Remedial Investigation Work Plan

399 Ohio Street Site
Buffalo, New York

Revised November 2014 0136-013-011

Prepared for:

1093 Group, LLC

Prepared by:

TurnKey Environmental Restoration, LLC

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WORK PLAN

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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) and Alternatives Analysis (AA) at the 399 Ohio Street Site, located in the City of Buffalo, Erie County , New York (Site; see Figures 1 and 2).

The Applicant, 1093 Group, LLC, acting as a Volunteer has elected to pursue cleanup and redevelopment of the Site under the New York State Brownfield Cleanup Program (BCP), and has submitted a BCP Application to the New York State Department of Environmental Conservation (NYSDEC) in conjunction with this work plan.

The RI will be completed by TurnKey Environmental Restoration, LLC (TurnKey), in association with Benchmark Environmental Engineering & Science, PLLC (Benchmark), on behalf of 1093 Group, LLC. The work will be completed in general accordance with NYSDEC DER-10 guidelines (Ref. 1).

1.1 Site Background

The BCP Site consists of an approximate 5.0 acre portion of a larger 7.26 acre property, located in a highly developed mixed use industrial, commercial, residential, and recreational area of the City of Buffalo, Erie County, New York (see Figures 1 and 2). It should be noted that prior operations at the Site were addressed from 301-399 Ohio Street, and as such historic records were researched according to the address range. For the purpose of the BCP, the Site is referred to herein as the 399 Ohio Street Site

The Site is comprised of approximate 10,000 square foot vehicle maintenance and office building with the remainder of the Site covered by asphalt/concrete. The Site has a long history of industrial and commercial operation, which has contaminated the Site. The Site has been utilized for various industrial and commercial operations since at least 1889. Operations included rail lines, material handling and shipping equipment maintenance, and the use and storage of paints, solvents, thinners, greases, hydraulic oils and lubricants common among former commercial operations. More recent property uses have included the operation of bus and trucking terminal and maintenance operations, including the placement of underground storage tanks (USTs), aboveground storage tanks (ASTs) and fuel dispensing pump(s), and the likely use and storage of automotive lubricants, oils, degreasers, solvents, grease, paints, thinners, and waste oils common for vehicle maintenance operations.

Previous environmental investigations completed across the Site have revealed evidence of environmental contamination related to the former use of the Site. Evidence of petroleum contamination, elevated polycyclic aromatic hydrocarbons (PAHs) and metals have been detected on Site exceeding 6NYCRR Part 375 Commercial Soil Cleanup Objectives (SCOs). Details of the previous investigation are presented in Section 2.8 below.

1.2 Project Objectives

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

- Collect additional soil/fill and groundwater samples, under appropriate quality assurance/quality control criteria, to better delineate the nature and extent of contamination;
- Collect sufficient data to evaluate the actual and potential threats to the public health and the environment; and,
- Collect the data necessary to evaluate the remedial action alternatives.

As part of the RI/AA 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 PID measurements, groundwater elevation measurements, and field analyses (i.e., pH, temperature, 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.

1.3 Project Organization and Responsibilities

The Applicant, 1093 Group, LLC, has applied to the New York State BCP as a 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), will monitor the investigation and remedial actions to verify that the work is performed in accordance with the Brownfield Cleanup Agreement, the approved RI Work Plan, and NYSDEC DER-10 guidance (May 2010).

TurnKey personnel and key 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.

Company	Role	Name	Contact Information
TurnKey	BCP Project Manager	Mike Lesakowski	(716) 856-0635
TurnKey	Field Personnel	TBD	(716) 856-0635
1093 Group, LLC	Applicant Contact	TBD	(716) 854-0060
TBD	Analytical Testing	TBD	TBD
TBD	Drilling Services	TBD	TBD
TBD	Excavation Services	TBD	TBD
Data Validation Services	Data Usability Summary Report	Judy Harry	(518) 251-4429

2.0 SITE DESCRIPTION

2.1 General

The Site is currently improved with a single office maintenance-garage building, with asphalt and concrete covering the remainder of the Site. The Site is bound by recreational property (River Fest Park) with vacant commercial/industrial properties beyond to the north, the scholastic rowing club facility to the south, Ohio Street with commercial, recreational and residential vacant property beyond to the east, and the Buffalo River to the west with industrial and commercial beyond.

2.2 Site Topography and Drainage

The Site is generally flat lying with limited topographic features. The surface of the Site is covered with the building and asphalt. 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 is described as Urban Land (Ud). This is indicative of the 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 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 approximated thickness of 110 to 160 feet.

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 is assumed to flow west towards the Buffalo River. 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 40.4 inches and snowfall is 90.4 inches (Ref. 4). Average monthly temperatures range from 25.6 degrees Fahrenheit in January to 71.5 degrees Fahrenheit in July (Ref. 4). The ground and lakes typically remain frozen from December to March. Winds are generally from the southwest (225 degrees) with a mean velocity of 10 miles per hour (Buffalo Airport, 2011-2013).

2.5 Population and Land Use

The City of Buffalo, encompassing 40.38 square miles, has a population of 261,310 (2010 US Census Bureau). The Site is located within Census Tract 13.02, in the City of Buffalo an area zoned for commercial/light industrial/residential property use.

The Site is located in a highly developed mixed use industrial, commercial, residential and recreational area of the City of Buffalo. Properties adjacent to the Site are mixed commercial, vacant and recreational/park areas. The surrounding land is utilized for commercial purposes and recreational space. Residential areas surrounding the Site are located approximately 0.15-miles to the southeast across Ohio Street.

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 known 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 wetlands or floodplains located on Site. The Federal Emergency Management Agency (FEMA) 100-year floodplain is identified across the western portion of the Site along the Buffalo River. Lake Erie is located approximately 1-mile to the west of the site. A NYSDEC regulated freshwater wetland (BU-3) is located approximately 0.6-miles to the northwest of the site (see Figure 3).

2.8 Previous Investigations

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

2.8.1 Site Inspection Report (June 1995)

Buffalo Drilling Company, Inc. completed a Site Inspection Report on several Ohio Street properties, including the 399 Ohio Street Site. Findings for the 399 Ohio Street Site are summarized below.

- Olfactory and field evidence of a petroleum contaminated soil was noted in soil boring B-3; including,
- Staining noted on concrete, in the vicinity of suspected waste oil/grease storage pails.
- Railroad spurs were noted historically on Site, through research of historic maps. Rail operations are frequently associated with elevated levels of semi-volatile organic compounds (SVOCs) and metals.

2.8.2 Phase I Environmental Site Assessment (November 2005)

Construction Lending Services, Inc. (CLS) completed a Phase I Environmental Site Assessment (ESA) on the southern portion of the Site, and the findings are summarized below.

- Past use of the property included automotive repair operations, including multiple USTs, pump island, and ASTs.
- Storage of 55-gallon drums of suspect oil
- Presence of floor drain in the maintenance pit and trench drench drains in the floor, with unknown discharge points

- Staining noted proximate waste oil/grease storage area.
- Railroad spurs were noted historically on Site. Rail operations are frequently associated with elevated levels of semi-volatile organic compounds (SVOCs) and metals.
- City of Buffalo historic permit records indicate the potential for at least three (3) USTs on Site.
- NYSDEC PBS database records show two (2) ASTs had been located on Site.

2.8.3 Limited Phase II Environmental Investigation Report (November 2013)

A limited environmental investigation detected elevated polycyclic aromatic hydrocarbons (PAHs) above Part 375 Commercial Use Soil Cleanup Objectives (SCOs) and metals, including arsenic, cadmium, chromium, lead, silver, and mercury, above their respective Part 375 Unrestricted, Restricted-Residential and/or Commercial Use SCOs across the Site.

2.9 NYSDEC Records

The Site is listed on the NYSDEC Petroleum Bulk Storage (PBS) database (Site No. 9-600347) showing at least two (2) aboveground storage tanks (ASTs) have been located on-Site. Copies of the PBS records are included in Appendix B.

2.10 City of Buffalo – Permits Office Records

Historic permits indicate the potential for historic USTs, dispensers, and truck maintenance operations were located on-Site, including:

- Dated 04/11/1941 – Place gasoline tank 1,000 gallon. Addressed at 393 Ohio Street (N.Y.C.R.R.)
- Dated 6/10/1974 – Erect steel building for storage and truck repair. Addressed at 263-393 Ohio Street (Modern Terminal of Boss Linco.)
- Dated 12/10/1986 – Place and use UST – (1) 10,000 gallon at existing truck repair garage. Addressed at 375 Ohio Street (Blue Bird Bus Lines)
- Dated 3/05/1987 - Electrical permit to install conduit and wiring to gas pump. Addressed at 301 Ohio Street (Blue Bird Bus)

The City of Buffalo historic permits are included Appendix B.

2.11 Primary Constituents of Potential Concern (COPCs)

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

- ***Soil: petroleum*** VOCs, SVOCs, and metals
- ***Groundwater:*** petroleum VOCs

3.0 REMEDIAL INVESTIGATION SCOPE OF WORK

The RI 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 risk assessment as part of 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 within the NYSDEC's DER-10 (May 2010) Appendix 1A (NYSDOH's Generic Community Air Monitoring Plan) and Appendix 1B (Fugitive Dust and Particulate Monitoring).

The investigation approach is described below. The proposed RI sample locations are presented on Figure 4 and the planned sampling and analytical program is identified on Table 1.

3.1 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.

3.2 Soil/Fill Investigation

A soil/fill investigation will be completed across the BCP Site to assess potential impacts related to the historic use of the Site. The soil/fill investigation will include the collection of near surface (0.5-2 feet below ground surface (fbgs)), and subsurface soil/fill samples. No surface soil samples are planned based on the predominant existing impermeable cover (e.g., building and asphalt/concrete) across the Site. The soil/fill investigation will include the excavation of exploratory test pits (TPs) across the accessible portions of the Site, and the advancement boreholes within the building interior to allow for inspection and characterization of subsurface soil/fill and sample collection. The proposed RI sample locations are presented on Figure 4 and a Sampling and Analytical Plan is presented on Table 1.

3.2.1 Subsurface Soil/Fill Investigation

An estimated nineteen (19) soil/fill exploratory locations will be completed across the BCP Site to assess the subsurface soil/fill, including the excavation of twelve (12) test pits, identified as TP-9 through TP-20; and the advancement of two (2) soil borings within the interior of the building, identified as SB-1 and SB-2, and the advancement of five (5) boring during groundwater monitoring well installation, identified as MW-1 through MW-5. Each TP will be approximately 2-3 feet in width, 8-10 feet in length, and will be advanced to an approximate depth of 12 to 16 fbgs, the extent of the excavator arm, or refusal. Interior borings and monitoring well locations will be advanced to approximately 12-16 feet below ground surface/concrete slab, or refusal. All soil samples will be field screened for the presence of VOCs using a field photoionization detector (PID) equipped with a 10.6 eV lamp as a procedure for ensuring the health and safety of personnel at the Site, and to identify potentially impacted soil samples for laboratory analysis.

Previous investigations, as described above, identified three vertical soil horizons, including: soil/fill at varying depths between 0 to 8 fbgs, a reworked silt, clay and sand soil/fill at varying depths from approximately 4 to 15 fbgs, and a native clay and sand at varying depths from approximately 8 to at least 15 fbgs. In an effort to characterize the differentiable soil horizons, near-surface, subsurface soil/fill, and native clay-sand, if encountered, will be investigated and characterized across the Site.

A total of 24 investigation soil/fill sample locations are planned to be collected across the Site during the RI, including five (5) near-surface samples, 14 subsurface soil/fill samples, including the interior borings, and five (5) native soil samples, if encountered.

3.2.2 Soil/Fill Sample Collection and Analysis

Tables 1 and 2 summarize the proposed RI analytical program and sampling requirements. During the subsurface investigation, the soil/fill interval identified as the most impacted within the target horizon (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 are identified, the soil/fill sample interval will be collected to delineate previously identified impacts and uniformly characterize the Site as detailed on Table 1. If additional differentiable impacts are noted within a target horizon, or if an additional soil horizon is identified, additional samples may be collected from the material for characterization.

Laboratory provided core samplers will be used to collect VOC soil/fill samples. All remaining 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 4ºC in the field, and transported under chain-of-custody command to a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory, in accordance with USEPA SW-846 methodology with equivalent NYSDEC Category B deliverables to allow for independent third-party data usability assessment. Soil samples will be analyzed in accordance with the Sampling and Analysis Plan presented on Table 1.

3.2.3 Groundwater Investigation

Five (5) groundwater monitoring wells will be advanced across the Site to assess groundwater flow direction and groundwater quality data. Proposed groundwater monitoring well locations are identified on Figure 4. Monitoring well installation, well development, and groundwater sample collection details are discussed in the following sections.

3.2.3.1 Monitoring Well Installation

A direct-push drill rig capable of advancing hollow-stem augers will be employed to install 2-inch inside diameter (ID) monitoring wells. Each well location will be advanced to approximately 14-16 fbgs, 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).

Each monitoring well will be installed using a 2-inch ID diameter flush-joint Schedule 40 PVC casing 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.

3.2.3.2 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 (DO), oxidation-reduction potential (ORP) 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 will be containerized and sampled to determine proper discharge requirements. Based on the analytical results, containerized water may be discharged to the ground surface, passed through a granular activated carbon unit or other on-Site treatment system, prior to discharge to ground surface, or taken off-site for disposal.

3.2.3.3 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, DO, ORP, 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, DO, ORP 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:

- **Submersible Pump with Dedicated Pump Tubing**

  All monitoring wells will be purged and sampled using a non-dedicated submersible pump and dedicated pump tubing following low-flow (minimal drawdown) purge and sample collection procedures, as described above. Non-dedicated pumps will require decontamination prior to use at each well location and the collection of an equipment blank.

- **Polyethylene Disposable Bailer**

  Wells of any depth (up to 100 fbgs) 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, DO, ORP, 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 NYSDOH ELAP-certified analytical laboratory for analysis; in accordance with USEPA

SW-846 methodology with equivalent NYSDEC Category B deliverables to allow for independent third-party data usability assessment.

3.2.3.4 Groundwater Sample Analyses

A total of five (5) groundwater samples will be collected and analyzed for TCL plus CP-51 VOCs, TCL SVOCs, TAL metals, PCBs, pesticides, and herbicides (see Table 1).

3.2.3.5 Groundwater Flow Evaluation

Groundwater elevation data will be collected during the RI. Two rounds of water level data from within the newly installed monitoring wells will be collected, and used to develop an on-Site groundwater isopotential map. A table that summarizes the well casing and groundwater elevations will be prepared. An isopotential map showing the general direction of groundwater flow will be prepared based on water elevation measurements relative to USGS vertical datum.

3.2.4 Soil Vapor Assessment

To evaluate potential vapor intrusion into the existing building, one (1) subslab vapor (SV) sample, one (1) interior ambient air samples, and one outdoor ambient air (i.e., background) sample will be collected. One duplicate SV sample will be collected for each day of SV 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 (see Appendix F). Soil vapor samples will be collected and sent to a NYSDOH-approved laboratory for analysis of USEPA TCL VOCs and SVOCs in accordance with USEPA Method TO-15.

3.2.4.1 Subslab Vapor Pre-Sample Assessment

Prior to initiation of SV 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.

3.2.4.2 Subslab Vapor Sample Collection

TurnKey personnel will drill a hole through the concrete slab using a hand-held hammer drill. Temporary subslab vapor probes and tubing will 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 sample, indoor ambient air and outdoor air samples will be collected. Indoor ambient air samples will be collected adjacent to the 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, or equivalent, 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.

3.2.4.3 Sub-slab Vapor Sample Analysis

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

3.2.5 Field Specific Quality Assurance/Quality Control Sampling

In addition to the near-surface soil, subsurface soil/fill and groundwater 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.

3.3 Investigation-Derived Waste Management

During subsurface test pitting activities, excavated materials will be returned to the test pit from which it was excavated upon completion of field assessment and analytical sample collection.

During installation of the monitoring wells, excess soil cuttings will be staged on poly sheeting or containerized in 55-gallon drums. Based on the RI analytical results, samples may be collected to determine if they can be utilized on-Site, require treatment, and/or off-Site disposal. Groundwater from well development will be containerized, and based on the RI analytical results, will be discharged to the ground, treated, and/or disposed off-site. However, if LNAPL/DNAPL is encountered within a particular well, development and purge waters from that location will be containerized. 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 analyses and remedial measures assessment.

3.4 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 handheld GPS unit to identify the locations of all soil boring, test pits and newly installed well locations relative to State planar grid coordinates. Additional geospatial data may be collected related to debris piles, structure locations, and/or subsurface structures, if encountered. Monitoring well elevations will be measured by TurnKey's surveyor. Site maps will be provided with the RI report.

4.0 QUALITY ASSURANCE PROJECT PLAN

A QAPP has been prepared in support of the RI 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).

4.1 Scope of the QAPP

This QAPP was prepared to provide quality assurance (QA) guidelines to be implemented during the RI 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.

4.2 QAPP Organization and Responsibility

The principal organizations involved in verifying achievement of data collection goals for the 399 Ohio Street Site include: the NYSDEC, NYSDOH, 1093 Group, LLC (Applicant), TurnKey Environmental Restoration, LLC and Benchmark Environmental Engineering and Science, PLLC (Volunteer's Consultants), 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 of TurnKey/benchmark personnel are included in Appendix A. Resumes of subcontractors will be provided upon request of the Department.

4.2.1 NYSDEC and NYSDOH

It is the responsibility of the NYSDEC, in conjunction with NYSDOH, to review the RI/AAR 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. The NYSDEC may split any waste, soil or groundwater sample during this investigation.

4.2.2 Applicant

1093 Group, 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 Applicant 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.

4.2.3 Environmental Consultants

TurnKey Environmental Restoration, LLC (TurnKey), in association with Benchmark Environmental Engineering and Science, PLLC (Benchmark), is the prime consultant on this project and is responsible for the performance of all services required to implement each phase of the RI 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.

