLING ROUNDS**

Investigating a soil vapor intrusion pathway usually requires more than one round of subsurface vapor, indoor air and/or outdoor air sampling, for reasons such as the following:

- To characterize the nature and extent of subsurface vapor contamination (similar to the delineation of groundwater contamination) and to address corresponding exposure concerns;
- To evaluate fluctuations in concentrations due to
  - Different weather conditions (e.g., seasonal effects),
  - Changes in building conditions (e.g., various operating conditions of a building's HVAC system),
  - Changes in source strength, or
  - Vapor migration or contaminant biodegradation processes (particularly when degradation products may be more toxic than the parent compounds); or
- To confirm sampling results or the effectiveness of mitigation or remedial systems.

Overall, successive rounds of sampling are conducted until the following questions can be answered:

- Are subsurface vapors contaminated? If so, what are the nature and extent of contamination? What is/are the source(s) of the contamination?
- What are the current and potential exposures to contaminated subsurface vapors?
- What actions, if any, are needed to prevent or mitigate exposures and to remediate subsurface vapor contamination?

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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Toward this end, multiple rounds of sampling may be required to characterize the nature and extent of subsurface vapor contamination such that

- Both potential and current exposures are adequately addressed;
- Measures can be designed to remediate subsurface vapor contamination, either directly (e.g., SVE system) or indirectly (e.g., soil excavation or groundwater remediation), given that monitoring and mitigation are considered temporary measures implemented to address exposures related to vapor intrusion until contaminated environmental media are remediated; and
- The effectiveness of remedial measures can be monitored and confirmed (e.g., endpoint sampling).

**ATTACHMENTS**

- Figure 1**     *Soil Vapor/Indoor Air Matrix 1*  
**Figure 2**     *Soil Vapor/Indoor Air Matrix 2*  
**Figure 3**     *Schematics of a permanent soil vapor probe and permanent nested soil vapor probes*  
**Figure 4**     *Schematic of a sub-slab vapor probe*  
**Figure 5**     *Schematics of tracer gas applications*

Indoor Air Quality Questionnaire and Building Inventory

**REFERENCES**

New York State Department of Health, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, February 2005.

New York State Department of Health, *Indoor Air Sampling & Analysis Guidance*. (February 1, 2005).

Office of Solid Waste and Emergency Response (OSWER). *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)*. November 2002.



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## FOP 004.3

### AMBIENT AIR/SUBSLAB VAPOR SAMPLE COLLECTION PROCEDURE

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United States Environmental Protection Agency. *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*. 1988

- Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). Pp. 15-1 through 15-62.
- Method TO-17, Determination of Volatile Organic Compounds in Ambient Air using Active Sampling on Sorbent Tubes. Pp. 17-1 through 17-49.
- Compendium of Methods for the Determination of Air Pollutants in Indoor Air, EPA/600/4-90-010.



## AMBIENT AIR/SUBSLAB VAPOR SAMPLE COLLECTION PROCEDURE

FIGURE 1

### Soil Vapor/Indoor Air Matrix 1

October 2006

SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m <sup>3</sup> )	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m <sup>3</sup> )			
	< 0.25	0.25 to < 1	1 to < 5.0	5.0 and above
< 5	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
5 to < 50	5. No further action	6. MONITOR	7. MONITOR	8. MITIGATE
50 to < 250	9. MONITOR	10. MONITOR / MITIGATE	11. MITIGATE	12. MITIGATE
250 and above	13. MITIGATE	14. MITIGATE	15. MITIGATE	16. MITIGATE

**No further action:**

Given that the compound was not detected in the indoor air sample and that the concentration detected in the sub-slab vapor sample is not expected to significantly affect indoor air quality, no additional actions are needed to address human exposures.

**Take reasonable and practical actions to identify source(s) and reduce exposures:**

The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Therefore, steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile organic compound-containing products in places where people do not spend much time, such as a garage or outdoor shed). Resampling may be recommended to demonstrate the effectiveness of actions taken to reduce exposures.

**MONITOR:**

Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, is needed to determine whether concentrations in the indoor air or sub-slab vapor have changed. Monitoring may also be needed to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined on a site-specific and building-specific basis, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

**MITIGATE:**

Mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system, and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

**MONITOR / MITIGATE:**

Monitoring or mitigation may be recommended after considering the magnitude of sub-slab vapor and indoor air concentrations along with building- and site-specific conditions.

See additional notes on page 2.

MATRIX 1 Page 1 of 2



**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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**ADDITIONAL NOTES FOR MATRIX 1**

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This matrix summarizes the minimum actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

- [1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate building-specific conditions (e.g., dirt floor in basement, crawl spaces, etc.) and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, resampling may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Additionally, actions more protective of public health than those specified within the matrix may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action is usually undertaken for reasons other than public health (e.g., seeking community acceptance, reducing excessive costs, etc.).
- [2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of vapor contamination, nor does it preclude remediating contaminated soil vapors or the source of soil vapor contamination.
- [3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 0.25 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples, a minimum reporting limit of 5 micrograms per cubic meter is recommended for buildings with full slab foundations, and 1 microgram per cubic meter for buildings with less than a full slab foundation.
- [4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion to occur is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions may be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.
- [5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.
- [6] The party responsible for implementing the recommended actions will differ depending upon several factors, including the identified source of the volatile chemicals, the environmental remediation program, and site-specific and building-specific conditions. For example, to the extent that all site data and site conditions demonstrate that soil vapor intrusion is not occurring and that the potential for soil vapor intrusion to occur is not likely, the soil vapor intrusion investigation would be considered complete. In general, if indoor exposures represent a concern due to indoor sources, then the State will provide guidance to the property owner and/or tenant on ways to reduce their exposure. If indoor exposures represent a concern due to outdoor sources, then the NYSDEC will decide who is responsible for further investigation and any necessary remediation. Depending upon the outdoor source, this responsibility may or may not fall upon the party conducting the soil vapor intrusion investigation.

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## AMBIENT AIR/SUBSLAB VAPOR SAMPLE COLLECTION PROCEDURE

FIGURE 2

### Soil Vapor/Indoor Air Matrix 2

October 2006

SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m <sup>3</sup> )	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m <sup>3</sup> )			
	< 3	3 to < 30	30 to < 100	100 and above
< 100	1. No further action	2. Take reasonable and practical actions to identify source(s) and reduce exposures	3. Take reasonable and practical actions to identify source(s) and reduce exposures	4. Take reasonable and practical actions to identify source(s) and reduce exposures
100 to < 1,000	5. MONITOR	6. MONITOR / MITIGATE	7. MITIGATE	8. MITIGATE
1,000 and above	9. MITIGATE	10. MITIGATE	11. MITIGATE	12. MITIGATE

**No further action:**

Given that the compound was not detected in the indoor air sample and that the concentration detected in the sub-slab vapor sample is not expected to significantly affect indoor air quality, no additional actions are needed to address human exposures.

**Take reasonable and practical actions to identify source(s) and reduce exposures:**

The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Therefore, steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile organic compound-containing products in places where people do not spend much time, such as a garage or outdoor shed). Resampling may be recommended to demonstrate the effectiveness of actions taken to reduce exposures.

**MONITOR:**

Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, is needed to determine whether concentrations in the indoor air or sub-slab vapor have changed. Monitoring may also be needed to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined on a site-specific and building-specific basis, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

**MITIGATE:**

Mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system, and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

**MONITOR / MITIGATE:**

Monitoring or mitigation may be recommended after considering the magnitude of sub-slab vapor and indoor air concentrations along with building- and site-specific conditions.

See additional notes on page 2.

MATRIX 2 Page 1 of 2

**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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**ADDITIONAL NOTES FOR MATRIX 2**

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This matrix summarizes the minimum actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

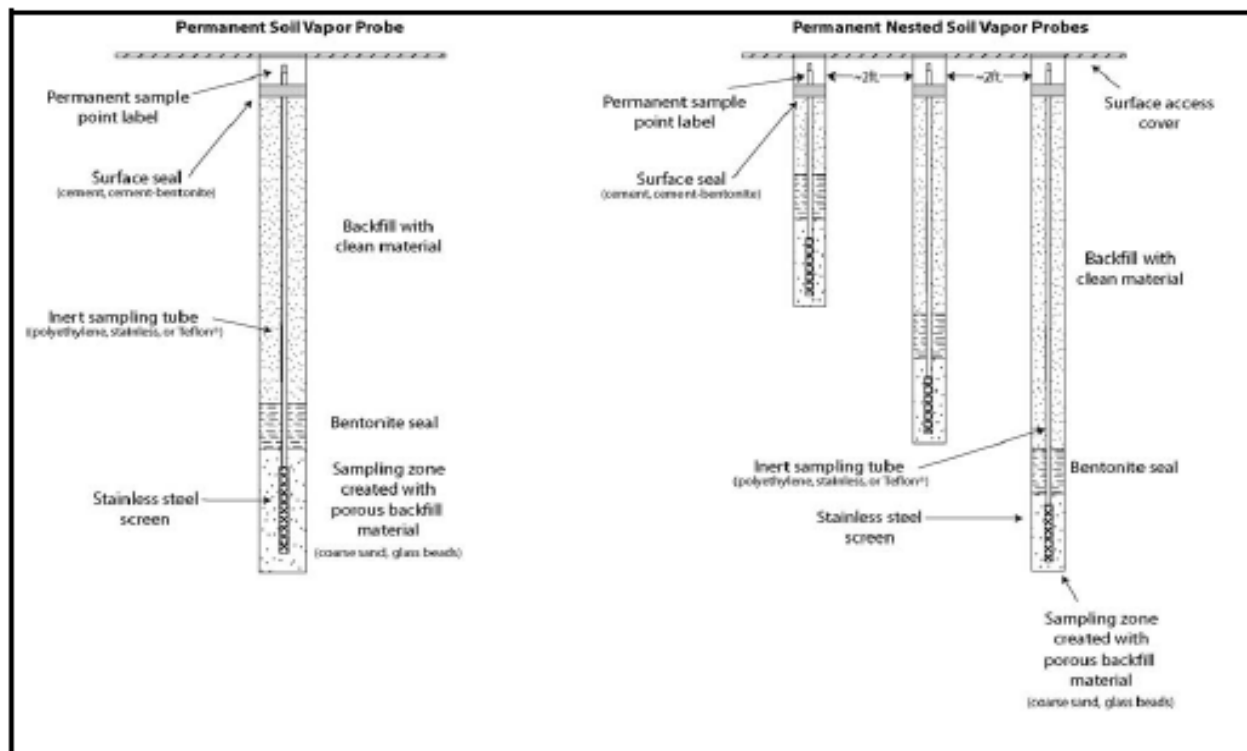
- [1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate building-specific conditions (e.g., dirt floor in basement, crawl spaces, etc.) and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, resampling may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Additionally, actions more protective of public health than those specified within the matrix may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action is usually undertaken for reasons other than public health (e.g., seeking community acceptance, reducing excessive costs, etc.).
- [2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of vapor contamination, nor does it preclude remediating contaminated soil vapors or the source of soil vapor contamination.
- [3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 3 micrograms per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples, a minimum reporting limit of 5 micrograms per cubic meter is recommended.
- [4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion to occur is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions may be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.
- [5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.
- [6] The party responsible for implementing the recommended actions will differ depending upon several factors, including the identified source of the volatile chemicals, the environmental remediation program, and site-specific and building-specific conditions. For example, to the extent that all site data and site conditions demonstrate that soil vapor intrusion is not occurring and that the potential for soil vapor intrusion to occur is not likely, the soil vapor intrusion investigation would be considered complete. In general, if indoor exposures represent a concern due to indoor sources, then the State will provide guidance to the property owner and/or tenant on ways to reduce their exposure. If indoor exposures represent a concern due to outdoor sources, then the NYSDEC will decide who is responsible for further investigation and any necessary remediation. Depending upon the outdoor source, this responsibility may or may not fall upon the party conducting the soil vapor intrusion investigation.

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AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE

FIGURE 3

*Schematics of a permanent soil vapor probe and permanent nested soil vapor probes*



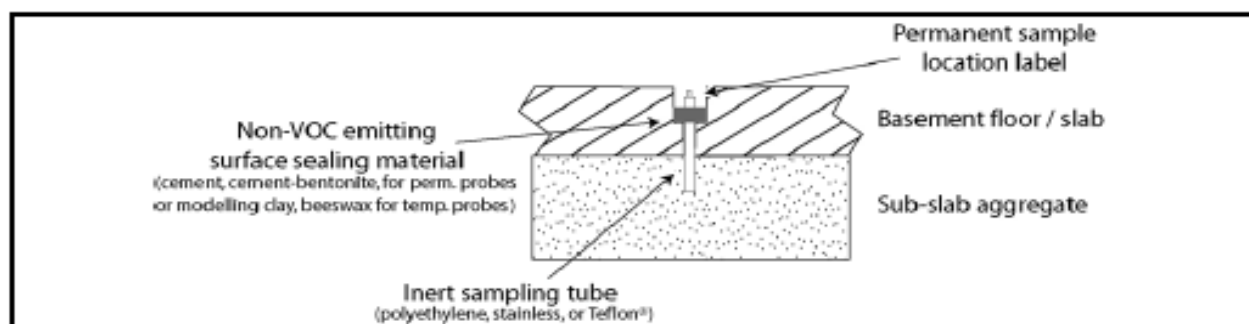


**AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE**

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**FIGURE 4**

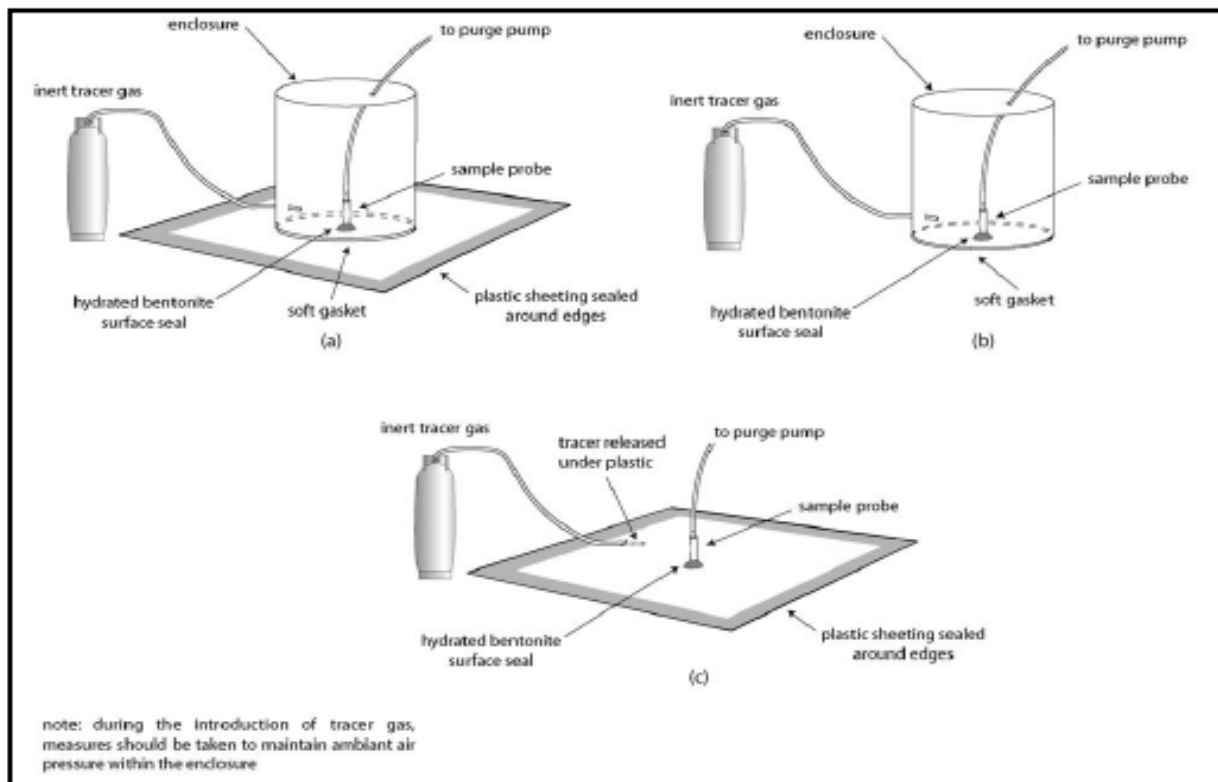
*Schematic of a sub-slab vapor probe*



AMBIENT AIR/SUBSLAB VAPOR SAMPLE  
COLLECTION PROCEDURE

FIGURE 5

*Schematics of tracer gas applications*



## AMBIENT AIR/SUBSLAB VAPOR SAMPLE COLLECTION PROCEDURE

**INDOOR AIR QUALITY QUESTIONNAIRE  
& BUILDING INVENTORY**

Project Name: \_\_\_\_\_ Project No.: \_\_\_\_\_  
 Project Location: \_\_\_\_\_ Client: \_\_\_\_\_  
 Preparer's Name: \_\_\_\_\_ Date/Time: \_\_\_\_\_  
 Preparer's Affiliation: \_\_\_\_\_ Phone No.: \_\_\_\_\_  
 Purpose of Investigation: \_\_\_\_\_

**1. OCCUPANT:**  
 Interviewed: ☐ yes ☐ no  
 Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 County: \_\_\_\_\_  
 Home Phone: \_\_\_\_\_ Office Phone: \_\_\_\_\_  
 Number of Occupants/persons at this location: \_\_\_\_\_ Number of Occupants: \_\_\_\_\_

**2. OWNER OR LANDLORD:** (check if same as occupant)  
 Interviewed: ☐ yes ☐ no  
 Last Name: \_\_\_\_\_ First Name: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 County: \_\_\_\_\_  
 Home Phone: \_\_\_\_\_ Office Phone: \_\_\_\_\_

**3. BUILDING CHARACTERISTICS:**  
 Type of Building: (check appropriate response)  
☐ Residential ☐ Commercial/Multi-use  
☐ Industrial ☐ Other: \_\_\_\_\_  
 If the property is residential type, check all that apply (use response):  
☐ Single Family ☐ 2-Family ☐ 3-Family  
☐ Duplex ☐ Split Level ☐ Colonial  
☐ Cape Cod ☐ Contemporary ☐ Mobile Home  
☐ Duplex ☐ Apartment House ☐ Townhouse/Condo  
☐ Modular ☐ Log Home ☐ Other: \_\_\_\_\_  
 If multiple units, how many? \_\_\_\_\_  
 If the property is commercial, type?  
 Business Type(s): \_\_\_\_\_  
 Does it include residences (i.e., multi-use)? ☐ yes ☐ no If yes, how many? \_\_\_\_\_  
 Other Characteristics:  
 Number of floors: \_\_\_\_\_ Building age: \_\_\_\_\_  
 Is the building insulated? ☐ yes ☐ no How air tight? ☐ tight ☐ average ☐ not tight

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**INDOOR AIR QUALITY QUESTIONNAIRE  
& BUILDING INVENTORY**

**4. AIR FLOW**  
 Use air current tubes or tracer smoke to evaluate air flow patterns and qualitatively describe:

Airflow between floors: \_\_\_\_\_  
 Airflow near source: \_\_\_\_\_  
 Outdoor air infiltration: \_\_\_\_\_  
 Infiltration into air ducts: \_\_\_\_\_

**5. BASEMENT AND CONSTRUCTION DETAILS (check all that apply)**  
 a. Above grade foundation: ☐ stone ☐ concrete  
 b. Basement floor: ☐ full ☐ crawl space ☐ slab  
 c. Basement floor: ☐ dirt ☐ stone  
 d. Basement floor: ☐ gravel ☐ covered with \_\_\_\_\_  
 e. Concrete floor: ☐ sealed ☐ sealed with \_\_\_\_\_  
 f. Foundation walls: ☐ poured ☐ block ☐ stone  
 g. Foundation walls: ☐ insulated ☐ sealed with \_\_\_\_\_  
 h. The basement is: ☐ wet ☐ damp ☐ dry  
 i. The basement is: ☐ finished ☐ unfinished ☐ partially finished  
 j. Sump present? ☐ yes ☐ no  
 k. Water in Sump? ☐ yes ☐ no ☐ not applicable  
 Basement/Lowest level depth below grade: \_\_\_\_\_  
 Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains): \_\_\_\_\_

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**INDOOR AIR QUALITY QUESTIONNAIRE  
& BUILDING INVENTORY**

**6. HEATING, VENTING, AND AIR CONDITIONING** (check all that apply)  
 Type of heating system(s) used in this building: (check all that apply - note primary)  
☐ Hot air circulation ☐ Heat pump ☐ Hot water baseboard  
☐ Space Heater ☐ Steam radiation ☐ Radiant floor  
☐ Electric baseboard ☐ Wood stove ☐ Outdoor wood boiler  
☐ Other: \_\_\_\_\_  
 The primary type of fuel used is:  
☐ Natural Gas ☐ Fuel oil ☐ Coal  
☐ Electric ☐ Propane ☐ Other: \_\_\_\_\_  
 Domestic hot water tank fueled by: \_\_\_\_\_  
 Boiler/furnace located in: \_\_\_\_\_  
☐ Basement ☐ Outdoor ☐ Other: \_\_\_\_\_  
 Air Conditioning:  
☐ Central Air ☐ Window ☐ Portable ☐ None  
 Are there air distribution ducts present? ☐ yes ☐ no  
 Describe the supply and return air registers, heating/cooling condition where visible, including whether there is a cold air return and distribution duct. Indicate the locations on the floor plan diagram.  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**7. OCCUPANCY**  
 Is basement/lowest level occupied? ☐ Full time ☐ Occasionally ☐ Seldom ☐ Almost Never  
 Level: \_\_\_\_\_ General Use of Each Floor (e.g., family room, bedroom, laundry, workshop, storage):  
 Basement: \_\_\_\_\_  
 First Floor: \_\_\_\_\_  
 Second Floor: \_\_\_\_\_  
 Third Floor: \_\_\_\_\_  
 Fourth Floor: \_\_\_\_\_

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**INDOOR AIR QUALITY QUESTIONNAIRE  
& BUILDING INVENTORY**

**8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY**

a. Is there an attached garage? ☐ yes ☐ no  
 b. Does the garage have a separate heating unit? ☐ yes ☐ no ☐ NA  
 c. Are petroleum powered machines or vehicles stored in the garage? ☐ yes ☐ no ☐ NA  
 (e.g., lawnmowers, etc.) If yes, please specify: \_\_\_\_\_  
 d. Has the building ever had a fire? ☐ yes ☐ no  
 If yes, when? \_\_\_\_\_  
 e. Is a kerosene or unvented gas space heater present? ☐ yes ☐ no  
 If yes, when? \_\_\_\_\_  
 f. Is there a workshop or hobby/craft area? ☐ yes ☐ no  
 If yes, when? \_\_\_\_\_  
 g. Is there smoking in the building? ☐ yes ☐ no  
 h. Have cleaning products been used recently? ☐ yes ☐ no  
 i. Have construction materials been used recently? ☐ yes ☐ no  
 If yes, when? \_\_\_\_\_  
 j. Has painting been done in the last 6 months? ☐ yes ☐ no  
 If yes, when? \_\_\_\_\_  
 k. Is there new carpet, drapes, or other textiles? ☐ yes ☐ no  
 If yes, when & where? \_\_\_\_\_  
 l. Have air fresheners been used recently? ☐ yes ☐ no  
 If yes, when & where? \_\_\_\_\_  
 m. Is there a kitchen exhaust fan? ☐ yes ☐ no  
 If yes, where vented? \_\_\_\_\_  
 n. Is there a bathroom exhaust fan? ☐ yes ☐ no  
 If yes, where vented? \_\_\_\_\_

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## AMBIENT AIR/SUBSLAB VAPOR SAMPLE COLLECTION PROCEDURE



# INDOOR AIR QUALITY QUESTIONNAIRE & BUILDING INVENTORY

## 8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY (continued)

a. Is there a clothes dryer? ☐ yes ☐ no

If yes, is it vented outside? ☐ yes ☐ no

b. Has there been a pesticide application? ☐ yes ☐ no

If yes, when is it type?

c. Are there odors in the building? ☐ yes ☐ no

If yes, please describe?

d. Do any of the building occupants use solvents at work or home?  
(e.g. chemical manufacturing or laboratory, auto maintenance, painting, metal cleaning, solvent mechanics, pesticide application, cosmetologist)

If yes, what types of solvents are used?

If yes, are their clothes washed at work or home?

e. Do any of the building occupants regularly use a paid or free dry cleaning service?

(check appropriate response)

☐ yes, use dry-cleaning service ☐ no  
☐ yes, use laundry facility at work or home ☐ unknown  
☐ yes, use a self-service laundromat

f. Is there a central heating or cooling system in the building? ☐ yes ☐ no  
 If yes, is it a forced air system? ☐ yes ☐ no  
 If yes, is it a gas furnace? ☐ yes ☐ no  
 If yes, is it a gas boiler? ☐ yes ☐ no  
 If yes, is it a gas water heater? ☐ yes ☐ no  
 If yes, is it a gas stove? ☐ yes ☐ no  
 If yes, is it a gas fireplace? ☐ yes ☐ no  
 If yes, is it a gas hot water heater? ☐ yes ☐ no  
 If yes, is it a gas furnace? ☐ yes ☐ no  
 If yes, is it a gas boiler? ☐ yes ☐ no  
 If yes, is it a gas water heater? ☐ yes ☐ no  
 If yes, is it a gas stove? ☐ yes ☐ no  
 If yes, is it a gas fireplace? ☐ yes ☐ no  
 If yes, is it a gas hot water heater? ☐ yes ☐ no

## 9. WATER AND SEWERAGE

Water Supply: ☐ Public Water ☐ Drilled Well ☐ Diverse Well ☐ Cug Well

Sewage Disposal: ☐ Public Sewer ☐ Septic Tank ☐ Leach Field ☐ Dry Well

☐ Other

## 10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended:

Reasons choose to: ☐ remain in home ☐ relocate to friends/family ☐ relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? ☐ yes ☐ no

d. Relocation package provided and explained to residents? ☐ yes ☐ no

Indoor Air Quality Questionnaire and Building Inventory

Page 5 of 8

## INDOOR AIR QUALITY QUESTIONNAIRE & BUILDING INVENTORY

### II. FLOOR PLANS


Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

**Basement**

**First Floor**

Indoor Air Quality Questionnaire and Building Inventory

Page 6 of 8

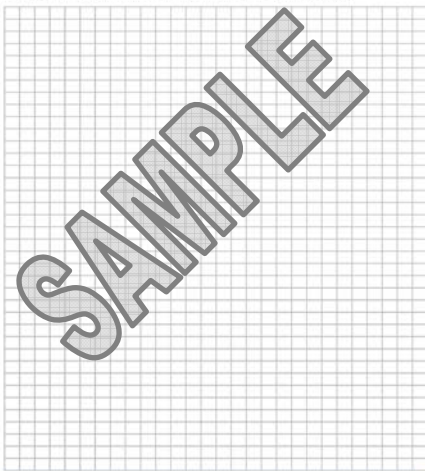


# INDOOR AIR QUALITY QUESTIONNAIRE & BUILDING INVENTORY

## 12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s), and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and sprie system, if applicable, and a qualifying statement to help locate the site on a topographic map.



Indiana Air Quality Consultants and Public Information

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[illegible]



# FIELD OPERATING PROCEDURES

## Calibration & Maintenance of Portable Dissolved Oxygen Meter

**CALIBRATION AND MAINTENANCE OF PORTABLE  
DISSOLVED OXYGEN METER**

---

**PURPOSE**

This guideline describes a method for calibration of a portable dissolved oxygen meter. This meter measures the concentration of dissolved oxygen within a water sample. This parameter is of interest both as a general indicator of water quality, and because of its pertinence to fate and transport of organics and inorganics. This guideline presents a method for calibration of this meter, which is performed to verify instrument accuracy and function. All field instruments will be calibrated, verified and recalibrated at frequencies required by their respective operating manuals or manufacturer's specifications, but not less than once each day that the instrument is in use. Field personnel should have access to all operating manuals for the instruments used for the field measurements. This procedure also documents critical maintenance activities for this meter.

**ACCURACY**

The calibrated accuracy of the dissolved oxygen meter will be within  $\pm 1\%$  of full-scale over the temperature range of 23° to 113° F (-5° to +45° C).

**PROCEDURE**

1. Calibrate the dissolved oxygen meter to ambient air based on probe temperature and true local atmospheric pressure conditions (or feet above sea level). Because procedures vary with different brands and models of meters, refer to the manufacturer's recommended calibration procedures.
2. In the event of a failure to adequately calibrate, follow the corrective action directed by the manufacturer.
3. If calibration cannot be achieved or maintained, obtain a replacement instrument (rental instruments) and/or order necessary repairs/adjustment.