- *<u>TurnKey Project Manager (PM):</u>* *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 1093 Group, LLC Project Coordinator and the NYSDEC/NYSDOH Project Coordinators and is responsible for technical and project oversight. The PM will:

  - Define project objectives and develop a detailed work plan schedule.
  - 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:* *Nathan Munley*

  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, sub-consultants, 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.

4.3 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 Riker*

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

4.4 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.

4.5 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 analytical laboratory under EPA analytical methods.

4.6 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.

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.

4.7 Sampling and Analysis Plan

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

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 2. 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.

4.7.1 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 E, describe procedures for maintaining sample custody from the time samples are collected to the time they are received by the analytical laboratory.

4.7.2 Sample Storage

Samples are stored in secure limited-access areas. Walk-in coolers or refrigerators are maintained at 4°C, ± 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.

4.7.3 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.

4.7.4 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).

4.8 Calibration Procedures and Frequency

Quantitative field data to be obtained during groundwater sampling include pH, turbidity, specific conductance, oxidation-reduction potential (ORP), temperature, dissolved oxygen 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 E 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.

4.9 Analytical Procedures

Samples collected during this investigation field sampling activities will be analyzed by a NYSDOH Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory. Field procedures for collecting, preserving and transporting field samples are described in FOPs located in Appendix E. A summary of the FOPs is presented on Table 3.

4.10 Data Usability Evaluation

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

4.10.1 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 E. 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.

4.10.2 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.

5.0 INVESTIGATION SUPPORT DOCUMENTS

5.1 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. 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.

5.1.1 Community Air Monitoring Plan

Real-time community air monitoring will be performed during all ground intrusive activities at the Site. A CAMP is included with TurnKey's HASP. 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).

5.2 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 was 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.

6.0 REPORTING AND SCHEDULE

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

6.1 Remedial Investigation Reporting

The RI/AA Report will include the following information and documentation, consistent with the NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation (May 2010) and 6 NYCRR Part 375 guidelines.

- 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;
- 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/AA Report.

6.2 Alternatives Analysis Report

An alternatives analysis report (AAR) will be completed to provide a forum for evaluating and selecting a recommended remedial approach. Based on the findings of the RI, a list of remedial action objectives will be developed with 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
- Implementation
- 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.

6.3 Project Schedule

An estimated project schedule for the RI and major environmental tasks to be performed is presented on Figure 5.

7.0 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. Geologic Map of New York, Niagara Sheet, Compiled and Edited by Lawrence V. Rickard and Donald W. Fisher, University of the State of New York, The State Education Department, March 1970.

4. National Oceanic & Atmospheric Administration (NOAA) Satellites and Information. Data Tables through 2000.

5. Buffalo Drilling Company, Inc. *Site Inspection Report, 282-301 Ohio Street, Buffalo, New York*. June 1995.

6. Construction Lending Services, Inc. *Phase I Environmental Site Assessment, 301 Ohio Street, Buffalo, New York*. November 2005.

7. TurnKey Environmental Restoration, LLC. *Limited Phase II Subsurface Environmental Investigation Report, 301 Ohio Street, Buffalo, New York*. November 2013.

8. U.S. Environmental Protection Agency. *Requirements for Quality Assurance Project Plans for Environmental Data Operations (EPA QA/R-5).* October 1998.

9. U.S. Environmental Protection Agency, Region II. *CERCLA Quality Assurance Manual, Revision I.* October 1989.

10. U.S. Environmental Protection Agency, *Methods for Chemical Analysis of Water and Wastes*, EPA 600/4-70-020. 1983b.

11. U.S. Environmental Protection Agency. National Functional Guidelines for Organic Data Review (EPA-540/R-94-012), 1994a.

12. U.S. Environmental Protection Agency. National Functional Guidelines for Inorganic Data Review (EPA-540/R-94-013), 1994b.

TABLES

TurnKey Environmental Restoration, LLC

TABLE 1

SAMPLING AND ANALYSIS PLAN

REMEDIAL INVESTIGATION WORK PLAN

399 OHIO STREET SITE

BUFFALO, NEW YORK

Matrix	Investigation Location		Estimated Number of Samples	Full List VOCs [1]	TCL SVOCs	TAL Metals	PCBs	Pesticide	Herbicide
Soil/Fill	TP-10	Near Surface	1		1	1	1	1	1
	TP-13		1		1	1			
	TP-16		1		1	1	1	1	1
	TP-18		1		1	1			
	TP-20		1		1	1	1	1	1
	TP-9	Exterior Subsurface	1	1	1	1	1	1	1
	TP-10		1		1	1			
	TP-11		1		1	1			
	TP-12		1	1	1	1	1	1	1
	TP-13		1		1	1			
	TP-14		1	1	1	1			
	TP-15		1		1	1			
	TP-16		1		1	1			
	TP-17		1	1	1	1	1	1	1
	TP-18		1		1	1			
	TP-19		1		1	1	1	1	1
	TP-20		1	1	1	1			
	SB-1	Interior Subsurface	1	1	1	1	1		
	SB-2		1	1	1				
	MW-1	Native	1		1	1			
	MW-2		1	1	1	1	1	1	1
	MW-3		1		1	1			
	MW-4		1	1	1	1	1		
	MW-5		1		1	1			
SV	SV-1	Subsurface Vapor	1	1					
	Ambient-1		1	1					
	Outdoor Air Sample		1	1					
QA/QC	Soil	MS	2	1	2	2	1	1	1
		MSD	2	1	2	2	1	1	1
		Blind Dup	2	1	2	2	1	1	1
	SV	Blind Dup	1	1					
			34	**16**	**30**	**29**	**13**	**11**	**11**
Groundwater	MW-1	Groundwater	1	1	1	1	1	1	1
	MW-2		1	1	1	1	1	1	1
	MW-3		1	1	1	1	1	1	1
	MW-4		1	1	1	1	1	1	1
	MW-5		1	1	1	1	1	1	1
QA/QC	Groundwater	MS	1	1	1	1	1	1	1
		MSD	1	1	1	1	1	1	1
		Blind Dup	1	1	1	1	1	1	1
		Equipment Blank	1	1	1	1	1	1	1
			9	**9**	**9**	**9**	**9**	**9**	**9**

Notes:

1. Full List VOCs = TCL plus CP-51 VOCs via EPA Method 8260; Air smaples will be analyzed via TO-15
2. All locations shall be sampled and archived by the laboratory for potential analysis / reanalysis.
3. GW field parameters including: pH, specific conductance, temperature, DO, ORP, and turbidity will be collected and recorded.
4. Additional samples may be collected if field screening results indicate potential contamination (e.g., elevated PID readings above 5 ppm).

Acronyms:

VOCs = volatile organic compounds
SVOCs = semi-volatile organic compounds
TCL = Target Compound List
TAL = Target Analyte List
PCBs = Polychlorinated Biphenyls

TURNKEY ENVIRONMENTAL RESTORATION, LLC

TABLE 2

SAMPLE CONTAINER, VOLUME, PRESERVATION &

HOLDING TIME REQUIREMENTS

399 OHIO STREET SITE

BUFFALO, NEW YORK

Matrix	Parameter [1]	Method [1]	Container Type	Minimum Volume	Preservation (Cool to 2-4 ^oC for all samples)	Holding Time from Sample Date
Soil/Sediment	TCL + CP-51 VOCs + MTBE	8260B	WMG	16 oz.	Cool to 2-4 ^oC, Zero Headspace	14 days
	TCL SVOCs & Tetraethyl Lead	8270C	WMG	16 oz.	Cool to 2-4 ^oC	14 days extrac./40 days
	TAL Metals & Total Lead	6010B	WMG	4 oz.	Cool to 2-4 ^oC	6 months/Hg 28 days
	Pesticides	8081	WMG	8oz	Cool to 2-4 ^oC	14 days extrac./40 days
	Herbicides	8151	WMG	8oz	Cool to 2-4 ^oC	14 days extrac./40 days
	PCBs	8082	WMG	4 oz.	Cool to 2-4 ^oC	14 days extrac./40 days
Groundwater	TCL + CP-51 VOCs + MTBE	8260B	glass vial	3 - 4 oz.	HCl to pH<2, Zero Headspace, Cool to 2-4 ^oC	14 days
	TCL SVOCs & Tetraethyl Lead	8270C	amber glass	1000 ml	Cool to 2-4 ^oC	7 days extrac/40 days
	TAL Metals & total Lead	6010B	plastic	600 ml	HNO_3 to pH<2, Cool to 2-4 ^oC	6 months/Hg 28 days
	PCBs	8082	amber glass	1000 ml	Cool to 2-4 ^oC	7 days extrac/40 days

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

TurnKey Environmental Restoration, LLC

TABLE 3

SUMMARY OF FIELD OPERATING PROCEDURES

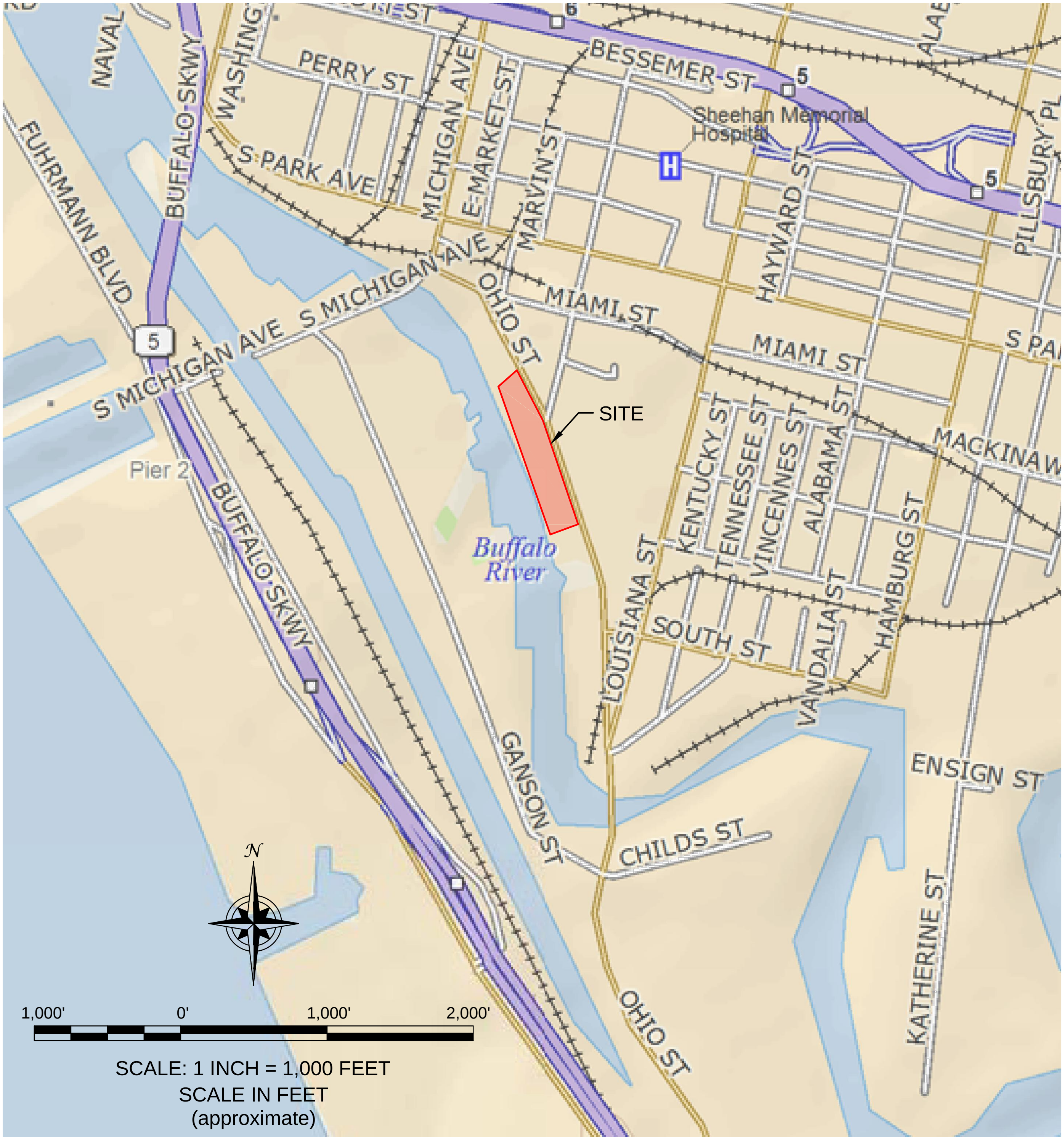
399 OHIO STREET

BUFFALO, NEW YORK

TurnKey FOP No.	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
058.0	Split-Spoon Sampling Procedures
063.2	Surface and Subsurface Soil Sampling Procedures
065.1	Test Pit Excavation and Logging Procedure
073.1	Real-Time Air Monitoring During Intrusive Activities
076.0	"Before Going Into the Field" Procedure
084.0	Calibration and Maintenance of Portable Particulate Meter

FIGURES

FIGURE 1



TurnKey Environmental Restoration, LLC 2558 HAMBURG TURNPIKE SUITE 300 BUFFALO, NY 14218 (716) 856-0635	**SITE LOCATION AND VICINITY MAP** REMEDIAL INVESTIGATION WORK PLAN 399 OHIO STREET SITE BUFFALO, NEW YORK PREPARED FOR 1093 GROUP, LLC
PROJECT NO.: 0136-013-011	
DATE: JANUARY 2014	
DRAFTED BY: JGT	

DATE: JANUARY 2014
DRAFTED BY: JGT

TurnKey Environmental Restoration, LLC
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BUFFALO, NY 14218
(716) 856-0635

JOB NO.: 0136-013-011

SITE PLAN (AERIAL)

REMEDIAL INVESTIGATION WORK PLAN

399 OHIO STREET SITE

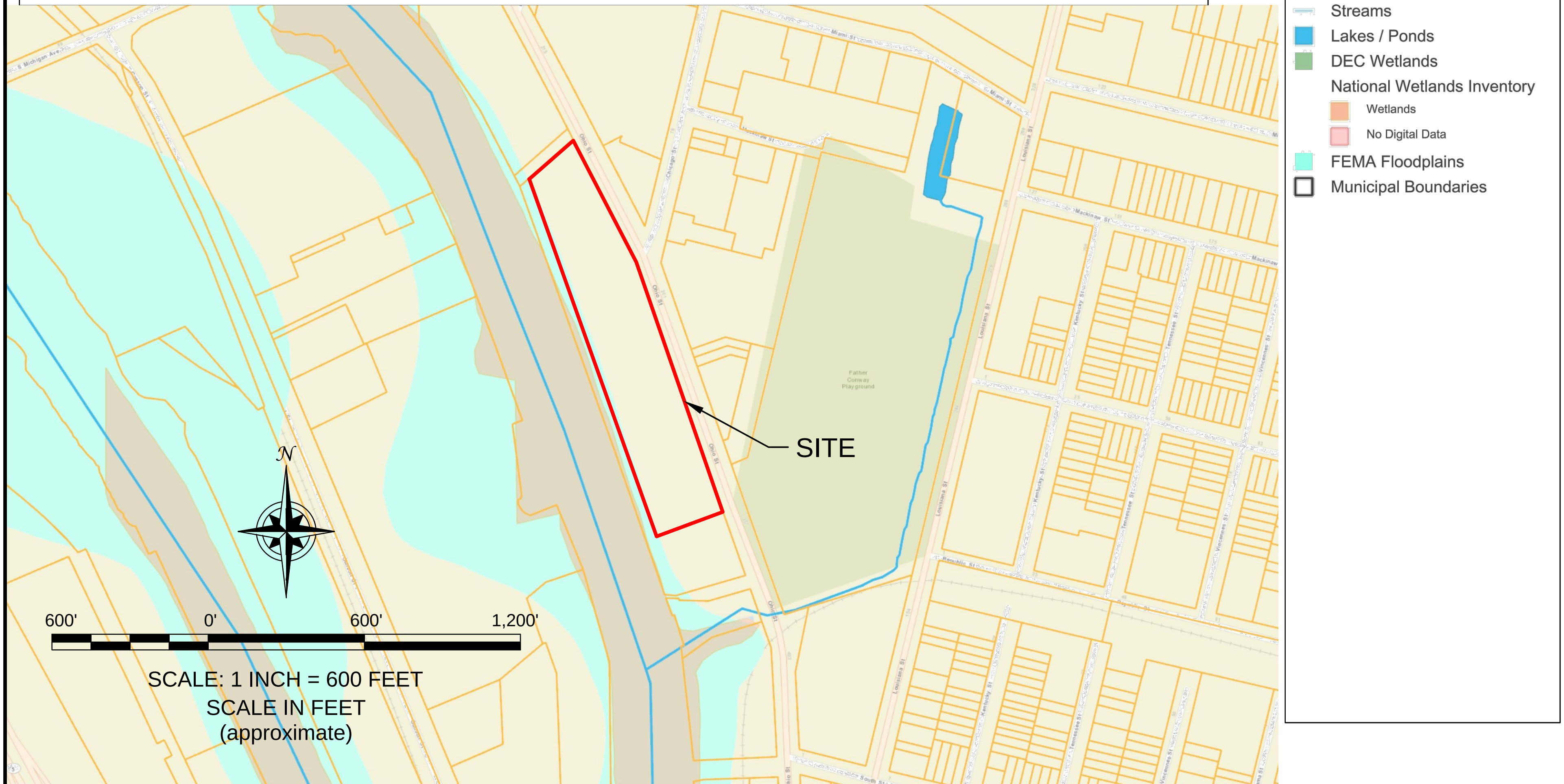
BUFFALO, NEW YORK

PREPARED FOR

1093 GROUP, LLC

FIGURE 2

Erie County On-Line Mapping Application



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PROJECT NO.: 0136-013-011

DATE: JANUARY 2014

DRAFTED BY: JGT

WETLAND & FLOODPLAIN MAP

REMEDIAL INVESTIGATION WORK PLAN

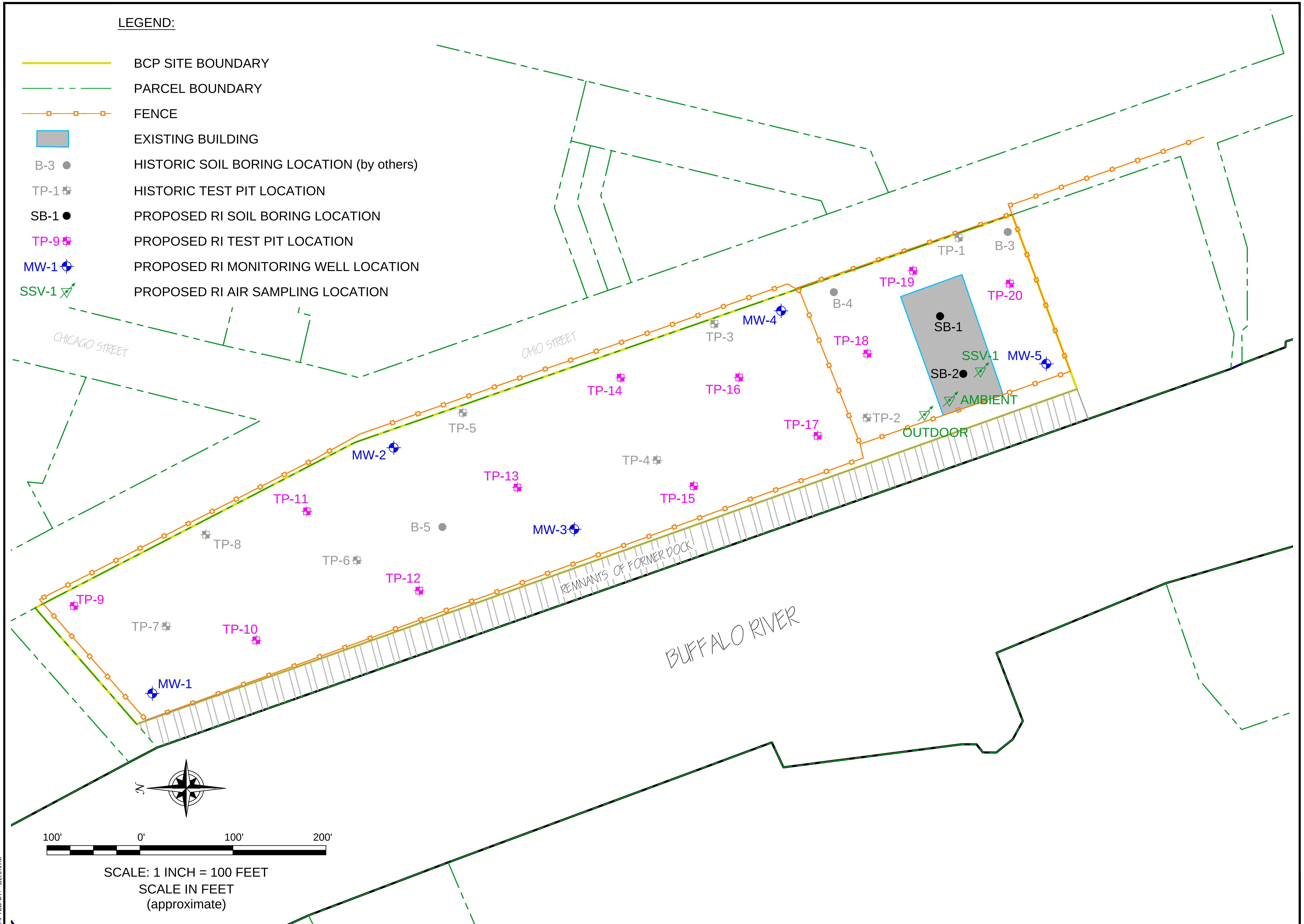
399 OHIO STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

1093 GROUP, LLC

FIGURE 3



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TurnKey Environmental Restoration, LLC

JOB NO.: 0136-013-011

PROPOSED RI SAMPLE LOCATIONS

REMEDIAL INVESTIGATION WORK PLAN

399 OHIO STREET SITE

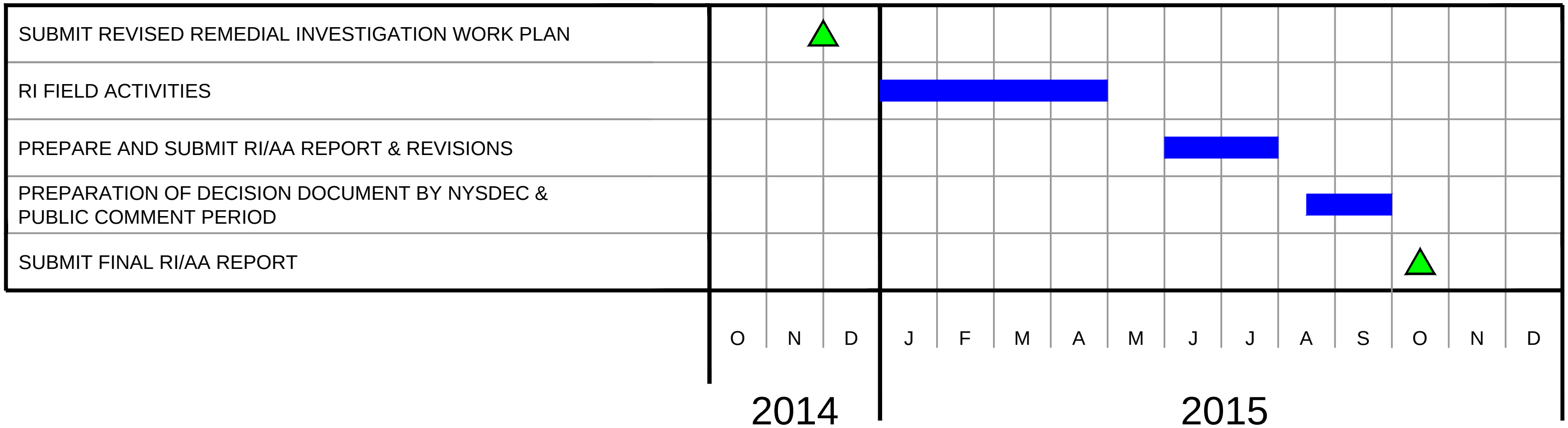
BUFFALO, NEW YORK

PREPARED FOR

1093 GROUP, LLC

FIGURE 4

PROJECT TASKS:



TurnKey Environmental Restoration, LLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NY 14218
(716) 856-0635

PROJECT NO.: 0136-013-011

DATE: REVISED NOVEMBER 2014

DRAFTED BY: BLR

PROJECT SCHEDULE

REMEDIAL INVESTIGATION WORK PLAN

399 OHIO STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

1093 GROUP, LLC

FIGURE 5

APPENDIX A

RESUMES

MICHAEL LESAKOWSKI
PROJECT MANAGER

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).

NEW YORK BROWNFIELD CLEANUP PROGRAM EXPERIENCE

301 Franklin Street Site, Olean, New York

- Recently completed a Remedial Investigation and Interim Remedial Measures for a property located within the ExxonMobil Legacy Site (EMSL) area, which was formerly developed as a petroleum refinery. Contaminants of concern include petroleum VOCs, SVOCs and metals in soil and VOCs and SVOCs and non-aqueous phase liquid (NAPL) in groundwater. The IRM included removal of approximately 3,000-tons of metals- and petroleum-impacted soil and removal of 5,800 linear feet of abandoned subsurface piping. A Remedial Action Work Plan has been prepared that includes: additional limited soil excavation and disposal; removal of subsurface piping and infrastructure; soil vapor extraction; an active subslab depressurization (ASD) system for the planned building; and, a soil cover system. Remedial work is planned for Summer/Fall 2011.

Homer Street Redevelopment Site, Olean, New York

- Recently completed a Remedial Investigation for a property located within the ExxonMobil Legacy Site (EMSL) Works #3 area, which was formerly developed as a petroleum refinery. Contaminants of concern include petroleum VOCs, SVOCs and metals in soil and VOCs and SVOCs in groundwater. Remedial Investigation work completed Spring/Summer 2011 included test pit excavations, soil borings/monitoring wells, surface soil, subsurface soil, sediment, surface water and groundwater sampling and delineation of surficial petroleum contamination.

NOCO S-41 Site, Buffalo, NY and Niagara Street and Pennsylvania Avenue Site, Buffalo, NY

- 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, 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.

3807 Highland Avenue Site, Niagara Falls, New York

- Completed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program sites at a historic metallurgical facility and steel factory in Niagara Falls, NY. The Remedial Investigation involved collecting over 100 surface and subsurface soil and sediment samples and installing and sampling groundwater monitoring wells on an approximate 25-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. A Certificate of Completion was issued in June 2010.

1501 College Avenue Site, Niagara Falls, New York

- Currently managing a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program sites at a historic heavy industrial facility in Niagara Falls, NY. The Remedial Investigation involved collecting surface and subsurface soil and sediment samples and installing and sampling groundwater monitoring wells on an approximate 15-acre parcel. IRMs include excavation of petroleum-impacted, PCB-impacted and SVOC-impacted soil in several areas of the Site, removal of galbestos PCB-impacted building materials, abandoned/damaged drum removal, chemical waste removal and a soil cover system. A Certificate of Completion is anticipated in summer 2011.

275 Franklin Street Site

- 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.

330 Maple Road Site, Amherst, New York

- 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 Summer 2011.

Seneca Market I, LLC Site, Watkins Glen, New York

- 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. 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.

GLR Holdings Site, Niagara Falls, New York

- Managed a Remedial Investigation (RI), Interim Remedial Measure (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for a former automotive repair facilty 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.

2250 Factory Outlet Boulevard Site, Niagara Falls, New York

- 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.

New Seventh Street Site, 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.

ENVIRONMENTAL LIABILITY TRANSFER EXPERIENCE

- Starting in 2010 through present, took the lead role in developing a liability transfer arrangement of a former refinery in New York State. Major tasks included technical review of historic Remedial Investigation data, remedial alternative selection and cost estimating, preparation of technical and liability transfer program proposal and negotiation with Fortune 100 company technical and business representatives. The deal involves a multi-million dollar remedial cleanup that is planned to be completed under the New York Brownfield Cleanup Program.

- 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. An Environmental Liability Transfer arrangement funded by the seller facilitated the additional environmental investigation and remediation of impacted sites.

- Played a key role in developing a liability transfer agreement for the transfer of a 48-site portfolio of gasoline stations with known petroleum impacts. Tasks included Phase I/Phase scoping, technical report review, oversight of remediation cost estimates and interfacing with the attorneys, insurance brokers, client and property sellers to develop and present the liability transfer arrangement.

- Provided technical consulting on behalf of HealthNow New York and Duke Realty for developing a liability transfer agreement for the transfer of a former manufactured gas plant site and gasoline station with significant soil, groundwater and soil vapor petroleum impacts. Tasks included technical report review, remediation cost estimating and interfacing with the attorneys, insurance brokers, client and property sellers to develop the liability transfer arrangement. Benchmark/TurnKey completed the remediation of the former gasoline station portion of the Site.

NATHAN T. MUNLEY
SENIOR PROJECT ENVIRONMENTAL SCIENTIST

EDUCATION

Masters of Science (Biology) 2004; State University of New York, Binghamton University

Bachelors of Science (Health Science) 1995; State University of New York, College at Cortland

Masters of Science (Engineering Science) (Currently Enrolled); State University of New York, University at Buffalo - Department of Environmental Engineering and Science.

Graduate coursework in: Stream Bank Restoration and Design, Biological Treatment Systems, Physiochemical Unit Processes, Aquatic Chemistry, Hazardous Waste Management, Hydrologic Engineering, Geographic Information Systems (GIS), and Computer Aided Design (CAD)

REGISTRATION AND AFFILIATIONS

Certified OSHA 40-Hour Hazardous Waste Site Training
Annual 8-Hour OSHA Refresher
Member – Society of Wetland Scientists

SUMMARY OF EXPERIENCE

Mr. Munley has over 10 years of experience in the environmental field ranging from conducting environmental research to consulting on environmental science and engineering projects. Environmental consulting projects that Mr. Munley has completed include a wide range of environmental site assessment, investigation, and remediation assignments including: Phase I & II Environmental Site Assessments (ESAs); Brownfield Cleanup Program investigation and cleanup; soil and groundwater treatment design projects, wetland mitigation permitting and design; Petroleum Bulk Storage (PBS) and Chemical Bulk Storage (CBS) permitting and closure, and hazardous waste site remediation projects. Prior to joining TurnKey, Mr. Munley was a researcher conducting laboratory and field based experiments investigated lake acidification and non-point source pollution degradation of wetlands. Mr. Munley has particular interests into the environmental site assessment, investigation, remedial design, and redevelopment of former industrial sites (Brownfields).

REPRESENTATIVE EXPERIENCE

June 2005 to Present: TurnKey Environmental Restoration, LLC

- Served as lead scientist on recently completed 30 gpm leachate collection, conveyance and pre-treatment system for a RCRA hazardous cleanup at former steel manufacturing site. The project included the assessment, evaluation and selection of treatment technology, and design of leachate pre-treatment system, including leachate collection and conveyance, petroleum product separation, pH adjustment, filtration, and VOC treatment via air stripping; and coordination and permit approval with local municipal sewer authority and regulatory agency (NYSDEC).

- Recently served as Project Scientist for a 22-acre Brownfield Cleanup Program Site cleanup encompassing 10 adjoining parcels Niagara Falls, NY. The BCP project included preparation of the BCP Application, as well as the. The RI involved collecting over 100 surface, subsurface soil and sediment samples; installing and sampling groundwater monitoring wells. 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 hazardous and non-hazardous chemical waste removal. The Certificate of completion was received in 2010.

- Currently managing the completion of Brownfield Cleanup Program (BCP) activities of a former automobile dealership and service station located in Lockport, New York. Project task included preparation of the BCP application, and Remedial Investigation (RI), Interim Remedial Measures (IRM), and Alternatives Analysis (AAR) Work Plan, oversight of remedial subcontractors, correspondence with NYSDEC representatives; completion of the RI-AAR-IRM Report, and Final Engineering Report (FER). Certificate of Completion (COC) is expected in December 2011.

- Recently completed the decommissioning of a former industrial facility in Niagara Falls, New York. Project tasks included: managing the characterization, cleanup and closure of petroleum bulk storage (PBS) and chemical bulk storage (CBS) facilities and associated NYSDEC licensing; cleanup, recycling and/or disposal of accumulated hazardous materials; characterization and disposal of PCB-containing waste materials; characterization and disposal of spent industrial raw materials; and oversight and management of recycling and/or disposal of universal waste materials including batteries, UV-lamps, and mercury containing-wastes.

- Completed investigation, remediation and NYSDEC spill closure activities at over 15 gasoline service station throughout western New York.

- Managed completion of multiple NYSDEC PBS Site Assessment Reports in compliance with 40CFR 280.43 regulations for large-scale retail gasoline and car washing company with locations throughout western New York. The completed reports were accepted by, and were successful in mitigating further regulatory compliance action by the NYSDEC.

- Recently assisted in the drafting and completion of a Universal Waste Management Plan for a large municipal government which included more than 100 separate facilities which are required to comply with the plan.

- Recently completed multiple Spill Prevention, Control, and Countermeasure (SPCC) plans for large multi-national manufacturing company with facilities throughout central New York.

- Recently completed a large 10-acre multi-parcel Phase I ESA for a wind turbine project located within a highly contaminated urban Site listed on the NYS Inactive Hazardous Waste Site list. Project tasks included a review of historic technical reports, and soil and groundwater investigation documents to determine potential impacts of the known contamination related to the proposed wind farm redevelopment. Coordination with multiple regulatory agencies, owner/operators and legal representatives were imperative for the successful outcome of the project. In addition to the Phase I ESA, a wetland assessment was completed to determine potential wetland issues related to the project.

- Served as Project Scientist responsible for all aspects of Phase I Environmental Site Assessment for nearly 50 properties in New York State.

April 2001 to June 2004 — Research Scientist
Research Foundation

- Designed research plans and conducted long-term field and greenhouse experiments on the impacts of acid precipitation on the lakes of the Adirondack Mountains (NYS)
- Conducted field sampling and water quality monitoring
- Experienced in wetland and plant identification
- Mapped experimental constructed wetland site using GPS and GIS (ESRI ArcGIS)
- Managed multiple bench-scale, greenhouse, and field-based experiments

PUBLICATIONS/PRESENTATIONS

- Presenter – Technical Papers
  Munley, Nathan T., Titus, John H., and Zhu, Weixing. "Nutrient Retention in Vegetated Buffer Strips: Testing the Effects of Different Species Assemblages." International Society of Wetland Scientist, The 25th Annual Conference, Seattle, WA. July 2004.

APPENDIX B

PREVIOUS INVESTIGATION AND MUNICIPAL RECORDS

(PROVIDED ELECTRONICALLY)

Limited Phase II Environmental Investigation Report

301 Ohio Street Site
Buffalo, New York

November 2013 0136-013-004

Prepared For:

Ellicott Development Company

Prepared By:

TurnKey Environmental Restoration, LLC

2558 Hamburg Turnpike, Suite 300, Buffalo, New York | phone: (716) 856-0635 | fax: (716) 856-0583

LIMITED PHASE II ENVIRONMENTAL INVESTIGATION REPORT

301 Ohio Street Site
Buffalo, New York

November 2013 0136-013-004

Prepared for:

Ellicott Development Company

LIMITED PHASE II ENVIRONMENTAL INVESTIGATION REPORT

301 Ohio Street Site

Buffalo, New York

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LIMITED PHASE II ENVIRONMENTAL INVESTIGATION REPORT

301 Ohio Street Site

Buffalo, New York

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1.0 INTRODUCTION

1.1 Background and Site Description

TurnKey Environmental Restoration, LLC (TurnKey) performed a Limited Phase II Environmental Investigation on behalf of Ellicott Development Company at 301 Ohio Street, City of Buffalo, Erie County, New York (Site; see Figure 1). This investigation was performed to assess the condition of subsurface soil at the Site.