**CALIBRATION AND MAINTENANCE OF PORTABLE  
DISSOLVED OXYGEN METER**

---

4. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample). Information will include, at a minimum:
- Time, date, and initials of the field team member performing the calibration
  - The unique identifier for the meter, including manufacturer, model, and serial number
  - The brand and expiration dates of calibration solutions
  - The calibration readings
  - The instrument settings (if applicable)
  - The approximate response time
  - The overall adequacy of calibration including the Pass or fail designation in accordance with the accuracy specifications presented above
  - Corrective action taken (see Step 5 above) in the event of failure to adequately calibrate

**MAINTENANCE**

- When not in use or between measurements, the dissolved oxygen probe will be kept immersed in or moist with deionized water.
- The meter batteries will be checked prior to each meter's use and will be replaced when the meter cannot be redline adjusted.
- The meter response time and stability will be tracked to determine the need for instrument maintenance. When response time becomes greater than two minutes, probe service is indicated.

**ATTACHMENTS**

Equipment Calibration Log (sample)



# FOP 007.0

## CALIBRATION AND MAINTENANCE OF PORTABLE DISSOLVED OXYGEN METER



### EQUIPMENT CALIBRATION

#### PROJECT INFORMATION:

Project Name: \_\_\_\_\_

Date: \_\_\_\_\_

Project No.: \_\_\_\_\_

Client: \_\_\_\_\_

Instrument Source: ☐ TK ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTLE
<input type="checkbox"/> pH meter	units		Myron L. Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
						< 0.4		
<input type="checkbox"/> Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		20		
						100		
						800		
<input type="checkbox"/> Sp. conductance meter	uS/mS		Myron L. Company Ultra Meter 6P	606987		uS @ 25 °C		
<input type="checkbox"/> PID	ppm		Photovac 2020 PID			open air zero		MIBK re factor :
						ppm Iso. Gas		
<input type="checkbox"/> Particulate meter	mg/m <sup>3</sup>					zero air		
<input type="checkbox"/> Oxygen	%					open air		
<input type="checkbox"/> Hydrogen sulfide	ppm					open air		
<input type="checkbox"/> Carbon monoxide	ppm					open air		
<input type="checkbox"/> LEL	%					open air		
<input type="checkbox"/> Radiation Meter	uR/h					background area		
<input type="checkbox"/>								

#### ADDITIONAL REMARKS:

PREPARED BY: \_\_\_\_\_

DATE: \_\_\_\_\_







# FIELD OPERATING PROCEDURES

## Calibration and Maintenance of Portable Field pH/Eh Meter

**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD pH/Eh METER**

---

**PURPOSE**

This guideline describes a method for calibration of a portable pH/Eh meter. The pH/Eh meter measures the hydrogen ion concentration or acidity of a water sample (pH function), and the oxidation/reduction potential of a water sample (Eh function). Calibration is performed to verify instrument accuracy and function. All field instruments will be calibrated, verified and recalibrated at frequencies required by their respective operating manuals or manufacturer's specifications, but not less than once each day that the instrument is in use. Field personnel should have access to all operating manuals for the instruments used for the field measurements. This procedure also documents critical maintenance activities for this meter.

**ACCURACY**

The calibrated accuracy of the pH/Eh meter will be:

pH      $\pm 0.2$  pH unit, over the temperature range of  $\pm 0.2$  C.

Eh      $\pm 0.2$  millivolts (mV) over the range of  $\pm 399.9$  mV, otherwise  $\pm 2$  mV.

**PROCEDURE**

**Note:** Meters produced by different manufacturers may have different calibration procedures. These instructions will take precedence over the procedure provided herein. This procedure is intended to be used as a general guideline, or in the absence of available manufacturer's instructions.

1. Obtain and active the meter to be used. As stated above, initial calibrations will be performed at the beginning of each sampling day.

**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD pH/Eh METER**

---

2. Immerse the sensing probe in a container of certified pH 7.0 buffer solution traceable to the National Bureau of Standards.
3. Measure the temperature of the buffer solution, and adjust the temperature setting accordingly.
4. Compare the meter reading to the known value of the buffer solution while stirring. If the reading obtained by the meter does not agree with the known value of the buffer solution, recalibrate the meter according to the manufacturer's instructions until the desired reading is obtained. This typically involves accessing and turning a dial or adjustment screw while measuring the pH of the buffer solution. The meter is adjusted until the output agrees with the known solution pH.
5. Repeat Steps 2 through 5 with a pH 4.0 and 10.0 buffer solution to provide a three-point calibration. Standards used to calibrate the pH meter will be of concentrations that bracket the expected values of the samples to be analyzed, especially for two-point calibrations (see note below).

**Note:** Some pH meters only allow two-point calibrations. Two-point calibrations should be within the suspected range of the groundwater to be analyzed. For example, if the groundwater pH is expected to be approximately 8, the two-point calibration should bracket that value. Buffer solutions of 7 and 10 should then be used for the two-point calibration.

6. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample). Information will include, at a minimum:
  - Time, date, and initials of the field team member performing the calibration
  - The unique identifier for the meter, including manufacturer, model, and serial number
  - The brand and expiration dates of buffer solutions
  - The instrument readings
  - The instrument settings (if applicable)

---

## FOP 008.0

### CALIBRATION AND MAINTENANCE OF PORTABLE FIELD pH/Eh METER

---

- Pass or fail designation in accordance with the accuracy specifications presented above
- Corrective action taken (see Maintenance below) in the event of failure to adequately calibrate

#### MAINTENANCE

- When not in use, or between measurements, keep the pH/Eh probe immersed in or moist with buffer solutions.
- Check the meter batteries at the end of each day and recharge or replace as needed.
- Replace the pH/Eh probe any time that the meter response time becomes greater than two minutes or the meter consistently fails to retain its calibrated accuracy for a minimum of ten sample measurements.
- If a replacement of the pH/Eh probe fails to resolve instrument response time and stability problems, obtain a replacement instrument (rental instruments) and/or order necessary repairs/adjustment.

#### ATTACHMENTS

Equipment Calibration Log (sample)



# FOP 008.0

## CALIBRATION AND MAINTENANCE OF PORTABLE FIELD pH/Eh METER



### EQUIPMENT CALIBRATION

#### PROJECT INFORMATION:

Project Name: \_\_\_\_\_

Date: \_\_\_\_\_

Project No.: \_\_\_\_\_

Client: \_\_\_\_\_

Instrument Source: ☐ TK ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTLE
<input type="checkbox"/> pH meter	units		Myron L. Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
						< 0.4		
<input type="checkbox"/> Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		20		
						100		
						800		
<input type="checkbox"/> Sp. conductance meter	uS/mS		Myron L. Company Ultra Meter 6P	606987		uS @ 25 °C		
<input type="checkbox"/> PID	ppm		Photovac 2020 PID			open air zero		MIBK re factor :
						ppm Iso. Gas		
<input type="checkbox"/> Particulate meter	mg/m <sup>3</sup>					zero air		
<input type="checkbox"/> Oxygen	%					open air		
<input type="checkbox"/> Hydrogen sulfide	ppm					open air		
<input type="checkbox"/> Carbon monoxide	ppm					open air		
<input type="checkbox"/> LEL	%					open air		
<input type="checkbox"/> Radiation Meter	uR/h					background area		
<input type="checkbox"/>								

#### ADDITIONAL REMARKS:

PREPARED BY: \_\_\_\_\_

DATE: \_\_\_\_\_





# FIELD OPERATING PROCEDURES

## Calibration and Maintenance of Portable Field Turbidity Meter

**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD TURBIDITY METER**

---

**PURPOSE**

This guideline describes the method for calibration of the HACH 2100P portable field turbidity meter. Turbidity is one water quality parameter measured during purging and development of wells. Turbidity is measured as a function of the samples ability to transmit light, expressed as Nephelometric Turbidity Units (NTUs). The turbidity meter is factory calibrated and must be checked daily prior to using the meter in the field. Calibration is performed to verify instrument accuracy and function. This procedure also documents critical maintenance activities for this meter.

**ACCURACY**

Accuracy shall be  $\pm 2\%$  of reading below 499 NTU or  $\pm 3\%$  of reading above 500 NTU with resolution to 0.01 NTU in the lowest range. The range key provides for automatic or manual range selection for ranges of 0.00 to 9.99, 0.0 to 99.9 and 0 to 1000 NTU. Another key provides for selecting automatic signal averaging. Pressing the key shall toggle signal averaging on or off.

**PROCEDURE**

Calibration of the 2100P Turbidimeter is based on formazin, the primary standard for turbidity. The instrument's electronic and optical design provides long-term stability and minimizes the need for frequent calibration. The two-detector ratioing system compensates for most fluctuations in lamp output. **A formazin recalibration should be performed at least once every three months**, more often if experience indicates the need. During calibration, use a primary standard such as StablCal™ Stabilized Standards or formazin standards.

**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD TURBIDITY METER**

---

**Note:** Meters produced by different manufacturers may have different calibration check procedures. These manufacturers' instructions will take precedence over the procedure provided here. This procedure is intended to be used as a general guideline, or in the absence of available manufacturer's instructions.

**Note:** Because the turbidity meter measures light transmission, it is critical that the meter and standards be cared for as precision optical instruments. Scratches, dirt, dust, etc. can all temporarily or permanently affect the accuracy of meter readings.

**Preparing StablCal Stabilized Standards in Sealed Vials**

Sealed vials that have been sitting undisturbed for longer than a month must be shaken to break the condensed suspension into its original particle size. Start at *step 1* for these standards. If the standards are used on at least a weekly interval, start at *step 3*.

**Note: These instructions do not apply to < 0.1 NTU StablCal Standards; < 0.1 NTU StablCal Standards should not be shaken or inverted.**

1. Shake the standard vigorously for 2-3 minutes to re-suspend any particles.
2. Allow the standard to stand undisturbed for 5 minutes.
3. Gently invert the vial of StablCal 5 to 7 times.
4. Prepare the vial for measurement using traditional preparation techniques. This usually consists of oiling the vial (see *Section 2.3.2 on page 11 of the manual*)



**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD TURBIDITY METER**

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and marking the vial to maintain the same orientation in the sample cell compartment (see *Section 2.3.3 on page 12 of the manual*). This step will eliminate any optical variations in the sample vial.

5. Let the vial stand for one minute. The standard is now ready for use in the calibration procedure.

**Calibration Procedure**

1. Turn the meter on.
2. Shake pre-mixed formazin primary standards in accordance with the above procedure.
3. Wipe the outside of the  $< 0.1$  NTU standard and insert the sample cell in the cell compartment by aligning the orientation mark on the cell with the mark on the front of the cell compartment.
4. Close the lid and press **I/O**.
5. Press the **CAL** button. The **CAL** and **S0** icons will be displayed and the 0 will flash. The four-digit display will show the value of the **S0** standard for the previous calibration. If the blank value was forced to 0.0, the display will be blank. Press the right arrow key ( $\rightarrow$ ) to get a numerical display.
6. Press **READ**. The instrument will count from 60 to 0, read the blank and use it to calculate a correction factor for the 20 NTU standard measurement. If the dilution water is  $\geq 0.5$  NTU, E 1 will appear when the calibration is calculated (see *Section 3.6.2.3 on page 31 of the manual*). The display will automatically increment to the next standard. Remove the sample cell from the cell compartment

**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD TURBIDITY METER**

---

**Note:** The turbidity of the dilution water can be “forced” to zero by pressing → rather than reading the dilution water. The display will show “S0 NTU” and the ↑ key must be pressed to continue with the next standard.

7. Repeat steps 1 through 7 for the 20, 100 and 800 standards.
8. Following the 800 NTU standard calibration, the display will increment back to the **S0** display. Remove the sample cell from the cell compartment.
9. Press **CAL** to accept the calibration. The instrument will return to measurement mode automatically.
10. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample). Information will include, at a minimum:
  - Time, date, and initials of the field team member performing the calibration
  - The unique identifier for the meter, including manufacturer, model, and serial number
  - The brand of calibration standards
  - The instrument readings
  - The instrument settings (if applicable)
  - Pass or fail designation in accordance with the accuracy specifications presented above
  - Corrective action taken (see Maintenance below) in the event of failure to adequately calibrate.

**Note:** Pressing **CAL** completes the calculation of the calibration coefficients. If calibration errors occurred during calibration, error messages will appear after **CAL** is pressed. If **E 1** or **E 2** appear, check the standard preparation and review the calibration; repeat the calibration if necessary. If “**CAL?**” appears, an error may have

**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD TURBIDITY METER**

---

occurred during calibration. If “CAL?” is flashing, the instrument is using the default calibration.

**NOTES**

- If the **I/O** key is pressed during calibration, the new calibration data is lost and the old calibration will be used for measurements. Once in calibration mode, only the **READ**, **I/O**, **↑**, and **→** keys function. Signal averaging and range mode must be selected before entering the calibration mode.
- If **E 1** or **E 2** are displayed, an error occurred during calibration. Check the standard preparation and review the calibration; repeat the calibration if necessary. Press **DIAG** to cancel the error message (**E 1** or **E 2**). To continue without repeating the calibration, press **I/O** twice to restore the previous calibration. If “CAL?” is displayed, an error may have occurred during calibration. The previous calibration may not be restored. Either recalibrate or use the calibration as is.
- To review a calibration, press **CAL** and then **↑** to view the calibration standard values. As long as **READ** is never pressed and **CAL** is not flashing, the calibration will not be updated. Press **CAL** again to return to the measurement mode.

**MAINTENANCE**

- **Cleaning:** Keep the turbidimeter and accessories as clean as possible and store the instrument in the carrying case when not in use. Avoid prolonged exposure to sunlight and ultraviolet light. Wipe spills up promptly. Wash sample cells with non-abrasive laboratory detergent, rinse with distilled or demineralized water, and air dry. Avoid scratching the cells and wipe all moisture and fingerprints off the cells before inserting them into the instrument. Failure to do so can give inaccurate readings. See *Section 2.3.1 on page 11 of the manual* for more information about sample cell care.
- **Battery Replacement:** AA alkaline cells typically last for about 300 tests with the signal-averaging mode off, about 180 tests if signal averaging is used. The “battery” icon flashes when battery replacement is needed. Refer to *Section 1.4.2 on page 5 of the manual* for battery installation instructions. If the batteries are changed within 30

**CALIBRATION AND MAINTENANCE OF PORTABLE  
FIELD TURBIDITY METER**

---

seconds, the instrument retains the latest range and signal average selections. If it takes more than 30 seconds, the instrument uses the default settings. If, after changing batteries, the instrument will not turn off or on and the batteries are good, remove the batteries and reinstall them. If the instrument still won't function, contact Hach Service or the nearest authorized dealer.

- **Lamp Replacement:** The procedure in *Section 4.0 on page 49 of the manual* explains lamp installation and electrical connections. Use a small screwdriver to remove and install the lamp leads in the terminal block. The instrument requires calibration after lamp replacement.

**ATTACHMENTS**

Equipment Calibration Log (sample)

# FOP 009.0

## CALIBRATION AND MAINTENANCE OF PORTABLE FIELD TURBIDITY METER



### EQUIPMENT CALIBRATION

#### PROJECT INFORMATION:

Project Name: \_\_\_\_\_  
Project No.: \_\_\_\_\_  
Client: \_\_\_\_\_

Date: \_\_\_\_\_

Instrument Source: ☐ TK ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTLE
<input type="checkbox"/> pH meter	units		Myron L. Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
						< 0.4		
<input type="checkbox"/> Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		20		
						100		
						800		
<input type="checkbox"/> Sp. conductance meter	uS/mS		Myron L. Company Ultra Meter 6P	606987		uS @ 25 °C		
<input type="checkbox"/> PID	ppm		Photovac 2020 PID			open air zero		MIBK re factor :
						ppm Iso. Gas		
<input type="checkbox"/> Particulate meter	mg/m <sup>3</sup>					zero air		
<input type="checkbox"/> Oxygen	%					open air		
<input type="checkbox"/> Hydrogen sulfide	ppm					open air		
<input type="checkbox"/> Carbon monoxide	ppm					open air		
<input type="checkbox"/> LEL	%					open air		
<input type="checkbox"/> Radiation Meter	uR/h					background area		
<input type="checkbox"/>								

#### ADDITIONAL REMARKS:

PREPARED BY: \_\_\_\_\_

DATE: \_\_\_\_\_





# FIELD OPERATING PROCEDURES

## Calibration and Maintenance of Portable Photoionization Meter

**CALIBRATION AND MAINTENANCE OF PORTABLE  
PHOTOIONIZATION DETECTOR**

---

**PURPOSE**

This procedure describes a general method for the calibration and maintenance of a portable photoionization detector (PID). The PID detects and initially quantifies a reading of the volatile organic compound (VOC) concentration in air. The PID is used as a field-screening tool for initial evaluation of soil samples and for ambient air monitoring of compounds with ionization potentials (IP) less than the PID lamp electron voltage (eV) rating. The IP is the amount of energy required to move an electron to an infinite distance from the nucleus thus creating a positive ion plus an electron. It should be noted that all of the major components of air (i.e., carbon dioxide, methane, nitrogen, oxygen etc.) have IP's above 12 eV. As a result, they will not be ionized by the 9.5, 10.2, 10.6 or 11.7 eV lamps typically utilized in field PIDs. The response of the PID will then be the sum of the organic and inorganic compounds in air that are ionized by the appropriate lamp (i.e., 9.5, 10.2, 10.6 or 11.7 eV). Attached to this FOP is a table summarizing common organic compounds and their respective IPs.

Calibration is performed to verify instrument accuracy and function. All field instruments will be calibrated, verified and recalibrated at frequencies required by their respective operating manuals or manufacturer's specifications, but not less than once each day that the instrument is in use. Field personnel should have access to all operating manuals for the instruments used for the field measurements. This procedure also documents critical maintenance activities for this meter.

**Note:** The information included below is equipment manufacturer- and model-specific, however, accuracy, calibration, and maintenance procedures for this type of portable



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## FOP 011.0

### CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

---

equipment are typically similar. The information below pertains to the Photovac 2020 photoionization detector equipped with a 10.6 eV lamp. The actual equipment to be used in the field will be equivalent or similar. The previously mentioned attached table indicates the compounds that cannot be detected by a standard 10.6 eV lamp.

**Note:** The PID indicates total VOC concentration readings that are normalized to an isobutylene standard, so actual quantification of individual compounds is not provided. In addition, the PID response to compounds is highly variable, dependent on ionization potential of the compound, and the presence or absence of other compounds.

#### ACCURACY

The Photovac 2020 is temperature compensated so that a 20 °C change in temperature corresponds to a change in reading of less than two percent full-scale at maximum sensitivity. The useful range of the instrument is from 0.5 – 2000 ppm isobutylene with an accuracy of  $\pm 10\%$  or  $\pm 2$  ppm. Response time is less than three seconds to 90 percent of full-scale. The operating temperature range is 0 to 40° C and the operating humidity range is 0 to 100 % relative humidity (non-condensing).

#### PROCEDURE

1. Calibrate all field test equipment at the beginning of each sampling day. Check and recalibrate the PID according to the manufacture's specifications.
2. Calibrate the PID meter using a compressed gas cylinder containing a 100-ppm isobutylene standard, a flow regulator, and a tubing assembly. In





**CALIBRATION AND MAINTENANCE OF PORTABLE  
PHOTOIONIZATION DETECTOR**

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addition, a compressed gas cylinder containing zero air (“clean” air) may be required if ambient air conditions do not permit calibration to “clean air”.

3. Fill two Tedlar bags equipped with a one-way valve with zero-air (if applicable) and 100-ppm isobutylene gas.
4. Assemble the calibration equipment and actuate the PID in its calibration mode. Connect the PID probe to the zero air calibration bag (or calibrate to ambient air if conditions permit) and wait for a stable indication.
5. Change the response factor of the PID to the Methyl Isobutyl Ketone (MIBK) setting, which is a response factor of 1.0 for the Photovac 2020.
6. Connect the PID probe to the 100-ppm isobutylene standard calibration bag. Measure an initial reading of the isobutylene standard and wait for a stable indication.
7. Keep the PID probe connected to the 100-ppm isobutylene standard calibration bag, calibrate to 100-ppm with the isobutylene standard and wait for a stable indication.
8. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample), indicating the meter readings before and after the instrument has been adjusted. This is important, not only for data validation, but also to establish maintenance schedules and component replacement. Information will include, at a minimum:
  - Time, date and initials of the field team member performing the calibration
  - The unique identifier for the meter, including manufacturer, model, and serial number
  - The brand and expiration date of the isobutylene gas
  - The instrument readings: before and after calibration
  - The instrument settings (if applicable)

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## FOP 011.0

### CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

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- Pass or fail designation in accordance with the accuracy specifications presented above
- Corrective action taken (see Maintenance below) in the event of failure to adequately calibrate.

#### MAINTENANCE

- The probe and dust filter of the PID should be checked before and after every use for cleanliness. Should instrument response become unstable, recalibration should be performed. If this does not resolve the problem, access the photoionization bulb and clean with the manufacturer-supplied abrasive compound, then recalibrate.
- The PID battery must be recharged after each use. Store the PID in its carrying case when not in use. Additional maintenance details related to individual components of the PID are provided in the equipment manufacturer's instruction manual. If calibration or instrument performance is not in accordance with specifications, send the instrument to the equipment manufacturer for repair.
- Maintain a log for each monitoring instrument. Record all maintenance performed on the instrument on this log with date and name of the organization performing the maintenance.

#### ATTACHMENTS

Table 1; Summary of Ionization Potentials  
Equipment Calibration Log (sample)



## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
<b>A</b>		
2-Amino pyridine	8	
Acetaldehyde	10.21	
Acetamide	9.77	
Acetic acid	10.69	X
Acetic anhydride	10	
Acetone	9.69	
Acetonitrile	12.2	X
Acetophenone	9.27	
Acetyl bromide	10.55	
Acetyl chloride	11.02	X
Acetylene	11.41	X
Acrolein	10.1	
Acrylamide	9.5	
Acrylonitrile	10.91	X
Allyl alcohol	9.67	
Allyl chloride	9.9	
Ammonia	10.2	
Aniline	7.7	
Anisidine	7.44	
Anisole	8.22	
Arsine	9.89	
<b>B</b>		
1,3-Butadiene (butadiene)	9.07	
1-Bromo-2-chloroethane	10.63	X
1-Bromo-2-methylpropane	10.09	
1-Bromo-4-fluorobenzene	8.99	
1-Bromobutane	10.13	
1-Bromopentane	10.1	
1-Bromopropane	10.18	
1-Bromopropene	9.3	
1-Butanethiol	9.14	
1-Butene	9.58	
1-Butyne	10.18	
2,3-Butadione	9.23	
2-Bromo-2-methylpropane	9.89	
2-Bromobutane	9.98	
2-Bromopropane	10.08	

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
2-Bromothiophene	8.63	
2-Butanone (MEK)	9.54	
3-Bromopropene	9.7	
3-Butene nitrile	10.39	
Benzaldehyde	9.53	
Benzene	9.25	
Benzenethiol	8.33	
Benzonitrile	9.71	
Benzotrifluoride	9.68	
Biphenyl	8.27	
Boron oxide	13.5	X
Boron trifluoride	15.56	X
Bromine	10.54	
Bromobenzene	8.98	
Bromochloromethane	10.77	X
Bromoform	10.48	
Butane	10.63	X
Butyl mercaptan	9.15	
cis-2-Butene	9.13	
m-Bromotoluene	8.81	
n-Butyl acetate	10.01	
n-Butyl alcohol	10.04	
n-Butyl amine	8.71	
n-Butyl benzene	8.69	
n-Butyl formate	10.5	
n-Butyraldehyde	9.86	
n-Butyric acid	10.16	
n-Butyronitrile	11.67	X
o-Bromotoluene	8.79	
p-Bromotoluene	8.67	
p-tert-Butyltoluene	8.28	
s-Butyl amine	8.7	
s-Butyl benzene	8.68	
sec-Butyl acetate	9.91	
t-Butyl amine	8.64	
t-Butyl benzene	8.68	
trans-2-Butene	9.13	
<b>C</b>		

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
1-Chloro-2-methylpropane	10.66	X
1-Chloro-3-fluorobenzene	9.21	
1-Chlorobutane	10.67	X
1-Chloropropane	10.82	X
2-Chloro-2-methylpropane	10.61	X
2-Chlorobutane	10.65	X
2-Chloropropane	10.78	X
2-Chlorothiophene	8.68	
3-Chloropropene	10.04	
Camphor	8.76	
Carbon dioxide	13.79	X
Carbon disulfide	10.07	
Carbon monoxide	14.01	X
Carbon tetrachloride	11.47	X
Chlorine	11.48	X
Chlorine dioxide	10.36	
Chlorine trifluoride	12.65	X
Chloroacetaldehyde	10.61	X
$\alpha$ -Chloroacetophenone	9.44	
Chlorobenzene	9.07	
Chlorobromomethane	10.77	X
Chlorofluoromethane (Freon 22)	12.45	X
Chloroform	11.37	X
Chlorotrifluoromethane (Freon 13)	12.91	X
Chrysene	7.59	
Cresol	8.14	
Crotonaldehyde	9.73	
Cumene (isopropyl benzene)	8.75	
Cyanogen	13.8	X
Cyclohexane	9.8	
Cyclohexanol	9.75	
Cyclohexanone	9.14	
Cyclohexene	8.95	
Cyclo-octatetraene	7.99	
Cyclopentadiene	8.56	
Cyclopentane	10.53	
Cyclopentanone	9.26	
Cyclopentene	9.01	

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
Cyclopropane	10.06	
m-Chlorotoluene	8.83	
o-Chlorotoluene	8.83	
p-Chlorotoluene	8.7	
<b>D</b>		
1,1-Dibromoethane	10.19	
1,1-Dichloroethane	11.12	X
1,1-Dimethoxyethane	9.65	
1,1-Dimethylhydrazine	7.28	
1,2-Dibromoethene	9.45	
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	12.2	X
1,2-Dichloroethane	11.12	X
1,2-Dichloropropane	10.87	X
1,3-Dibromopropane	10.07	
1,3-Dichloropropane	10.85	X
2,2-Dimethyl butane	10.06	
2,2-Dimethyl propane	10.35	
2,3-Dichloropropene	9.82	
2,3-Dimethyl butane	10.02	
3,3-Dimethyl butanone	9.17	
cis-Dichloroethene	9.65	
Decaborane	9.88	
Diazomethane	9	
Diborane	12	X
Dibromochloromethane	10.59	
Dibromodifluoromethane	11.07	X
Dibromomethane	10.49	
Dibutylamine	7.69	
Dichlorodifluoromethane (Freon 12)	12.31	X
Dichlorofluoromethane	12.39	X
Dichloromethane	11.35	X
Diethoxymethane	9.7	
Diethyl amine	8.01	
Diethyl ether	9.53	
Diethyl ketone	9.32	
Diethyl sulfide	8.43	
Diethyl sulfite	9.68	
Difluorodibromomethane	11.07	X

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
Dihydropyran	8.34	
Diiodomethane	9.34	
Diisopropylamine	7.73	
Dimethoxymethane (methylal)	10	
Dimethyl amine	8.24	
Dimethyl ether	10	
Dimethyl sulfide	8.69	
Dimethylaniline	7.13	
Dimethylformamide	9.18	
Dimethylphthalate	9.64	
Dinitrobenzene	10.71	X
Dioxane	9.19	
Diphenyl	7.95	
Dipropyl amine	7.84	
Dipropyl sulfide	8.3	
Durene	8.03	
m-Dichlorobenzene	9.12	
N,N-Diethyl acetamide	8.6	
N,N-Diethyl formamide	8.89	
N,N-Dimethyl acetamide	8.81	
N,N-Dimethyl formamide	9.12	
o-Dichlorobenzene	9.06	
p-Dichlorobenzene	8.95	
p-Dioxane	9.13	
trans-Dichloroethene	9.66	
<b>E</b>		
Epichlorohydrin	10.2	
Ethane	11.65	X
Ethanethiol (ethyl mercaptan)	9.29	
Ethanolamine	8.96	
Ethene	10.52	
Ethyl acetate	10.11	
Ethyl alcohol	10.48	
Ethyl amine	8.86	
Ethyl benzene	8.76	
Ethyl bromide	10.29	
Ethyl chloride (chloroethane)	10.98	X
Ethyl disulfide	8.27	

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
Ethyl ether	9.51	
Ethyl formate	10.61	X
Ethyl iodide	9.33	
Ethyl isothiocyanate	9.14	
Ethyl mercaptan	9.29	
Ethyl methyl sulfide	8.55	
Ethyl nitrate	11.22	X
Ethyl propionate	10	
Ethyl thiocyanate	9.89	
Ethylene chlorohydrin	10.52	
Ethylene diamine	8.6	
Ethylene dibromide	10.37	
Ethylene dichloride	11.05	X
Ethylene oxide	10.57	
Ethylenimine	9.2	
Ethynylbenzene	8.82	
<b>F</b>		
2-Furaldehyde	9.21	
Fluorine	15.7	X
Fluorobenzene	9.2	
Formaldehyde	10.87	X
Formamide	10.25	
Formic acid	11.05	X
Freon 11 (trichlorofluoromethane)	11.77	X
Freon 112 (1,1,2,2-tetrachloro-1,2-difluoroethane)	11.3	X
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	11.78	X
Freon 114 (1,2-dichloro-1,1,2,2-tetrafluoroethane)	12.2	X
Freon 12 (dichlorodifluoromethane)	12.31	X
Freon 13 (chlorotrifluoromethane)	12.91	X
Freon 22 (chlorofluoromethane)	12.45	X
Furan	8.89	
Furfural	9.21	
m-Fluorotoluene	8.92	
o-Fluorophenol	8.66	
o-Fluorotoluene	8.92	
p-Fluorotoluene	8.79	
<b>H</b>		
1-Hexene	9.46	



## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
2-Heptanone	9.33	
2-Hexanone	9.35	
Heptane	10.08	
Hexachloroethane	11.1	X
Hexane	10.18	
Hydrazine	8.1	
Hydrogen	15.43	X
Hydrogen bromide	11.62	X
Hydrogen chloride	12.74	X
Hydrogen cyanide	13.91	X
Hydrogen fluoride	15.77	X
Hydrogen iodide	10.38	
Hydrogen selenide	9.88	
Hydrogen sulfide	10.46	
Hydrogen telluride	9.14	
Hydroquinone	7.95	
<b>I</b>		
1-Iodo-2-methylpropane	9.18	
1-Iodobutane	9.21	
1-Iodopentane	9.19	
1-Iodopropane	9.26	
2-Iodobutane	9.09	
2-Iodopropane	9.17	
Iodine	9.28	
Iodobenzene	8.73	
Isobutane	10.57	
Isobutyl acetate	9.97	
Isobutyl alcohol	10.12	
Isobutyl amine	8.7	
Isobutyl formate	10.46	
Isobutyraldehyde	9.74	
Isobutyric acid	10.02	
Isopentane	10.32	
Isophorone	9.07	
Isoprene	8.85	
Isopropyl acetate	9.99	
Isopropyl alcohol	10.16	
Isopropyl amine	8.72	

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
Isopropyl benzene	8.69	
Isopropyl ether	9.2	
Isovaleraldehyde	9.71	
m-Iodotoluene	8.61	
o-Iodotoluene	8.62	
p-Iodotoluene	8.5	
<b>K</b>		
Ketene	9.61	
<b>L</b>		
2,3-Lutidine	8.85	
2,4-Lutidine	8.85	
2,6-Lutidine	8.85	
<b>M</b>		
2-Methyl furan	8.39	
2-Methyl naphthalene	7.96	
1-Methyl naphthalene	7.96	
2-Methyl propene	9.23	
2-Methyl-1-butene	9.12	
2-Methylpentane	10.12	
3-Methyl-1-butene	9.51	
3-Methyl-2-butene	8.67	
3-Methylpentane	10.08	
4-Methylcyclohexene	8.91	
Maleic anhydride	10.8	X
Mesityl oxide	9.08	
Mesitylene	8.4	
Methane	12.98	X
Methanethiol (methyl mercaptan)	9.44	
Methyl acetate	10.27	
Methyl acetylene	10.37	
Methyl acrylate	9.9	
Methyl alcohol	10.85	X
Methyl amine	8.97	
Methyl bromide	10.54	
Methyl butyl ketone	9.34	
Methyl butyrate	10.07	
Methyl cellosolve	9.6	
Methyl chloride	11.28	X

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
Methyl chloroform (1,1,1-trichloroethane)	11	X
Methyl disulfide	8.46	
Methyl ethyl ketone	9.53	
Methyl formate	10.82	X
Methyl iodide	9.54	
Methyl isobutyl ketone	9.3	
Methyl isobutyrate	9.98	
Methyl isocyanate	10.67	X
Methyl isopropyl ketone	9.32	
Methyl isothiocyanate	9.25	
Methyl mercaptan	9.44	
Methyl methacrylate	9.7	
Methyl propionate	10.15	
Methyl propyl ketone	9.39	
$\alpha$ -Methyl styrene	8.35	
Methyl thiocyanate	10.07	
Methylal (dimethoxymethane)	10	
Methylcyclohexane	9.85	
Methylene chloride	11.32	X
Methyl-n-amyl ketone	9.3	
Monomethyl aniline	7.32	
Monomethyl hydrazine	7.67	
Morpholine	8.2	
n-Methyl acetamide	8.9	
<b>N</b>		
1-Nitropropane	10.88	X
2-Nitropropane	10.71	X
Naphthalene	8.12	
Nickel carbonyl	8.27	
Nitric oxide, (NO)	9.25	
Nitrobenzene	9.92	
Nitroethane	10.88	X
Nitrogen	15.58	X
Nitrogen dioxide	9.78	
Nitrogen trifluoride	12.97	X
Nitromethane	11.08	X
Nitrotoluene	9.45	
p-Nitrochloro benzene	9.96	

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
<b>O</b>		
Octane	9.82	
Oxygen	12.08	X
Ozone	12.08	X
<b>P</b>		
1-Pentene	9.5	
1-Propanethiol	9.2	
2,4-Pentanedione	8.87	
2-Pentanone	9.38	
2-Picoline	9.02	
3-Picoline	9.02	
4-Picoline	9.04	
n-Propyl nitrate	11.07	X
Pentaborane	10.4	
Pentane	10.35	
Perchloroethylene	9.32	
Pheneloic	8.18	
Phenol	8.5	
Phenyl ether (diphenyl oxide)	8.82	
Phenyl hydrazine	7.64	
Phenyl isocyanate	8.77	
Phenyl isothiocyanate	8.52	
Phenylene diamine	6.89	
Phosgene	11.77	X
Phosphine	9.87	
Phosphorus trichloride	9.91	
Phthalic anhydride	10	
Propane	11.07	X
Propargyl alcohol	10.51	
Propiolactone	9.7	
Propionaldehyde	9.98	
Propionic acid	10.24	
Propionitrile	11.84	X
Propyl acetate	10.04	
Propyl alcohol	10.2	
Propyl amine	8.78	
Propyl benzene	8.72	
Propyl ether	9.27	

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
Propyl formate	10.54	
Propylene	9.73	
Propylene dichloride	10.87	X
Propylene imine	9	
Propylene oxide	10.22	
Propyne	10.36	
Pyridine	9.32	
Pyrrole	8.2	
<b>Q</b>		
Quinone	10.04	
<b>S</b>		
Stibine	9.51	
Styrene	8.47	
Sulfur dioxide	12.3	X
Sulfur hexafluoride	15.33	X
Sulfur monochloride	9.66	
Sulfuryl fluoride	13	X
<b>T</b>		
o-Terphenyls	7.78	
1,1,2,2-Tetrachloro-1,2-difluoroethane (Freon 112)	11.3	X
1,1,1-Trichloroethane	11	X
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	11.78	X
2,2,4-Trimethyl pentane	9.86	
o-Toluidine	7.44	
Tetrachloroethane	11.62	X
Tetrachloroethene	9.32	
Tetrachloromethane	11.47	X
Tetrahydrofuran	9.54	
Tetrahydropyran	9.25	
Thiolacetic acid	10	
Thiophene	8.86	
Toluene	8.82	
Tribromoethene	9.27	
Tribromofluoromethane	10.67	X
Tribromomethane	10.51	
Trichloroethene	9.45	
Trichloroethylene	9.47	
Trichlorofluoromethane (Freon 11)	11.77	X

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR

TABLE 1

### SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
Trichloromethane	11.42	X
Triethylamine	7.5	
Trifluoromonobromo-methane	11.4	X
Trimethyl amine	7.82	
Tripropyl amine	7.23	
<b>V</b>		
o-Vinyl toluene	8.2	
Valeraldehyde	9.82	
Valeric acid	10.12	
Vinyl acetate	9.19	
Vinyl bromide	9.8	
Vinyl chloride	10	
Vinyl methyl ether	8.93	
<b>W</b>		
Water	12.59	X
<b>X</b>		
2,4-Xylidine	7.65	
m-Xylene	8.56	
o-Xylene	8.56	
p-Xylene	8.45	

# FOP 011.0

## CALIBRATION AND MAINTENANCE OF PORTABLE PHOTOIONIZATION DETECTOR



### EQUIPMENT CALIBRATION

#### PROJECT INFORMATION:

Project Name: \_\_\_\_\_

Date: \_\_\_\_\_

Project No.: \_\_\_\_\_

Client: \_\_\_\_\_

Instrument Source: ☐ TK ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTLE
<input type="checkbox"/> pH meter	units		Myron L. Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
						< 0.4		
<input type="checkbox"/> Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		20		
						100		
						800		
<input type="checkbox"/> Sp. conductance meter	uS/mS		Myron L. Company Ultra Meter 6P	606987		uS @ 25 °C		
<input type="checkbox"/> PID	ppm		Photovac 2020 PID			open air zero		MIBK re
						ppm Iso. Gas		factor :
<input type="checkbox"/> Particulate meter	mg/m <sup>3</sup>					zero air		
<input type="checkbox"/> Oxygen	%					open air		
<input type="checkbox"/> Hydrogen sulfide	ppm					open air		
<input type="checkbox"/> Carbon monoxide	ppm					open air		
<input type="checkbox"/> LEL	%					open air		
<input type="checkbox"/> Radiation Meter	uR/h					background area		
<input type="checkbox"/>								

#### ADDITIONAL REMARKS:

PREPARED BY: \_\_\_\_\_

DATE: \_\_\_\_\_





# FIELD OPERATING PROCEDURES

## Calibration and Maintenance of Portable Specific Conductance Meter



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## FOP 012.0

### CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

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#### PURPOSE

This guideline describes a method for calibration of a portable specific conductance meter. This meter measures the ability of a water sample to conduct electricity, which is largely a function of the dissolved solids within the water. The instrument has been calibrated by the manufacturer according to factory specifications. This guideline presents a method for checking the factory calibration of a portable specific conductance meter. A calibration check is performed to verify instrument accuracy and function. All field test equipment will be checked at the beginning of each sampling day. This procedure also documents critical maintenance activities for this meter.

#### ACCURACY

The calibrated accuracy of the specific conductance meter will be within  $\pm 1$  percent of full-scale, with repeatability of  $\pm 1$  percent. The built-in cell will be automatically temperature compensated from at least 32° to 160° F (0° to 71°C).

#### PROCEDURE

**Note:** The information included below is equipment manufacturer- and model-specific, however, accuracy, calibration, and maintenance procedures for this type of portable equipment are typically similar. The information below pertains to the Myron L Company Ultrameter Model 6P. The actual equipment to be used in the field will be equivalent or similar.



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## FOP 012.0

### CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

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1. Calibrate all field test equipment at the beginning of each sampling day. Check and recalibrate the specific conductance meter according to the manufacture's specifications.
2. Use a calibration solution of known specific conductivity and salinity. For maximum accuracy, use a Standard Solution Value closest to the samples to be tested.
3. Rinse conductivity cell three times with proper standard.
4. Re-fill conductivity cell with same standard.
5. Press **COND** or **TDS**, then press **CAL/MCLR**. The "CAL" icon will appear on the display.
6. Press the **↑/MS** or **MR/↓** key to step the displayed value toward the standard's value or hold a key down to cause rapid scrolling of the reading.
7. Press **CAL/MCLR** once to confirm new value and end the calibration sequence for this particular solution type.
8. Repeat steps 1 through 7 with additional new solutions, as necessary.
9. Document the calibration results and related information in the Project Field Book and on an **Equipment Calibration Log** (see attached sample), indicating the meter readings before and after the instrument has been adjusted. This is important, not only for data validation, but also to establish maintenance schedules and component replacement. Information will include, at a minimum:
  - Time, date and initials of the field team member performing the calibration
  - The unique identifier for the meter, including manufacturer, model, and serial number
  - The brand and expiration date of the calibration standards
  - The instrument readings: before and after calibration

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## FOP 012.0

### CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

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- The instrument settings (if applicable)
- The overall adequacy of calibration including the Pass or fail designation in accordance with the accuracy specifications presented above.
- Corrective action taken (see Maintenance below) in the event of failure to adequately calibrate.

#### MAINTENANCE

**NOTE:** Ultrameters should be rinsed with clean water after use. Solvents should be avoided. Shock damage from a fall may cause instrument failure.

#### Temperature Extremes

Solutions in excess of 160°F/71°C should not be placed in the cell cup area; this may cause damage. Care should be exercised not to exceed rated operating temperature. Leaving the Ultrameter in a vehicle or storage shed on a hot day can easily subject the instrument to over 150°F voiding the warranty.

#### Battery Replacement

**Dry Instrument THOROUGHLY.** Remove the four bottom screws. Open instrument carefully; it may be necessary to rock the bottom slightly side to side to release it from the RS-232 connector. Carefully detach battery from circuit board. Replace with 9-volt alkaline battery. Replace bottom, ensuring the sealing gasket is installed in the groove of the top half of case. Re-install screws, tighten evenly and securely.



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## FOP 012.0

### CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

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**NOTE:** Because of nonvolatile EEPROM circuitry, all data stored in memory and all calibration settings are protected even during power loss or battery replacement.

#### Cleaning Sensors

The conductivity cell cup should be kept as clean as possible. Flushing with clean water following use will prevent buildup on electrodes. However, if very dirty samples — particularly scaling types — are allowed to dry in the cell cup, a film will form. This film reduces accuracy. When there are visible films of oil, dirt, or scale in the cell cup or on the electrodes, use a foaming non-abrasive household cleaner. Rinse out the cleaner and your Ultrameter is ready for accurate measurements.

**NOTE:** Maintain a log for each monitoring instrument. Record all maintenance performed on the instrument on this log with date and name of the organization performing the maintenance.

#### ATTACHMENTS

Equipment Calibration Log (sample)



# FOP 012.0

## CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER



### EQUIPMENT CALIBRATION

#### PROJECT INFORMATION:

Project Name: \_\_\_\_\_  
Project No.: \_\_\_\_\_  
Client: \_\_\_\_\_

Date: \_\_\_\_\_

Instrument Source: ☐ TK ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	READING	SETTLE
<input type="checkbox"/> pH meter	units		Myron L. Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
						< 0.4		
<input type="checkbox"/> Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		20		
						100		
						800		
<input type="checkbox"/> Sp. conductance meter	uS/mS		Myron L. Company Ultra Meter 6P	606987		uS @ 25 °C		
<input type="checkbox"/> PID	ppm		Photovac 2020 PID			open air zero		MIBK re
						ppm Iso. Gas		factor :
<input type="checkbox"/> Particulate meter	mg/m <sup>3</sup>					zero air		
<input type="checkbox"/> Oxygen	%					open air		
<input type="checkbox"/> Hydrogen sulfide	ppm					open air		
<input type="checkbox"/> Carbon monoxide	ppm					open air		
<input type="checkbox"/> LEL	%					open air		
<input type="checkbox"/> Radiation Meter	uR/h					background area		
<input type="checkbox"/>								

#### ADDITIONAL REMARKS:

PREPARED BY: \_\_\_\_\_

DATE: \_\_\_\_\_





# FIELD OPERATING PROCEDURES

## Documentation Requirements for Drilling and Well Installation

**DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL  
INSTALLATION**

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**PURPOSE**

The purpose of these documentation requirements is to document the procedures used for drilling and installing wells in order to ensure the quality of the data obtained from these operations. TurnKey field technical personnel will be responsible for developing and maintaining documentation for quality control of field operations. At least one field professional will monitor each major operation (e.g. one person per drilling rig) to document and record field procedures for quality control. These procedures provide a description of the format and information for this documentation.

**PROCEDURE**

**Project Field Book**

Personnel assigned by the TurnKey Field Team Leader or Project Manager will maintain a Project Field Book for all site activities. These Field Books will be started upon initiation of any site activities to document the field investigation process. The Field Books will meet the following criteria:

- Permanently bound, with nominal 8.5-inch by 11-inch gridded pages.
- Water resistant paper.
- Pages must be pre-numbered or numbered in the field, front and back.

Notations in the field book will be in black or blue ink that will not smudge when wet. Information that may be recorded in the Field Book includes:

- Time and date of all entries.



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## FOP 015.0

### DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL INSTALLATION

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- Name and location of project site and project job number.
- Listing of key project, client and agency personnel and telephone numbers.
- Date and time of daily arrivals and departures, name of person keeping the log, names and affiliation of persons on site, purpose of visit (if applicable), weather conditions, outline of project activities to be completed.
- Details of any variations to the procedures/protocols (i.e., as presented in the Work Plan or Field Operating Procedures) and the basis for the change.
- Field-generated data relating to implementation of the field program, including sample locations, sample descriptions, field measurements, instrument calibration, etc.
- Record of all photographs taken in the field, including date, time, photographer, site location and orientation, sequential number of photograph, and roll number.

Upon completion of the site activities, all Field Books will be photocopied and both the original and photocopied versions placed in the project files. In addition, all field notes except those presented on specific field forms will be neatly transcribed into Field Activity Daily Log (FADL) forms (sample attached).

#### **Field Borehole/Monitoring Well Installation Log Form**

Examples of the Field Borehole Log and Field Borehole/Monitoring Well Installation Log forms are attached to this Field Operating Procedure. One form will be completed for every boring by the TurnKey field person overseeing the drilling. At a minimum, these forms will include:

- Project name, location, and number.
- Boring number.





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## FOP 015.0

### DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL INSTALLATION

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- Rig type and drilling method.
- Drilling dates.
- Sampling method.
- Sample descriptions, to meet the requirements of the Unified Soil Classification System (USCS) for soils and the Unified Rock Classification System (URCS) for rock.
- Results of photoionization evaluations (scan and/or headspace determinations).
- Blow counts for sampler penetration (Standard Penetration Test, N-Value).
- Drilling rate, rig chatter, and other drilling-related information, as necessary.

All depths recorded on Boring/Monitoring Well Installation Log forms will be expressed in increments tenths of feet, and not in inches.

#### **Well Completion Detail Form**

An example of this form is attached to this Field Operating Procedure. One form will be completed for every boring by the TurnKey field person overseeing the well installation. At a minimum, these forms will include:

- Project name, location, and number.
- Well number.
- Installation dates.
- Dimensions and depths of the various well components illustrated in the Well Completion Detail (attached). These include the screened interval, bottom caps or plugs, centralizers, and the tops and bottoms of the various annular materials.



**DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL  
INSTALLATION**

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- Drilling rate, rig chatter, and other drilling related information.

All depths recorded on Field Borehole/Monitoring Well Installation Logs will be expressed in tenths of feet, and not in inches.

**Daily Drilling Report Form**

An example of this form is attached to this Field Operating Procedure. This form should be used to summarize all drilling activities. One form should be completed for each rig for each day. These forms will include summaries of:

- Footage drilled, broken down by diameter (e.g. 200 feet of 6-inch diameter hole, 50 feet of 10-inch diameter hole).
- Footage of well and screen installed, broken down by diameter.
- Quantities of materials used, including sand, cement, bentonite, centralizers, protective casings, traffic covers, etc. recorded by well or boring location.
- Active time (hours), and activity (drilling, decontamination, development, well installation, surface completions, etc.)
- Down-time (hours) and reason.
- Mobilizations and other events.
- Other quantities that will be the basis for drilling invoices.

The form should be signed daily by both the TurnKey field supervisor and the driller's representative, and provided to the TurnKey Field Team Leader.

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## FOP 015.0

### DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL INSTALLATION

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#### ***Other Project Field Forms***

Well purging/well development forms, test pit logs, environmental sampling field data sheets, water level monitoring forms, and well testing (slug test or pumping test) forms. Refer to specific guidelines for form descriptions.

#### **ATTACHMENTS**

- Field Activity Daily Log (FADL) (sample)
- Field Borehole Log (sample)
- Field Borehole/Monitoring Well Installation Log (sample)
- Stick-up Well/Piezometer Completion Detail (sample)
- Flush-mount Well/Piezometer Completion Detail (sample)
- Daily Drilling Report (sample)



## FOP 015.0

# DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL INSTALLATION



DAILY LOG	DATE			
	NO.			
	SHEET		OF	

### FIELD ACTIVITY DAILY LOG

PROJECT NAME:		PROJECT NO.	
PROJECT LOCATION:		CLIENT:	
FIELD ACTIVITY SUBJECT:			
<b>DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:</b>			
TIME	DESCRIPTION		
<div style="position: absolute; top: 50%; left: 50%; transform: translate(-50%, -50%) rotate(-45deg); opacity: 0.3; font-size: 100px; pointer-events: none;">SAMPLE</div>			
VISITORS ON SITE:		CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:	
WEATHER CONDITIONS:		IMPORTANT TELEPHONE CALLS:	
A.M.:			
P.M.:			
BM/TK PERSONNEL ON SITE:			
SIGNATURE		DATE:	



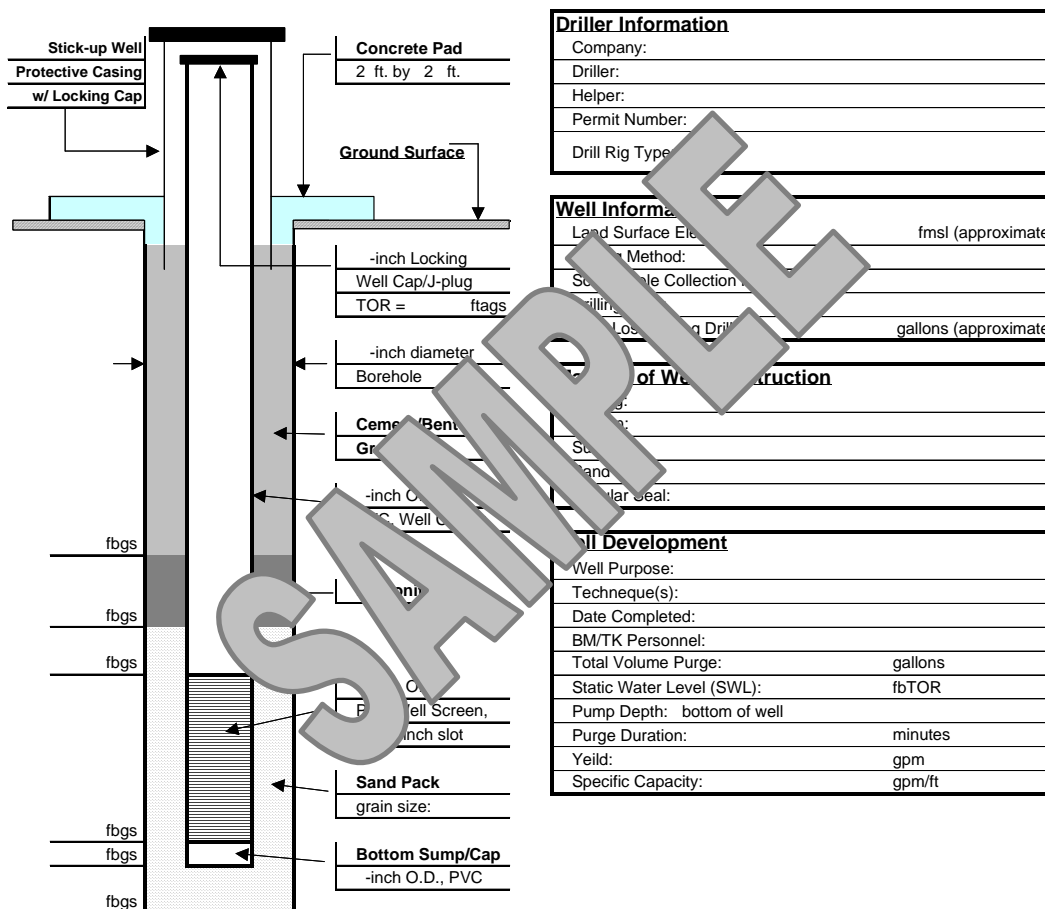


## DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL INSTALLATION

[illegible]

## STICK-UP MONITORING WELL COMPLETION DETAIL

Project Name:	WELL NUMBER:
Client:	Date Installed:
Boring Location:	Project Number:



Comments:	saturated thickness:	SWL - stickup =	fbgs
Total Depth =	fbTOR	Total Depth - SWL =	feet
stick-up =	feet		
Total Depth =	fbgs		

PREPARED BY: \_\_\_\_\_ DATE: \_\_\_\_\_

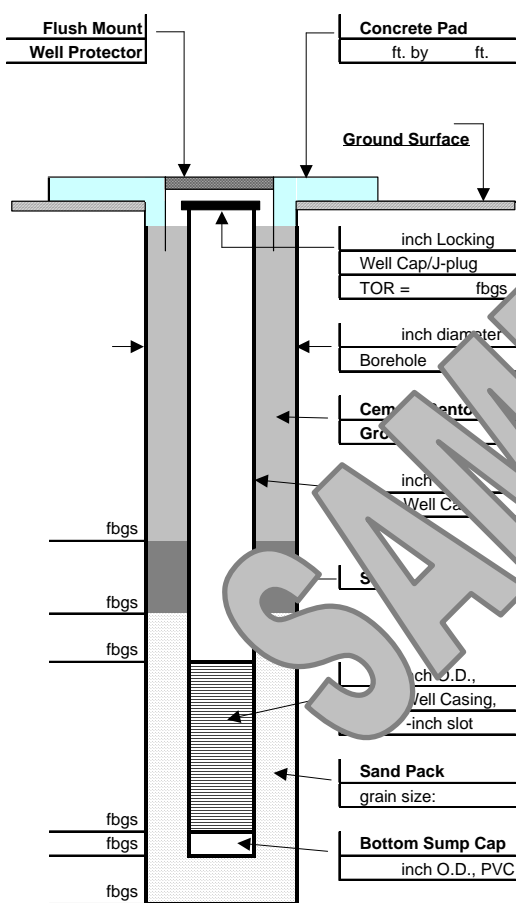
# FOP 015.0

## DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL INSTALLATION



### FLUSHMOUNT WELL/PIEZOMETER COMPLETION DETAIL

Project Name: \_\_\_\_\_ WELL NUMBER: \_\_\_\_\_  
 Client: \_\_\_\_\_ Date Installed: \_\_\_\_\_  
 Boring Location: \_\_\_\_\_ Project Number: \_\_\_\_\_



Driller Information	
Company:	
Driller:	
Helper:	
Permit Number:	
Drill Rig Type:	

Well Information	
Land Surface Elevation:	fmsl (approximate)
Method:	
Soil Sample Collection Method:	
Well Depth:	gallons (approximate)

Method of Well Construction	
Method:	
Surface:	
Ground:	
Seal:	

Well Development	
Well Purpose:	
Technique(s):	
Date Completed:	
BM/TK Personnel:	
Total Volume Purge:	gallons
Static Water Level:	fbTOR
Pump Depth:	
Purge Duration:	minutes
Yield:	gpm
Specific Capacity:	gpm/ft

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 PREPARED BY: \_\_\_\_\_ DATE: \_\_\_\_\_









# FIELD OPERATING PROCEDURES

## Drill Site Selection Procedure

**DRILL SITE SELECTION PROCEDURE**

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**PURPOSE**

This procedure presents a method for selecting a site location for drilling. Drill site selection should be based on the project objectives, ease of site access, freedom from obstructions and buried metallic objects (drums) and site safety (appropriate set backs from overhead and buried services).

**PROCEDURE**

The following procedure outlines procedures prior to drilling activities:

1. Review project objectives and tentatively select drilling locations that provide necessary information for achieving objectives (i.e., Work Plan).
2. Clear locations with property owner/operator to ensure that drilling activities will not interfere with site operations and select appropriate access routes.
3. Stake locations in the field, measure distance from locations to recognizable landmarks, such as building or fence lines and plot locations on site plan. Ensure location is relatively flat, free of overhead wires and readily accessible. Survey location if property ownership is in doubt.
4. Obtain clearances from appropriate utilities and if buried waste/metallic objects are suspected, screen location with appropriate geophysical method.
5. Establish a secure central staging area for storage of drilling supplies and for equipment decontamination. Locate a secure storage area for drilling samples, as necessary.

**ATTACHMENTS**

none





# FIELD OPERATING PROCEDURES

## Drilling & Excavation Equipment Decontamination Procedures

**DRILLING AND EXCAVATION EQUIPMENT  
DECONTAMINATION PROCEDURES**

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**PURPOSE**

This procedure is to be used for the decontamination of drilling and excavation equipment (i.e., drill rigs, backhoes, augers, drill bits, drill rods, buckets, and associated equipment) used during a subsurface investigation. The purpose of this procedure is to remove chemical constituents associated with a particular drilling or excavation location from this equipment. This prevents these constituents from being transferred between drilling or excavation locations, or being transported out of controlled areas.

**PROCEDURE**

The following procedure will be utilized prior to the use of drilling or excavation equipment at each location, and prior to the demobilization of such equipment from the site:

1. Remove all loose soil and other particulate materials from the equipment at the survey site.
2. Wrap augers, tools, plywood, and other reusable items with a plastic cover prior to transport from the site of use to the decontamination facility.
3. Transport equipment to the decontamination facility. All equipment must be decontaminated at an established decontamination facility. This facility will be placed within a controlled area, and will be equipped with necessary features to contain and collect wash water and entrained materials.
4. Wash equipment thoroughly with pressurized low-volume water or steam, supplied by a pressure washer or steam cleaner.
5. If necessary, use a brush or scraper to remove visible soils adhering to the equipment, and a non-phosphate detergent to remove any oils, grease, and/or hydraulic fluids adhering to the equipment. Continue pressure washing until all visible contaminants are removed.