The subject property is located in a highly developed commercial area of Buffalo, New York. The subject Site, addressed at 301 Ohio Street, is also identified as Tax ID No. 122.10-2-7.21. The Site, totaling approximately 7.26-acres, is bordered by vacant commercial property and River Fest Park to the north; Dead Creek to the south, commercial properties and Conway Park across Ohio Street to the east; and the Buffalo River to the west. The Site is improved with two structures one metal clad building and one hoop frame building toward the south end of the property.

This Limited Phase II investigation included completion of a soil investigation to assess potential environmental impacts from chemical constituents of concern, including volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and Resource Conservation and Recovery Act (RCRA) metals.

2.0 SUBSURFACE SOIL/FILL INVESTIGATION

2.1 Test Pits

On October 15th, 2013, TurnKey mobilized a track-mounted excavator to the site and excavated eight test pits, identified as TP-1 through TP-8, at various locations across the Site. Test pit locations are shown on Figure 2. Soil samples were collected for laboratory analytical analysis from TP-2 through TP-7. Test pit logs are presented in Appendix A. Soil descriptions were completed in the field via visual characterization of excavated soils and test pit excavation faces using the Unified Soil Classification System (USCS), and scanned for total volatile organic vapors with a calibrated MiniRae 2000 PID equipped with a 10.6 eV lamp.

2.2 Soil Characterization

The subsurface soil/fill for the 301 Ohio Street parcel of the Site observed in TP-1 through TP-8 was typically characterized as asphalt in TP-2, TP-4, and TP-7, or topsoil in TP-3, TP-5, TP-6, and TP-8 from 0-0.5 fbgs overlying a soil/fill layer with varying depth and amounts of material (i.e. ash, brick, and sand) overlying native clay. Test pit logs are presented in Appendix A. Groundwater was encountered in native clay material at TP-4, TP6, and TP-8 at approximately 4-6 fbgs during the test pit excavations.

2.3 Laboratory Analysis

Soil samples collected from test pits were placed in pre-cleaned, laboratory provided sample bottles using dedicated stainless steel sampling tools, and cooled to 4º C in the field. The samples were transported under chain-of-custody command to Alpha Analytical of Westborough, MA for analysis. Soil samples from TP-2 through TP-7 were analyzed for polycyclic aromatic hydrocarbons (PAHs) and Resource Conservation and Recovery Act (RCRA) metals while TP-2 and TP-5 were also analyzed for Target Compound List (TCL) volatile organic compounds (VOCs).

3.0 INVESTIGATION FINDINGS

Eight test pits (TP-1 through TP-8) were completed and six soil/fill samples were collected for analysis. Table 1 presents a summary of the soil sample results. Each compound that was analyzed and detected above the laboratory reporting limit is listed on the table with its associated result to provide a complete data summary. For comparison purposes, Table 1 presents soil cleanup objectives (SCOs) for each of the detected parameters as published in 6 NYCRR Part 375 Soil Cleanup Objectives dated May 2010. Appendix B contains a copy of the laboratory analytical data package.

3.1 Qualitative Soil Screening

Soil samples were screened via headspace for VOCs using a MiniRae 2000 PID. PID measurements ranged from 0 ppm to approximately 161 ppm (TP-2). Fill material was noted at varying thickness in TP-1 through TP-8 consisting of ash, brick, and sand. Refer to the test pit logs Appendix A for a summary of soil classification for each sample interval, field observations, and PID measurements.

3.2 Site Hydrogeology

The property is located within the Erie-Ontario lake plain physiographic province, which is typified by little topographic relief, except in the immediate vicinity of major drainage ways. Surface soils are generally characterized as urban land with level to gently sloping land in which 80 percent or more of the soil surface is covered by asphalt, concrete, buildings, or other impervious structures typical of an urban environment. In addition, the presence of overburden fill material is widespread and common throughout the City of Buffalo.

Groundwater flow direction likely follows regional topography in the vicinity of the subject property and is to the west toward the Buffalo River. Local groundwater flows, however, may be influenced by subsurface features, such as excavations, utilities, and localized fill-conditions. Groundwater was encountered in native clay material in test pits on the western side of the Site, nearest the Buffalo River, from 4-6 fbgs during the test pit excavations.

3.2 Soil Analytical Results

Soil samples from TP-2 through TP-7 were analyzed for PAHs and RCRA metals. Soil samples from soil borings TP-2 and TP-5 were also analyzed for TCL VOCs. As indicated on Table 2, the analytical data results indicate several PAHs were detected above their respective Unrestricted, Restricted-Residential and/or Commercial Use SCOs in TP-2 and TP-5; including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene. Several RCRA metals were detected above their respective Unrestricted, Restricted-Residential and/or Commercial Use SCOs in TP-2, TP-3 and TP-5. Of note, arsenic, cadmium and lead were detected above Commercial Use SCOs on-Site.

4.0 PREVIOUS INVESTIGATION

TurnKey reviewed "Preliminary Subsurface Exploration Report for 282-301 Ohio Street, Buffalo, New York", dated June 15, 1995, completed by Buffalo Drilling Company, Inc. (see Appendix C). The report was an attachment to "Site Inspection Report" also completed by Buffalo Drilling Company, Inc, and dated June 15, 1995. Four subsurface soil borings, designated B-3 through B-6, were completed on-Site (B-1 and B-2 were completed on an adjacent site). Based on that report, elevated levels of VOCs were detected in soil samples screened with a photoionization detector (PID) in each of the borings, with highest VOC concentrations noted in borings B-3 and B-4. Soil boring B-3 also had evidence of petroleum-like sheen and petroleum-like odors from four to eight fbgs.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the soil investigation at the Site, TurnKey offers the following conclusions and recommendations:

- Elevated PID readings were noted in current test pits (TP-2, TP-5) and historical soil borings (B-3, B-4);
- Petroleum-like odors and petroleum-like sheen were noted in historical soil boring B-3;
- Numerous PAHs were detected in on-Site soil above their respective Unrestricted, Restricted-Residential and/or Commercial Use SCOs;
- Several RCRA metals (arsenic, cadmium, chromium, lead, silver and mercury) were detected above their respective Unrestricted, Restricted-Residential and/or Commercial Use SCOs.
- Based on the findings of this investigation, additional Site investigation and remediation appears warranted. We understand that Ellicott Development Company is considering redeveloping the property; based on environmental impacts noted during the 2013 and historic 1995 investigation, the Site may be eligible for the New York Brownfield Cleanup Program.

6.0 LIMITATIONS

This report has been prepared for the exclusive use of Ellicott Development Company. The contents of this report are limited to information available at the time of the site investigation activities and to data referenced herein, and assume all referenced historic information sources to be true and accurate. The findings herein may be relied upon only at the discretion of Ellicott Development Company. Use of or reliance on this report or its findings by any other person or entity is prohibited without written permission of TurnKey Environmental Restoration, LLC.

TABLES

TurnKey Environmental Restoration, LLC

TABLE 1

SUMMARY OF SOIL ANALYTICAL RESULTS

301 OHIO STREET SITE

BUFFALO, NEW YORK

Parameter[1]	Unrestricted Use SCOs[2]	Restricted Residential Use SCOs[2]	Commercial Use SCOs[2]	Sample Locations (Depth)					
				TP-2 (1-3)	TP-3 (1-3)	TP-4 (1-3)	TP-5 (2-4)	TP-6 (0-2)	TP-7 (2-4)
				10/15/13	10/15/13	10/15/13	10/15/13	10/15/13	10/15/13
Volatile Organic Compounds (VOCs) - mg/Kg [3]									
Methylene chloride	**0.05**	**100**	**500**	0.0039 J	--	--	ND	--	--
Semi-Volatile Organic Compounds (SVOCs) - mg/Kg [3]									
2-Methylnaphthalene	--	**--**	--	ND	0.52	0.072 J	ND	ND	ND
Acenaphthene	**20**	**100**	**500**	ND	0.078 J	ND	ND	ND	ND
Acenaphthylene	**100**	**100**	**500**	1.9	ND	0.039 J	0.93 J	0.085 J	ND
Anthracene	**100**	**100**	**500**	1 J	ND	0.067 J	1.8	0.14 J	ND
Benzo(a)anthracene	**1**	**1**	**5.6**	**2.7**	0.13 J	0.29	**7.8**	0.38	ND
Benzo(a)pyrene	**1**	**1**	**1**	**2.8**	0.092 J	0.26	**7.4**	0.5	ND
Benzo(b)fluoranthene	**1**	**1**	**5.6**	**4.7**	0.24	0.38	**9.9**	0.54	ND
Benzo(g,h,i)perylene	**100**	**100**	**500**	2.8	0.099 J	0.19	4.7	0.54	ND
Benzo(k)fluoranthene	**0.8**	**3.9**	**56**	**1.8**	0.069 J	0.12	**4.1**	0.19 J	ND
Chrysene	**1**	**3.9**	**56**	**3**	0.24	0.35	**7.9**	0.41	ND
Dibenzo(a,h)anthracene	**0.33**	**0.33**	**0.56**	**0.72 J**	ND	0.049 J	**1.1**	0.12 J	ND
Fluoranthene	**100**	**100**	**500**	4.5	0.29	0.54	19	0.61	ND
Indeno(1,2,3-cd)pyrene	**0.5**	**0.5**	**5.6**	**3.2**	0.091 J	0.19	**5.3**	0.44	ND
Naphthalene	**12**	**100**	**500**	1.5 J	0.57	0.064 J	ND	ND	ND
Phenanthrene	**100**	**100**	**500**	2.4	0.7	0.38	7.5	0.41	ND
Pyrene	**100**	**100**	**500**	3.4	0.22	0.45	16	0.59	ND
Total Metals - mg/Kg									
Arsenic	**13**	**16**	**16**	**89**	7.3	1.9	3.9	3.7	2.4
Barium	**350**	**400**	**400**	68	110	27	73	37	140
Cadmium	**2.5**	**4.3**	**9.3**	**19**	**32**	0.14 J	**4.8**	0.42 J	0.29 J
Chromium	**30**	**180**	**1500**	**170**	**110**	2.7	27	5.9	7
Lead	**63**	**400**	**1000**	**1200**	**1300**	16	**230**	16	10
Selenium	**3.9**	**180**	**1500**	0.26 J	ND	0.17 J	0.13 J	0.14 J	1.8
Silver	**2**	**180**	**1500**	1.4	**7.3**	ND	0.82	0.11 J	0.12 J
Mercury	**0.18**	**0.81**	**2.8**	0.14	**0.39**	ND	**0.22**	0.02 J	ND

Notes:

1. Only those parameters detected at a minimum of one sample location are presented in this table; all other compounds were reported as non-detect.
2. Values per NYSDEC Part 375 Soil Cleanup Objectives (December 2006)
3. Sample results were reported by the laboratory in ug/kg and converted to mg/kg for comparison to SCOs.

Definitions:

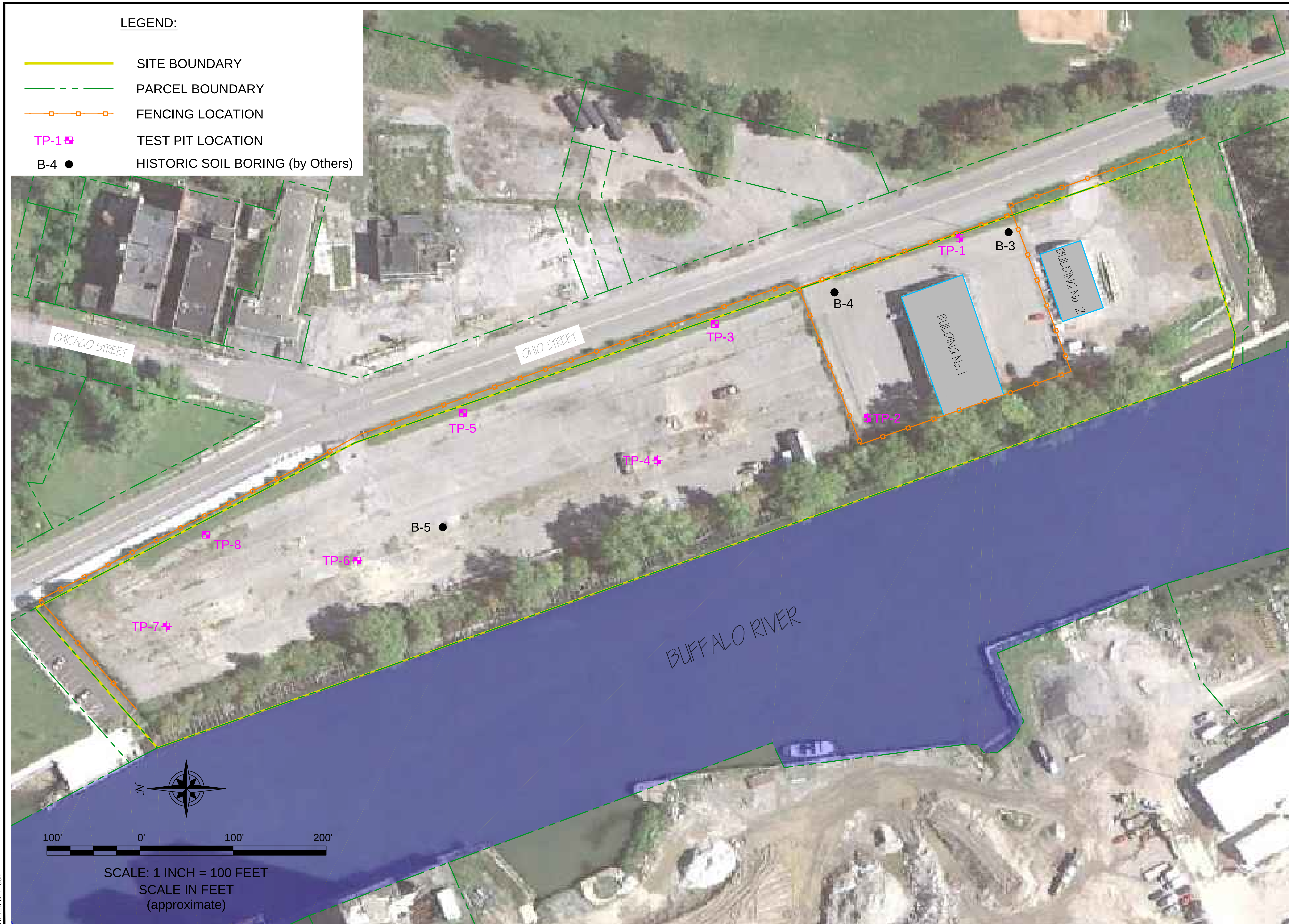
ND = Parameter not detected above laboratory detection limit.

"--" = Sample not analyzed for parameter or no SCO available for the parameter.

J = Estimated value; result is less than the sample quantitation limit but greater than zero.

BOLD (green)	= Result exceeds Part 375 Unrestricted Use SCOs.
BOLD (blue)	= Result exceeds Part 375 Restricted Residential Use SCOs.
BOLD (yellow)	= Result exceeds Part 375 Commercial Use SCOs.

FIGURES



DATE: OCTOBER 2013
DRAFTED BY: JGT

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TurnKey Environmental Restoration, LLC

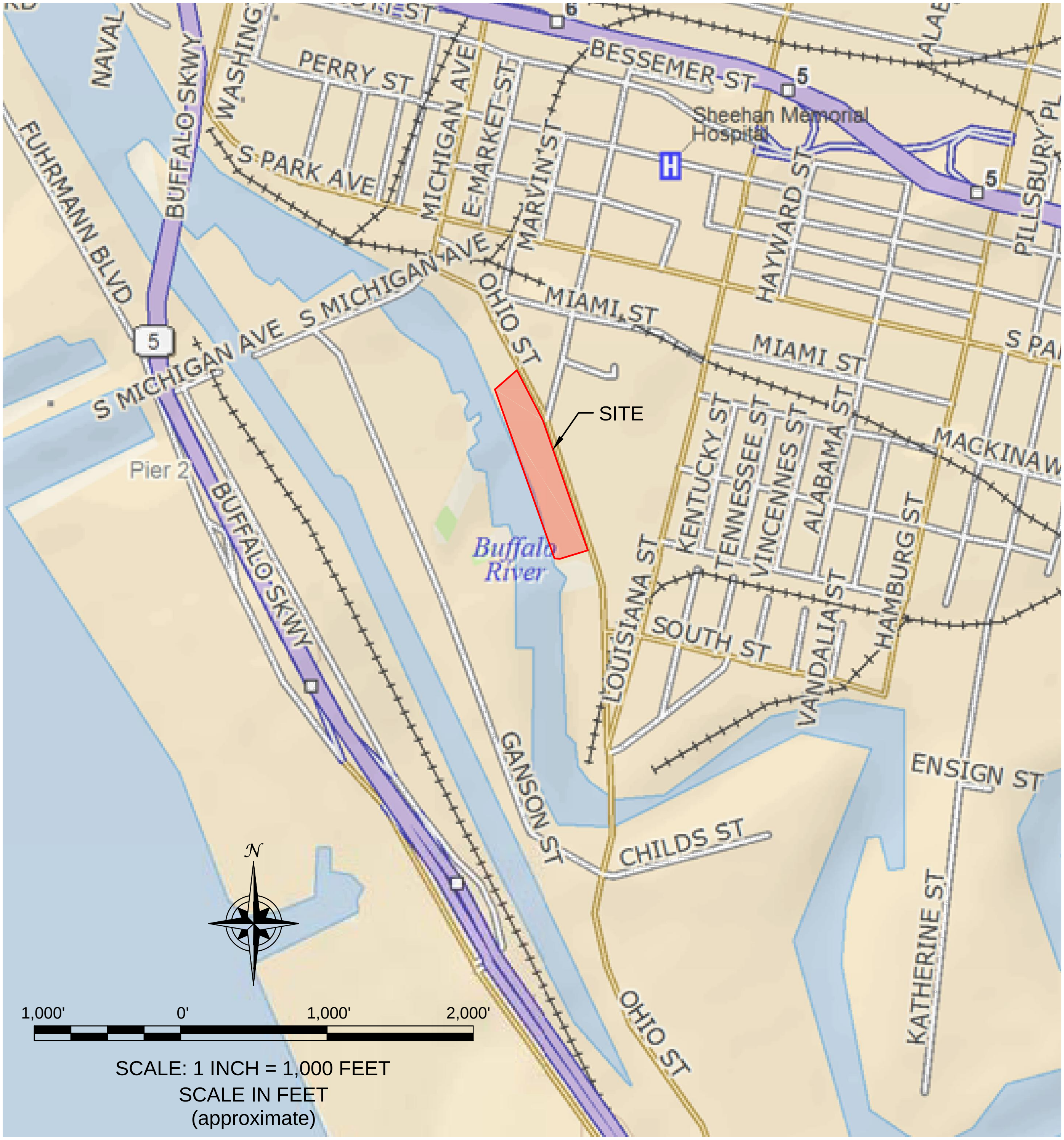
JOB NO.: 0136-013-004

SITE PLAN (AERIAL)