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## FOP 018.0

### DRILLING AND EXCAVATION EQUIPMENT DECONTAMINATION PROCEDURES

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6. Allow equipment to air dry.
7. Store equipment in a clean area or wrap the equipment in new plastic sheeting as necessary to ensure cleanliness until ready for use.
8. Manage all wash waters and entrained solids as described in the TurnKey Field Operating Procedure for Management of Investigation-Derived Waste.

#### ATTACHMENTS

none





# FIELD OPERATING PROCEDURES

## Establishing Horizontal and Vertical Control

**ESTABLISHING HORIZONTAL AND VERTICAL CONTROL**

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**PURPOSE**

This guideline presents a method for establishing horizontal and vertical controls at a project site. It is imperative that this procedure be performed accurately, as all topographic and site maps, monitoring well locations and test pit locations will be based on these controls.

**PROCEDURE**

**A. Establishing Horizontal Primary and Project Control**

1. Research the State Plan Coordinate, USGS or project site applicable horizontal control monuments.
2. At the project site, recover the above-mentioned monuments, two markers minimum being recovered.
3. Establish control points on the project site by bringing in the primary control points recovered in the field.
4. All control points will be tied into a closed traverse to assure the error of closure.
5. Compute closures for obtaining degree of accuracy to adjust traverse points.

**B. Establishing Vertical Primary and Project Control**

1. Research project or USGS datum for recovering monument(s) for vertical control if different than those previously found.
2. Recover the monuments in the field, two markers minimum being found.
3. Set the projects benchmarks.
4. Run a level line from the monuments to the set project benchmarks and back, setting turning points on all benchmarks set on site.



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## FOP 021.0

### ESTABLISHING HORIZONTAL AND VERTICAL CONTROL

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5. Reduce field notes and compute error of closure to adjust benchmarks set on site.
6. Prepare the recovery sketches and tabulate a list for horizontal and vertical control throughout project site.





# FIELD OPERATING PROCEDURES

## Groundwater Level Measurement

**GROUNDWATER LEVEL MEASUREMENT**

---

**PURPOSE**

This procedure describes the methods used to obtain accurate and consistent water level measurements in monitoring wells, piezometers and well points. Water levels will be measured at monitoring wells and, if practicable, in supply wells to estimate purge volumes associated with sampling, and to develop a potentiometric surface of the groundwater in order to estimate the direction and velocity of flow in the aquifer. Water levels in monitoring wells will be measured using an electronic water level indicator (e-line) that has been checked for operation prior to mobilization.

**PROCEDURE**

1. Decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the TurnKey's Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.
2. Unlock and remove the well protective cap or cover and place on clean plastic.
3. Lower the probe slowly into the monitoring well until the audible alarm sounds. This indicates the depth to water has been reached.
4. Move the cable up and down slowly to identify the depth at which the alarm just begins to sound. Measure this depth against the mark on the lip of the well riser used as a surveyed reference point (typically the north side of the riser).
5. Read depth from the graduated cable to the nearest 0.01 foot. Do not use inches. If the e-line is not graduated, use a rule or tape measure graduated in 0.01-foot increments to measure from the nearest reference mark on the e-line cable.

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## FOP 022.0

### GROUNDWATER LEVEL MEASUREMENT

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6. Record the water level on a Water Level Monitoring Record (sample attached).
7. Remove the probe from the well slowly, drying the cable and probe with a clean paper wipe. Be sure to repeat decontamination before use in another well.
8. Replace well plug and protective cap or cover. Lock in place as appropriate.

#### ATTACHMENTS

Water Level Monitoring Record (sample)

#### REFERENCES

TurnKey FOPs:

040 *Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*



## GROUNDWATER LEVEL MEASUREMENT

[illegible]

**TURNKEY**  
ENVIRONMENTAL  
RESTORATION, LLC



# FIELD OPERATING PROCEDURES

## Groundwater Sample Collection Procedures

**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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**PURPOSE**

This procedure describes the methods for collecting groundwater samples from monitoring wells and domestic supply wells following purging and sufficient recovery. This procedure also includes the preferred collection order in which water samples are collected based on the volatilization sensitivity or suite of analytical parameters required.

**PROCEDURE**

Allow approximately 3 to 10 days following well development before performing purge and sample activities at any well location. Conversely, perform sampling as soon as practical after sample purging at any time after the well has recovered sufficiently to sample, or within 24 hours after evacuation, if the well recharges slowly. If the well does not yield sufficient volume for all required laboratory analytical testing (including quality control), a decision should be made to prioritize analyses based on contaminants of concern at the site. If the well takes longer than 24 hours to recharge, the Project Manager should be consulted. The following two procedures outline sample collection activities for monitoring and domestic type wells.

**Monitoring Wells**

1. Purge the monitoring well in accordance with the Benchmark FOPs for Groundwater Purging Procedures Prior to Sample Collection or Low Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedures. Perform sampling as soon as practical after purging at any time after the well has recovered sufficiently to sample, or within 24 hours after evacuation, if the well recharges slowly. If the well does not yield sufficient volume for all required laboratory analytical testing (including quality control), a decision should be made to prioritize analyses based on contaminants of concern at the site. Analyses will be prioritized in the order of the parameters volatilization sensitivity. After volatile organics have been collected, field parameters

**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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must be measured from the next sample collected. If a well takes longer than 24 hours to recharge, the Project Manager should be consulted.

2. Sampling equipment that is not disposable or dedicated to the well will be decontaminated in accordance with the Benchmark Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.
3. Calibrate all field meters (i.e., pH/Eh, turbidity, specific conductance, dissolved oxygen, PID etc.) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of the specific field meter.
4. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Benchmark Field Operating Procedure for Groundwater Level Measurement and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark Field Operating Procedure for Non-disposable and Non-dedicated Sampling Equipment Decontamination. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.
5. Inspect the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Field Form (sample attached). Specifically, inspect the integrity of the following: concrete surface seal, lock, protective casing and well cover, well casing and J-plug/cap. Report any irregular findings to the Project Manager.
6. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.
7. Calibrate the photoionization detector (PID) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of Portable Photoionization Detector.
8. Monitor the well for organic vapors using a PID, as per the Work Plan. If a reading of greater than 5 ppm is recorded, the well should be allowed to vent until levels drop below 5 ppm before proceeding with purging. Record PID measurements on a well-specific Groundwater Field Form (sample attached).



**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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9. Lower the e-line probe slowly into the monitoring well and record the measurement on a well-specific Groundwater Field Form (sample attached).
10. Groundwater samples will be collected directly from the sampling valve on the flow through cell (low-flow), discharge port of a standard pump assembly (peristaltic, pneumatic, submersible, or Waterra™ pump) or bailer (stainless steel, PVC or polyethylene) into appropriate laboratory provided containers. In low-yielding wells at which the flow through cell is not used, the samples may be collected using a disposable bailer.
11. If disposable polyethylene bailers are used, the bailer should be lowered *slowly* below the surface of the water to minimize agitation and volatilization. For wells that are known to produce turbid samples (values greater than 50 NTU), the bailer should be lowered and retrieved at a rate that limits surging of the well.
12. Sampling data will be recorded on a Groundwater Field Form (sample attached).
13. Pre-label all sample bottles in the field using a waterproof permanent marker in accordance with the Benchmark Sample Labeling, Storage and Shipment FOP. The following information, at a minimum, should be included on the label:
  - Project Number;
  - Sample identification code (as per project specifications);
  - Date of sample collection (mm, dd, yy);
  - Time of sample collection (military time only) (hh:mm);
  - Specify “grab” or “composite” sample type;
  - Sampler initials;
  - Preservative(s) (if applicable); and
  - Analytes for analysis (if practicable).
14. Collect a separate sample of approximately 200 ml into an appropriate container prior to collecting the first and following the last groundwater sample collected to measure the following field parameters:

Parameter	Units
Dissolved Oxygen	parts per million (ppm)

**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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Specific Conductance	$\mu\text{mhos/cm}$ or $\mu\text{S}$ or $\text{mS}$
pH	pH units
Temperature	$^{\circ}\text{C}$ or $^{\circ}\text{F}$
Turbidity	NTU
Eh ( <i>optional</i> )	mV
PID VOCs ( <i>optional</i> )	ppm

Record all field measurements on a Groundwater Field Form (sample attached).

15. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated in the **Sample Collection Order** section below.
16. Lower the e-line probe slowly into the monitoring well and record the measurement on a well-specific Groundwater Field Form (sample attached).
17. The samples will be labeled, stored and shipped in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

**Domestic Supply Wells**

1. Calculate or estimate the volume of water in the well. It is desirable to purge at least one casing volume before sampling. This is controlled, to some extent, by the depth of the well, well yield and the rate of the existing pump. If the volume of water in the well cannot be calculated, the well should be purged continuously for no less than 15 minutes.
2. Connect a sampling tap to an accessible fitting between the well and the pressure tank where practicable. A hose will be connected to the device and the hose discharge located 25 to 50 feet away. The well will be allowed to pump until the lines and one well volume is removed. Flow rate will be measured with a container of known volume and a stopwatch.

## GROUNDWATER SAMPLE COLLECTION PROCEDURES

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3. Place a clean piece of polyethylene or Teflon™ tubing on the sampling port and collect the samples in the order designated below and in the sample containers supplied by the laboratory for the specified analytes. **DO NOT** use standard garden hose to collect samples.
4. Sampling results and measurements will be recorded on a Groundwater Field Form (sample attached) as described in the previous section.
5. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated in the **Sample Collection Order** section below.
6. The samples will be labeled, stored and shipped in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

### SAMPLE COLLECTION ORDER

All groundwater samples, from monitoring wells and domestic supply wells, will be collected in accordance with the following.

1. Samples will be collected preferentially in recognition of volatilization sensitivity. The preferred order of sampling if no free product is present is:
  - Field parameters
  - Volatile Organic Compounds (VOCs)
  - Purgeable organic carbons (POC)
  - Purgeable organic halogens (POH)
  - Total Organic Halogens (TOX)
  - Total Organic Carbon (TOC)
  - Extractable Organic Compounds (i.e., BNAs, SVOCs, etc.)
  - Total petroleum hydrocarbons (TPH) and oil and grease
  - PCBs and pesticides
  - Total metals (Dissolved Metals)
  - Total Phenolic Compounds

**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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- Cyanide
  - Sulfate and Chloride
  - Turbidity
  - Nitrate (as Nitrogen) and Ammonia
  - Preserved inorganics
  - Radionuclides
  - Unpreserved inorganics
  - Bacteria
  - Field parameters
2. Document the sampling procedures and related information in the Project Field Book and on a Groundwater Field Form (sample attached).

**DOCUMENTATION**

The three words used to ensure adequate documentation for groundwater sampling are accountability, controllability, and traceability. Accountability is undertaken in the sampling plan and answers the questions who, what, where, when, and why to assure that the sampling effort meets its goals. Controllability refers to checks (including QA/QC) used to ensure that the procedures used are those specified in the sampling plan. Traceability is documentation of what was done, when it was done, how it was done, and by whom it was done, and is found in the field forms, Project Field Book, and chain-of-custody forms. At a minimum, adequate documentation of the sampling conducted in the field consists of an entry in the Project Field Book (with sewn binding), field data sheets for each well, and a chain-of-custody form.

As a general rule, if one is not sure whether the information is necessary, it should nevertheless be recorded, as it is impossible to over-document one's fieldwork. Years may go by before the documentation comes under close scrutiny, so the documentation must be

**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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capable of defending the sampling effort without the assistance or translation of the sampling crew.

The minimum information to be recorded daily with an indelible pen in the Project Field Book and/or field data sheets includes date and time(s), name of the facility, name(s) of the sampling crew, site conditions, the wells sampled, a description of how the sample shipment was handled, and a QA/QC summary. After the last entry for the day in the Project Field Book, the Field Team Leader should sign the bottom of the page under the last entry and then draw a line across the page directly under the signature.

**PRECAUTIONS/RECOMMENDATIONS**

The following precautions should be adhered to prior to and during sample collection activities:

- Field vehicles should be parked downwind (to avoid potential sample contamination concerns) at a minimum of 15 feet from the well and the engine turned off prior to PID vapor analysis and VOC sample collection.
- Ambient odors, vehicle exhaust, precipitation, or windy/dusty conditions can potentially interfere with obtaining representative samples. These conditions should be minimized and should be recorded in the field notes. Shield sample bottles from strong winds, rain, and dust when being filled.
- The outlet from the sampling device should discharge below the top of the sample's air/water interface, when possible. The sampling plan should specify how the samples will be transferred from the sample collection device to the sample container to minimize sample alterations.

**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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- The order of sampling should be from the least contaminated to the most contaminated well to reduce the potential for cross contamination of sampling equipment (see the Sampling Plan or Work Plan).
- Samples should not be transferred from one sampling container to another.
- Sampling equipment must not be placed on the ground, because the ground may be contaminated and soil contains trace metals. Equipment and supplies should be removed from the field vehicle only when needed.
- Smoking and eating should not be allowed until the well is sampled and hands are washed with soap and water, due to safety and possibly sample contamination concerns. These activities should be conducted beyond a 15-foot radius of the well.
- No heat-producing or electrical instruments should be within 15 feet of the well, unless they are intrinsically safe, prior to PID vapor analysis.
- Minimize the amount of time that the sample containers remain open.
- Do not touch the inside of sample bottles or the groundwater sample as it enters the bottle. Disposable gloves may be a source of phthalates, which could be introduced into groundwater samples if the gloves contact the sample.
- Sampling personnel should use a new pair of disposable gloves for each well sampled to reduce the potential for exposure of the sampling personnel to contaminants and to reduce sample cross contamination. In addition, sampling personnel should change disposable gloves between purging and sampling operations at the same well.
- Sampling personnel should not use perfume, insect repellent, hand lotion, etc., when taking groundwater samples. If insect repellent must be used, then sampling personnel should not allow samples or sampling equipment

**GROUNDWATER SAMPLE COLLECTION PROCEDURES**

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to contact the repellent, and it should be noted in the documentation that insect repellent was used.

- Complete the documentation of the well. A completed assemblage of paperwork for a sampling event includes the completed field forms, entries in the Project Field Book (with a sewn binding), transportation documentation (if required), and possibly chain-of-custody forms.

**ATTACHMENTS**

Groundwater Field Form (sample)

**REFERENCES**

1. Wilson, Neal. *Soil Water and Ground Water Sampling*, 1995

Benchmark FOPs:

- 007 *Calibration and Maintenance of Portable Dissolved Oxygen Meter*
- 008 *Calibration and Maintenance of Portable Field pH/Eh Meter*
- 009 *Calibration and Maintenance of Portable Field Turbidity Meter*
- 011 *Calibration and Maintenance of Portable Photoionization Detector*
- 012 *Calibration and Maintenance of Portable Specific Conductance Meter*
- 022 *Groundwater Level Measurement*
- 023 *Groundwater Purging Procedures Prior to Sample Collection (optional)*
- 031 *Low Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedures (optional)*
- 040 *Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*
- 046 *Sample Labeling, Storage and Shipment Procedures*

## GROUNDWATER SAMPLE COLLECTION PROCEDURES



## GROUNDWATER FIELD FORM

Project Name: \_\_\_\_\_

Date: \_\_\_\_\_

Location: \_\_\_\_\_

Project No.: \_\_\_\_\_

Field Team: \_\_\_\_\_

<b>Well No.</b>			Diameter (inches):			Sample Time:			
Product Depth (ft/TOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (ft/TOR):			Casing Volume:			Purpose: <input type="checkbox"/> Development <input type="checkbox"/> Sampling			
Total Depth (ft/TOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (ft/TOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
0	Initial								
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
<b>Sample Information:</b>									
	S1								
	S2								

<b>Well No.</b>			Diameter (inches):			Sample Time:			
Product Depth (ft/TOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (ft/TOR):			Casing Volume:			Purpose: <input type="checkbox"/> Development <input type="checkbox"/> Sampling			
Total Depth (ft/TOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (ft/TOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
0	Initial								
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
<b>Sample Information:</b>									
	S1								
	S2								

## REMARKS:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Note: All measurements are in feet, distance from top of riser.

## Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

## Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY: \_\_\_\_\_







# FIELD OPERATING PROCEDURES

## Hollow Stem Auger (HSA) Drilling Procedures

**HOLLOW STEM AUGER (HSA) DRILLING PROCEDURES**

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**PURPOSE**

This guideline presents a method for drilling a borehole through unconsolidated materials, including soils or overburden, and consolidated materials, including bedrock.

**PROCEDURE**

The following procedure will be used to drill a borehole for sampling and/or well installation, using hollow-stem auger methods and equipment.

1. Follow TurnKey's Field Operating Procedure for Drill Site Selection Procedure prior to implementing any drilling activity.
2. Perform drill rig safety checks with the driller by completing the Drilling Safety Checklist form (sample attached).
3. Conduct tailgate health and safety meeting with project team and drillers by completing the Tailgate Safety Meeting Form.
4. Calibrate air-monitoring equipment in accordance with the appropriate Benchmark's Field Operating Procedures (i.e., PID, FID, combustible gas meter) or manufacturer's recommendations for calibration of field meters (i.e., DataRAM 4 Particulate Meter).
5. Ensure all drilling equipment (i.e., augers, rods, split-spoons) appear clean and free of soil prior to initiating any subsurface intrusion. Decontamination of drilling equipment should be in accordance with TurnKey's FOP: Drilling and Excavation Equipment Decontamination Procedures.
6. Mobilize the auger rig to the site and position over the borehole.
7. Level and stabilize the rig using the rig jacks, and recheck the rig location against the planned drilling location. If necessary, raise the jacks and adjust the rig position.

**HOLLOW STEM AUGER (HSA) DRILLING PROCEDURES**

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8. Place a metal or plywood auger pan over the borehole location to collect the auger cuttings. This auger pan will be equipped with a 12-inch nominal diameter hole for auger passage. As an alternative, a piece of polyethylene tarp may be used as a substitute.
9. Advance augers into the subsurface. For sampling or pilot-hole drilling, nominal 8-inch outside diameter (OD) augers should be used. The boring diameter will be approved by the TurnKey field supervisor.
10. Collect soil samples via split spoon sampler in accordance with TurnKey's Field Operating Procedure for Split Spoon Sampling.
11. Check augers periodically during drilling to ensure the boring is plumb. Adjust rig position as necessary to maintain plumb.
12. Continue drilling until reaching the assigned total depth, or until auger refusal occurs. Auger refusal is when the drilling penetration drops below 0.1 feet per 10 minutes, with the full weight of the rig on the auger bit, and a center bit (not center plug) in place.
13. Plug and abandon boreholes not used for well installation in accordance with TurnKey's Field Operating Procedure for Abandonment of Borehole.

**OTHER PROCEDURAL ISSUES**

- Slip rings may be used for lifting a sampling or bit string. The string will not be permitted to extend more than 15 feet above the mast crown.
- Borings will not be over drilled (rat holed) without the express permission of the TurnKey field supervisor. All depth measurements should be accurate to the nearest 0.1 foot, to the extent practicable.
- Potable water may be placed in the auger stem if critically necessary for borehole control or to accomplish sampling objectives and must be approved by the TurnKey Project Manager and/or NYSDEC Project Manager. Upon approval,

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## FOP 026.1

### HOLLOW STEM AUGER (HSA) DRILLING PROCEDURES

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the potable water source and quantity used will be documented in the Project Field Book and subsequent report submittal.

#### ATTACHMENTS

Drilling Safety Checklist (sample)  
Tailgate Safety Meeting Form (sample)

#### REFERENCES

TurnKey FOPs:

- 001 *Abandonment of Borehole Procedures*
- 010 *Calibration and Maintenance of Portable Flame Ionization Detector*
- 011 *Calibration and Maintenance of Portable Photoionization Detector*
- 017 *Drill Site Selection Procedure*
- 018 *Drilling and Excavation Equipment Decontamination Procedures*
- 058 *Split Spoon Sampling Procedures*



## FOP 026.1

### HOLLOW STEM AUGER (HSA) DRILLING PROCEDURES



#### DRILLING SAFETY CHECKLIST

Project:

Date:

Project No.:

Drilling Company:

Client:

Drill Rig Type:

ITEMS TO CHECK	OK	ACTION NEEDED
"Kill switches" installed by the manufacturer are in operable condition and all workers at the drill site are familiar with their location and how to activate them?		
"Kill switches" are accessible to workers on both sides of the rotating stem? NOTE: Optional based on location and number of switches provided by the manufacturer.		
Cables on drill rig are free of kinks, frayed wires, "bird cages" and worn or missing sections?		
Cables are terminated at the working end with a proper eye splice, either swaged Coupling or using cable clamps?		
Cable clamps are installed with the saddle on the live or load side? Clamps should not be alternated and should be of the correct size and number for the cable size to which it is installed. Clamps are complete with no missing parts?		
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation?		
Safety latches are functional and completely span the entire throat of the hook and have positive action to close the throat except when manually displaced for connecting or disconnecting a load?		
Drive shafts, belts, chain drives and universal joints shall be guarded to prevent accidental insertion of hands and fingers or tools.		
Outriggers shall be extended prior to and whenever the boom is raised off its cradle. Hydraulic outriggers must maintain pressure to continuously support and stabilize the drill rig even while unattended.		
Outriggers shall be properly supported on the ground surface to prevent settling into the soil.		
Controls are properly labeled and have freedom of movement? Controls should not be blocked or locked in an action position.		
Safeties on any device shall not be bypassed or neutralized.		
Controls shall be operated smoothly and cables and lifting devices shall not be jerked or operated erratically to overcome resistance.		
Slings, chokers and lifting devices are inspected before using and are in proper working order? Damaged units are removed from service and are properly tagged?		
Shackles and clevises are in proper working order and pins and screws are fully inserted before placing under a load?		
High-pressure hoses have a safety (chain, cable or strap) at each end of the hose section to prevent whipping in the event of a failure?		
Rotating parts of the drill string shall be free of sharp projections or hooks, which could entrap clothing or foreign objects?		



## FOP 026.1

### HOLLOW STEM AUGER (HSA) DRILLING PROCEDURES



#### DRILLING SAFETY CHECKLIST

Project: \_\_\_\_\_

Date: \_\_\_\_\_

ITEMS TO CHECK	OK	ACTION NEEDED
Wire ropes should not be allowed to bend around sharp edges without cushion material.		
The exclusion zone is centered over the borehole and the radius is equal or greater than the boom height?		
The work area around the borehole shall be kept clear of trip hazards and walking surfaces should be free of slippery material.		
Workers shall not proceed higher than the drilling deck without a fall restraining device and must attach the device in a manner to restrict fall to less than 6 feet.		
A fire extinguisher of appropriate size shall be immediately available to the drill crew. The drill crew shall have received annual training on proper use of the fire extinguisher.		
29 CFR 1910.333 © (3) Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to, under, by, or near power lines only in accordance with the following:  .333 © (3) (ii) 50 kV or less - minimum clearance is 10 ft. For 50 kV or over - 10ft. Plus ½ in. For each additional kV <b>TurnKey Policy: Maintain 20 feet clearance</b>		
29 CFR 1910.333 © (3) (iii) While the rig is in transit with the boom in the down position, clearance from energized power lines will be maintained as follows:  Less than 50 kV - 4 feet 50 to 365 kV - 10 feet 365 to 720 kV - 16 feet		

Name: \_\_\_\_\_ (printed)

Signed: \_\_\_\_\_ Date: \_\_\_\_\_



## FOP 026.1

### HOLLOW STEM AUGER (HSA) DRILLING PROCEDURES



#### TAILGATE SAFETY MEETING FORM

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_  
Project Number: \_\_\_\_\_ Client: \_\_\_\_\_  
Work Activities: \_\_\_\_\_

#### HOSPITAL INFORMATION:

Name: \_\_\_\_\_  
Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone No.: \_\_\_\_\_ Ambulance Phone No. \_\_\_\_\_

#### SAFETY TOPICS PRESENTED:

Chemical Hazards: \_\_\_\_\_  
\_\_\_\_\_  
Physical Hazards: Slips, Trips, Falls  
\_\_\_\_\_

#### PERSONAL PROTECTIVE EQUIPMENT:

Activity:	PPE Level:	A	B	C	D
Activity:	PPE Level:	A	B	C	D
Activity:	PPE Level:	A	B	C	D
Activity:	PPE Level:	A	B	C	D
Activity:	PPE Level:	A	B	C	D

New Equipment: \_\_\_\_\_

Other Safety Topic (s): Environmental Hazards (aggressive fauna)  
Eating, drinking, use of tobacco products is prohibited in the Exclusion Zone (EZ)

#### ATTENDEES

Name Printed	Signatures
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting conducted by: \_\_\_\_\_





# FIELD OPERATING PROCEDURES

## Low-Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedure



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## FOP 031.1

### LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

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#### PURPOSE

This procedure describes the methods used for performing low flow (minimal drawdown) purging, also referred to as micro-purging, at a well prior to groundwater sampling to obtain a representative sample from the water-bearing zone. This method of purging is used to minimize the turbidity of the produced water. This may increase the representativeness of the groundwater samples by avoiding the necessity of filtering suspended solids in the field prior to preservation of the sample.

Well purging is typically performed immediately preceding groundwater sampling. The sample should be collected as soon as the parameters measured in the field (i.e., pH, specific conductance, dissolved oxygen, Eh, temperature, and turbidity) have stabilized.

#### PROCEDURE

Allow approximately 3 to 10 days following well development for groundwater to return to static conditions before performing low-flow purge and sample activities at any well location. Conversely, perform low-flow sampling as soon as purged groundwater has stabilized. If the well does not yield sufficient volume (i.e., cannot maintain a constant water level during purging) for low-flow purge and sampling, then an alternative method must be performed in accordance with TurnKey's Groundwater Purging Procedures Prior to Sample Collection FOP.

1. Water samples should not be taken immediately following well development. Sufficient time should be allowed to stabilize the groundwater flow regime in the vicinity of the monitoring well. This lag time will depend on site conditions and methods of installation but may exceed one week.



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## FOP 031.1

### LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

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2. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Benchmark's Groundwater Level Measurement FOP and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.
3. Calibrate all sampling devices and monitoring equipment in accordance with manufacturer's recommendations, the site Quality Assurance Project Plan (QAPP) and/or Field Sampling Plan (FSP). Calibration of field instrumentation should be followed as specified in Benchmark's Calibration and Maintenance FOP for each individual meter.
4. Inspect the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Field Form (sample attached). Specifically, inspect the integrity of the following: concrete surface seal, lock, protective casing and well cover, well casing and J-plug/cap. Report any irregular findings to the Project Manager.
5. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.
6. Monitor the well for organic vapors using a PID, as per the Work Plan. If a reading of greater than 5 ppm is recorded, the well should be allowed to vent until levels drop below 5 ppm before proceeding with purging.
7. Lower the e-line probe slowly into the monitoring well and record the initial water level in accordance with the procedures referenced in Benchmark's Groundwater Level Measurement FOP. Refer to the construction diagram for the well to identify the screened depth.
8. Decontaminate all non-dedicated pump and tubing equipment following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP.

**LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER  
PURGING & SAMPLING PROCEDURES**

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9. Lower the purge pump or tubing (i.e., low-flow electrical submersible, peristaltic, etc.) slowly into the well until the pump/tubing intake is approximately in the middle of the screened interval. Rapid insertion of the pump will increase the turbidity of well water, and can increase the required purge time. This step can be eliminated if dedicated tubing is already within the well.

Placement of the pump close to the bottom of the well will cause increased entrainment of solids, which may have settled in the well over time. Low-flow purging has the advantage of minimizing mixing between the overlying stagnant casing water and water within the screened interval. The objective of low-flow purging is to maintain a purging rate, which minimizes stress (drawdown) of the water level in the well. Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen.

10. Lower the e-line back down the well as water levels will be frequently monitored during purge and sample activities.
11. Begin pumping to purge the well. The pumping rate should be between 100 and 500 milliliters (ml) per minute (0.03 to 0.13 gallons per minute) depending on site hydrogeology. Periodically check the well water level with the e-line adjusting the flow rate as necessary to stabilize drawdown within the well. If possible, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 feet or less). If the water level exceeds 2 feet below static and declining, slow the purge rate until the water level generally stabilizes. Record each pumping rate and water level during the event.

The low flow rate determined during purging will be maintained during the collection of analytical samples. At some sites where geologic heterogeneities are sufficiently different within the screened interval, high conductivity zones may be preferentially sampled.

**LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER  
PURGING & SAMPLING PROCEDURES**

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12. Measure and record field parameters (pH, specific conductance, Eh, dissolved oxygen (DO), temperature, and turbidity) during purging activities. In lieu of measuring all of the parameters, a minimum subset could be limited to pH, specific conductance, and turbidity or DO. A reduction in the field parameter list must be approved by the Project Manager and/or the NYSDEC Project Manager.

Water quality indicator parameters should be used to determine purging needs prior to sample collection in each well. Stabilization of indicator parameters should be used to determine when formation water is first encountered during purging. In general, the order of stabilization is pH, temperature, and specific conductance, followed by Eh, DO and turbidity. Performance criteria for determination of stabilization should be based on water-level drawdown, pumping rate and equipment specifications for measuring indicator parameters. An in-line flow through cell to continuously measure the above parameters may be used. The in-line device should be disconnected or bypassed during sample collection.