PHASE II SITE INVESTIGATION
301 OHIO STREET SITE
BUFFALO, NEW YORK
PREPARED FOR
ELLICOTT DEVELOPMENT COMPANY

FIGURE 2

FIGURE 1



TurnKey Environmental Restoration, LLC

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

PROJECT NO.: 013-013-004

DATE: OCTOBER 2013

DRAFTED BY: JGT

SITE LOCATION AND VICINITY MAP

PHASE II SITE INVESTIGATION

301 OHIO STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

ELLICOTT DEVELOPMENT COMPANY

APPENDIX A

SOIL BORING AND TEST PIT LOGS

TEST PIT EXCAVATION LOG

Project No: 0136-013-004
Project: 301 Ohio Street
Client: Ellicott Development Company
Site Location: 301 Ohio Strret

Test Pit I.D.: TP-01
Logged By: PWW
Checked By: BCH

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs ppm (0–100)	Lab Sample	Remarks
0.0	0.0	Ground Surface				
	0.0 / -0.5	***Topsoil***		0.0		
	0.5 / -3.0	***Fill*** Black, moist, ash fill with fine sand, loose when disturbed, massive		0.0; 0.0; 0.0	Sampled (1-3)	
	3.0 / -9.0	***Lean Clay*** Brown, moist, mostly medium plasticity fines, little non-plastic fines, trace fine sand, stiff, massive		0.0; 0.0; 0.0		
5.0						
	9.0	End of Test Pit		0.0		
10.0						

Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 9.0 fbgs

Depth to Water: none
Visual Impacts: none
Olfactory Observations: none

Sheet: 1 of 1

TEST PIT EXCAVATION LOG

Project No: 0136-013-004
Project: 301 Ohio Street
Client: Ellicott Development Company
Site Location: 301 Ohio Strret

Test Pit I.D.: TP-02
Logged By: PWW
Checked By: BCH

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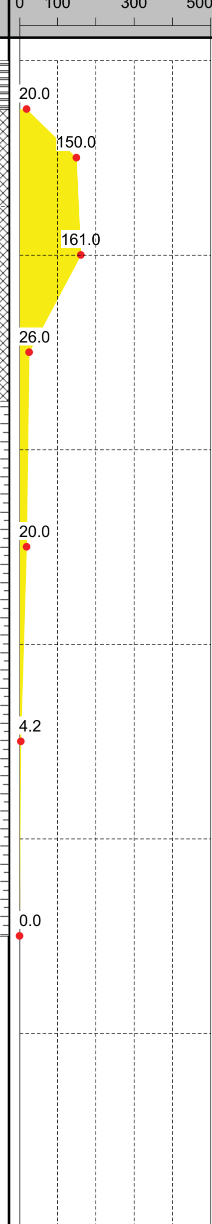
(716) 856-0635

SUBSURFACE PROFILE

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs (ppm)	Lab Sample	Remarks
0.0	0.0 0.0	Ground Surface				
	-0.5 0.5	***Ashphalt***		20.0		
	-1.5 1.5	***Fill*** Reddish brown, moist, mostly slag fill, little fine sand, trace non-plastic fines, loose when disturbed, no odor		150.0		
	-3.5 3.5	***Fill*** yellow, moist, mostly fine sand with brick, loose when disturbed, no odor		161.0 26.0	Sampled (1-3)	
5.0	-9.0 9.0	***Lean Clay*** Brown, moist, mostly medium plasticity fines, little non-plastic fines, trace fine sand, stiff, massive		20.0 4.2 0.0		
10.0		End of Test Pit				



Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 9.0 fbgs

Depth to Water: none
Visual Impacts: none
Olfactory Observations: none; although elevated PID

TEST PIT EXCAVATION LOG

Project No: 0136-013-004
Project: 301 Ohio Street
Client: Ellicott Development Company
Site Location: 301 Ohio Strret

Test Pit I.D.: TP-03
Logged By: PWW
Checked By: BCH

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs ppm (0 25 50 75 100)	Lab Sample	Remarks
	0.0	Ground Surface				
0.0	0.0 -0.5	***Topsoil***		0.0		
	0.5	***Fill*** Black, moist, ash fill with fine sand, loose when disturbed, massive		0.0 0.0	Sampled (1-3)	
	-3.0 3.0	***Lean Clay*** Brown, moist, mostly medium plasticity fines, little non-plastic fines, trace fine sand, stiff, massive		0.0 0.0 0.0 0.0		
5.0						
	-9.0 9.0	End of Test Pit				
10.0						

Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 9.0 fbgs

Depth to Water: none
Visual Impacts: none
Olfactory Observations: none

TEST PIT EXCAVATION LOG

Project No: 0136-013-004
Project: 301 Ohio Street
Client: Ellicott Development Company
Site Location: 301 Ohio Strret

Test Pit I.D.: TP-04
Logged By: PWW
Checked By: BCH

TurnKey Environmental Restoration, LLC
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Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs ppm (0 25 50 75 100)	Lab Sample	Remarks
0.0	0.0 0.0	Ground Surface				
	-0.5 0.5	***Ashphalt***		0.0		
	-1.5 1.5	***Fill*** Reddish brown, moist, mostly slag fill, little fine sand, trace non-plastic fines, loose when disturbed		0.0		
	-3.5 3.5	***Fill*** yellow, moist, mostly fine sand with brick, loose when disturbed		0.0 0.0	Sampled (1-3)	
5.0	-9.0 9.0	***Lean Clay*** Brown, moist, mostly medium plasticity fines, little non-plastic fines, trace fine sand, stiff, massive		0.0 0.0 0.0		
10.0		End of Test Pit				

Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 9.0 fbgs

Depth to Water: none
Visual Impacts: none
Olfactory Observations: none

TEST PIT EXCAVATION LOG

Project No: 0136-013-004

Project: 301 Ohio Street

Client: Ellicott Development Company

Site Location: 301 Ohio Strret

Test Pit I.D.: TP-05

Logged By: PWW

Checked By: BCH

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs ppm (0 25 50 75 100)	Lab Sample	Remarks
0.0	0.0	Ground Surface				
	0.0	***Topsoil***				
	-0.5 / 0.5	***Fill*** Black, moist, ash fill with fine sand, loose when disturbed, massive		0.0		
				0.0		
	-2.0 / 2.0	***Fill*** Reddish brown, moist, mostly brick fill with fine sand, wood debris, slight petroleum-like odor, massive,		15.2	Sampled (1-3)	
				20.6		
	-4.0 / 4.0	refusal on suspected concrete @ 4 fbgs		19.3		
		End of Test Pit				
5.0						

Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 4.0 fbgs

Depth to Water: none
Visual Impacts: none
Olfactory Observations: slight petroleum-like odor

TEST PIT EXCAVATION LOG

Project No: 0136-013-004
Project: 301 Ohio Street
Client: Ellicott Development Company
Site Location: 301 Ohio Strret

Test Pit I.D.: TP-06
Logged By: PWW
Checked By: BCH

TurnKey Environmental Restoration, LLC
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Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs (ppm)	Lab Sample	Remarks
0.0	0.0	Ground Surface				
	0.0 / -0.5	***Topsoil***		0.0		
	0.5 / -2.0	***Fill*** Reddish brown, moist, mostly brick fill with fine sand, wood debris, refusal on concrete floor @ 4', massive, slight petroleum-like odor		0.0; 0.0	Sampled (0.5-2')	
5.0	2.0 / -9.0	***Lean Clay*** Brown, moist to wet (7'), mostly medium plasticity fines, little fine sand, stiff, massive		0.0; 0.0; 0.0; 0.0		*DTW = 7 fbgs*
10.0	9.0	End of Test Pit		0.0		

Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 9.0 fbgs

Depth to Water: 7.0 fbgs
Visual Impacts: none
Olfactory Observations: slightly petroleum-like odor

TEST PIT EXCAVATION LOG

Project No: 0136-013-004
Project: 301 Ohio Street
Client: Ellicott Development Company
Site Location: 301 Ohio Strret

Test Pit I.D.: TP-07
Logged By: PWW
Checked By: BCH

TurnKey Environmental Restoration, LLC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs ppm (0 25 50 75 100)	Lab Sample	Remarks
0.0	0.0	Ground Surface				
	0.0 / -0.5	***Ashphalt***		0.0		
	0.5 / -2.0	***Fill*** Reddish brown, moist, mostly slag fill, little fine sand, trace non-plastic fines, loose when disturbed		0.0, 0.0		
	2.0 / -4.0	***Fill*** yellow, moist, mostly fine sand with brick, loose when disturbed		0.0, 0.0	Sampled (2-4)	
5.0	4.0 / -9.0	***Lean Clay*** Brown, moist, mostly medium plasticity fines, little non-plastic fines, trace fine sand, stiff, massive		0.0, 0.0, 0.0		
10.0	9.0	End of Test Pit				

Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 9.0 fbgs

Depth to Water: none
Visual Impacts: none
Olfactory Observations: none

TEST PIT EXCAVATION LOG

Project No: 0136-013-004
Project: 301 Ohio Street
Client: Ellicott Development Company
Site Location: 301 Ohio Strret

Test Pit I.D.: TP-08
Logged By: PWW
Checked By: BCH

TurnKey Environmental Restoration, LLC
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Buffalo, NY 14218
(716) 856-0635

SUBSURFACE PROFILE

Depth (fbgs)	Elev. /Depth	Description (ASTM D2488: Visual-Manual Procedure)	Lithologic Symbol	PID VOCs ppm (0 25 50 75 100)	Lab Sample	Remarks
0.0	0.0	Ground Surface				
	0.0 / -0.5	***Topsoil***		0.0		
	0.5 / -6.5	***Fill*** Black, moist to wet (6'), ash-like material with fine sand, loose when disturbed, massive		0.0, 0.0, 0.0, 0.0, 0.0	Sampled (1-4)	
5.0						
	6.5 / -9.0	***Lean Clay*** Brown, moist, mostly medium plasticity fines, little non-plastic fines, trace fine sand, stiff, massive		0.0, 0.0		
	9.0	End of Test Pit				
10.0						

Excavated By: Turnkey Environmental Restoration
Excavator Type: Bobcat Excavator ZHS
Excavation Date(s): 10-15-13
Comments:

Length: 6.0'
Width: 2.5'
Depth: 9.0 fbgs

Depth to Water: none
Visual Impacts: none
Olfactory Observations: none

APPENDIX B

LABORATORY ANALYTICAL DATA SUMMARY PACKAGE

ANALYTICAL REPORT

Lab Number:	L1320788
Client:	Benchmark & Turnkey Companies 2558 Hamburg Turnpike Suite 300 Buffalo, NY 14218
ATTN:	Mike Lesakowski
Phone:	(716) 856-0599
Project Name:	301 OHIO ST
Project Number:	0136-013-004
Report Date:	10/23/13

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1320788-01	TP-02 (1-3)	301 OHIO ST	10/15/13 11:45
L1320788-02	TP-03 (1-3)	301 OHIO ST	10/15/13 14:15
L1320788-03	TP-04 (1-3)	301 OHIO ST	10/15/13 14:30
L1320788-04	TP-05 (2-4)	301 OHIO ST	10/15/13 14:45
L1320788-05	TP-06 (0-2)	301 OHIO ST	10/15/13 15:10
L1320788-06	TP-07 (2-4)	301 OHIO ST	10/15/13 15:35

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Volatile Organics

Any reported concentrations that are below 200 ug/kg may be biased low due to the sample not being collected according to 5035-L/5035A-L low-level specifications.

Semivolatile Organics

L1320788-01, -04, -05 and -06 have elevated detection limits due to the dilutions required by the sample matrices.

Metals

The CCV recovery associated with WG645024-1 was above the acceptance criteria for silver. Any associated samples with positive detections were re-analyzed under a passing CCV. The samples that were non-detect for this element are reporting results from the original analyses.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative

Date: 10/23/13

ORGANICS

VOLATILES

Project Name: 301 OHIO ST **Lab Number:** L1320788

Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-01	Date Collected:	10/15/13 11:45
Client ID:	TP-02 (1-3)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified
Matrix:	Soil		
Analytical Method:	1,8260C		
Analytical Date:	10/22/13 05:48		
Analyst:	PP		
Percent Solids:	83%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	3.9	J	ug/kg	12	2.4	1
1,1-Dichloroethane	ND		ug/kg	1.8	0.21	1
Chloroform	ND		ug/kg	1.8	0.45	1
Carbon tetrachloride	ND		ug/kg	1.2	0.25	1
1,2-Dichloropropane	ND		ug/kg	4.2	0.28	1
Dibromochloromethane	ND		ug/kg	1.2	0.37	1
1,1,2-Trichloroethane	ND		ug/kg	1.8	0.37	1
Tetrachloroethene	ND		ug/kg	1.2	0.17	1
Chlorobenzene	ND		ug/kg	1.2	0.42	1
Trichlorofluoromethane	ND		ug/kg	6.0	0.15	1
1,2-Dichloroethane	ND		ug/kg	1.2	0.18	1
1,1,1-Trichloroethane	ND		ug/kg	1.2	0.13	1
Bromodichloromethane	ND		ug/kg	1.2	0.28	1
trans-1,3-Dichloropropene	ND		ug/kg	1.2	0.14	1
cis-1,3-Dichloropropene	ND		ug/kg	1.2	0.15	1
Bromoform	ND		ug/kg	4.8	0.50	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	1.2	0.20	1
Benzene	ND		ug/kg	1.2	0.14	1
Toluene	ND		ug/kg	1.8	0.13	1
Ethylbenzene	ND		ug/kg	1.2	0.18	1
Chloromethane	ND		ug/kg	6.0	0.94	1
Bromomethane	ND		ug/kg	2.4	0.41	1
Vinyl chloride	ND		ug/kg	2.4	0.17	1
Chloroethane	ND		ug/kg	2.4	0.38	1
1,1-Dichloroethene	ND		ug/kg	1.2	0.25	1
trans-1,2-Dichloroethene	ND		ug/kg	1.8	0.25	1
Trichloroethene	ND		ug/kg	1.2	0.18	1
1,2-Dichlorobenzene	ND		ug/kg	6.0	0.22	1
1,3-Dichlorobenzene	ND		ug/kg	6.0	0.22	1
1,4-Dichlorobenzene	ND		ug/kg	6.0	0.29	1
Methyl tert butyl ether	ND		ug/kg	2.4	0.12	1

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-01	Date Collected:	10/15/13 11:45
Client ID:	TP-02 (1-3)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
p/m-Xylene	ND		ug/kg	2.4	0.39	1
o-Xylene	ND		ug/kg	2.4	0.33	1
cis-1,2-Dichloroethene	ND		ug/kg	1.2	0.18	1
Styrene	ND		ug/kg	2.4	0.37	1
Dichlorodifluoromethane	ND		ug/kg	12	0.26	1
Acetone	ND		ug/kg	12	3.7	1
Carbon disulfide	ND		ug/kg	12	2.4	1
2-Butanone	ND		ug/kg	12	0.43	1
4-Methyl-2-pentanone	ND		ug/kg	12	0.29	1
2-Hexanone	ND		ug/kg	12	0.23	1
Bromochloromethane	ND		ug/kg	6.0	0.24	1
1,2-Dibromoethane	ND		ug/kg	4.8	0.21	1
n-Butylbenzene	ND		ug/kg	1.2	0.24	1
sec-Butylbenzene	ND		ug/kg	1.2	0.25	1
tert-Butylbenzene	ND		ug/kg	6.0	0.68	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	6.0	0.95	1
Isopropylbenzene	ND		ug/kg	1.2	0.20	1
p-Isopropyltoluene	ND		ug/kg	1.2	0.23	1
Naphthalene	ND		ug/kg	6.0	0.93	1
n-Propylbenzene	ND		ug/kg	1.2	0.15	1
1,2,3-Trichlorobenzene	ND		ug/kg	6.0	0.20	1
1,2,4-Trichlorobenzene	ND		ug/kg	6.0	0.95	1
1,3,5-Trimethylbenzene	ND		ug/kg	6.0	0.17	1
1,2,4-Trimethylbenzene	ND		ug/kg	6.0	0.69	1
Methyl Acetate	ND		ug/kg	24	0.92	1
Cyclohexane	ND		ug/kg	24	1.3	1
1,4-Dioxane	ND		ug/kg	120	21.	1
Freon-113	ND		ug/kg	24	0.33	1
Methyl cyclohexane	ND		ug/kg	4.8	1.5	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	101		70-130
Toluene-d8	97		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	101		70-130

Project Name: 301 OHIO ST **Lab Number:** L1320788
Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-04
Client ID: TP-05 (2-4)
Sample Location: 301 OHIO ST
Matrix: Soil
Analytical Method: 1,8260C
Analytical Date: 10/22/13 06:16
Analyst: PP
Percent Solids: 87%

Date Collected: 10/15/13 14:45
Date Received: 10/16/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	12	2.3	1
1,1-Dichloroethane	ND		ug/kg	1.7	0.20	1
Chloroform	ND		ug/kg	1.7	0.43	1
Carbon tetrachloride	ND		ug/kg	1.2	0.24	1
1,2-Dichloropropane	ND		ug/kg	4.0	0.26	1
Dibromochloromethane	ND		ug/kg	1.2	0.36	1
1,1,2-Trichloroethane	ND		ug/kg	1.7	0.35	1
Tetrachloroethene	ND		ug/kg	1.2	0.16	1
Chlorobenzene	ND		ug/kg	1.2	0.40	1
Trichlorofluoromethane	ND		ug/kg	5.8	0.14	1
1,2-Dichloroethane	ND		ug/kg	1.2	0.17	1
1,1,1-Trichloroethane	ND		ug/kg	1.2	0.13	1
Bromodichloromethane	ND		ug/kg	1.2	0.26	1
trans-1,3-Dichloropropene	ND		ug/kg	1.2	0.14	1
cis-1,3-Dichloropropene	ND		ug/kg	1.2	0.15	1
Bromoform	ND		ug/kg	4.6	0.48	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	1.2	0.20	1
Benzene	ND		ug/kg	1.2	0.14	1
Toluene	ND		ug/kg	1.7	0.13	1
Ethylbenzene	ND		ug/kg	1.2	0.17	1
Chloromethane	ND		ug/kg	5.8	0.90	1
Bromomethane	ND		ug/kg	2.3	0.39	1
Vinyl chloride	ND		ug/kg	2.3	0.16	1
Chloroethane	ND		ug/kg	2.3	0.36	1
1,1-Dichloroethene	ND		ug/kg	1.2	0.24	1
trans-1,2-Dichloroethene	ND		ug/kg	1.7	0.24	1
Trichloroethene	ND		ug/kg	1.2	0.18	1
1,2-Dichlorobenzene	ND		ug/kg	5.8	0.21	1
1,3-Dichlorobenzene	ND		ug/kg	5.8	0.21	1
1,4-Dichlorobenzene	ND		ug/kg	5.8	0.28	1
Methyl tert butyl ether	ND		ug/kg	2.3	0.12	1

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-04	Date Collected:	10/15/13 14:45
Client ID:	TP-05 (2-4)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
p/m-Xylene	ND		ug/kg	2.3	0.37	1
o-Xylene	ND		ug/kg	2.3	0.31	1
cis-1,2-Dichloroethene	ND		ug/kg	1.2	0.17	1
Styrene	ND		ug/kg	2.3	0.36	1
Dichlorodifluoromethane	ND		ug/kg	12	0.25	1
Acetone	ND		ug/kg	12	3.6	1
Carbon disulfide	ND		ug/kg	12	2.3	1
2-Butanone	ND		ug/kg	12	0.41	1
4-Methyl-2-pentanone	ND		ug/kg	12	0.28	1
2-Hexanone	ND		ug/kg	12	0.22	1
Bromochloromethane	ND		ug/kg	5.8	0.23	1
1,2-Dibromoethane	ND		ug/kg	4.6	0.20	1
n-Butylbenzene	ND		ug/kg	1.2	0.23	1
sec-Butylbenzene	ND		ug/kg	1.2	0.24	1
tert-Butylbenzene	ND		ug/kg	5.8	0.65	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	5.8	0.91	1
Isopropylbenzene	ND		ug/kg	1.2	0.19	1
p-Isopropyltoluene	ND		ug/kg	1.2	0.22	1
Naphthalene	ND		ug/kg	5.8	0.89	1
n-Propylbenzene	ND		ug/kg	1.2	0.14	1
1,2,3-Trichlorobenzene	ND		ug/kg	5.8	0.19	1
1,2,4-Trichlorobenzene	ND		ug/kg	5.8	0.91	1
1,3,5-Trimethylbenzene	ND		ug/kg	5.8	0.16	1
1,2,4-Trimethylbenzene	ND		ug/kg	5.8	0.66	1
Methyl Acetate	ND		ug/kg	23	0.88	1
Cyclohexane	ND		ug/kg	23	1.2	1
1,4-Dioxane	ND		ug/kg	120	20.	1
Freon-113	ND		ug/kg	23	0.32	1
Methyl cyclohexane	ND		ug/kg	4.6	1.4	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	100		70-130

Project Name: 301 OHIO ST **Lab Number:** L1320788
Project Number: 0136-013-004 **Report Date:** 10/23/13

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 10/21/13 21:51
Analyst: PP

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01,04 Batch: WG645907-3					
Methylene chloride	ND		ug/kg	10	2.0
1,1-Dichloroethane	ND		ug/kg	1.5	0.18
Chloroform	ND		ug/kg	1.5	0.37
Carbon tetrachloride	ND		ug/kg	1.0	0.21
1,2-Dichloropropane	ND		ug/kg	3.5	0.23
Dibromochloromethane	ND		ug/kg	1.0	0.31
1,1,2-Trichloroethane	ND		ug/kg	1.5	0.30
Tetrachloroethene	ND		ug/kg	1.0	0.14
Chlorobenzene	ND		ug/kg	1.0	0.35
Trichlorofluoromethane	ND		ug/kg	5.0	0.12
1,2-Dichloroethane	ND		ug/kg	1.0	0.15
1,1,1-Trichloroethane	ND		ug/kg	1.0	0.11
Bromodichloromethane	ND		ug/kg	1.0	0.23
trans-1,3-Dichloropropene	ND		ug/kg	1.0	0.12
cis-1,3-Dichloropropene	ND		ug/kg	1.0	0.13
Bromoform	ND		ug/kg	4.0	0.41
1,1,2,2-Tetrachloroethane	ND		ug/kg	1.0	0.17
Benzene	ND		ug/kg	1.0	0.12
Toluene	ND		ug/kg	1.5	0.11
Ethylbenzene	ND		ug/kg	1.0	0.15
Chloromethane	ND		ug/kg	5.0	0.78
Bromomethane	ND		ug/kg	2.0	0.34
Vinyl chloride	ND		ug/kg	2.0	0.14
Chloroethane	ND		ug/kg	2.0	0.32
1,1-Dichloroethene	ND		ug/kg	1.0	0.20
trans-1,2-Dichloroethene	ND		ug/kg	1.5	0.21
Trichloroethene	ND		ug/kg	1.0	0.15
1,2-Dichlorobenzene	ND		ug/kg	5.0	0.18
1,3-Dichlorobenzene	ND		ug/kg	5.0	0.18
1,4-Dichlorobenzene	ND		ug/kg	5.0	0.24
Methyl tert butyl ether	ND		ug/kg	2.0	0.10

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 10/21/13 21:51
Analyst: PP

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01,04 Batch: WG645907-3					
p/m-Xylene	ND		ug/kg	2.0	0.32
o-Xylene	ND		ug/kg	2.0	0.27
cis-1,2-Dichloroethene	ND		ug/kg	1.0	0.15
Styrene	ND		ug/kg	2.0	0.31
Dichlorodifluoromethane	ND		ug/kg	10	0.22
Acetone	ND		ug/kg	10	3.1
Carbon disulfide	ND		ug/kg	10	2.0
2-Butanone	ND		ug/kg	10	0.36
4-Methyl-2-pentanone	ND		ug/kg	10	0.24
2-Hexanone	ND		ug/kg	10	0.19
Bromochloromethane	ND		ug/kg	5.0	0.20
1,2-Dibromoethane	ND		ug/kg	4.0	0.18
n-Butylbenzene	ND		ug/kg	1.0	0.20
sec-Butylbenzene	ND		ug/kg	1.0	0.20
tert-Butylbenzene	ND		ug/kg	5.0	0.56
1,2-Dibromo-3-chloropropane	ND		ug/kg	5.0	0.79
Isopropylbenzene	ND		ug/kg	1.0	0.17
p-Isopropyltoluene	ND		ug/kg	1.0	0.19
Naphthalene	ND		ug/kg	5.0	0.77
n-Propylbenzene	ND		ug/kg	1.0	0.12
1,2,3-Trichlorobenzene	ND		ug/kg	5.0	0.17
1,2,4-Trichlorobenzene	ND		ug/kg	5.0	0.79
1,3,5-Trimethylbenzene	ND		ug/kg	5.0	0.14
1,2,4-Trimethylbenzene	ND		ug/kg	5.0	0.57
Methyl Acetate	ND		ug/kg	20	0.76
Cyclohexane	ND		ug/kg	20	1.1
1,4-Dioxane	ND		ug/kg	100	17.
Freon-113	ND		ug/kg	20	0.27
Methyl cyclohexane	ND		ug/kg	4.0	1.3

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 10/21/13 21:51
Analyst: PP

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01,04 Batch: WG645907-3					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	107		70-130
Toluene-d8	96		70-130
4-Bromofluorobenzene	99		70-130
Dibromofluoromethane	105		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,04 Batch: WG645907-1 WG645907-2								
Methylene chloride	110		106		70-130	4		30
1,1-Dichloroethane	111		108		70-130	3		30
Chloroform	116		113		70-130	3		30
Carbon tetrachloride	127		123		70-130	3		30
1,2-Dichloropropane	107		105		70-130	2		30
Dibromochloromethane	107		104		70-130	3		30
1,1,2-Trichloroethane	102		100		70-130	2		30
Tetrachloroethene	108		106		70-130	2		30
Chlorobenzene	104		102		70-130	2		30
Trichlorofluoromethane	122		121		70-139	1		30
1,2-Dichloroethane	117		114		70-130	3		30
1,1,1-Trichloroethane	121		118		70-130	3		30
Bromodichloromethane	113		110		70-130	3		30
trans-1,3-Dichloropropene	106		103		70-130	3		30
cis-1,3-Dichloropropene	108		107		70-130	1		30
1,1-Dichloropropene	111		110		70-130	1		30
Bromoform	102		100		70-130	2		30
1,1,2,2-Tetrachloroethane	95		92		70-130	3		30
Benzene	109		106		70-130	3		30
Toluene	100		98		70-130	2		30
Ethylbenzene	105		102		70-130	3		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST

Project Number: 0136-013-004

Lab Number: L1320788

Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,04 Batch: WG645907-1 WG645907-2								
Chloromethane	**134**	Q	**132**	Q	52-130	2		30
Bromomethane	133		115		57-147	15		30
Vinyl chloride	126		128		67-130	2		30
Chloroethane	122		120		50-151	2		30
1,1-Dichloroethene	111		109		65-135	2		30
trans-1,2-Dichloroethene	111		108		70-130	3		30
Trichloroethene	115		110		70-130	4		30
1,2-Dichlorobenzene	103		100		70-130	3		30
1,3-Dichlorobenzene	102		101		70-130	1		30
1,4-Dichlorobenzene	102		101		70-130	1		30
Methyl tert butyl ether	109		108		66-130	1		30
p/m-Xylene	108		105		70-130	3		30
o-Xylene	108		106		70-130	2		30
cis-1,2-Dichloroethene	110		108		70-130	2		30
Dibromomethane	114		111		70-130	3		30
Styrene	110		107		70-130	3		30
Dichlorodifluoromethane	126		115		30-146	9		30
Acetone	106		83		54-140	24		30
Carbon disulfide	103		100		59-130	3		30
2-Butanone	101		90		70-130	12		30
Vinyl acetate	106		105		70-130	1		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004
Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,04 Batch: WG645907-1 WG645907-2								
4-Methyl-2-pentanone	102		100		70-130	2		30
1,2,3-Trichloropropane	100		91		68-130	9		30
2-Hexanone	89		83		70-130	7		30
Bromochloromethane	115		112		70-130	3		30
2,2-Dichloropropane	121		117		70-130	3		30
1,2-Dibromoethane	103		101		70-130	2		30
1,3-Dichloropropane	100		98		69-130	2		30
1,1,1,2-Tetrachloroethane	108		106		70-130	2		30
Bromobenzene	98		98		70-130	0		30
n-Butylbenzene	105		102		70-130	3		30
sec-Butylbenzene	103		102		70-130	1		30
tert-Butylbenzene	104		102		70-130	2		30
o-Chlorotoluene	101		91		70-130	10		30
p-Chlorotoluene	101		100		70-130	1		30
1,2-Dibromo-3-chloropropane	109		103		68-130	6		30
Hexachlorobutadiene	106		103		67-130	3		30
Isopropylbenzene	101		100		70-130	1		30
p-Isopropyltoluene	106		104		70-130	2		30
Naphthalene	97		96		70-130	1		30
Acrylonitrile	109		100		70-130	9		30
Isopropyl Ether	103		103		66-130	0		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,04 Batch: WG645907-1 WG645907-2								
tert-Butyl Alcohol	106		98		70-130	8		30
n-Propylbenzene	100		98		70-130	2		30
1,2,3-Trichlorobenzene	100		98		70-130	2		30
1,2,4-Trichlorobenzene	103		99		70-130	4		30
1,3,5-Trimethylbenzene	105		103		70-130	2		30
1,2,4-Trimethylbenzene	106		104		70-130	2		30
Methyl Acetate	103		98		51-146	5		30
Ethyl Acetate	102		98		70-130	4		30
Acrolein	104		101		70-130	3		30
Cyclohexane	107		106		59-142	1		30
1,4-Dioxane	90		82		65-136	9		30
Freon-113	114		111		50-139	3		30
1,4-Diethylbenzene	106		104		70-130	2		30
4-Ethyltoluene	102		101		70-130	1		30
1,2,4,5-Tetramethylbenzene	107		105		70-130	2		30
Tetrahydrofuran	96		94		66-130	2		30
Ethyl ether	**132**	Q	**134**	Q	67-130	2		30
trans-1,4-Dichloro-2-butene	106		101		70-130	5		30
Methyl cyclohexane	108		105		70-130	3		30
Ethyl-Tert-Butyl-Ether	109		109		70-130	0		30
Tertiary-Amyl Methyl Ether	109		107		70-130	2		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,04 Batch: WG645907-1 WG645907-2								

Surrogate	*LCS %Recovery*	*Qual*	*LCSD %Recovery*	*Qual*	*Acceptance Criteria*
1,2-Dichloroethane-d4	110		107		70-130
Toluene-d8	97		96		70-130
4-Bromofluorobenzene	95		96		70-130
Dibromofluoromethane	107		105		70-130

SEMIVOLATILES

Project Name: 301 OHIO ST　　**Lab Number:** L1320788

Project Number: 0136-013-004　　**Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-01	D	Date Collected:	10/15/13 11:45
Client ID:	TP-02 (1-3)		Date Received:	10/16/13
Sample Location:	301 OHIO ST		Field Prep:	Not Specified
Matrix:	Soil		Extraction Method:	EPA 3546
Analytical Method:	1,8270D		Extraction Date:	10/17/13 17:34
Analytical Date:	10/23/13 09:38			
Analyst:	RC			
Percent Solids:	83%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	1600	410	10
2-Chloronaphthalene	ND		ug/kg	2000	650	10
Fluoranthene	4500		ug/kg	1200	370	10
Naphthalene	1500	J	ug/kg	2000	660	10
Benzo(a)anthracene	2700		ug/kg	1200	390	10
Benzo(a)pyrene	2800		ug/kg	1600	490	10
Benzo(b)fluoranthene	4700		ug/kg	1200	400	10
Benzo(k)fluoranthene	1800		ug/kg	1200	380	10
Chrysene	3000		ug/kg	1200	390	10
Acenaphthylene	1900		ug/kg	1600	370	10
Anthracene	1000	J	ug/kg	1200	330	10
Benzo(ghi)perylene	2800		ug/kg	1600	410	10
Fluorene	ND		ug/kg	2000	570	10
Phenanthrene	2400		ug/kg	1200	390	10
Dibenzo(a,h)anthracene	720	J	ug/kg	1200	390	10
Indeno(1,2,3-cd)pyrene	3200		ug/kg	1600	440	10
Pyrene	3400		ug/kg	1200	390	10
2-Methylnaphthalene	ND		ug/kg	2400	640	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	70		23-120
2-Fluorobiphenyl	91		30-120
4-Terphenyl-d14	81		18-120

Project Name: 301 OHIO ST **Lab Number:** L1320788

Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-02	Date Collected:	10/15/13 14:15
Client ID:	TP-03 (1-3)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	10/17/13 17:34
Analytical Date:	10/23/13 10:06		
Analyst:	RC		
Percent Solids:	70%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	190	48.	1
2-Chloronaphthalene	ND		ug/kg	230	76.	1
Fluoranthene	290		ug/kg	140	43.	1
Naphthalene	570		ug/kg	230	78.	1
Benzo(a)anthracene	130	J	ug/kg	140	46.	1
Benzo(a)pyrene	92	J	ug/kg	190	57.	1
Benzo(b)fluoranthene	240		ug/kg	140	47.	1
Benzo(k)fluoranthene	69	J	ug/kg	140	45.	1
Chrysene	240		ug/kg	140	46.	1
Acenaphthylene	ND		ug/kg	190	44.	1
Anthracene	78	J	ug/kg	140	39.	1
Benzo(ghi)perylene	99	J	ug/kg	190	49.	1
Fluorene	ND		ug/kg	230	67.	1
Phenanthrene	700		ug/kg	140	46.	1
Dibenzo(a,h)anthracene	ND		ug/kg	140	45.	1
Indeno(1,2,3-cd)pyrene	91	J	ug/kg	190	52.	1
Pyrene	220		ug/kg	140	46.	1
2-Methylnaphthalene	520		ug/kg	280	75.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	62		23-120
2-Fluorobiphenyl	73		30-120
4-Terphenyl-d14	65		18-120