13. Purging will continue until parameters of water quality have stabilized. Record measurements for field indicator parameters (including water levels) at regular intervals during purging. The stability of these parameters with time can be used to guide the decision to discontinue purging. Proper adjustments must be made to stabilize the flow rate as soon as possible.
14. Record well purging and sampling data in the Project Field Book or on the Groundwater Field Form (sample attached). Measurements should be taken approximately every three to five minutes, or as merited given the rapidity of change.
15. Purging is complete when field indicator parameters stabilize. Stabilization is achieved after all field parameters have stabilized for three successive readings. Three successive readings should be within  $\pm 0.1$  units for pH,  $\pm 3\%$  for specific conductance,  $\pm 10$  mV for Eh, and  $\pm 10\%$  for turbidity and dissolved oxygen. These stabilization guidelines are provided for rough estimates only,

**LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER  
PURGING & SAMPLING PROCEDURES**

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actual site-specific knowledge may be used to adjust these requirements higher or lower.

An in-line water quality measurement device (e.g., flow-through cell) should be used to establish the stabilization time for several field parameters on a well-specific basis. Data on pumping rate, drawdown and volume required for parameter stabilization can be used as a guide for conducting subsequent sampling activities.

16. Collect all project-required samples from the discharge tubing at the flow rate established during purging in accordance with Benchmark's Groundwater Sample Collection Procedures FOP. **If a peristaltic pump and dedicated tubing is used, collect all project-required samples from the discharge tubing as stated before, however volatile organic compounds should be collected in accordance with the procedure presented in the next section.** Continue to maintain a constant flow rate such that the water level is not drawn down as described above. Fill sample containers with minimal turbulence by allowing the ground water to flow from the tubing along the inside walls of the container.
17. If field filtration is recommended as a result of increased turbidity greater than 50 NTU, an in-line filter equipped with a 0.45-micron filter should be utilized. Collection of a filtered sample must be accompanied by an unfiltered sample.
18. Replace the dedicated tubing down the well taking care to avoid contact with the ground surface.
19. Restore the well to its capped/covered and locked condition.
20. Upon purge and sample collection completion, slowly lower the e-line to the bottom of the well/piezometer. Record the total depth to the nearest 0.01-foot and compare to the previous total depth measurement. If a significant discrepancy exists, re-measure the total depth. Record observations of purge water to determine whether the well/piezometer had become silted due to inactivity or damaged (i.e., well sand within purge water). Upon confirmation

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## FOP 031.1

### LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

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of the new total depth and determination of the cause (i.e., siltation or damage), notify the Project Manager following project field activities.

#### PERISTALTIC PUMP VOC SAMPLE COLLECTION PROCEDURE

The collection of VOCs from a peristaltic pump and dedicated tubing assembly shall be collected using the following procedure.

1. Once all other required sample containers have been filled, turn off the peristaltic pump. The negative pressure effects of the pump head have not altered groundwater remaining within the dedicated tubing assembly and as such, this groundwater can be collected for VOC analysis.
2. While maintaining the pressure on the flexible tubing within the pump head assembly, carefully remove and coil the polyethylene tubing from the well; taking care to prevent the tubing from coming in contact with the ground surface and without allowing groundwater to escape or drain from the tubing intake.
3. Once the polyethylene tubing is removed, turn the variable speed control to zero and reverse the pump direction.
4. Slowly increase the pump rate allowing the groundwater within the polyethylene tubing to be “pushed” out of the intake end (i.e., positive displacement) making sure the groundwater within the tubing is not “pulled” through the original discharge end (i.e., negative displacement). Groundwater pulled through the pump head assembly CANNOT be collected for VOC analysis.
5. Slowly fill each VOC vial by holding the vial at a 45-degree angle and allowing the flowing groundwater to cascade down the side until the vial is filled with as minimal disturbance as possible. As the vial fills, slowly rotate the vial to vertical. **DO NOT OVERFILL THE VIAL, AS THE PRESERVATIVE WILL BE LOST.** The vial should be filled only enough so that the water creates a slight meniscus at the vial mouth.

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## FOP 031.1

### LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

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6. Cap the VOC vials leaving no visible headspace (i.e., air-bubbles). Gently tap each vial against your hand checking for air bubbles.
7. If an air bubble is observed, slowly remove the cap and repeat Steps 5 and 6.

#### ATTACHMENTS

Groundwater Field Form (sample)

#### REFERENCES

United States Environmental Protection Agency, 540/S-95/504, 1995. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*.

#### Benchmark FOPs:

- 007 *Calibration and Maintenance of Portable Dissolved Oxygen Meter*
- 008 *Calibration and Maintenance of Portable Field pH/Eh Meter*
- 009 *Calibration and Maintenance of Portable Field Turbidity Meter*
- 011 *Calibration and Maintenance of Portable Photoionization Detector*
- 012 *Calibration and Maintenance of Portable Specific Conductance Meter*
- 022 *Groundwater Level Measurement*
- 024 *Groundwater Sample Collection Procedures*
- 040 *Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*
- 046 *Sample Labeling, Storage and Shipment Procedures*



# FOP 031.0

## LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES



### GROUNDWATER FIELD FORM

Project Name:

Date:

Location:

Project No.:

Field Team:

<b>Well No.</b>			Diameter (inches):			Sample Time:			
Product Depth (ftTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (ftTOR):			Casing Volume:			Purpose: <input type="checkbox"/> Development <input type="checkbox"/> Sampling			
Total Depth (ftTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (ftTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
0	Initial								
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
<b>Sample Information:</b>									
S1									
S2									

<b>Well No.</b>			Diameter (inches):			Sample Time:			
Product Depth (ftTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (ftTOR):			Casing Volume:			Purpose: <input type="checkbox"/> Development <input type="checkbox"/> Sampling			
Total Depth (ftTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (ftTOR)	Acc. Volume (gallons)	pH (units)	Temp. (deg. C)	SC (uS)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor
0	Initial								
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
<b>Sample Information:</b>									
S1									
S2									

REMARKS:

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\_\_\_\_\_

\_\_\_\_\_

Note: All measurements are in feet, distance from top of riser.

Volume Calculation

Diam.	Vol. (g/ft)
1"	0.041
2"	0.163
4"	0.653
6"	1.469

Stabilization Criteria

Parameter	Criteria
pH	± 0.1 unit
SC	± 3%
Turbidity	± 10%
DO	± 0.3 mg/L
ORP	± 10 mV

PREPARED BY:







# FIELD OPERATING PROCEDURES

## Management of Investigation-Derived Waste (IDW)

**MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW)**

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**PURPOSE**

The purpose of these guidelines is to ensure the proper holding, storage, transportation, and disposal of materials generated from field investigation activities that may contain hazardous wastes. Investigation-derived waste (IDW) includes the following:

- Drill cuttings, discarded soil samples, drilling mud solids, and used sample containers.
- Well development and purge waters and discarded groundwater samples.
- Decontamination waters and associated solids.
- Soiled disposable personal protective equipment (PPE).
- Used disposable sampling equipment.
- Used plastic sheeting and aluminum foil.
- Other equipment or materials that either contain or have been in contact with potentially impacted environmental media.

Because these materials may contain regulated chemical constituents, they must be managed as a solid waste. This management may be terminated if characterization analytical results indicate the absence of these constituents.

**PROCEDURE**

1. Contain all investigation-derived wastes in Department of Transportation (DOT)-approved 55-gallon drums, roll-off boxes, or other containers suitable for the wastes.

MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW)

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2. Contain wastes from separate borings or wells in separate containers (i.e. do not combine wastes from several borings/wells in a single container, unless it is a container used specifically for transfer purposes, or unless specific permission to do so has been provided by the TurnKey Field Team Leader. Unused samples from surface sample locations within a given area may be combined.
3. To the extent practicable, separate solids from drilling muds, decontamination waters, and similar liquids. Place solids within separate containers.
4. Transfer all waste containers to a staging area. Access to this area will be controlled. Waste containers must be transferred to the staging area as soon as practicable after the generating activity is complete.
5. Pending transfer, all containers will be covered and secured when not immediately attended.
6. Label all containers with regard to contents, origin, date of generation, using TurnKey's IDW container label (sample attached). Use indelible ink for all labeling.
7. Complete the Investigative Derived Waste Container Log (sample attached) as waste containers are labeled in order to track and inventory project waste. Leave a copy of the log with the site manager or fax copy to the owner/operator as necessary.
8. Collect samples for waste characterization purposes, or use boring/well sample analytical data for characterization.
9. For wastes determined to be hazardous in character, **be aware of accumulation time limitations**. Coordinate the disposal of these wastes with the plant manager/owner/operator, if applicable.
10. Upon Property Owner, Project Manager, and/or NYSDEC Project Manager approval, dispose of investigation-derived wastes as follows:

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## FOP 032.1

### MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW)

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- Soil, water, and other environmental media for which analysis does not detect organic constituents, and for which inorganic constituents are at levels that meet the Site's cleanup objectives, may be spread on the Property or otherwise treated as a non-waste material. Disposal quantity and on-site location will be documented on Project Field Books and in the project report submittal.
- Soil, water, and other environmental media in which organic compounds are detected or metals are present above the Site's cleanup objectives will be disposed off-site in accordance with applicable state and federal regulations. Disposal quantity and off-site location will be documented on Project Field Books and in the project report submittal.
- Personal protective equipment, disposable bailers, and similar equipment may be disposed as municipal waste, unless waste characterization results mandate otherwise.

#### WASTE STORAGE MANAGEMENT

Hazardous materials generated on site should be temporarily stored in a secure location that is under the control of the owner/operator or does not allow for vandalism (i.e., within a locked building structure or within a locked fenced in area). A waste-staging area should be designated on-site by the Project Manager in conjunction with the owner/operator.

#### ATTACHMENTS

Investigation Derived Waste Container Log (sample)  
Investigation Derived Waste Container Label (sample)

#### REFERENCES

None






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FOP 032.1

MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW)

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**IDW Container Label (sample):**


Project Name: _____
Project Number: _____
Container I.D.: _____
Contents/Matrix: _____
Estimated Quantity: _____
Date of Generation: _____
Date of Sample Collection: _____
Contact Name: _____
Contact Phone Number: _____



# FIELD OPERATING PROCEDURES

## Monitoring Well Construction for Hollow Stem Auger Boreholes

**MONITORING WELL CONSTRUCTION FOR  
HOLLOW STEM AUGER BOREHOLES**

---

**PURPOSE**

Wells will be installed within selected boreholes for the purpose of evaluating groundwater characteristics. Well installation procedures depend upon the drilling method. This procedure describes well construction and installation for boreholes drilled using the hollow stem auger method. Refer to the TurnKey's Hollow Stem Auger Drilling Procedures FOP. Nominal dimensions and materials for the well are shown in the attached well construction diagram.

**PROCEDURE**

1. Advance borehole in accordance with the TurnKey's Hollow Stem Auger Drilling Procedure FOP to the required depth. The nominal inside diameter (ID) of the auger stem used should be at least 2 inches larger than the outside diameter (OD) of the riser and screen selected for the well installation. Record the monitoring well construction on the Field Borehole/Monitoring Well Installation Log (sample attached) (see Documentation Requirements for Drilling and Well Installation FOP).
2. Remove the drill rods and center bit/plug from the auger stem and verify borehole depth using weighted measuring tape.
3. In the event of an over drill (i.e. borehole depth is more than one foot greater than desired base of screen depth), use bentonite chips poured through the auger stem to seal the over drilled portion of the borehole. Be sure to note bentonite chip thickness on Field Borehole/Monitoring Well Installation Log.
4. Add a maximum of 6 inches of filter pack material through the auger stem to the base of the borehole. (Note: This step may be avoided if dense non-aqueous phase liquids are suspected to be present and it is desirable to have the screen and/or sump at the base of the borehole.)



**MONITORING WELL CONSTRUCTION FOR  
HOLLOW STEM AUGER BOREHOLES**

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5. Measure the length of the well string (i.e. riser and screen), and lower the well string into the well assembly to the desired depth. All measurements during the well installation process will be accurate to 0.1 foot.
6. Surface pour filter pack material into the annulus between the well and the auger stem as the augers are gradually withdrawn from the borehole. Use a weighted tape to confirm that the level of sand is maintained within the augers at all times. Record material volumes used.
7. After filter pack materials are brought to the required level, surface pour bentonite chips or pellets into the annulus between the well and the auger stem to form the filter pack seal. If necessary to avoid bridging, delayed hydration (coated) pellets may be used. Record the volume of material used.
8. Allow the bentonite chips/pellets to adequately hydrate for approximately 30 to 45-minutes. Cap or cover the well top of riser.
9. Mix cement/bentonite grout to a smooth consistency using a centrifugal or reciprocating pump. Do not hand mix. All water used must be potable quality. Record the volume of water used.
10. Fill the remaining annulus between the well and the auger stem with grout by surface pouring or pumping, and begin withdrawal of the auger string. Periodically top the auger string off with additional grout. If groundwater is present within the annulus above the bentonite chip/pellet seal, cement/bentonite grout will be pressure tremie grouted from bottom to top in order to displace groundwater from the borehole.
11. When the auger string is withdrawn, center the upper portion of the well riser within the borehole, and place drums or barricades around the well for protection while the grout cures. Place and lock a security cap (i.e., J-plug) in the opening of the well riser.
12. Leave the well undisturbed for at least 24 hours to allow the grout to cure. If excessive grout fallback occurs, top off as necessary with bentonite chips or additional grout.

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## FOP 033.0

### MONITORING WELL CONSTRUCTION FOR HOLLOW STEM AUGER BOREHOLES

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13. Construct the surface completion as shown in the attached Typical Monitoring Well Detail (Figure 1). Select flush completions for all locations in active operational or high traffic areas, or in other areas where an above grade completion would be undesirable. Use aboveground completions in all other areas.
14. Place a dedicated lock on the well or protective casing, and keep well locked when not actively attended.
15. Permanently label the well with the appropriate well identifier as determined by the Project Manager or specified in the Work Plan.
16. Permanently mark a survey location on the north side at the top of the casing with a saw cut. Survey all wells for horizontal location and elevation, using a surveyor licensed by the State of New York. Coordinates and elevations will be provided in a coordinate system consistent with previous well surveys at the Site. Information obtained will include location ( $x$  and  $y$ ) of the well, and elevation ( $z$ ) of the ground surface, the pad, and the top of riser.
17. Develop the well as described in the TurnKey's Field Operating Procedure for Monitoring Well Development.
18. Manage all waste materials generated during well installation and development as described in the TurnKey's Field Operating Procedure for Management of Investigation Derived Waste.

#### ATTACHMENTS

Field Borehole/Monitoring Well Installation Log (sample)  
Typical Monitoring Well Detail (Figure 1)



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## FOP 033.0

### MONITORING WELL CONSTRUCTION FOR HOLLOW STEM AUGER BOREHOLES

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#### REFERENCES

TurnKey FOPs:

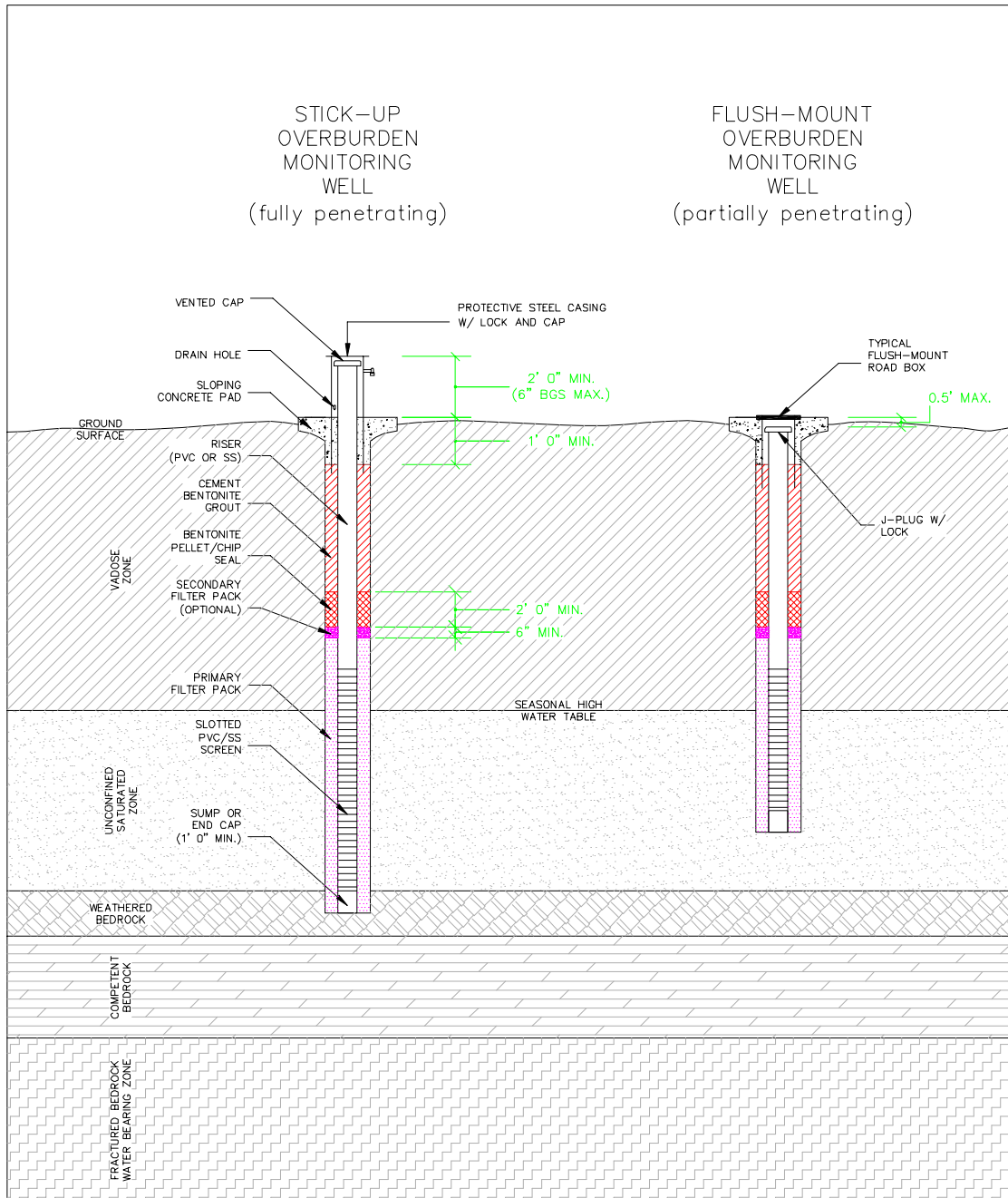
- 015 *Documentation Requirements for Drilling and Well Installation*
- 026 *Hollow Stem Auger Drilling Procedures*
- 032 *Management of Investigation Derived Waste*
- 036 *Monitoring Well Development Procedures*





**MONITORING WELL CONSTRUCTION FOR  
HOLLOW STEM AUGER BOREHOLES**

**FIGURE 1**





# FIELD OPERATING PROCEDURES

## Monitoring Well Development Procedures

**MONITORING WELL DEVELOPMENT PROCEDURES**

---

**PURPOSE**

This procedure describes the methods for the development of newly installed monitoring wells and re-development of existing monitoring wells that have been inactive for an extended period of time (i.e., one year or more). Monitoring wells are developed after installation in order to remove introduced water and drilling fluids, reduce the turbidity of the water, and improve the hydraulic communication between the well and the water-bearing formation. Well development will not commence until the annular grout seal has cured, but will be performed within ten calendar days of well installation.

**PROCEDURE**

1. All well development will include surge blocking or false bailing with one or more of the following fluid removal methods. Well development activities may include:
  - Bailing
  - Air Lifting
  - Submersible Pumping
  - Other methods as approved by the TurnKey Field Team Leader.
  - The appropriate water removal method will be selected based on water level depth and anticipated well productivity.
2. Assemble and decontaminate equipment (if necessary), and place in the well. Reference the TurnKey's Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.
3. Alternate the use of agitation methods with water removal methods, using the former to suspend solids in the well water, and the latter to remove the turbid water. For example, use a vented surge block to agitate the well, moving up and down within the screened interval and then use a pump to clear the well. A bailer may be used for both purposes, by surging with the bailer (false

**MONITORING WELL DEVELOPMENT PROCEDURES**

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bailing) for a period within the screened interval, then bailing a volume of water from the well.

4. When using surging methods, initiate this activity gradually, with short (2 to 3 feet) strokes. After several passes across the screened interval, increase the speed and length of the surge strokes.
5. Continue development until the following objectives are achieved:
  - Field parameters stabilize to the following criteria:
    - o Dissolved Oxygen:  $\pm 0.3$  mg/L
    - o Turbidity:  $\pm 10\%$
    - o Specific Conductance:  $\pm 3\%$
    - o ORP:  $\pm 10$  mV
    - o pH:  $\pm 0.1$  units
  - The well will generate non-turbid water during continued pumping typically less than 50 NTU.
  - A minimum of 10 well volumes has been evacuated from the well.
  - In the case of lost water during drilling activities, the volume of water removed exceeds twice the volume of water lost to the formation during the drilling process, as indicated by the water balance.
6. Document the development methods, volumes, field parameter measurements, and other observations on the attached Groundwater Well Development Log (sample attached).

**ATTACHMENTS**

Groundwater Well Development Log (sample)

**REFERENCES**

TurnKey FOPs:

040 *Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*





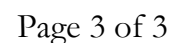


<b>WELL DATA:</b>	DATE:	TIME:
Casing Diameter (inches):	Casing Material:	
Screened interval (ftTOR):	Screen Material:	
Static Water Level (ftTOR):	Bottom Depth (ftTOR):	
Elevation Top of Well Riser (fmssl):	Datum Ground Surface: Mean Sea Level	
Elevation Top of Screen (fmssl):	Stick-up (feet):	

Well Diameter	Volume gal/ft	Parameter	Criteria
1"	0.041		+/- 0.3 mg/L
2"	0.163	Specific Gravity	+/- 10%
3"	0.424	SC	+/- 3%
4"	0.696	ORP	+/- 10 mV
5"	1.020	pH	+/- 0.1 unit
6"	1.469		
8"	2.611		

[illegible]

**PREPARED BY:**





# FIELD OPERATING PROCEDURES

## Sample Labeling, Storage, and Shipment Procedures

**SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES**

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**PURPOSE**

The collection and analysis of samples of environmental media, including soils, groundwater, surface water, and sediment, are the central activities of the field investigation. These samples must be properly labeled to preserve its identity, and properly stored and shipped in a manner that preserves its integrity and chain of custody. This procedure presents methods for these activities.

**SAMPLE LABELING PROCEDURE**

1. Assign each sample retained for analysis a unique 9-digit alphanumeric identification code or as indicated in the Project Work Plan. Typically, this code will be formatted as follows:

<b>Sample I.D. Example: GW051402047</b>	
<b>GW</b>	<b>Sample matrix</b> GW = groundwater; SW = surface water; SUB = subsurface soil; SS = surface soil; SED = sediment; L = leachate; A = air
<b>05</b>	Month of sample collection
<b>14</b>	Day of sample collection
<b>02</b>	Year of sample collection
<b>047</b>	Consecutive sample number

2. Consecutive sample numbers will indicate the individual sample's sequence in the total set of samples collected during the investigation/sampling event. The sample number above, for example, would indicate the 47<sup>th</sup> sample retained for analysis during the field investigation, collected on May 14, 2002.

**SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES**

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3. Affix a non-removable (when wet) label to each sample container. The following information will be written on the label with black or blue ink that will not smudge when wet:
  - Project number
  - Sample ID (see Step 1 above)
  - Date of sample collection
  - Time of sample collection (military time only)
  - Specify “grab” or “composite” sample with an “X”
  - Sampler initials
  - Preservative(s) (if applicable)
  - Analytes for analysis (if practicable)
4. Record all sample label information in the Project Field Book and on a Sample Summary Collection Log (see attached samples), keyed to the sample identification number. In addition, add information regarding the matrix, sample location, depth, etc. to provide a complete description of the sample.

**SAMPLE STORAGE PROCEDURE**

1. Immediately after collection, placement in the proper container, and labeling, place samples to be retained for chemical analysis into resealable plastic bags.
2. Place bagged samples into an ice chest filled approximately half-full of double bagged ice. Blue ice is not an acceptable substitute for ice.
3. Maintain samples in an ice chest or in an alternative location (e.g. sample refrigerator) as approved by the TurnKey Field Team Leader until time of shipment. Periodically drain melt-water off coolers and replenish ice as necessary.

**SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES**

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4. Ship samples on a daily basis, unless otherwise directed by the TurnKey Field Team Leader.
5. Maintain appropriate custody procedures on coolers and other sample storage containers at all times. These procedures are discussed in detail in the Project Quality Assurance Project Plan, Monitoring Plan or Work Plan.
6. Samples shall be kept in a secure location locked and controlled (i.e., locked building or fenced area) so that only the Project Field Team Leader has access to the location or under the constant visual surveillance of the same.

**SAMPLE SHIPPING PROCEDURE**

1. Fill out the chain-of-custody form completely (see attached sample) with all relevant information. The white original goes with the samples and should be placed in a resealable plastic bag and taped inside the sample cooler lid; the sampler should retain the copy.
2. Place a layer of inert cushioning material such as bubble pack in the bottom of cooler.
3. Place each bottle in a bubble wrap sleeve or other protective wrap. To the extent practicable, then place each bottle in a resealable plastic bag.
4. Open a garbage bag (or similar) into a cooler and place sample bottles into the garbage bag (or similar) with volatile organic analysis (VOA) vials near the center of the cooler.
5. Pack bottles with ice in plastic bags. At packing completion, cooler should be at least 50 percent ice, by volume. Coolers should be completely filled, so that samples do not move excessively during shipping.
6. Duct tape (or similar) cooler drain closed and wrap cooler completely in two or more locations to secure lid, specifically covering the hinges of the cooler.

**SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES**

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7. Place laboratory label address identifying cooler number (i.e., 1 of 4, 2 of 4 etc.) and overnight delivery waybill sleeves on cooler lid or handle sleeve (Federal Express).
8. Sign the custody seal tape with an indelible soft-tip marker and place over the duct tape across the front and back seam between the lid and cooler body.
9. Cover the signed custody seal tape with an additional wrap of transparent strapping tape.
10. Place “Fragile” and “This Side Up” labels on all four sides of the cooler. “This Side Up” labels are yellow labels with a black arrow with the arrowhead pointing toward the cooler lid.
11. For coolers shipped by overnight delivery, retain a copy of the shipping waybill, and attach to the chain-of-custody documentation.

**ATTACHMENTS**

Soil/Sediment Sample Summary Collection Log (sample)  
Groundwater/Surface Water Sample Summary Collection Log (sample)  
Wipe Sample Summary Collection Log (sample)  
Air Sample Summary Collection Log (sample)  
Chain-Of-Custody Form (sample)

**REFERENCES**

None







water over or through decontaminated equipment into sample containers. Collect at a fixed location collected the same day. Field blanks should be collected by the same person at the same location. If of concern to rinse/decontaminate equipment. For decon fluids, contact water manufacturers info & data. Collect 10-20 samples of each decon fluid per day. Analyze for metals in decon fluids. Metals analyzed for the samples collected. Final decon rinse water should be collected in a separate container at the sampling site. Collect field blanks at a fixed location.

for decon fluids. One container per decon fluid. Analyze for metals in decon fluids and soil. Please note number of samples collected.

4. FD - Field Duplicate.  
5. MS/MSD/MSB - Matrix Spike, Matrix Spike Duplicate.  
6. BD - Blind Duplicate.



## SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES

[illegible]

1. See QAPP for sampling frequency and actual number of QC samples.
2. CWM - clear, wide-mouth glass jar with Teflon-lined cap.
3. FD - Field Duplicate.
4. FB - Field Blank.
5. RS - Rinsate.
6. No Matrix Spike, Matrix Spike Duplicate or Matrix Spike Blanks for this sample.
7. Rinsates should be taken at a rate of 1 per day for each sampling event if this type of equipment is used.
8. Wipe sample FB collected by wiping unused glove and any other sampling equipment (not in contact with sampled surface) with prepared gauze pad and place in sample jar. Take at a rate of 1 FB per 20 samples.
9. Wipe sample FDs taken adjacent to original sample for 20 samples.
10. **EH** : Extract and Hold



## SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES

[illegible]

## CHAIN OF CUSTODY RECORD

[illegible]



# FIELD OPERATING PROCEDURES

## Screening of Soil Samples for Organic Vapors During Drilling Activities

**SCREENING OF SOIL SAMPLES FOR ORGANIC  
VAPORS DURING DRILLING ACTIVITIES**

---

**PURPOSE**

This procedure is used to screen soil samples for the presence of volatile organic constituents (VOCs) using a field organic vapor meter. These meters will be either photoionization detector (PID) or flame-ionization detector (FID) type. This screening is performed at the drilling and sampling location as a procedure for ensuring the health and safety of personnel at the site and to identify potentially contaminated soil samples for laboratory analysis. All soil samples will be field screened to provide a vertical profile of soil contamination by volatile organic substances.