Project Name: 301 OHIO ST **Lab Number:** L1320788

Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-03	Date Collected:	10/15/13 14:30
Client ID:	TP-04 (1-3)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	10/17/13 17:34
Analytical Date:	10/23/13 10:34		
Analyst:	RC		
Percent Solids:	90%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	150	38.	1
2-Chloronaphthalene	ND		ug/kg	180	60.	1
Fluoranthene	540		ug/kg	110	34.	1
Naphthalene	64	J	ug/kg	180	61.	1
Benzo(a)anthracene	290		ug/kg	110	36.	1
Benzo(a)pyrene	260		ug/kg	150	45.	1
Benzo(b)fluoranthene	380		ug/kg	110	37.	1
Benzo(k)fluoranthene	120		ug/kg	110	35.	1
Chrysene	350		ug/kg	110	36.	1
Acenaphthylene	39	J	ug/kg	150	34.	1
Anthracene	67	J	ug/kg	110	30.	1
Benzo(ghi)perylene	190		ug/kg	150	38.	1
Fluorene	ND		ug/kg	180	52.	1
Phenanthrene	380		ug/kg	110	36.	1
Dibenzo(a,h)anthracene	49	J	ug/kg	110	35.	1
Indeno(1,2,3-cd)pyrene	190		ug/kg	150	41.	1
Pyrene	450		ug/kg	110	36.	1
2-Methylnaphthalene	72	J	ug/kg	220	58.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	74		23-120
2-Fluorobiphenyl	89		30-120
4-Terphenyl-d14	91		18-120

Project Name: 301 OHIO ST **Lab Number:** L1320788

Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-04	D	Date Collected:	10/15/13 14:45
Client ID:	TP-05 (2-4)		Date Received:	10/16/13
Sample Location:	301 OHIO ST		Field Prep:	Not Specified
Matrix:	Soil		Extraction Method:	EPA 3546
Analytical Method:	1,8270D		Extraction Date:	10/17/13 17:34
Analytical Date:	10/23/13 11:03			
Analyst:	RC			
Percent Solids:	87%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	1500	390	10
2-Chloronaphthalene	ND		ug/kg	1900	620	10
Fluoranthene	19000		ug/kg	1100	350	10
Naphthalene	ND		ug/kg	1900	630	10
Benzo(a)anthracene	7800		ug/kg	1100	370	10
Benzo(a)pyrene	7400		ug/kg	1500	470	10
Benzo(b)fluoranthene	9900		ug/kg	1100	380	10
Benzo(k)fluoranthene	4100		ug/kg	1100	360	10
Chrysene	7900		ug/kg	1100	380	10
Acenaphthylene	930	J	ug/kg	1500	360	10
Anthracene	1800		ug/kg	1100	320	10
Benzo(ghi)perylene	4700		ug/kg	1500	400	10
Fluorene	ND		ug/kg	1900	550	10
Phenanthrene	7500		ug/kg	1100	370	10
Dibenzo(a,h)anthracene	1100		ug/kg	1100	370	10
Indeno(1,2,3-cd)pyrene	5300		ug/kg	1500	420	10
Pyrene	16000		ug/kg	1100	370	10
2-Methylnaphthalene	ND		ug/kg	2300	610	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	65		23-120
2-Fluorobiphenyl	80		30-120
4-Terphenyl-d14	77		18-120

Project Name: 301 OHIO ST **Lab Number:** L1320788

Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-05	D	Date Collected:	10/15/13 15:10
Client ID:	TP-06 (0-2)		Date Received:	10/16/13
Sample Location:	301 OHIO ST		Field Prep:	Not Specified
Matrix:	Soil		Extraction Method:	EPA 3546
Analytical Method:	1,8270D		Extraction Date:	10/17/13 17:34
Analytical Date:	10/23/13 11:31			
Analyst:	RC			
Percent Solids:	89%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	300	77.	2
2-Chloronaphthalene	ND		ug/kg	370	120	2
Fluoranthene	610		ug/kg	220	68.	2
Naphthalene	ND		ug/kg	370	120	2
Benzo(a)anthracene	380		ug/kg	220	73.	2
Benzo(a)pyrene	500		ug/kg	300	91.	2
Benzo(b)fluoranthene	540		ug/kg	220	75.	2
Benzo(k)fluoranthene	190	J	ug/kg	220	71.	2
Chrysene	410		ug/kg	220	73.	2
Acenaphthylene	85	J	ug/kg	300	70.	2
Anthracene	140	J	ug/kg	220	62.	2
Benzo(ghi)perylene	540		ug/kg	300	78.	2
Fluorene	ND		ug/kg	370	110	2
Phenanthrene	410		ug/kg	220	73.	2
Dibenzo(a,h)anthracene	120	J	ug/kg	220	72.	2
Indeno(1,2,3-cd)pyrene	440		ug/kg	300	83.	2
Pyrene	590		ug/kg	220	72.	2
2-Methylnaphthalene	ND		ug/kg	450	120	2

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	51		23-120
2-Fluorobiphenyl	70		30-120
4-Terphenyl-d14	68		18-120

Project Name: 301 OHIO ST | **Lab Number:** L1320788

Project Number: 0136-013-004 | **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-06	D	Date Collected:	10/15/13 15:35
Client ID:	TP-07 (2-4)		Date Received:	10/16/13
Sample Location:	301 OHIO ST		Field Prep:	Not Specified
Matrix:	Soil		Extraction Method:	EPA 3546
Analytical Method:	1,8270D		Extraction Date:	10/17/13 17:34
Analytical Date:	10/23/13 11:59			
Analyst:	RC			
Percent Solids:	87%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	1500	390	10
2-Chloronaphthalene	ND		ug/kg	1900	620	10
Fluoranthene	ND		ug/kg	1100	350	10
Naphthalene	ND		ug/kg	1900	630	10
Benzo(a)anthracene	ND		ug/kg	1100	370	10
Benzo(a)pyrene	ND		ug/kg	1500	470	10
Benzo(b)fluoranthene	ND		ug/kg	1100	380	10
Benzo(k)fluoranthene	ND		ug/kg	1100	360	10
Chrysene	ND		ug/kg	1100	380	10
Acenaphthylene	ND		ug/kg	1500	360	10
Anthracene	ND		ug/kg	1100	320	10
Benzo(ghi)perylene	ND		ug/kg	1500	400	10
Fluorene	ND		ug/kg	1900	550	10
Phenanthrene	ND		ug/kg	1100	370	10
Dibenzo(a,h)anthracene	ND		ug/kg	1100	370	10
Indeno(1,2,3-cd)pyrene	ND		ug/kg	1500	420	10
Pyrene	ND		ug/kg	1100	370	10
2-Methylnaphthalene	ND		ug/kg	2300	610	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	83		23-120
2-Fluorobiphenyl	93		30-120
4-Terphenyl-d14	81		18-120

Project Name: 301 OHIO ST **Lab Number:** L1320788
Project Number: 0136-013-004 **Report Date:** 10/23/13

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 10/23/13 09:37
Analyst: RC

Extraction Method: EPA 3546
Extraction Date: 10/17/13 17:34

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01-06 Batch: WG644882-1					
Acenaphthene	ND		ug/kg	130	34.
Hexachlorobenzene	ND		ug/kg	98	30.
Bis(2-chloroethyl)ether	ND		ug/kg	150	46.
2-Chloronaphthalene	ND		ug/kg	160	53.
3,3'-Dichlorobenzidine	ND		ug/kg	160	43.
2,4-Dinitrotoluene	ND		ug/kg	160	35.
2,6-Dinitrotoluene	ND		ug/kg	160	42.
Fluoranthene	ND		ug/kg	98	30.
4-Chlorophenyl phenyl ether	ND		ug/kg	160	50.
4-Bromophenyl phenyl ether	ND		ug/kg	160	38.
Bis(2-chloroisopropyl)ether	ND		ug/kg	200	58.
Bis(2-chloroethoxy)methane	ND		ug/kg	180	49.
Hexachlorobutadiene	ND		ug/kg	160	46.
Hexachlorocyclopentadiene	ND		ug/kg	470	100
Hexachloroethane	ND		ug/kg	130	30.
Isophorone	ND		ug/kg	150	43.
Naphthalene	ND		ug/kg	160	54.
Nitrobenzene	ND		ug/kg	150	39.
NDPA/DPA	ND		ug/kg	130	34.
n-Nitrosodi-n-propylamine	ND		ug/kg	160	49.
Bis(2-ethylhexyl)phthalate	ND		ug/kg	160	43.
Butyl benzyl phthalate	ND		ug/kg	160	32.
Di-n-butylphthalate	ND		ug/kg	160	32.
Di-n-octylphthalate	ND		ug/kg	160	40.
Diethyl phthalate	ND		ug/kg	160	34.
Dimethyl phthalate	ND		ug/kg	160	42.
Benzo(a)anthracene	ND		ug/kg	98	32.
Benzo(a)pyrene	ND		ug/kg	130	40.
Benzo(b)fluoranthene	ND		ug/kg	98	33.
Benzo(k)fluoranthene	ND		ug/kg	98	31.
Chrysene	ND		ug/kg	98	32.

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 10/23/13 09:37
Analyst: RC

Extraction Method: EPA 3546
Extraction Date: 10/17/13 17:34

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01-06 Batch: WG644882-1					
Acenaphthylene	ND		ug/kg	130	30.
Anthracene	ND		ug/kg	98	27.
Benzo(ghi)perylene	ND		ug/kg	130	34.
Fluorene	ND		ug/kg	160	47.
Phenanthrene	ND		ug/kg	98	32.
Dibenzo(a,h)anthracene	ND		ug/kg	98	32.
Indeno(1,2,3-cd)pyrene	ND		ug/kg	130	36.
Pyrene	ND		ug/kg	98	32.
Biphenyl	ND		ug/kg	370	54.
4-Chloroaniline	ND		ug/kg	160	43.
2-Nitroaniline	ND		ug/kg	160	46.
3-Nitroaniline	ND		ug/kg	160	45.
4-Nitroaniline	ND		ug/kg	160	44.
Dibenzofuran	ND		ug/kg	160	54.
2-Methylnaphthalene	ND		ug/kg	200	52.
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	160	51.
Acetophenone	ND		ug/kg	160	51.
2,4,6-Trichlorophenol	ND		ug/kg	98	31.
p-Chloro-m-cresol	ND		ug/kg	160	47.
2-Chlorophenol	ND		ug/kg	160	49.
2,4-Dichlorophenol	ND		ug/kg	150	53.
2,4-Dimethylphenol	ND		ug/kg	160	49.
2-Nitrophenol	ND		ug/kg	350	51.
4-Nitrophenol	ND		ug/kg	230	53.
2,4-Dinitrophenol	ND		ug/kg	780	220
4,6-Dinitro-o-cresol	ND		ug/kg	420	60.
Pentachlorophenol	ND		ug/kg	130	35.
Phenol	ND		ug/kg	160	48.
2-Methylphenol	ND		ug/kg	160	53.
3-Methylphenol/4-Methylphenol	ND		ug/kg	240	54.
2,4,5-Trichlorophenol	ND		ug/kg	160	53.

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

Method Blank Analysis
Batch Quality Control

Analytical Method:	1,8270D	Extraction Method:	EPA 3546
Analytical Date:	10/23/13 09:37	Extraction Date:	10/17/13 17:34
Analyst:	RC		

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01-06 Batch: WG644882-1					
Carbazole	ND		ug/kg	160	35.
Benzaldehyde	ND		ug/kg	220	66.
Caprolactam	ND		ug/kg	160	45.
Atrazine	ND		ug/kg	130	37.
2,3,4,6-Tetrachlorophenol	ND		ug/kg	160	28.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	79		25-120
Phenol-d6	80		10-120
Nitrobenzene-d5	74		23-120
2-Fluorobiphenyl	73		30-120
2,4,6-Tribromophenol	70		0-136
4-Terphenyl-d14	79		18-120

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-06 Batch: WG644882-2 WG644882-3								
Acenaphthene	86		87		31-137	1		50
1,2,4-Trichlorobenzene	71		73		38-107	3		50
Hexachlorobenzene	83		81		40-140	2		50
Bis(2-chloroethyl)ether	78		78		40-140	0		50
2-Chloronaphthalene	84		87		40-140	4		50
1,2-Dichlorobenzene	75		75		40-140	0		50
1,3-Dichlorobenzene	74		74		40-140	0		50
1,4-Dichlorobenzene	74		74		28-104	0		50
3,3'-Dichlorobenzidine	66		68		40-140	3		50
2,4-Dinitrotoluene	**96**	Q	**97**	Q	28-89	1		50
2,6-Dinitrotoluene	93		96		40-140	3		50
Fluoranthene	95		95		40-140	0		50
4-Chlorophenyl phenyl ether	88		87		40-140	1		50
4-Bromophenyl phenyl ether	84		84		40-140	0		50
Bis(2-chloroisopropyl)ether	80		82		40-140	2		50
Bis(2-chloroethoxy)methane	82		86		40-117	5		50
Hexachlorobutadiene	67		68		40-140	1		50
Hexachlorocyclopentadiene	74		75		40-140	1		50
Hexachloroethane	72		72		40-140	0		50
Isophorone	84		87		40-140	4		50
Naphthalene	78		79		40-140	1		50

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-06 Batch: WG644882-2 WG644882-3								
Nitrobenzene	80		83		40-140	4		50
NDPA/DPA	94		94			0		50
n-Nitrosodi-n-propylamine	81		85		32-121	5		50
Bis(2-ethylhexyl)phthalate	93		91		40-140	2		50
Butyl benzyl phthalate	92		96		40-140	4		50
Di-n-butylphthalate	94		93		40-140	1		50
Di-n-octylphthalate	91		91		40-140	0		50
Diethyl phthalate	92		92		40-140	0		50
Dimethyl phthalate	89		90		40-140	1		50
Benzo(a)anthracene	89		89		40-140	0		50
Benzo(a)pyrene	88		88		40-140	0		50
Benzo(b)fluoranthene	88		86		40-140	2		50
Benzo(k)fluoranthene	94		92		40-140	2		50
Chrysene	92		91		40-140	1		50
Acenaphthylene	89		92		40-140	3		50
Anthracene	95		93		40-140	2		50
Benzo(ghi)perylene	74		80		40-140	8		50
Fluorene	91		90		40-140	1		50
Phenanthrene	91		90		40-140	1		50
Dibenzo(a,h)anthracene	79		83		40-140	5		50
Indeno(1,2,3-cd)pyrene	76		80		40-140	5		50

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-06 Batch: WG644882-2 WG644882-3								
Pyrene	94		95		35-142	1		50
Biphenyl	78		79			1		50
4-Chloroaniline	74		76		40-140	3		50
2-Nitroaniline	96		99		47-134	3		50
3-Nitroaniline	75		80		26-129	6		50
4-Nitroaniline	89		92		41-125	3		50
Dibenzofuran	88		88		40-140	0		50
2-Methylnaphthalene	78		80		40-140	3		50
1,2,4,5-Tetrachlorobenzene	70		71		40-117	1		50
Acetophenone	79		80		14-144	1		50
2,4,6-Trichlorophenol	92		96		30-130	4		50
p-Chloro-m-cresol	98		102		26-103	4		50
2-Chlorophenol	84		88		25-102	5		50
2,4-Dichlorophenol	88		90		30-130	2		50
2,4-Dimethylphenol	102		107		30-130	5		50
2-Nitrophenol	82		84		30-130	2		50
4-Nitrophenol	**118**	Q	**122**	Q	11-114	3		50
2,4-Dinitrophenol	88		94		4-130	7		50
4,6-Dinitro-o-cresol	92		95		10-130	3		50
Pentachlorophenol	81		80		17-109	1		50
Phenol	88		**93**	Q	26-90	6		50

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004
Lab Number: L1320788
Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-06 Batch: WG644882-2 WG644882-3								
2-Methylphenol	90		94		30-130.	4		50
3-Methylphenol/4-Methylphenol	95		100		30-130	5		50
2,4,5-Trichlorophenol	92		94		30-130	2		50
Benzoic Acid	80		84			5		50
Benzyl Alcohol	83		88		40-140	6		50
Carbazole	94		93		54-128	1		50
Benzaldehyde	83		84			1		50
Caprolactam	108		111			3		50
Atrazine	113		114			1		50
2,3,4,6-Tetrachlorophenol	85		86			1		50

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Fluorophenol	88		91		25-120
Phenol-d6	90		96		10-120
Nitrobenzene-d5	84		87		23-120
2-Fluorobiphenyl	87		90		30-120
2,4,6-Tribromophenol	86		84		0-136
4-Terphenyl-d14	85		86		18-120

METALS

Project Name: 301 OHIO ST **Lab Number:** L1320788
Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-01 Date Collected: 10/15/13 11:45
Client ID: TP-02 (1-3) Date Received: 10/16/13
Sample Location: 301 OHIO ST Field Prep: Not Specified
Matrix: Soil
Percent Solids: 83%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	89		mg/kg	0.46	0.09	1	10/18/13 10:30	10/19/13 16:40	EPA 3050B	1,6010C	MG
Barium, Total	68		mg/kg	0.46	0.14	1	10/18/13 10:30	10/19/13 16:40	EPA 3050B	1,6010C	MG
Cadmium, Total	19		mg/kg	0.46	0.03	1	10/18/13 10:30	10/19/13 16:40	EPA 3050B	1,6010C	MG
Chromium, Total	170		mg/kg	0.46	0.09	1	10/18/13 10:30	10/19/13 16:40	EPA 3050B	1,6010C	MG
Lead, Total	1200		mg/kg	2.3	0.09	1	10/18/13 10:30	10/19/13 16:40	EPA 3050B	1,6010C	MG
Mercury, Total	0.14		mg/kg	0.10	0.02	1	10/23/13 10:31	10/23/13 13:58	EPA 7471B	1,7471B	MC
Selenium, Total	0.26	J	mg/kg	0.92	0.14	1	10/18/13 10:30	10/19/13 16:40	EPA 3050B	1,6010C	MG
Silver, Total	1.4		mg/kg	0.46	0.09	1	10/18/13 10:30	10/22/13 02:07	EPA 3050B	1,6010C	TT