**PROCEDURE**

1. Calibrate air-monitoring equipment in accordance with the appropriate TurnKey's Field Operating Procedures or manufacturers recommendations for calibration of field meters.
2. Collect split-spoon (or other sampler) samples in accordance with TurnKey's Split Spoon Sampling Procedure FOP.
3. When the split-spoon or other sampler is opened or accessed, shave a thin layer of material from the entire length of the core.
4. Scan the core visually and with the PID or FID noting stratification, visible staining, or other evidence of contamination.
5. Based on this initial scan of the sample, collect approximately 100 milliliters (ml) of soil using a decontaminated or dedicated stainless steel spatula, scoop, or equivalent. Place this soil into a labeled wide-mouth glass jar approximately  $\frac{1}{2}$  to  $\frac{3}{4}$  full and seal with aluminum foil and a screw top cap. Alternatively, the soil may be placed into a clean, re-sealable plastic bag and sealed. Be sure to leave some headspace above the soil sample within the sealed container.

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## FOP 047.0

### SCREENING OF SOIL SAMPLES FOR ORGANIC VAPORS DURING DRILLING ACTIVITIES

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6. Place field screening sample (i.e., jar or bag) in a location where the ambient temperature is at least 70° Fahrenheit.
7. Leave the field screening sample bag for at least 30 minutes, but no more than 60 minutes.
8. Carefully remove the screw top cap from the jar and slowly insert the tip of the organic vapor meter (PID or FID) through the aluminum foil seal making the smallest hole possible. Alternatively, unseal a portion of the plastic bag just big enough to insert the probe of a calibrated PID.
9. Record the maximum reading in parts per million by volume (ppmv) on the Field Borehole Log or Field Borehole/Monitoring Well Installation Log form (see attached samples) (see Documentation Requirements for Drilling and Well Installation FOP), at the depth interval corresponding to the depth of sample collection.

#### ATTACHMENTS

Field Borehole Log (sample)

Field Borehole/Monitoring Well Installation Log (sample)

#### REFERENCES

##### TurnKey FOPs:

010 *Calibration and Maintenance of Portable Flame Ionization Detector*

011 *Calibration and Maintenance of Portable Photoionization Detector*

015 *Documentation Requirements for Drilling and Well Installation*

058 *Split Spoon Sampling Procedures*



**FOP 047.0**

**SCREENING OF SOIL SAMPLES FOR ORGANIC  
VAPORS DURING DRILLING ACTIVITIES**

## FIELD BOREHOLE LOG

[illegible]

**FOP 047.0**

**SCREENING OF SOIL SAMPLES FOR ORGANIC  
VAPORS DURING DRILLING ACTIVITIES**





Page 4 of 4





# FIELD OPERATING PROCEDURES

## Soil Description Procedures Using The Visual-Manual Method

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

---

**PURPOSE**

This guideline presents a means for insuring consistent and proper field identification and description of collected soils during a project (via, split-spoon (barrel) sampler, hand auger, test pit etc.). The lithology and moisture content of each soil sample will be physically characterized by visual-manual observation in accordance with ASTM Method D2488, Standard Practice for Description and Identification of Soils (Visual-Manual Procedure). When precise classification of soils for engineering purposes is required, the procedures prescribed in ASTM Method D2487 (Standard Practice for Classification of Soils for Engineering Purposes [Unified Soil Classification System, USCS]) will be used. The method of soil characterization presented herein describes soil types based on grain size, liquid and plastic limits, and moisture content based on visual examination and manual tests. When using this FOP to classify soil, the detail of description provided for a particular material should be dictated by the complexity and objectives of the project. However, more often than not, “after the fact” field information is required later in the project, therefore, every attempt to describe the soil as completely as possibly should be made.

Intensely weathered or decomposed rock that is friable and can be reduced to gravel size or smaller by normal hand pressure should be classified as a soil. The soil classification would be followed by the parent rock name in parenthesis. Projects requiring depth to bedrock determinations should always classify weathered or decomposed bedrock as bedrock (i.e., landfill siting). The project manager should always be consulted prior to making this determination.

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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**PROCEDURE**

Assemble necessary equipment and discuss program requirements with drilling contractor.

1. Calibrate air-monitoring equipment in accordance with the appropriate TurnKey's Field Operating Procedures or manufacturers recommendations for calibration of field meters.
2. Collect desired soil sample in accordance with appropriate TurnKey FOP (i.e., split-spoon sampling, hand augering, test pitting etc.).
3. Shave a thin layer off the entire length of the sample to expose fresh sample.
4. Photograph and scan the sample with a photoionization detector (PID) at this time, if applicable, in accordance with TurnKey's Screening of Soil Samples for Organic Vapors During Drilling Activities FOP.
5. Describe the sample using terminology presented in the Descriptive Terms section below.
6. Record all pertinent information in the Project Field Book and Field Borehole Log (sample attached) or Field Borehole/Monitoring Well Installation Log (sample attached).
7. After the sample has been described, place a representative portion of the sample in new, precleaned jars or self-sealing plastic bags for archival purposes (if required). Label the jar or bag with the sample identification number, sample interval, date, project number and store in a secure location.
8. If the soil is to be submitted to a laboratory for analysis, collect the soil sample with a dedicated stainless steel sampling tool, place the sample into the appropriate laboratory-supplied containers, and store in an ice-chilled cooler staged in a secure location in accordance with TurnKey's Sample Labeling, Storage and Shipment Procedures FOP.

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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9. All remaining soil from soil sample collection activities shall be containerized in accordance with TurnKey's Management of Investigative-Derived Waste (IDW) FOP and/or the Project Work Plan.

**DESCRIPTIVE TERMS**

All field soil samples will be described using the Unified Soil Classification System (USCS) presented in Figures 1 and 2 (attached). In addition to ASTM Method D2488, Method D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils (a.k.a., Standard Penetration Test, STP), when implemented, can also be used to classify the resistance of soils. In certain instances, it is desirable to supplement the USCS classification with a geologic interpretation of the soil sample that is supported by the soil descriptive terms presented in this section. The project manager should be consulted when making any geologic interpretation. Field test methods are provided to assist field personnel in classifying soil and are identified by a bold blue **FTM** and shaded. Classification of sampled soils will use the following ASTM descriptive terms and criteria:

- **Group Name** (USCS, see Figure 2)
- **Group Symbol** (USCS, see Figure 2) – only use if physical laboratory testing has been performed to substantiate. The USCS can be applied to most unconsolidated materials, and is represented by a two-letter symbol, except Peat (Pt).
  - The first letter includes: G (gravel), S (sand), M (silt), C (clay), and O (organic).
  - The second letter includes: P (poorly graded or uniform particle sizes), W (well graded or diversified particle sizes), H (high plasticity), and L (low plasticity).
  - Examples:
    - GW = well graded gravels and gravel-sand mixtures, little or no fines
    - GP = poorly graded gravels and gravel-sand mixtures, little or no fines
    - GM = silty gravels, gravel-sand-silt mixtures

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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- GC = clayey gravels, gravel-sand-clay mixtures
  - SW = well graded sands and gravelly sands, little or no fines
  - SP = poorly graded sands and gravelly sands, little or no fines
  - SM = silty sand, sand-silt mixtures
  - SC = clayey sand sand-clay mixtures
  - ML = inorganic silts, very fine sands, rock flour, silty or clayey fine sands
  - CL = inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays
  - OL = organic silts and organic silty clays of low plasticity
  - MH = inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts (very rare)
  - CH = inorganic clays of high plasticity, fat clays
  - OH = organic clays of medium to high plasticity
  - Pt = peat, muck, and other highly organic soils
- **Angularity** (ASTM D2488; Table 1)
    - Angular – particles have sharp edges and relatively planar sides with unpolished surfaces
    - Subangular – particles are similar to angular description but have rounded edges
    - Subrounded – particles have nearly planar sides but have well-rounded corners and edges
    - Rounded – particles have smoothly curved sides and no edges
  - **Particle Shape** (ASTM D2488; Table 2)
    - Flat – particles with width/thickness  $> 3$
    - Elongated – particles with length/width  $> 3$
    - Flat and Elongated – particles meet criteria for both flat and elongated
  - **Moisture Condition** (ASTM D2488; Table 3)
    - Dry – absence of moisture, dusty, dry to the touch
    - Moist – damp, but no visible water
    - Wet – visible free water, usually soil is below water table
  - **Reaction with Hydrochloric Acid (HCL)** (ASTM D2488; Table 4)
    - None – no visible reaction

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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- Weak – some reaction, with bubbles forming slowly
- Strong – violent reaction, with bubbles forming immediately
- **Consistency of Cohesive Soils** (ASTM D2488; Table 5)
  - Very soft – squeezes between fingers when fist is closed; easily penetrated several inches by fist (SPT = 2 or less)
  - Soft – easily molded by fingers; easily penetrated several inches by thumb (SPT = 2 to 4)
  - Firm – molded by strong pressure of fingers; can be penetrated several inches by thumb with moderate effort (SPT = 4 to 8)
  - Stiff – dented by strong pressure of fingers; readily indented by thumb but can be penetrated only with great effort (SPT = 8 to 15)
  - Very stiff – readily indented by thumbnail (SPT = 15 to 30)
  - Hard – indented with difficulty by thumbnail (SPT >30)
- **Cementation** (ASTM D2488; Table 6)
  - Weak – crumbles or breaks with handling or slight finger pressure
  - Moderate – crumbles or breaks with considerable finger pressure
  - Strong – will not crumble or break with finger pressure
- **Structure (Fabric)** (ASTM D2488; Table 7)
  - Varved – alternating 1 mm to 12 mm (0.04 – 0.5 inch) layers of sand, silt and clay
  - Stratified – alternating layers of varying material or color with the layers less than 6 mm (0.23 inches) thick; note thickness
  - Laminated – alternating layers of varying material or color with the layers less than 6 mm (0.23 inches) thick; note thickness
  - Fissured – contains shears or separations along planes of weakness
  - Slickensided – shear planes appear polished or glossy, sometimes striated

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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- Blocky – cohesive soil that can be broken down into small angular lumps which resist further breakdown
- Lensed – inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
- Homogeneous or Massive – same color and appearance throughout
- **Inorganic Fine-Grained Soil Characteristics** (ASTM D2488; Table 12)

Several field tests can be performed to determine the characteristics of fine-grained soils (material passing the No. 40 sieve), such as dry strength, dilatency, and toughness. These field testing methods are described below.

- **Dry Strength** (ASTM D2488; Table 8)

**FTM (Dry Strength):** Select enough material and moisten with water until it can be molded or shaped without sticking to your fingers (slightly below the sticky limit) into a ball about 1 inch in diameter. From this ball, form three balls about ½ inch in diameter and allow to dry in air, or sun, or by artificial means (temperature not to exceed 60° C (140° F). Soil containing natural dry lumps about ½ inch in diameter may be used in place of molded balls, however the dry strengths are usually lower. Test the strength by crushing the dry balls or lumps between your fingers using the descriptions below.

- None – the dry specimen crumbles with the slightest pressure of handling
  - Low – the dry specimen crumbles with some finger pressure
  - Medium – the dry specimen breaks into pieces or crumbles with considerable finger pressure
  - High – the dry specimen cannot be broken with finger pressure. The specimen will break into pieces between the thumb and a hard surface.
  - Very High – the dry specimen cannot be broken between the thumb and a hard surface
- **Dilatency** (ASTM D2488; Table 9)

**FTM (Dilatency):** Place enough material in your hand to form a ball approximately ½ inch in diameter and moisten with water until it can be

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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molded or shaped without sticking to your fingers (slightly below the sticky limit). Smooth the ball in the palm of one hand with the blade of a knife or small spatula. Shake horizontally, striking the side of the hand vigorously against the other several times. Note the reaction of water appearing on the surface of the soil. The soil is said to have given a reaction to this test if, when it is shaken, water comes to the surface of the sample producing a smooth, shiny appearance. Squeeze the sample between the thumb and forefinger and note the reaction as follows:

- None – no visible change in the specimen
  - Slow – water slowly appears on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
  - Rapid – water quickly appears on the surface of the specimen during shaking and disappears upon squeezing
- **Toughness** (ASTM D2488; Table 10)

**FTM (Toughness):** Following the dilatency test above, shape the test specimen into an elongated pat and roll by hand on a smooth surface or between palms into a thread about 1/8 inch in diameter. Fold the sample threads and re-roll repeatedly until the thread crumbles at a diameter of about 1/8 inch (e.g., near the plastic limit). Note the pressure required to roll the thread near the plastic limit as well as the strength of the thread. After the thread crumbles, lump the pieces together and knead the lump until it crumbles. Describe the toughness as follows:

- Low – only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and very soft.
- Medium – medium pressure is required to roll the thread to near the plastic limit. The thread and the lump are soft.
- High – considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump are firm.

Using the results of the dry strength, dilatency, and toughness test described above, classify the soil according to the following:



**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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Soil Symbol	Dry Strength	Dilatency	Toughness
Silt (ML)	None to low	Slow to rapid	Low or thread cannot be formed
Lean clay (CL)	Medium to high	None to slow	Medium
Elastic Silt (MH)	Low to medium	None to slow	Low to medium
Fat Clay (CH)	High to very high	None	Low to medium high

- **Plasticity** (ASTM D2488; Table 11)

Two field test methods can be used to determine plasticity of fine-grained soils (material passing the No. 40 sieve): the roll or thread test and the ribbon test. Each test is described below.

**FTM (Roll or Thread Test):** As with the toughness test above, mix a representative portion of the soil sample with water until it can be molded or shaped without sticking to your fingers (slightly below the sticky limit). Place an elongated cylindrical sample on a nonabsorbent rolling surface (e.g., glass or wax paper on a flat surface) and attempt to roll it into a thread approximately 1/8 inch in diameter. The results of this test are defined below (non-plastic to high plasticity).

**FTM (Ribbon Test):** Form a roll from a handful of moist soil (slightly below the sticky limit) about 1/2 to 3/4 inches in diameter and about 3 to 5 inches long. Place the material in the palm of your hand and, starting at one end, flatten the roll between your thumb and forefinger to form the longest and thinnest ribbon possible that can be supported by the cohesive properties of the material before breaking. If the soil sample holds together for a length of 6 to 10 inches without breaking, the material is considered to be both highly plastic and highly compressive (Fat Clay, CH). If the soil cannot be ribboned, it is non-plastic (Silt, ML or MH). If it can be ribboned only with difficulty into short lengths, it has low plasticity (Lean Clay, CL). Use the following terms to describe the plasticity of soil:

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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- Nonplastic (ML or MH) – a 3 mm (0.12 inches) thread cannot be rolled at any water content
- Low Plasticity (CL, ML, or MH) – the thread can barely be rolled, and crumbles easily
- Medium Plasticity (CL) – the thread is easy to roll and not much time is required to reach the plastic limit before crumbling
- High Plasticity (CH) – it takes considerable time rolling and kneading to reach the plastic limit; the thread can be rolled several times before crumbling

*Note: A soil with as little as 20% clay will behave as a clayey soil. A soil needs 45% to over 60% medium to coarse sand to behave as a sandy soil. In a soil with 20% clay and 80% sand, the soil will behave as a clayey soil.*

- **Relative Density of Cohesionless (Granular) Soils**

- Very loose – easily penetrated 30 cm (1.2 inches) with 13 mm (0.5 inch) rebar pushed by hand (SPT = 0 to 4)
- Loose – easily penetrated several cm with 13 mm (0.5 inch) rebar pushed by hand (SPT = 4 to 10)
- Medium dense – easily to moderately penetrated with 13 mm (0.5 inch) rebar driven by 2.3 kg (6 pound) hammer (SPT = 10 to 30)
- Dense – penetrated 0.3 m (1 foot) with difficulty using 13 mm (0.5 inch) rebar driven by 2.3 kg (6 pound) hammer (SPT = 30 to 50)
- Very dense – penetrated only a few cm with 13 mm (0.5 inch) rebar driven by 2.3 kg (6 pound) hammer (SPT = >50)

- **Color** (use Munsel® Color System, as necessary)

- **Particle Size** (see Figure 3)

- Boulder – larger than a basketball
- Cobble – grapefruit, orange, volleyball
- Coarse Gravel – tennis ball, grape

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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- Fine Gravel – pea
- Coarse Sand – rock salt
- Medium Sand – opening in window screen
- Fine Sand – sugar, table salt
- Fines (silt and clay) – cannot visually determine size (unaided)
- **Gradation**
  - Well Graded (GW, SW) – full range and even distribution of grain sizes present
  - Poorly-graded (GP, SP) – narrow range of grain sizes present
  - Uniformly-graded (GP, SP) – consists predominantly of one grain size
  - Gap-graded (GP-SP) – within the range of grain sizes present, one or more sizes are missing
- **Organic Material** – Organic soils usually have a dark brown to black color and may have an organic odor. Often, organic soils will change color, for example, black to brown, when exposed to the air. Some organic soils will lighten in color significantly when air-dried. Organic soils normally will not have a high toughness or plasticity. The thread of the toughness test will be spongy.
  - PEAT – 50 to 100 percent organics by volume, primary constituent
  - Organic (soil name) – 15 to 50 percent organics by volume, secondary organic constituent
  - (Soil name) with some organics – 5 to 15 percent organics by volume, additional organic constituents
- **Fill Materials** – All soils should be examined to see if they contain materials indicative of man-made fills. Man-made fill items should be listed in each of the soil descriptions. Common fill indicators include glass, brick, dimensioned lumber, concrete, pavement sections, asphalt, metal, plastics, plaster etc. Other items that could suggest fill include buried vegetation mats, tree limbs, stumps etc. The soil description for a fill material should be followed by the term “FILL”, i.e., for a sandy silt with some brick fragments the description would be “SANDY

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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SILT (ML), with brick fragments (Fill)”. The size and distribution of fill indicators should be noted. The limits (depth range) of fill material should be determined and identified at each exploration location.

- **Other Constituents/Characteristics**
  - Additional constituents and/or pertinent soil characteristics not included in the previous categories should be described depending on the scope and objectives of the project. Observations that may be discussed include:
    - Oxide staining
    - Odor
    - Origin
    - Presence of root cast
    - Presence of mica
    - Presence of gypsum
    - Presence of calcium carbonate
    - Percent by volume of cobbles & boulders with size description and appropriate rock classification
  - Other pertinent information from the exploratory program should be recorded, if it would be useful from a biddability/constructability perspective. The conditions that should be listed include caving or sloughing, difficulty in drilling and groundwater infiltration.

**SOIL DESCRIPTIONS**

Generally, soil descriptions collected during most investigations are not intended for civil engineering (construction) purposes, but rather for hydrogeologic and contaminant transport purposes. As such, the ASTM visual-manual assessments are somewhat limited in that they are only performed in order to indicate important information about potential hydraulic properties of a soil. Soil descriptions should be concise, stressing major constituents and

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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characteristics, and should be given in a consistent order and format. The following order is recommended:

- Soil name. The basic name of the predominant grain size and a single-word modifier indicating the major subordinate grain size (i.e., mostly clay with some silt). The feel test can be used to determine the texture of the soil by rubbing some moist soil between your fingers; sand feels gritty, silt feels smooth, and clays feel sticky. The terms representing percentages of grain size to be used include:
  - Trace – particles are present, but estimated to be less than 5%
  - Few – 5 to 10%
  - Little – 15 to 25%
  - Some – 30 to 45%
  - Mostly – 50 to 100%
- Color (using Munsell® charts, as necessary). Color is an important property in identifying organic soils, and within a given locality it may also be useful in identifying materials of similar geologic origin. If the sample contains layers or patches of varying colors (e.g., mottled), this shall be noted and all representative colors shall be described. The color shall be described for moist samples, however if the color represents a dry condition, it must be stated as such in the log. Generally, colors become darker as the moisture content increases and lighter as the soil dries. Examples include:
  - Some fine-grained soils (OL, OH) with dark drab shades of brown or gray, including almost black, contain organic colloidal matter.
  - In contrast, clean, bright looking shades of gray, olive green, brown, red, yellow, and white are associated with inorganic soils.
  - Gray-blue or gray- and yellow-mottled colors frequently result from poor drainage.
  - Red, yellow, and yellowish brown result from the presence of iron oxides.

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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- White to pink may indicate considerable silica, calcium carbonate, or aluminum compounds.
- Field moisture condition as dry, moist, or wet;
- Gradation or Plasticity. Granular soils (i.e., sands or gravels) should be described as well-graded, poorly graded, uniform, or gap-graded, depending on the gradation of the minus 3-inch fraction. Cohesive soils (i.e., silts and clays) should be described as non-plastic, low, medium, or high, depending on the results of the manual evaluation for dry strength, dilatency, toughness, and plasticity discussed previously.
- Consistency/Density. An estimate of consistency of a cohesive soil or density of a granular soil, usually based on the SPT results (see Descriptive Terms section of this FOP);
- Soil Structure or Mineralogy. Description of discontinuities, inclusions, and structures, including joints, fissures, and slickensides.
- Odor. Describe the odor if organic or unusual. Soils containing a significant amount of organic material usually have a distinctive odor of decaying vegetation. This is especially apparent in fresh samples, but if the samples are dried, the odor may often be revived by heating a moistened sample. If the odor is unusual (petroleum, chemical, etc.), it should be noted in the log.
- Other important geologic information such as consolidation, gravel size and shape, visible internal structure, root holes, mica, odors, etc.

The first step when describing soil is to determine if the sample is predominantly fine-grained or coarse-grained (see Figures 3 and 4). Coarse-grained soils are relatively easy to identify, however descriptions of fine-grained soils can be more difficult, requiring additional field tests to assist the field geologist arrive at the proper soils classification (see [FTMs](#) under Descriptive Terms above). These tests are explained in detail in the ASTM Standard D2488 and briefly herein. Generally, the differentiation between silt and clay is based on plasticity and “texture”. However, tests for dry strength and dilatency, along with plasticity,

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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can be very helpful and are recommended in the ASTM Standard. If additional tests are performed, in addition to plasticity, to classify the fines, record them with the soil description on the logs. Doing this will assist the reader (i.e., Project Manager) to follow the logic used to describe a soil (e.g., medium plasticity, low dry strength = elastic silt [MH]; not a lean clay [CL]).

Fines described in the classification should be modified by their plasticity (e.g., non-plastic fines, low plasticity fines, etc.) reserving the words “silt” and “clay” for the soil name.

In summary, adhering to the ASTM Standard and the guidelines outlined in this FOP will provide uniformity in soil descriptions provided by all field personnel. Prior to mobilization to the field, field staff should make sure to have laminated copies of the ASTM Standard flow charts and tables as well as this FOP (as necessary). Some examples of complete soil descriptions are as follows:

**Coarse-grained Soil**

POORLY GRADED FINE SAND w/ SILT: Dark grey, wet, mostly fine sand with some non-plastic fines, some iron-stained mottling, laminated, medium dense

**Fine-grained Soil**

LEAN CLAY: Dark reddish/brown, moist, mostly fines, medium plasticity, firm, no dilatency, medium dry strength, root holes.

**Soil/Fill (option 1) – visual evidence of fill**

FILL: Black, moist, mostly fines with some fine sand, slag, cinders, metal, brick, non-plastic, loose when disturbed, strong odor

**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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**Soil/Fill (option 2) – no visual evidence of fill, suspected reworked material**

FILL (reworked): Black, moist, mostly fines with some fine sand and few coarse angular gravel, non-plastic, hard, loose when disturbed, mild odor

**BORING AND MONITORING WELL INSTALLATION LOGS**

Currently, TurnKey utilizes WinLoG software to construct subsurface logs and a template of the log is included in this FOP as an example. One of the most important functions of a boring/monitoring well installation log, besides transmitting the soil description, is to indicate where the “data” (soil samples) were collected, giving the reader an idea of how reliable or representative the description is. On each sample log, depths of attempted and recovered or non-recovered interval are shown. Odor, if noted, should be considered subjective and not necessarily indicative of specific compounds or concentrations.

Remember: all field logs should be NEAT, ACCURATE, and LEGIBLE. Don’t forget that the well completion diagram completed for each well requires details of the surface completion (i.e., flush-mount, stick-up etc.). It is the responsibility of the field staff to double-check each log (i.e., soil names, classifications, well construction details etc.) prior to implementing into a final report. A registered professional (i.e., professional engineer, PE or professional geologist, PG) must review each log and will be ultimately responsible for its content and accuracy.

**REQUIRED EQUIPMENT**

- Knife
- Engineer’s rule/measuring tape





**SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD**

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- Permanent marker
- Pre-cleaned wide-mouth sample jars (typically provided by the driller)
- Pre-cleaned wide-mouth laboratory sample jars (provided by the laboratory)
- Stainless steel sampling equipment (i.e., spoons, spatulas, bowls etc.)
- 10x hand lens
- Hydrochloric acid
- ASTM D2488 flow charts (preferably laminated)
- ASTM D2488 test procedures (Tables 1 through 12) (preferably laminated)
- Camera (disposable, 35 mm or digital)
- Munsell soil color chart (as necessary)
- Project Field Book/field forms

**ATTACHMENTS**

Figure 1; Field Guide for Soil and Stratigraphic Analysis

Figure 2; USCS Soil Classification Flow Chart (modified from ASTM D2488)

Figure 3; Illustration of Particle Sizes

Figure 4; Grain-Size Scale (Modified Wentworth Scale)

Field Borehole Log (sample)

**REFERENCES**

American Society for Testing and Materials, 2008a. *ASTM D1586: Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.*

American Society for Testing and Materials, 2010. *ASTM D2487: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).*

American Society for Testing and Materials, 2009a. *ASTM D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).*

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## FOP 054.2

### SOIL DESCRIPTION PROCEDURES USING THE VISUAL-MANUAL METHOD

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State of California, Department of Transportation, Engineering Service Center,  
Office of Structural Foundations, August 1996. *Soil & Rock Logging Classification Manual  
(Field Guide)*, by Joseph C. de Larios.

TurnKey FOPs:

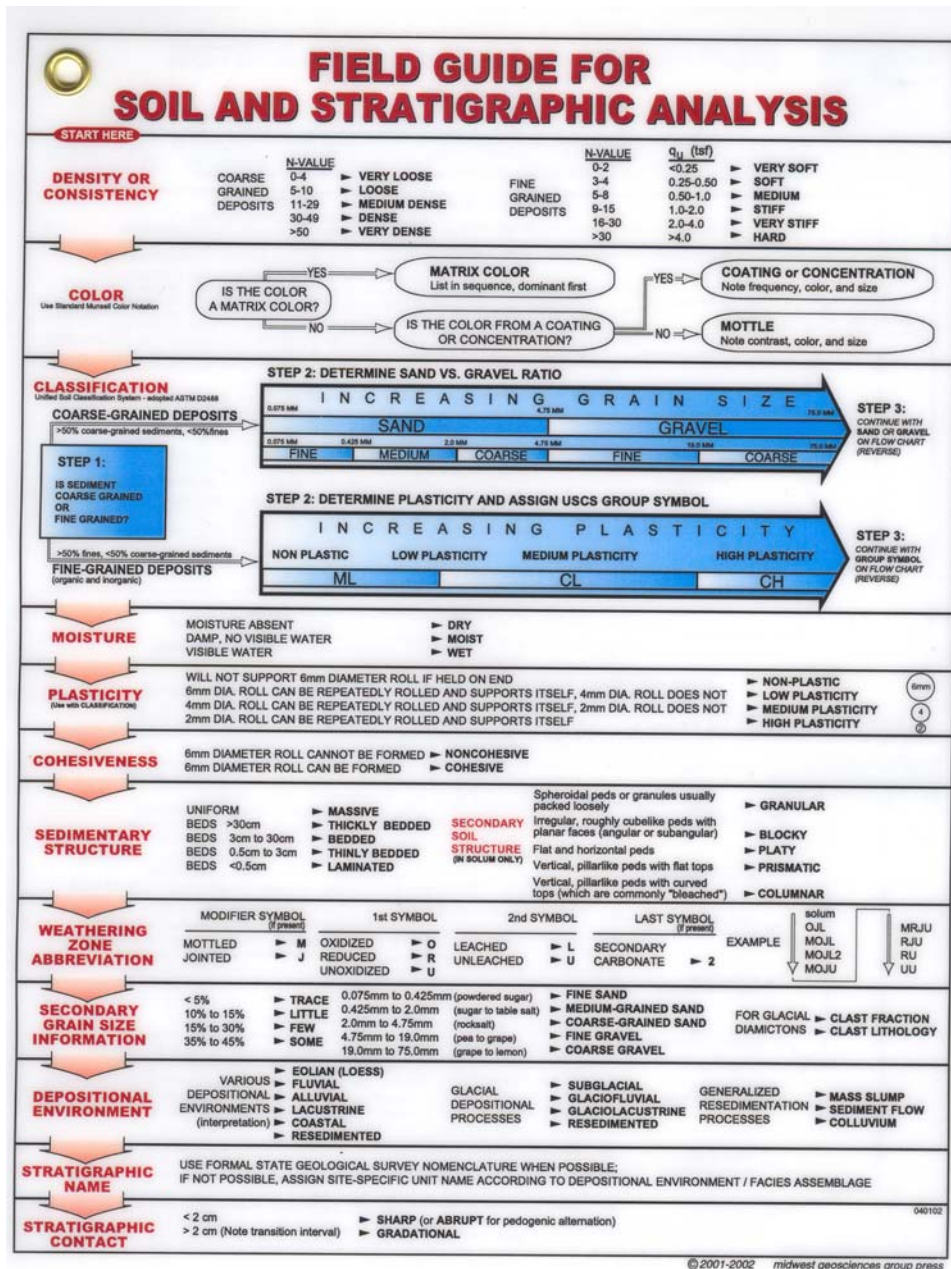
- 010 *Calibration and Maintenance of Portable Flame Ionization Detector*
- 011 *Calibration and Maintenance of Portable Photoionization Detector*
- 015 *Documentation Requirements for Drilling and Well Installation*
- 025 *Hand Augering Procedures*
- 032 *Management of Investigation-Derived Waste*
- 046 *Sample Labeling, Storage and Shipment Procedures*
- 047 *Screening of Soil Samples for Organic Vapors During Drilling Activities*
- 058 *Split-Spoon Sampling Procedures*
- 065 *Test Pit Excavation and Logging Procedures*



# SOIL DESCRIPTION PROCEDURES USING THE VISUAL-MANUAL METHOD

FIGURE 1

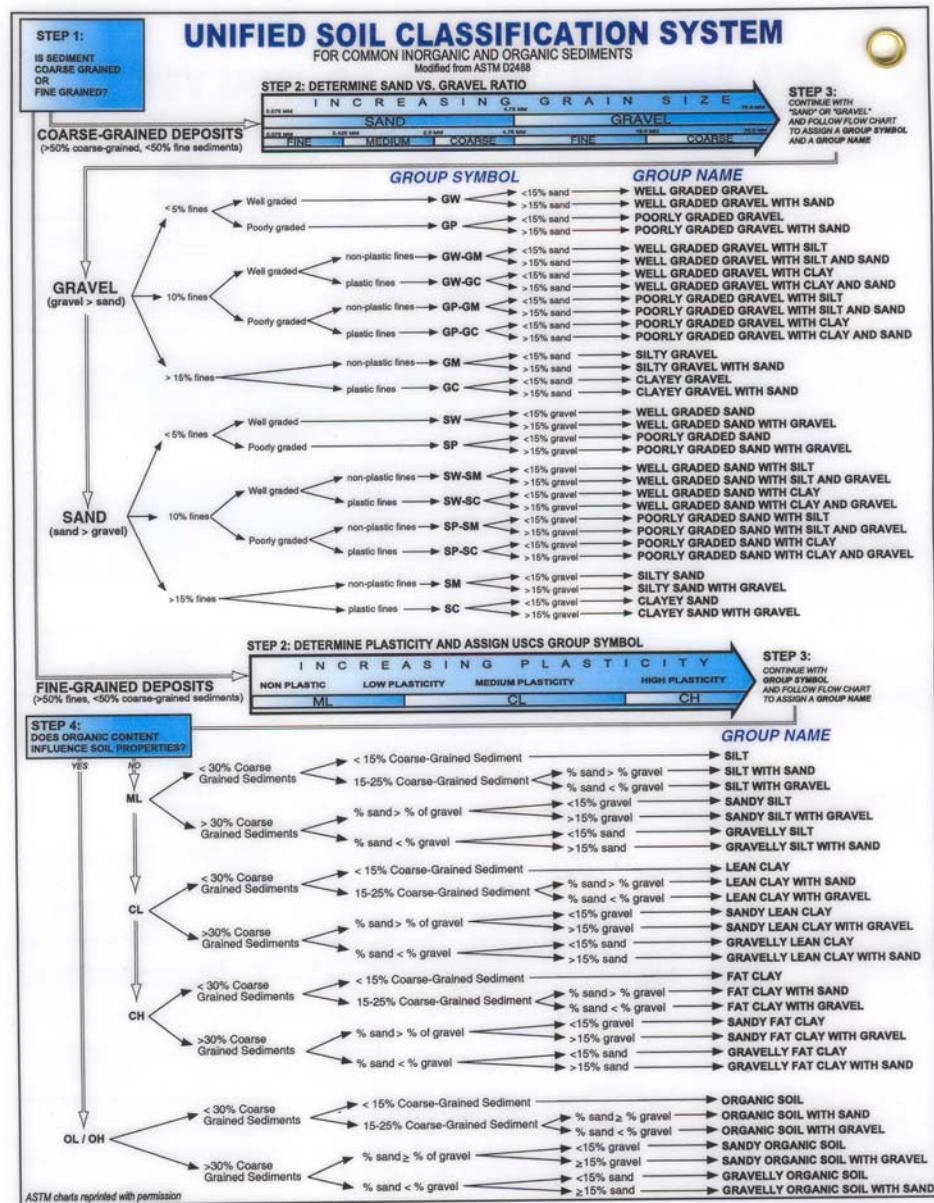
## FIELD GUIDE FOR SOIL AND STRATIGRAPHIC ANALYSIS



## SOIL DESCRIPTION PROCEDURES USING THE VISUAL-MANUAL METHOD

FIGURE 2

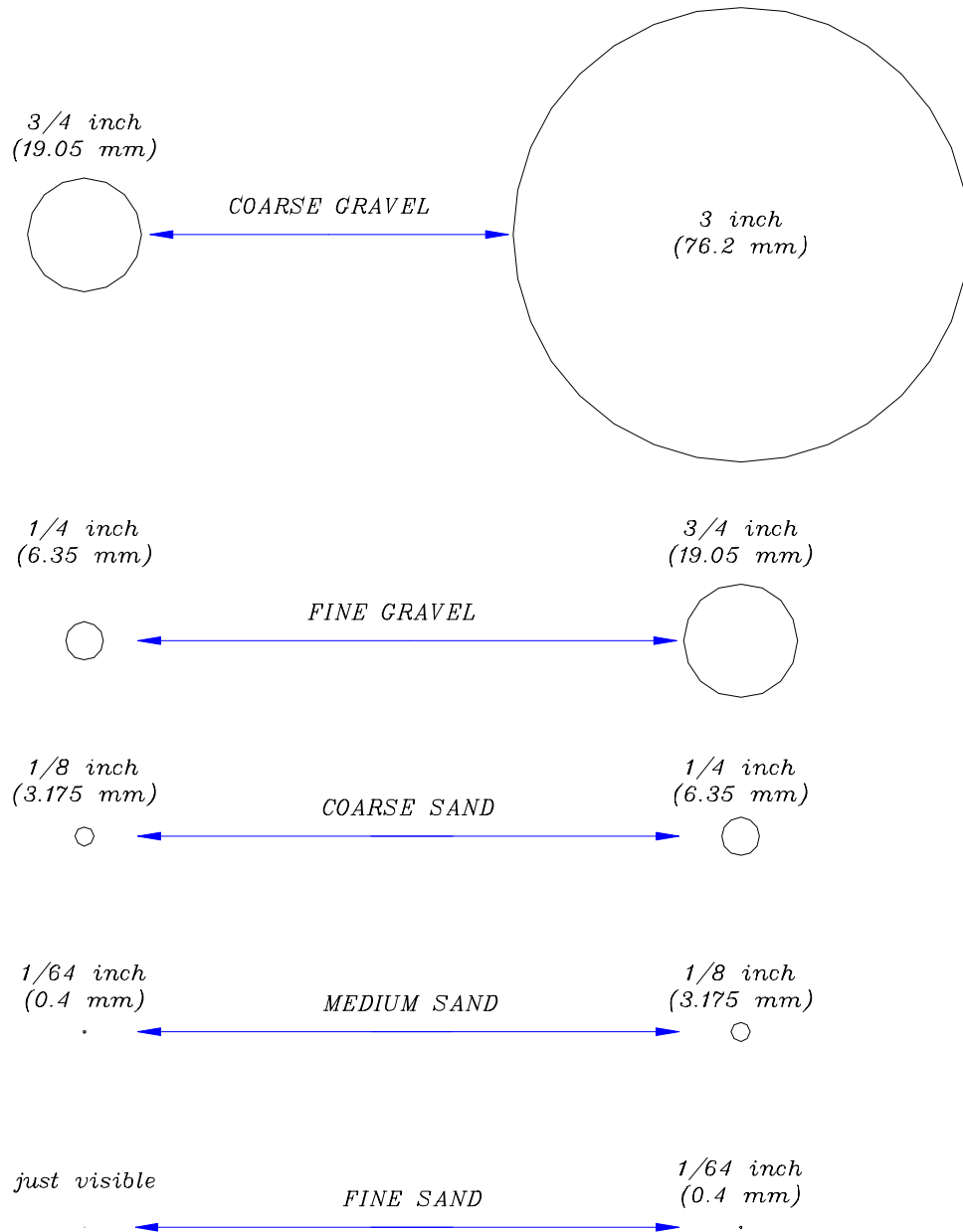
### USCS SOIL CLASSIFICATION FLOW CHART (MODIFIED FROM ASTM D2488)



SOIL DESCRIPTION PROCEDURES  
USING THE VISUAL-MANUAL METHOD

FIGURE 3

ILLUSTRATION OF PARTICLE SIZES



## SOIL DESCRIPTION PROCEDURES USING THE VISUAL-MANUAL METHOD

FIGURE 4

### GRAIN-SIZE SCALE (MODIFIED WENTWORTH SCALE)


**Grain size** refers to the physical dimensions of particles of rock or other solid. This is different from the crystallite size, which is the size of a single crystal inside the solid (a grain can be made of several single crystals). Grain sizes can range from very small colloidal particles, through clay, silt, sand, and gravel, to boulders. Size ranges define limits of classes that are given names in the Wentworth scale used in the United States. The Krumbein *phi* ( $\varphi$ ) scale, a modification of the Wentworth scale created by W. C. Krumbein, is a logarithmic scale computed by the equation:  $\varphi = -\log_2(\text{grain size in mm})$ .

$\varphi$ scale	Size range (metric)	Size range (approx. inches)	Aggregate name (Wentworth Class)
$< -8$	$> 256$ mm	$> 10.1$ in	Boulder
$-6$ to $-8$	64–256 mm	2.5–10.1 in	Cobble
$-5$ to $-6$	32–64 mm	1.26–2.5 in	Very coarse gravel
$-4$ to $-5$	16–32 mm	0.63–1.26 in	Coarse gravel
$-3$ to $-4$	8–16 mm	0.31–0.63 in	Medium gravel
$-2$ to $-3$	4–8 mm	0.157–0.31 in	Fine gravel
$-1$ to $-2$	2–4 mm	0.079–0.157 in	Very fine gravel
0 to $-1$	1–2 mm	0.039–0.079 in	Very coarse sand
1 to 0	$\frac{1}{2}$ –1 mm	0.020–0.039 in	Coarse sand
2 to 1	$\frac{1}{4}$ – $\frac{1}{2}$ mm	0.010–0.020 in	Medium sand
3 to 2	125–250 $\mu\text{m}$	0.0049–0.010 in	Fine sand
4 to 3	62.5–125 $\mu\text{m}$	0.0025–0.0049 in	Very fine sand
8 to 4	3.90625–62.5 $\mu\text{m}$	0.00015–0.0025 in	Silt
$> 8$	$< 3.90625$ $\mu\text{m}$	$< 0.00015$ in	Clay
$< 10$	$< 1$ $\mu\text{m}$	$< 0.000039$ in	Colloid

*In some schemes "gravel" is anything larger than sand ( $> 2.0$  mm), and includes "granule", "pebble", "cobble", and "boulder" in the above table. In this scheme, "pebble" covers the size range 4 to 64 mm ( $-2$  to  $-6$   $\varphi$ ).*



# SOIL DESCRIPTION PROCEDURES USING THE VISUAL-MANUAL METHOD

<b>Project No:</b>  <b>Project:</b>  <b>Client:</b>  <b>Site Location:</b>		<b>Borehole Number:</b>   <b>Logged By:</b>  <b>Checked By:</b>		 <b>TurnKey Environmental Restoration, LLC</b> 726 Exchange Street, Suite 624 Buffalo, NY (716) 856-0635	
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SUBSURFACE PROFILE			SAMPLE				PID VOCs  ppm 0    25    50	Lab Sample	Well Completion Details or Remarks
Elev. /Depth	Symbol	Description (ASTM D2488: Visual-Manual Procedure)	Sample No.	SPT N-Value	Recovery (ft)	Symbol			
0.0 0.0		Ground Surface							
<div style="font-size: 100px; opacity: 0.3; transform: rotate(-30deg); pointer-events: none;">SAMPLE</div>									

<b>Drilled By:</b> <b>Drill Rig Type:</b> <b>Drill Method:</b>  <b>Drill Date(s):</b>	<b>Hole Size:</b> <b>Stick-up:</b> <b>Datum:</b>  <b>Sheet: 1 of 1</b>
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# FIELD OPERATING PROCEDURES

## Surface and Subsurface Soil Sampling Procedures



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## FOP 063.2

### SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES

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#### PURPOSE

This procedure describes the methods for sampling surface soil and subsurface soil samples for physical and chemical laboratory analysis during intrusive activities such as test pitting, hand augering, drilling, surface soil sampling etc. Typical health and safety related issues should be addressed in the Project Health and Safety Plan.

#### PRE-SAMPLING PROCEDURES

1. Review project objectives and the Project Health and Safety Plan (HASP).
2. Conduct tailgate health and safety meeting with project team and/or subcontractor(s) by completing the Tailgate Safety Meeting Form (sample attached).
3. Calibrate air-monitoring equipment in accordance with the appropriate TurnKey's Field Operating Procedures or manufacturers recommendations for calibration of field meters.
4. Commence intrusive activities in accordance with specific TurnKey's FOPs (test pitting, hand augering, drilling etc.) or as directed by the Project Work Plan.
5. Conduct air monitoring as required by the HASP, Project Work Plan or TurnKey's FOP Real-Time Air Monitoring During Intrusive Activities. Record all results on the Real Time Air Monitoring Log (sample attached).
6. Decontaminate all non-dedicated stainless steel (or Pyrex glass) equipment in accordance with TurnKey's Non-disposable and Non-dedicated Sampling Equipment Decontamination procedures.
7. Collect soil samples in accordance with the following sections.



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## FOP 063.2

### **SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES**

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#### **SURFACE SOIL/FILL SAMPLING PROCEDURES**

Collection of surface soil/fill samples facilitates the evaluation of potential health risks to current site receptors that may be exposed to soil/fill via direct contact, incidental ingestion, or inhalation of airborne particulates. The following procedure is in accordance with NYSDEC sampling protocol of surface soil/fill material.

1. Collect all soil samples using dedicated (or decontaminated non-dedicated) sampling tools (i.e., spoons, trowels, bowls etc.), preferably constructed of stainless steel.
2. If the sample area is vegetated, then collect the surface soil sample from 0 to 2 inches below ground surface (bgs) following removal of the sod.
3. If there is no soil present within the sample area (i.e., only slag, concrete, mixed with fines), excavate an area 12 inches by 12 inches by 6 inches deep, screen the material to less than 1/8 inch (No. 4 sieve), and submit the screened material for analysis. If there is not enough material to completely fill the sample jar, then expand the excavation 3 inches in all four directions screening the additional material. Expand the excavation in this manner until sufficient sample volume is obtained. Volatile organic analysis of surface soil/fill utilizing this method will yield negatively biased results and should not be performed.

#### **SURFACE/SUBSURFACE SOIL SAMPLING PROCEDURES**

1. Collect all soil samples using dedicated (or decontaminated non-dedicated) sampling tools (i.e., spoons, trowels, bowls etc.), preferably constructed of stainless steel.

Surface soil samples are typically collected from 0 to 6 inches below ground surface (bgs). Subsurface soils are typically sampled from varying depths greater than 6-inches bgs based on field observations and as directed by the Project Work Plan.



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## FOP 063.2

### SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES

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2. Transfer samples for chemical (VOC, SVOC, Metals etc.) and physical (i.e., Atterberg Limits, Grain Size, Permeability etc.) analytical testing by direct grab (i.e., directly from the bucket of the excavation equipment, split-spoon sampler, hand auger etc.) using the dedicated (or decontaminated non-dedicated) sampling tools into appropriate laboratory-supplied containers and seal. The chemical or physical laboratory selected to perform the analysis should determine minimum sample volume for analysis.
3. Prepare collected samples in accordance with TurnKey's FOP: Sample Labeling, Storage and Shipment Procedures. Do not allow the chemical soil samples to freeze during storage and shipping. It should be noted, ice is not required for physical soil samples and all physical soil samples should be kept at the collected soil moisture by securing with a tight sealing lid. Do not allow physical soil samples to gain or lose moisture from the collected soil moisture prior to analysis.
4. Record all sampling details (i.e., depth and location) in the Project Field Book; appropriate TurnKey log sheets depending on method of intrusion (i.e., drilling, test pitting, hand augering etc.); and on the Soil/Sediment Sample Collection Summary Log (sample attached).

#### PARAMETER-SPECIFIC PROCEDURES

1. Volatile Organic Compound (VOCs): Transfer sufficient soil volume to fill the laboratory-supplied container (typically 4 ounces) by packing the soil sample with the sampling tool to the top of the container leaving no headspace. At no time should a gloved hand (i.e., latex, nitrile etc.) be used to pack the sample into the sample container as the sample may be compromised via cross-contamination.
2. All Other Parameters: All other parameters include, but are not limited to, Semi-VOCs (SVOCs), polychlorinated biphenyls (PCBs), herbicides, pesticides, total metals etc. Transfer sufficient soil volume to fill the laboratory-supplied container by packing the soil sample with the sampling



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## FOP 063.2

### SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES

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tool to the top of the container. Unless otherwise indicated by the laboratory or the Project Work Plan, the sample jar for all other parameters does not have to be packed completely leaving no headspace as with the VOC containers.

#### ATTACHMENTS

Tailgate Safety Meeting Form (sample)  
Soil/Sediment Sample Collection Summary Log (sample)  
Real Time Air Monitoring Log (sample)

#### REFERENCES

##### TurnKey FOPs:

- 006 *Calibration and Maintenance of Combustible Gas/Oxygen Meter*
- 010 *Calibration and Maintenance of Portable Flame Ionization Detector*
- 011 *Calibration and Maintenance of Portable Photoionization Detector*
- 040 *Non-disposable and Non-dedicated Sampling Equipment Decontamination*
- 046 *Sample Labeling, Storage and Shipment Procedures*
- 073 *Real-Time Air Monitoring During Intrusive Activities*



## FOP 063.2

### SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES



#### TAILGATE SAFETY MEETING FORM

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_  
Project Number: \_\_\_\_\_ Client: \_\_\_\_\_  
Work Activities: \_\_\_\_\_

#### HOSPITAL INFORMATION:

Name: \_\_\_\_\_  
Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone No.: \_\_\_\_\_ Ambulance Phone No. \_\_\_\_\_

#### SAFETY TOPICS PRESENTED:

Chemical Hazards: \_\_\_\_\_  
\_\_\_\_\_  
Physical Hazards: Slips, Trips, Falls  
\_\_\_\_\_

#### PERSONAL PROTECTIVE EQUIPMENT:

Activity: _____	PPE Level: A	B	C	D
Activity: _____	PPE Level: A	B	C	D
Activity: _____	PPE Level: A	B	C	D
Activity: _____	PPE Level: A	B	C	D
Activity: _____	PPE Level: A	B	C	D

New Equipment: \_\_\_\_\_

Other Safety Topic (s): Environmental Hazards (aggressive fauna)  
Eating, drinking, use of tobacco products is prohibited in the Exclusion Zone (EZ)

#### ATTENDEES

Name Printed	Signatures
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting conducted by: \_\_\_\_\_



## SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES



## SOIL/SEDIMENT SAMPLE COLLECTION SUMMARY LOG

[illegible]

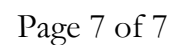
## SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES



**WEATHER CONDITIONS:**

[illegible]

Prepared By: \_\_\_\_\_





# FIELD OPERATING PROCEDURES

## Real-Time Air Monitoring During Intrusive Activities



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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#### PURPOSE

This guideline presents requirements for real-time community air monitoring and required responses during all project required intrusive activities, such as drilling, test pitting, earthwork construction etc. This procedure is consistent with the requirements for community air monitoring for all intrusive projects, including projects conducted at remediation sites, as established by the New York State Department of Health (NYSDOH) and the New York State Department of Environmental Conservation (NYSDEC). Accordingly, this Field Operating Procedure (FOP) follows procedures and practices outlined under the NYSDEC's Draft DER-10 (November 2009) generic Community Air Monitoring Plan dated November 2009 and NYSDEC Technical Assistance and Guidance Memorandum (TAGM) 4031: Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites.

This FOP requires real-time monitoring for constituents of concern (COC) (i.e., volatile organic compounds (VOCs), lower explosive limit (% LEL), particulates (i.e., dust) etc.) at the upwind and downwind perimeter as well as the exclusion zone of a project site during all intrusive activities. This FOP is not intended for use in establishing action levels for worker respiratory protection (see Project Health and Safety Plan (HASP) for worker protection action levels). Rather, its intent is to provide a measure of protection for the surrounding community from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The community, as referenced in this document, includes any off-site residences, public buildings/grounds and commercial or industrial establishments adjacent to the project site. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, this FOP helps



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## **FOP 073.1**

### **REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE**

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to confirm that work activities did not spread contamination off-site through via air transport mechanisms. Community air monitoring shall be integrated with the construction worker personal exposure-monitoring program contained in the project and site-specific HASP.

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (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 NYSDEC/NYSDOH staff.

#### **MONITORING & MITIGATION PROCEDURE**

Real-time air monitoring for COC levels at the upwind and downwind perimeter as well as the exclusion zone of the project site will be required. The perimeter locations of monitoring stations will be established based on the location of the exclusion zone (i.e., immediate work area) and wind direction. Where wind direction is shifting or winds are calm, the downwind monitoring location will default to the perimeter location nearest the most sensitive receptor (i.e., residential property). All downwind receptors being equal, the downwind monitoring location will default to the perimeter location downwind of the prevailing winds at the site. Although additional site specific COCs may be monitored during real-time air monitoring activities, the most common COCs are discussed in this



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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FOP, including organic vapors (i.e., VOCs), airborne particulates (i.e., fugitive dust) and combustible gases (i.e., methane) and oxygen.

**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

#### ORGANIC VAPORS

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work should be



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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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.

- 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.
- 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.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown (see Major Vapor Emission Monitoring below).
- All 15-minute readings must be recorded and be available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

#### **Major Vapor Emission Monitoring**

- If the sustained organic vapor level is greater than 25 ppm at the perimeter of the



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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work area, all work activities must be halted. If, following the cessation of the work activities or as the result of an emergency, organic levels persist above 25 ppm above background at the perimeter of the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest off-site receptor (20-foot zone).

- If efforts to abate the emission source are unsuccessful and if organic vapor levels approach or exceed 25 ppm above background at the perimeter of the work area, then the Major Vapor Emission Response Plan will automatically be placed into effect (see next section).

#### **Major Vapor Emission Response Plan**

Upon activation of Major Vapor Emission Response Plan, the following activities will be undertaken:

1. All Emergency Response Contacts as listed below and in the Site-Specific Health and Safety Plan will be contacted.
2. The local police authorities will immediately be contacted by the Site Safety and Health Officer and advised of the situation.
3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Site Safety and Health Officer.
4. The Site Safety and Health Officer will determine if site workers can safely undertake source abatement measures. Abatement measures may include covering the source area with clean fill or plastic sheeting, or consolidating contaminated materials to minimize surface area. The Site Safety and Health Officer will adjust worker personal protective equipment as necessary to protect workers from over-exposure to organic vapors.

The following personnel are to be notified by the Site Safety and Health Officer in the listed



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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sequence if the Major Vapor Emission Response Plan is activated:

Contact	Phone
Police/Fire Department	911
New York State DOH	(716) 847-4502
New York State DEC Region 8	(585) 226-2466, switchboard
New York State DEC Region 9	(716) 851-7220
State Emergency Response Hotline	(800) 457-7362

In addition, the Site Safety and Health Officer will provide these authorities with a description of the apparent source of the contamination and abatement measures being taken by the contractor, if any.

#### AIRBORNE PARTICULATES

Fugitive dust suppression and airborne particulate monitoring shall be performed during any intrusive activities involving disturbance or handling of site soil/fill materials. Fugitive dust suppression techniques will include the following minimum measures:

- Excavated stockpiles will be seeded or covered with clean soil or synthetic materials (e.g., tarps, membranes, etc.) whenever stockpiling activities cease for a period of longer than 90 days.
- Spraying potable water on all excessively dry work areas and roads.
- All fill materials leaving the site will be hauled in properly covered containers or haul trailers.



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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- Additional dust suppression efforts may be required as discussed below.

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.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ) 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  $\mu\text{g}/\text{m}^3$  above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150  $\mu\text{g}/\text{m}^3$  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  $\mu\text{g}/\text{m}^3$  of the upwind level and in preventing visible dust migration.
- All readings must be recorded and be available for State (DEC and DOH) personnel to review.

**REAL-TIME AIR MONITORING DURING INTRUSIVE  
ACTIVITIES PROCEDURE**

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**Visual Assessment**

In conjunction with the real-time monitoring program, TurnKey personnel and any subcontractors thereof will be responsible for visually assessing fugitive dust migration from the site. If airborne dust is observed leaving the site, the work will be stopped until supplemental dust suppression techniques are employed in those areas.

**Supplemental Dust Suppression**

Supplemental dust suppression techniques may include but are not necessarily limited to the following measures:

- Reducing the excavation size, number of excavations or volume of material handled.
- Restricting vehicle speeds.
- Applying water on buckets during excavation and dumping.
- Wetting equipment and excavation faces.
- Wetting haul roads.
- Restricting work during extreme wind conditions.
- Use of a street sweeper on paved haul roads, where feasible.

Work can resume using supplemental dust suppression techniques provided that the measures are successful in reducing the sustained downwind particulate concentration to below 150 ug/m<sup>3</sup> of the upwind level, and in preventing visible dust migration off-site.



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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#### COMBUSTIBLE GASES & OXYGEN

Ambient combustible gas and oxygen concentrations should be measured prior to commencing intrusive activities each workday and a minimum of every 30-minutes thereafter. Air monitoring activities should be performed using equipment appropriate to measure combustible gases in percent lower explosive limit (LEL) and percent oxygen and calibrated daily. All combustible gas and oxygen readings must be recorded in the Project Field Book and/or Real-Time Air Monitoring Logs (sample attached) and, if applicable, be made available for State (DEC and DOH) personnel to review.

Mitigation upon the detection of various action levels of organic vapors are presented below:

#### Combustible Gas:

- If the sustained ambient air concentration of combustible gas at the downwind perimeter of the site exceeds a reading of 10 to 25% LEL, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 10% LEL, work activities can resume with continued monitoring.
- If sustained combustible gas levels at the downwind perimeter of the site persist at levels in excess of 25% LEL, work activities must be halted, the source of explosion hazards identified, corrective actions taken to abate emissions and monitoring continued. Following combustible gas mitigation, work activities can resume provided that the sustained total organic vapor level 200 feet downwind of the exclusions 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 a sustained value of 10% LEL.

#### Oxygen:

- If the sustained ambient oxygen concentration at the downwind perimeter of the site measures a reading between 19.5% - 21% oxygen, work activities can



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## FOP 073.1

### REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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continue with extreme caution, however attempts to determine the potential source of oxygen displacement must be conducted.

- If the sustained oxygen level readily decreases below 19.5% LEL, work activities should be discontinued and all personnel must leave the area immediately.
- If the sustained oxygen level at the downwind perimeter of the site persists at levels between 21-25%, work activities can resume with caution.
- If the sustained oxygen level at the downwind perimeter of the site persists at levels exceeding 25% (fire hazard potential), work activities should be discontinued and all personnel must leave the area immediately.

#### ATTACHMENTS

Real-Time Air Monitoring Log (sample)

#### REFERENCES

##### TurnKey FOPs:

- 006 *Calibration and Maintenance of Combustible Gas/Oxygen Meter*
- 010 *Calibration and Maintenance of Flame Ionization Detector*
- 011 *Calibration and Maintenance of Portable Photoionization Detector*
- 084 *Calibration and Maintenance of Portable Particulate Meter*





**“BEFORE & AFTER”  
PROJECT PROCEDURES FOR FIELD PERSONNEL**

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**PURPOSE**

This procedure describes the required field and office activities to be preformed “before and after” project assignments by field personnel. Field activities may include, but are not limited to, drilling oversight, excavation contractor oversight, matrix sample collection (e.g., soil, sediment, groundwater, surface water, wipe, and/or air), third party oversight, and site reconnaissance to name a few. Office activities may include, but are not limited to, photocopying field book entries, completing all field forms, tabulating collected field and laboratory data, and preparation of report text.

The primary goal of this procedure is to eliminate delays and unnecessary budgetary “strain” due to a lack of preparedness and knowledge of the site by the field team members. This procedure also seeks to streamline the preparation and transfer of field information/data from field personnel to the Project Manager upon field work completion.

**PROJECT ASSIGNMENT**

During the initial meeting with the Project Manager, several questions should be raised by the field team member and answered by the Project Manager. A pad of paper and pen should be in hand to record all pertinent job information. At a minimum, the following questions should be answered:

1. *What is the job number?*
2. *Who is the client and the on-site representative (if applicable)?*
3. *What is the name of the project?*
4. *What are the job responsibilities and how should they be accomplished?*
5. *How much time do I have to complete the assigned tasks?*
6. *Are there any project required documents? What are they?*

Any deviation from the above questions should be approved by the Project Manager prior to contravention, not at the end of the day or following the project completion.



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## FOP 076.0

### **“BEFORE & AFTER” PROJECT PROCEDURES FOR FIELD PERSONNEL**

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#### **“BEFORE” CHECKLISTS**

Checklists should be developed and used so that all of the required steps prior to going into the field are undertaken. A good checklist will include:

- Adequate review of the documents listed in this FOP
- Any documents, equipment, and supplies presented in this FOP
- Providing adequate notification to the laboratory (so that holding times are not exceeded) and to the owner of the site and the primary regulatory agency (usually in writing) that a round of sampling is to commence in order to facilitate sampling and allow for a sampling audit or split sampling.
- Specifying and documenting the equipment maintenance and calibration undertaken prior to going into the field relative to the sampling event.
- Checking and calibrating the equipment.
- Listing the documents, equipment, and supplies required to collect samples at the site as presented in this FOP.

Prior to going into the field, sampling personnel should reacquaint themselves with the sampling plan. The review is undertaken so that the required specific protocol such as sampling from the least to the most contaminated wells, knowing where quality control samples are to be taken, knowing the disposition of purge water, etc., is understood and followed.

The amount of equipment maintenance and calibration required prior to going into the field should be clearly specified in the presampling equipment maintenance and calibration checklists, which are based on the manufacturer’s recommendations, sampling objectives, and prior experience. Maintenance and calibration performed before sampling must be



**“BEFORE & AFTER”  
PROJECT PROCEDURES FOR FIELD PERSONNEL**

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documented to provide evidence that the equipment was adequately maintained and calibrated and to keep a permanent record of equipment servicing and performance.

A list of all the documents, equipment, and supplies required for the sampling event should be prepared and used. It can be frustrating and time consuming to forget equipment and supplies, so some up-front preparation is warranted. The following sections provide a list of the documentation, equipment, and supplies, which should assist in preparing a site-specific equipment and supply checklist. Once prepared, the checklist and project requirements should be reviewed with the Project Manager.

**“BEFORE” DOCUMENTATION SUMMARY**

Prior to going into the field, the field team should review and understand all of the project documents including, but not limited to:

- The Health and Safety Plan (HASP)
- The Site Analytical Plan (SAP), Sampling Plan, or similar document
- The Quality Assurance Project Plan (QAPP)
- The Work Plan
- Project specific Field Operating Procedures and field forms
- Site Maps
- Equipment operation manuals
- Chain-of-Custody forms
- Shipping labels and custody seals
- Any reference materials (i.e., conversion tables, volume calculation, etc.). The Pocket Ref, Third Edition by Thomas Glover is a great source for the field.

If at any time, the field team does not understand the project required protocol, procedures, sample locations, etc.; the Project Manager should be consulted for clarification.

**“BEFORE & AFTER”  
PROJECT PROCEDURES FOR FIELD PERSONNEL**

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**“BEFORE” EQUIPMENT SUMMARY**

Prior to going into the field, the field team should review the following equipment checklist, noting that project specific equipment may not be included in this list:

- Water level indicator
- Pumps, sample tubing, flow controllers, power cord(s), batteries, compressors, generators, etc.
- Bailers (disposable, PVC, stainless steel, glass), rope
- Flow-through cell
- Field meters with adequate calibration solutions (pH/Eh meter, conductivity meter, dissolved oxygen meter, turbidity meter, batteries, etc.)
- Garden hose
- Explosive gas meter and/or photoionization detector (PID) with calibration supplies
- Complete set of hand tools including a sharp knife, screw drivers, pliers, hacksaw, flashlight, large pipe wrench, hammer, bolt cutters, and replacement locks
- Fish hook with weight and string
- Field filtering equipment and supplies
- Decontamination supplies, such as scrub brushes, Alconox®, distilled water, potable water, 5-gallon bucket, paper towels, aluminum foil
- 5-gallon bucket(s)
- Measuring cup
- Sample bottles/containers (with extras) and preservatives
- Stainless steel spoons, trowels, shovels
- Shipping containers (i.e., coolers)
- Clipboard
- Calculator
- Water resistant clock or watch with second hand
- First aid kit

**“BEFORE & AFTER”  
PROJECT PROCEDURES FOR FIELD PERSONNEL**

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**“BEFORE” SUPPLIES SUMMARY**

Prior to going into the field, the field team should review the following supplies checklist, noting that project specific supplies may not be included in this list:

- Laboratory grade non-phosphate detergent (Alconox®)
- Appropriate personal protective equipment appropriate to the contaminants of concern, such as nitrile gloves, Tyvek, boots, hardhat, safety glasses, hearing protection, etc.
- Bags of ice
- Plastic garbage bags
- Plastic sheeting
- Sufficient quantities of potable and laboratory grade deionized water for cleaning and equipment blanks
- Methanol
- Isopropyl alcohol
- Clean rags and paper towels
- Electrical tape, duct tape, and wide transparent tape
- Hand soap
- Regular, ballpoint, and indelible pens
- Hollow braid polyethylene rope

After providing adequate notification (lab, state and/or federal agencies), performing the presampling maintenance and calibration, obtaining the site and well keys, and packing the supplies and equipment, the field activities are ready to be performed.

**“AFTER” – PROJECT FILE REVIEW & CREATION**

It is the responsibility of each field crew member to review his/her own field notes and time sheet for accuracy and completeness. All errors to the field notes should be corrected, dated, and initialed for Project Manager review. Once reviewed by the field team member, the Project Field Book, all field forms, photographs, chain-of-custodies etc. must be



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## FOP 076.0

### **“BEFORE & AFTER” PROJECT PROCEDURES FOR FIELD PERSONNEL**

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photocopied, scanned (if required), downloaded, etc. and then given to the Project Manager in an organized file folder in a timely manner. Avoiding delay during this step is critical, especially when there are severe time constraints for the project.

#### **REFERENCES**

1. Wilson, Neal. *Soil Water and Ground Water Sampling*, 1995





# FIELD OPERATING PROCEDURES

## Geoprobe Drilling Procedures

**GEOPROBE DRILLING PROCEDURES**

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**PURPOSE**

This guideline presents a method for direct-push drilling a borehole through unconsolidated materials, including soils or overburden.

**PROCEDURE**

The following procedure will be used to drill a borehole for sampling and/or well installation, using direct-push methods and equipment.

1. Follow TurnKey's Field Operating Procedure (FOP) for Drill Site Selection Procedure prior to implementing any drilling activity.
2. Perform drill rig safety checks with the driller by completing the Drilling Safety Checklist form (sample attached).
3. Conduct tailgate health and safety meeting with project team and drillers by completing the Tailgate Safety Meeting Form (sample attached).
4. Calibrate air-monitoring equipment in accordance with the appropriate TurnKey's FOPs or manufacturers recommendations.
5. Ensure all drilling equipment (i.e., rods, 4-foot sampler, dedicated PVC sleeves) appear clean and free of soil prior to initiating any subsurface intrusion. Decontamination of drilling equipment should be in accordance with TurnKey's Drilling and Excavation Equipment Decontamination Procedures FOP.
6. Mobilize the Geoprobe™ rig to the site and position over the borehole.
7. Level and stabilize the rig and recheck the rig location against the planned drilling location.

**GEOPROBE DRILLING PROCEDURES**

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8. Fully advance the sampler into the subsurface using an ATV-mounted direct-push Geoprobe™ drill rig and 1.5-inch diameter sampler, typically 4-feet in length and fitted with a dedicated PVC sleeve, for each four-foot core of soil.
9. Retrieve the 4-foot sample core from the driller, place on a piece of polyethylene tarp, and cut open using a sharp utility knife.
10. Visually characterize each 4-foot soil core using the Unified Soil Classification System (USCS) in accordance with TurnKey's Soil Description Procedures Using the USCS FOP.
11. Scan each 4-foot core for total volatile organic vapors with a calibrated Photovac 2020 PID equipped with a 10.6 eV lamp, and report any visual and/or olfactory observations. Record PID scan measurements in the Project Field Book and appropriate field forms.
12. If required, collect a representative soil sample for headspace determinations. In general, soil samples representative of each 4-foot core interval are collected, placed in a sealable plastic bag, and kept at or near room temperature (approximately 65-70° F) for a minimum of 15 minutes prior to measurement. Record PID headspace determination measurements in the Project Field Book and appropriate field forms.
13. Check sampler and rods periodically during drilling to ensure the boring is plumb. Adjust rig position as necessary to maintain plumb.
14. Continue drilling until reaching the assigned total depth, or until sampler refusal occurs. Sampler refusal is when the drilling penetration drops below 0.1 feet per 2 minutes, with the full weight of the rig on the sampler.
15. Plug and abandon boreholes not used for temporary well installation in accordance with TurnKey's Field Operating Procedure for Abandonment of Borehole. Boreholes to be used as temporary wells should be completed in accordance with TurnKey's Temporary Well (Piezometer) Construction Procedures FOP.

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## FOP 078.0

### GEOPROBE DRILLING PROCEDURES

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16. Decontaminate all non-dedicated drilling tools between boring locations using potable tap water and a phosphate-free detergent (i.e., Alconox™) in accordance with TurnKey's Drilling and Excavation Equipment Decontamination Procedures FOP.

#### OTHER PROCEDURAL ISSUES

- Borings will not be over drilled (rat holed) without the express permission of the TurnKey field supervisor. All depth measurements should be accurate to the nearest 0.1 foot, to the extent practicable.
- Potable water may be placed in the sampler stem if critically necessary for borehole control or to accomplish sampling objectives. This will be performed only with the express permission of the TurnKey field supervisor.

#### ATTACHMENTS

Drilling Safety Checklist (sample)  
Tailgate Safety Meeting Form (sample)

#### REFERENCES

TurnKey FOPs:

- 001 *Abandonment of Borehole Procedures*
- 017 *Drill Site Selection Procedure*
- 018 *Drilling and Excavation Equipment Decontamination Procedures*
- 054 *Soil Description Procedures Using the USCS*
- 077 *Temporary Well (Piezometer) Construction Procedures*



## FOP 078.0

### GEOPROBE DRILLING PROCEDURES



#### DRILLING SAFETY CHECKLIST

Project:	Date:
Project No.:	Drilling Company:
Client:	Drill Rig Type:

ITEMS TO CHECK	OK	ACTION NEEDED
"Kill switches" installed by the manufacturer are in operable condition and all workers at the drill site are familiar with their location and how to activate them?		
"Kill switches" are accessible to workers on both sides of the rotating stem? NOTE: Optional based on location and number of switches provided by the manufacturer.		
Cables on drill rig are free of kinks, frayed wires, "bird cages" and other missing sections?		
Cables are terminated at the working end with a proper eye splice or swaged Coupling or using cable clamps?		
Cable clamps are installed with the saddle on the live or non-live side? Clamps should not be alternated and should be of the correct size and number for the cable size to which it is installed. Clamps are connected to the correct parts?		
Hooks installed on hoist cables are the safety type with a function to prevent accidental separation?		
Safety latches are functional and completely close the end of the hook and have positive action to close the hook when it is manually displaced for connecting or disconnecting a load?		
Drive shafts, belts, chain drives and other rotating parts will be guarded to prevent accidental insertion of hands and limbs?		
Outriggers shall be extended and locked when the boom is raised off its cradle. Hydraulic outriggers must maintain pressure to continuously support and stabilize the boom when in use.		
Outriggers shall be properly supported on the ground surface to prevent settling into the soil.		
Controls are properly labeled and have freedom of movement? Controls should not be blocked or locked in action position.		
Safeties on any device shall not be bypassed or neutralized.		
Controls shall be operated smoothly and cables and lifting devices shall not be jerked or operated erratically to overcome resistance.		
Slings, chokers and lifting devices are inspected before using and are in proper working order? Damaged units are removed from service and are properly tagged?		
Shackles and clevises are in proper working order and pins and screws are fully inserted before placing under a load?		
High-pressure hoses have a safety (chain, cable or strap) at each end of the hose section to prevent whipping in the event of a failure?		
Rotating parts of the drill string shall be free of sharp projections or hooks, which could entrap clothing or foreign objects?		



## FOP 078.0

### GEOPROBE DRILLING PROCEDURES



#### DRILLING SAFETY CHECKLIST

Project: \_\_\_\_\_

Date: \_\_\_\_\_

ITEMS TO CHECK	OK	ACTION NEEDED
Wire ropes should not be allowed to bend around sharp edges without cushion material.		
The exclusion zone is centered over the borehole and the radius is equal or greater than the boom height?		
The work area around the borehole shall be kept clear of trip hazards and walking surfaces should be free of slippery material.		
Workers shall not proceed higher than the drilling deck with fall restraining device and must attach the device in a manner to restrict less than 6 feet.		
A fire extinguisher of appropriate size shall be immediately available to the crew. The drill crew shall have received annual training on proper use of the fire extinguisher.		
29 CFR 1910.333 © (3) Except where electric lines have been de-energized and visibly grounded, all rigging shall be proximate to, under, by, or near power lines only. Clearance shall be maintained as follows:  .333 © (3) (ii) 50 kV or less - 10 feet For 50 kV or over - 10ft. Plus 4 inches for each additional kV <b>TurnKey Policy: Maintain 20 feet</b>		
29 CFR 1910.333 © (3) (iii) When the boom is in the down position, clearance from energized power lines shall be maintained as follows:  Less than 4 feet - 10 feet 50 to 365 kV - 10 feet 365 to 725 kV - 12 feet		

Name: \_\_\_\_\_ (printed)

Signed: \_\_\_\_\_ Date: \_\_\_\_\_



## FOP 078.0

### GEOPROBE DRILLING PROCEDURES



#### TAILGATE SAFETY MEETING FORM

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_  
Project Number: \_\_\_\_\_ Client: \_\_\_\_\_  
Work Activities: \_\_\_\_\_

#### HOSPITAL INFORMATION:

Name: \_\_\_\_\_  
Address: \_\_\_\_\_ City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
Phone No.: \_\_\_\_\_ Ambulance Phone No. \_\_\_\_\_

#### SAFETY TOPICS PRESENTED:

Chemical Hazards: \_\_\_\_\_  
\_\_\_\_\_  
Physical Hazards: Slips, Trips, Falls \_\_\_\_\_  
\_\_\_\_\_

#### PERSONAL PROTECTIVE EQUIPMENT:

Activity:	Eye Protection	Head Protection	Hand Protection	Foot Protection
Activity: _____	B	C	D	
Activity: _____	B	C	D	
Activity: _____	A	B	C	D
Activity: _____	A	B	C	D
Activity: _____	A	B	C	D

New Equipment: \_\_\_\_\_

Other Safety Topic (s): \_\_\_\_\_  
\_\_\_\_\_

#### ATTENDEES

Name Printed	Signatures
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Meeting conducted by: \_\_\_\_\_







# FIELD OPERATING PROCEDURES

## Calibration & Maintenance of Portable Particulate Meter

**CALIBRATION AND MAINTENANCE OF PORTABLE  
PARTICULATE METER**

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**PURPOSE**

This guideline describes a method for calibration of a portable particulate meter, specifically the Thermo Electron Corporation MIE DataRAM 4 (Model DR-4000). The DataRAM 4 measures the concentration of airborne particulate matter (liquid or solid), as well as mean particle size, air temperature, and humidity, providing direct and continuous readout as well as electronic recording of the information. This parameter is of interest both as a general indicator of air quality, and because of its pertinence to community air monitoring typically required at most construction/remediation/investigation sites. The DataRAM covers a wide measurement range from 0.0001 mg/m<sup>3</sup> to 400 mg/m<sup>3</sup>. With its large capacity internal data logging capabilities with data retrieval on screen or downloaded, the DataRAM can store up to 50,000 data points, including individual point averages, particle size, temperature, and humidity with time stamp as well as overall average and maximum concentration.

Because the DataRAM meter must be factory calibrated once a year, this guideline presents a method for start-up, operation, and maintenance, which is performed to verify instrument function. All field instruments will be calibrated, verified and recalibrated at frequencies required by their respective operating manuals or manufacturer's specifications, but not less than once each year. Field personnel should have access to all operating manuals for the instruments used for the field measurements. This procedure also documents critical maintenance activities for this meter. The user should reference the manufacturer's instruction manual prior to operating this unit.

**ACCURACY & PRECISION**

The calibrated accuracy of the DataRAM 4 particulate meter is within  $\pm 2\%$  of reading  $\pm$  precision over the temperature range of  $-4^{\circ}$  to  $158^{\circ}$  F ( $-10^{\circ}$  to  $50^{\circ}$  C) and 10 to 95% relative humidity (non-condensing). The precision is  $\pm 1\%$  of reading or  $\pm 0.001$  mg/m<sup>3</sup>, whichever

### INSTRUMENT PANEL VIEW

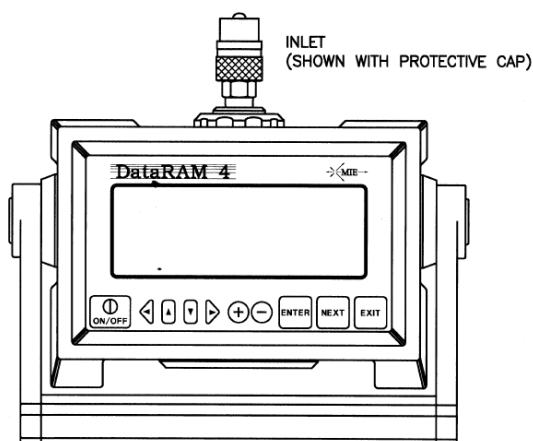


FIGURE 1. FRONT-PANEL VIEW OF DataRAM

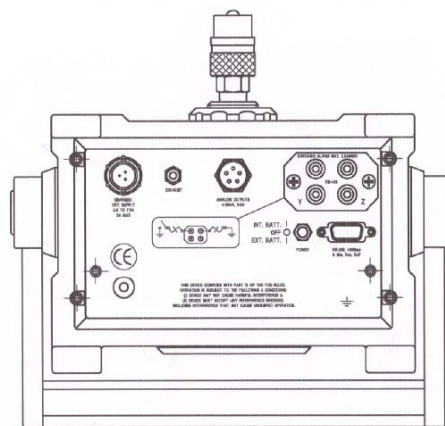


FIGURE 2. BACK-PANEL VIEW OF DataRAM

## MAINTENANCE

The DataRAM 4 is designed to be repaired at the factory. No user serviceable components are inside the metal enclosure of the DataRAM 4 with exception of the filter cartridge or the analytic filter holder. Access to the internal components of the unit by others than authorized MIE personnel voids warranty.

### Battery Charging and Cycling

If the DataRAM 4 is to be operated without its charger/power supply, i.e., deriving power from its internal battery, this battery should be fully charged before initiating a run. The

**CALIBRATION AND MAINTENANCE OF PORTABLE  
PARTICULATE METER**

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DataRAM 4 charger/power supply can be connected continuously to the instrument whether the DataRAM 4 is on or off. If the charger/power supply is not connected, the internal battery will discharge very slowly depending on storage temperature. Low storage temperature reduces battery capacity. High storage temperatures, however, reduce battery life which is of the order of 8 years at 20°C (68°F), and only 2 years at 40°C (104°F).

In general, the user should maintain the battery charge as high as possible in order to extend its charge/discharge cycling capacity (this characteristic differs from that of nickel-cadmium batteries).

Instrument Storage

If the DataRAM 4 is to be stored for an extended period of time (i.e., 3 months or more), place the 3-position switch on the back panel in its OFF position (mid-position), in order to minimize gradual battery discharge. This will have no effect on data retention or internal clock function. It is recommended, however, that the battery be recharged every 3 months in order to prolong battery life.

During storage always snap on quick-connect cap over the instrument inlet to protect the sensing optics from gradual dust contamination. Store DataRAM 4 in a dry environment.

Filter Replacement

To replace either of two types of filters used with DataRAM 4, place the instrument on its back rubber feet (front panel facing upward). On the bottom surface of the DataRAM, locate the large threaded plastic filter cover and holding the cross bar, rotate this cover counterclockwise. Remove cover and the filter holder within the open cavity.

*HEPA Filter Cartridge Replacement*

The DataRAM 4 is shipped from the factory with the HEPA filter cartridge installed. This cartridge can be identified by its metallic cover. Remove this cartridge. Clean the internal black rubber gasket against which the cartridge is normally compressed. Install new HEPA-type cartridge (MIE part no. MSA-95302) by inserting its wider ridged end first. Reposition threaded plastic cover engaging threads carefully; rotate cover clockwise, hand tightening firmly. Properly dispose of used cartridge to prevent inadvertent re-use.

**CALIBRATION AND MAINTENANCE OF PORTABLE  
PARTICULATE METER**

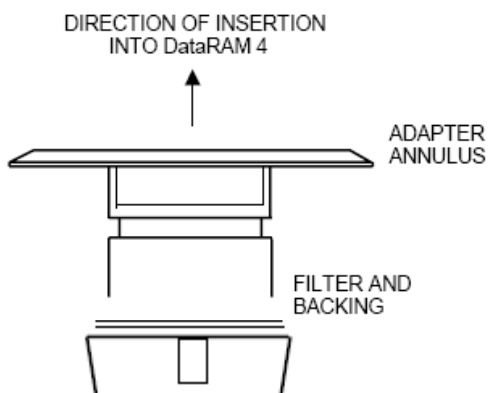
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*Analytic Filter Installation/Replacement*

In order to install or replace the analytical filter holder, proceed as follows. Remove the HEPA cartridge normally in place. Remove (separate) the inlet cover (with the blue plug) of the Millipore plastic filter holder from the rest of that holder assembly containing the white membrane filter. Insert firmly the gray plastic adapter annulus into the open face of the filter holder assembly. Remove the red plastic plug from the exhaust nipple of the filter holder assembly. Ensure that all three components of the holder assembly are fully compressed to preclude any leakage. Insert the assembly into the filter cavity of the DataRAM 4 with the gray plastic adapter annulus bearing against the internal black gasket (adapter annulus inserted first). Reposition threaded plastic cover and hand-tighten carefully and firmly. Set aside HEPA cartridge for future use.

In order to remove and/or to replace the membrane filter within its holder, remove the gray plastic adapter annulus and separate (pry apart) the two transparent plastic rings that compress the membrane filter. Make sure to remove and replace only the membrane filter (using tweezers), leaving the white backing disc in the holder. A new membrane filter should then be placed over that backing and the sealing ring should then be inserted to trap and compress the filter and backing discs. For storage, the inlet cap with the blue plug should be inserted as well as the red plug on the back of the filter holder.

*Analytical filter holder with adapter annulus inserted*



**CALIBRATION AND MAINTENANCE OF PORTABLE  
PARTICULATE METER**

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Cleaning of Optical Sensing Chamber

Although the DataRAM 4 incorporates filtered air shielding of the critical optical sensing surfaces, continued sampling of airborne particles at high concentrations may result in gradual build-up of contamination on those interior surfaces of the sensing chamber components. This may cause an excessively high optical background level. If this background level does becomes excessive, the DataRAM 4 will alert the user at the completion of the zeroing sequence by the display of a BACKGROUND HIGH message. If this message is presented, the DataRAM 4 can continue to be operated providing accurate measurements. However, it is then advisable to clean the front surfaces of the optical lenses within the sensing chamber at the first convenient opportunity, as described below. The tools required for this cleaning are: an intense concentrated light source (e.g., flash light) to view the inside of the sensing chamber, denatured alcohol, a soft lint-free cloth, and the special cleaning tool provided with the DataRAM 4 consisting of a cut-off cotton swab inserted in a plastic sleeve and held by a right-angle Allen wrench.

Proceed as follows to clean the lens surfaces within the sensing chamber:

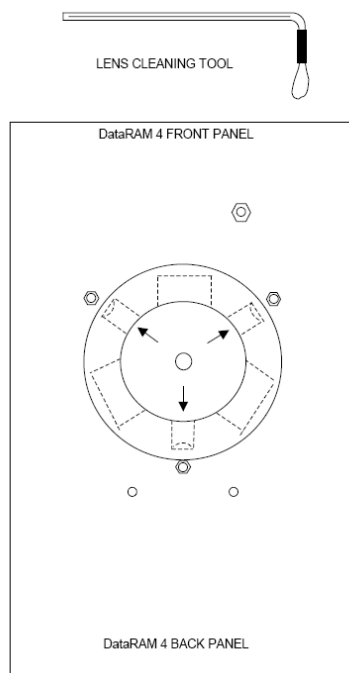
- **Make sure to shut off power completely before proceeding with cleaning**
- Install the stainless steel cover on the inlet of the DataRAM 4 to protect this fitting.
- Place the DataRAM 4 upside down on a table, resting the instrument on the inlet cover and the rear protective bumper.
- Unscrew the gray plastic cover of the filter cavity on the bottom surface of the DataRAM 4.
- Remove the filter cartridge from its cavity.
- Carefully clean the black soft filter-sealing gasket within the filter cavity by wiping it with the lint-free soft cloth. Use alcohol if necessary.
- Shine the concentrated light source into the sensing chamber located about 3 cm (1¼ in.) beyond the soft-sealing gasket in the filter cavity.
- Locate the three smaller side cavities inside the sensing chamber, identified by the arrows on that figure (see page 6). These three cavities contain the lenses of the two sources and the common detector of the DataRAM 4. The frontal surfaces of these lenses are likely to require cleaning if the instrument indicates BACKGROUND HIGH.
- Wet the cotton swab of the lens-cleaning tool with alcohol (e.g., methanol, ethanol, or rubbing alcohol).

**CALIBRATION AND MAINTENANCE OF PORTABLE  
PARTICULATE METER**

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- Holding the cleaning tool by its long handle, insert this tool into the sensing chamber without touching the walls of this chamber.
- Direct the cotton swab tip towards the opening of one of the three smaller cavities as indicated by the arrows of the figure below, and insert the cotton tip into this cavity as far as it will go. Gently wipe that internal surface touched by the swab tip by a rotating motion. Carefully withdraw the swab tip from the cavity.
- Repeat previous cleaning step for the other two small cavities.
- Carefully remove the cleaning tool from the sensing chamber. Allow the alcohol to dry leaving the filter cavity open for about 15 minutes.
- Re-insert the filter cartridge into its cavity and close it with its gray plastic cover, hand-tightening it firmly. Remove the inlet cap and store on its pod on the back panel.
- Place the DataRAM 4 right side up and key ON. Proceed to check its optical background by running the ZERO/INITIALIZE check as. The message READY! should appear at the end of this check indicating that the lens contamination has been eliminated. Should the message BACKGROUND HIGH persist after completion of the above-described lens cleaning procedure, please contact the factory.

*Lens cleaning tool and bottom view of open filter cavity showing location of sensor chamber lens cavities (arrows).*



**CALIBRATION AND MAINTENANCE OF PORTABLE  
PARTICULATE METER**

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**FACTORY CALIBRATION**

For mass concentration measurements, each DataRAM 4 is factory calibrated against a set of reference monitors that, in turn, are periodically calibrated against a gravimetric standard traceable to the National Institute of Standards and Testing (NIST).

The primary factory reference method consists of generating a dust aerosol by means of a fluidized bed generator, and injecting continuously the dust into a mixing chamber from which samples are extracted concurrently by two reference filter collectors and by two master real-time monitors that are used for the routine calibration of every DataRAM 4.

The primary dust concentration reference value is obtained from the weight increase of the two filters due to the dust collected over a measured period of time, at a constant and known flow rate. The two master real-time monitors are then adjusted to agree with the reference mass concentration value (obtained from averaging the measurements of the two gravimetric filters) to within  $\pm 1\%$ .

Three primary, NIST traceable, measurements are involved in the determination of the reference mass concentration: the weight increment from the dust collected on the filter, the sampling flow rate, and the sampling time. Additional conditions that must be met are: a) suspended dust concentration uniformity at all sampling inlets of the mixing chamber; b) identical sample transport configurations leading to reference and instrument under calibration; and c) essentially 100% collection efficiency of filters used for gravimetric reference for the particle size range of the test dust.



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## FOP 084.0

### CALIBRATION AND MAINTENANCE OF PORTABLE PARTICULATE METER

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The test dust used for the MIE factory calibration of the DataRAM 4 is SAE Fine (ISO Fine) supplied by Powder Technology, Inc. It has the following physical characteristics (as dispersed into the mixing chamber):

- Mass median aerodynamic particle diameter: 2 to 3  $\mu\text{m}$
- Geometric standard deviation of lognormal size distribution: 2.5
- Bulk density: 2.60 to 2.65 g/cm<sup>3</sup>
- Refractive index: 1.54

In addition to the mass calibration described above, the DataRAM 4 is factory calibrated using a gas with known scattering coefficient in order to adjust the relative scattering irradiance at the two source wavelengths.

#### ATTACHMENTS

None



# APPENDIX G

ELECTRONIC COPY