Project Name: 301 OHIO ST
Lab Number: L1320788
Project Number: 0136-013-004
Report Date: 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-02
Date Collected: 10/15/13 14:15
Client ID: TP-03 (1-3)
Date Received: 10/16/13
Sample Location: 301 OHIO ST
Field Prep: Not Specified
Matrix: Soil
Percent Solids: 70%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	7.3		mg/kg	0.54	0.11	1	10/18/13 10:30	10/19/13 16:44	EPA 3050B	1,6010C	MG
Barium, Total	110		mg/kg	0.54	0.16	1	10/18/13 10:30	10/19/13 16:44	EPA 3050B	1,6010C	MG
Cadmium, Total	32		mg/kg	0.54	0.04	1	10/18/13 10:30	10/19/13 16:44	EPA 3050B	1,6010C	MG
Chromium, Total	110		mg/kg	0.54	0.11	1	10/18/13 10:30	10/19/13 16:44	EPA 3050B	1,6010C	MG
Lead, Total	1300		mg/kg	2.7	0.11	1	10/18/13 10:30	10/19/13 16:44	EPA 3050B	1,6010C	MG
Mercury, Total	0.39		mg/kg	0.11	0.02	1	10/23/13 10:31	10/23/13 14:00	EPA 7471B	1,7471B	MC
Selenium, Total	ND		mg/kg	1.1	0.16	1	10/18/13 10:30	10/19/13 16:44	EPA 3050B	1,6010C	MG
Silver, Total	7.3		mg/kg	0.54	0.11	1	10/18/13 10:30	10/22/13 02:12	EPA 3050B	1,6010C	TT

Project Name: 301 OHIO ST **Lab Number:** L1320788
Project Number: 0136-013-004 **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-03 Date Collected: 10/15/13 14:30
Client ID: TP-04 (1-3) Date Received: 10/16/13
Sample Location: 301 OHIO ST Field Prep: Not Specified
Matrix: Soil
Percent Solids: 90%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	1.9		mg/kg	0.44	0.09	1	10/18/13 10:30	10/19/13 16:47	EPA 3050B	1,6010C	MG
Barium, Total	27		mg/kg	0.44	0.13	1	10/18/13 10:30	10/19/13 16:47	EPA 3050B	1,6010C	MG
Cadmium, Total	0.14	J	mg/kg	0.44	0.03	1	10/18/13 10:30	10/19/13 16:47	EPA 3050B	1,6010C	MG
Chromium, Total	2.7		mg/kg	0.44	0.09	1	10/18/13 10:30	10/19/13 16:47	EPA 3050B	1,6010C	MG
Lead, Total	16		mg/kg	2.2	0.09	1	10/18/13 10:30	10/19/13 16:47	EPA 3050B	1,6010C	MG
Mercury, Total	ND		mg/kg	0.09	0.02	1	10/23/13 10:31	10/23/13 14:02	EPA 7471B	1,7471B	MC
Selenium, Total	0.17	J	mg/kg	0.87	0.13	1	10/18/13 10:30	10/19/13 16:47	EPA 3050B	1,6010C	MG
Silver, Total	ND		mg/kg	0.44	0.09	1	10/18/13 10:30	10/19/13 16:47	EPA 3050B	1,6010C	MG

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-04	Date Collected:	10/15/13 14:45
Client ID:	TP-05 (2-4)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	87%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	3.9		mg/kg	0.44	0.09	1	10/18/13 10:30	10/19/13 17:09	EPA 3050B	1,6010C	MG
Barium, Total	73		mg/kg	0.44	0.13	1	10/18/13 10:30	10/19/13 17:09	EPA 3050B	1,6010C	MG
Cadmium, Total	4.8		mg/kg	0.44	0.03	1	10/18/13 10:30	10/19/13 17:09	EPA 3050B	1,6010C	MG
Chromium, Total	27		mg/kg	0.44	0.09	1	10/18/13 10:30	10/19/13 17:09	EPA 3050B	1,6010C	MG
Lead, Total	230		mg/kg	2.2	0.09	1	10/18/13 10:30	10/19/13 17:09	EPA 3050B	1,6010C	MG
Mercury, Total	0.22		mg/kg	0.08	0.02	1	10/23/13 10:31	10/23/13 14:04	EPA 7471B	1,7471B	MC
Selenium, Total	0.13	J	mg/kg	0.87	0.13	1	10/18/13 10:30	10/19/13 17:09	EPA 3050B	1,6010C	MG
Silver, Total	0.82		mg/kg	0.44	0.09	1	10/18/13 10:30	10/22/13 02:15	EPA 3050B	1,6010C	TT

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-05	Date Collected:	10/15/13 15:10
Client ID:	TP-06 (0-2)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	89%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	3.7		mg/kg	0.43	0.09	1	10/18/13 10:30	10/19/13 17:12	EPA 3050B	1,6010C	MG
Barium, Total	37		mg/kg	0.43	0.13	1	10/18/13 10:30	10/19/13 17:12	EPA 3050B	1,6010C	MG
Cadmium, Total	0.42	J	mg/kg	0.43	0.03	1	10/18/13 10:30	10/19/13 17:12	EPA 3050B	1,6010C	MG
Chromium, Total	5.9		mg/kg	0.43	0.09	1	10/18/13 10:30	10/19/13 17:12	EPA 3050B	1,6010C	MG
Lead, Total	16		mg/kg	2.1	0.09	1	10/18/13 10:30	10/19/13 17:12	EPA 3050B	1,6010C	MG
Mercury, Total	0.02	J	mg/kg	0.09	0.02	1	10/23/13 10:31	10/23/13 14:06	EPA 7471B	1,7471B	MC
Selenium, Total	0.14	J	mg/kg	0.85	0.13	1	10/18/13 10:30	10/19/13 17:12	EPA 3050B	1,6010C	MG
Silver, Total	0.11	J	mg/kg	0.43	0.09	1	10/18/13 10:30	10/19/13 17:12	EPA 3050B	1,6010C	MG

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

SAMPLE RESULTS

Lab ID:	L1320788-06	Date Collected:	10/15/13 15:35
Client ID:	TP-07 (2-4)	Date Received:	10/16/13
Sample Location:	301 OHIO ST	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	87%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	2.4		mg/kg	0.45	0.09	1	10/18/13 10:30	10/19/13 17:16	EPA 3050B	1,6010C	MG
Barium, Total	140		mg/kg	0.45	0.13	1	10/18/13 10:30	10/19/13 17:16	EPA 3050B	1,6010C	MG
Cadmium, Total	0.29	J	mg/kg	0.45	0.03	1	10/18/13 10:30	10/19/13 17:16	EPA 3050B	1,6010C	MG
Chromium, Total	7.0		mg/kg	0.45	0.09	1	10/18/13 10:30	10/19/13 17:16	EPA 3050B	1,6010C	MG
Lead, Total	10		mg/kg	2.2	0.09	1	10/18/13 10:30	10/19/13 17:16	EPA 3050B	1,6010C	MG
Mercury, Total	ND		mg/kg	0.09	0.02	1	10/23/13 10:31	10/23/13 14:07	EPA 7471B	1,7471B	MC
Selenium, Total	1.8		mg/kg	0.89	0.13	1	10/18/13 10:30	10/19/13 17:16	EPA 3050B	1,6010C	MG
Silver, Total	0.12	J	mg/kg	0.45	0.09	1	10/18/13 10:30	10/19/13 17:16	EPA 3050B	1,6010C	MG

Project Name: 301 OHIO ST **Lab Number:** L1320788
Project Number: 0136-013-004 **Report Date:** 10/23/13

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Westborough Lab for sample(s): 01-06 Batch: WG645024-1										
Arsenic, Total	ND		mg/kg	0.50	0.10	1	10/18/13 10:30	10/19/13 15:07	1,6010C	MG
Barium, Total	ND		mg/kg	0.50	0.15	1	10/18/13 10:30	10/19/13 15:07	1,6010C	MG
Cadmium, Total	ND		mg/kg	0.50	0.04	1	10/18/13 10:30	10/19/13 15:07	1,6010C	MG
Chromium, Total	ND		mg/kg	0.50	0.10	1	10/18/13 10:30	10/19/13 15:07	1,6010C	MG
Lead, Total	ND		mg/kg	2.5	0.10	1	10/18/13 10:30	10/19/13 15:07	1,6010C	MG
Selenium, Total	ND		mg/kg	1.0	0.15	1	10/18/13 10:30	10/19/13 15:07	1,6010C	MG
Silver, Total	ND		mg/kg	0.50	0.10	1	10/18/13 10:30	10/22/13 00:47	1,6010C	TT

Prep Information

Digestion Method: EPA 3050B

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Westborough Lab for sample(s): 01-06 Batch: WG645987-1										
Mercury, Total	ND		mg/kg	0.08	0.02	1	10/23/13 10:31	10/23/13 13:42	1,7471B	MC

Prep Information

Digestion Method: EPA 7471B

Lab Control Sample Analysis
Batch Quality Control

Project Name: 301 OHIO ST

Project Number: 0136-013-004

Lab Number: L1320788

Report Date: 10/23/13

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Westborough Lab Associated sample(s): 01-06 Batch: WG645024-2 SRM Lot Number: 0518-10-02								
Arsenic, Total	100		-		81-119	-		
Barium, Total	96		-		83-118	-		
Cadmium, Total	94		-		82-117	-		
Chromium, Total	101		-		80-119	-		
Lead, Total	95		-		80-120	-		
Selenium, Total	106		-		80-120	-		
Silver, Total	101		-		66-134	-		
Total Metals - Westborough Lab Associated sample(s): 01-06 Batch: WG645987-2 SRM Lot Number: 0518-10-02								
Mercury, Total	114		-		67-133	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004
Lab Number: L1320788
Report Date: 10/23/13

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG645024-4 QC Sample: L1320926-01 Client ID: MS Sample												
Arsenic, Total	20.	11.8	38	**153**	Q	-	-		75-125	-		35
Barium, Total	90.	196	300	107		-	-		75-125	-		35
Cadmium, Total	4.4	5	10	112		-	-		75-125	-		35
Chromium, Total	4200	19.6	7000	**14300**	Q	-	-		75-125	-		35
Lead, Total	160	50	180	**40**	Q	-	-		75-125	-		35
Selenium, Total	0.92J	11.8	13	110		-	-		75-125	-		35
Silver, Total	7.3	29.4	32	84		-	-		75-125	-		35
Total Metals - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG645987-4 QC Sample: L1320782-04 Client ID: MS Sample												
Mercury, Total	ND	0.225	0.28	124		-	-		70-130	-		35

Lab Duplicate Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG645024-3 QC Sample: L1320926-01 Client ID: DUP Sample						
Arsenic, Total	20.	18	mg/kg	11		35
Barium, Total	90.	69	mg/kg	26		35
Cadmium, Total	4.4	4.1	mg/kg	7		35
Chromium, Total	4200	4600	mg/kg	9		35
Lead, Total	160	120	mg/kg	29		35
Selenium, Total	0.92J	0.78J	mg/kg	NC		35
Total Metals - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG645024-3 QC Sample: L1320926-01 Client ID: DUP Sample						
Silver, Total	7.3	2.5	mg/kg	**98**	Q	35
Total Metals - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG645987-3 QC Sample: L1320782-04 Client ID: DUP Sample						
Mercury, Total	ND	ND	mg/kg	NC		35

INORGANICS
&
MISCELLANEOUS

Project Name: 301 OHIO ST

Project Number: 0136-013-004

Lab Number: L1320788

Report Date: 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-01
Client ID: TP-02 (1-3)
Sample Location: 301 OHIO ST
Matrix: Soil

Date Collected: 10/15/13 11:45
Date Received: 10/16/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	83.0		%	0.100	NA	1	-	10/18/13 02:59	30,2540G	RT

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-02
Client ID: TP-03 (1-3)
Sample Location: 301 OHIO ST
Matrix: Soil

Date Collected: 10/15/13 14:15
Date Received: 10/16/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	70.2		%	0.100	NA	1	-	10/18/13 02:59	30,2540G	RT

Project Name: 301 OHIO ST | **Lab Number:** L1320788
Project Number: 0136-013-004 | **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-03
Client ID: TP-04 (1-3)
Sample Location: 301 OHIO ST
Matrix: Soil

Date Collected: 10/15/13 14:30
Date Received: 10/16/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	90.0		%	0.100	NA	1	-	10/18/13 02:59	30,2540G	RT

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-04
Client ID: TP-05 (2-4)
Sample Location: 301 OHIO ST
Matrix: Soil

Date Collected: 10/15/13 14:45
Date Received: 10/16/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	86.7		%	0.100	NA	1	-	10/18/13 02:59	30,2540G	RT

Project Name: 301 OHIO ST | **Lab Number:** L1320788

Project Number: 0136-013-004 | **Report Date:** 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-05 | Date Collected: 10/15/13 15:10

Client ID: TP-06 (0-2) | Date Received: 10/16/13

Sample Location: 301 OHIO ST | Field Prep: Not Specified

Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	89.1		%	0.100	NA	1	-	10/18/13 02:59	30,2540G	RT

Project Name: 301 OHIO ST
Lab Number: L1320788
Project Number: 0136-013-004
Report Date: 10/23/13

SAMPLE RESULTS

Lab ID: L1320788-06
Client ID: TP-07 (2-4)
Sample Location: 301 OHIO ST
Matrix: Soil
Date Collected: 10/15/13 15:35
Date Received: 10/16/13
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	86.9		%	0.100	NA	1	-	10/18/13 02:59	30,2540G	RT

Lab Duplicate Analysis
Batch Quality Control

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-06 QC Batch ID: WG644956-1 QC Sample: L1320747-01 Client ID: DUP Sample						
Solids, Total	81.3	78.0	%	4		20

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Custody Seal

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1320788-01A	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8260(14)
L1320788-01B	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-01C	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-02A	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-02B	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-02C	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-03A	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-03B	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-03C	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-04A	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8260(14)

*Values in parentheses indicate holding time in days

Project Name: 301 OHIO ST
Project Number: 0136-013-004

Lab Number: L1320788
Report Date: 10/23/13

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1320788-04B	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-04C	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-05A	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-05B	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-05C	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-06A	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-06B	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1320788-06C	Amber 120ml unpreserved	A	N/A	2.5	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)

*Values in parentheses indicate holding time in days

Project Name:	301 OHIO ST	**Lab Number:**	L1320788
Project Number:	0136-013-004	**Report Date:**	10/23/13

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

Report Format: DU Report with "J" Qualifiers

Project Name: 301 OHIO ST **Lab Number:** L1320788

Project Number: 0136-013-004 **Report Date:** 10/23/13

Data Qualifiers

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

J - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with "J" Qualifiers

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

30 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF. 18th Edition. 1992.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certificate/Approval Program Summary

Last revised October 1, 2013 - Westboro Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0574. ***NELAP Accredited Solid Waste/Soil.***

Drinking Water (Inorganic Parameters: Color, pH, Turbidity, Conductivity, Alkalinity, Chloride, Free Residual Chlorine, Fluoride, Calcium Hardness, Sulfate, Nitrate, Nitrite, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Selenium, Silver, Sodium, Thallium, Zinc, Total Dissolved Solids, Total Organic Carbon, Total Cyanide, Perchlorate. Organic Parameters: Volatile Organics 524.2, Total Trihalomethanes 524.2, 1,2-Dibromo-3-chloropropane (DBCP) 504.1, Ethylene Dibromide (EDB) 504.1, 1,4-Dioxane (Mod 8270). Microbiology Parameters: Total Coliform-MF mEndo (SM9222B), Total Coliform – Colilert (SM9223, Enumeration and P/A), E. Coli. – Colilert (SM9223, Enumeration and P/A), HPC – Pour Plate (SM9215B), Fecal Coliform – MF m-FC (SM9222D), Fecal Coliform-EC Medium (SM 9221E).

Wastewater/Non-Potable Water (Inorganic Parameters: Color, pH, Conductivity, Acidity, Alkalinity, Chloride, Total Residual Chlorine, Fluoride, Total Hardness, Silica, Sulfate, Sulfide, Ammonia, Kjeldahl Nitrogen, Nitrate, Nitrite, O-Phosphate, Total Phosphorus, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, Zinc, Total Residue (Solids), Total Dissolved Solids, Total Suspended Solids (non-filterable), BOD, CBOD, COD, TOC, Total Cyanide, Phenolics, Foaming Agents (MBAS), Bromide, Oil and Grease. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Acid Extractables (Phenols), Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, Polynuclear Aromatic Hydrocarbons, Haloethers, Chlorinated Hydrocarbons, Volatile Organics, TPH (HEM/SGT), CT-Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH. Microbiology Parameters: Total Coliform – MF mEndo (SM9222B), Total Coliform – MTF (SM9221B), E. Coli – Colilert (SM9223 Enumeration), HPC – Pour Plate (SM9215B), Fecal Coliform – MF m-FC (SM9222D), Fecal Coliform – A-1 Broth (SM9221E), Enterococcus - Enterolert.

Solid Waste/Soil (Inorganic Parameters: pH, Sulfide, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Tin, Vanadium, Zinc, Total Cyanide, Ignitability, Phenolics, Corrosivity, TCLP Leach (1311), SPLP Leach (1312 metals only), Reactivity. Organic Parameters: PCBs, PCBs in Oil, Organochlorine Pesticides, Technical Chlordane, Toxaphene, CT-Extractable Petroleum Hydrocarbons (ETPH), MA-EPH, MA-VPH, Dicamba, 2,4-D, 2,4,5-T, 2,4,5-TP(Silvex), Dalapon, Volatile Organics (SW 8260), Acid Extractables (Phenols) (SW 8270), Benzidines (SW 8270), Phthalates (SW 8270), Nitrosamines (SW 8270), Nitroaromatics & Cyclic Ketones (SW 8270), PAHs (SW 8270), Haloethers (SW 8270), Chlorinated Hydrocarbons (SW 8270).)

State of Illinois Certificate/Lab ID: 003155. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM2120B, 2320B, 2510B, 2540C, SM4500CN-CE, 4500F-C, 4500H-B, 4500NO3-F, 5310C, EPA 200.7, 200.8, 245.1, 300.0. Organic Parameters: EPA 504.1, 524.2.)

Wastewater/Non-Potable Water (Inorganic Parameters: SM2120B, 2310B, 2320B, 2340B, 2510B, 2540B, 2540C, 2540D, SM4500CL-E, 4500CN-E, 4500F-C, 4500H-B, 4500NH3-H, 4500NO2-B, 4500NO3-F, 4500P-E, 4500S-D, 4500SO3-B, 5210B, 5220D, 5310C, 5540C, EPA 120.1, 1664A, 200.7, 200.8, 245.1, 300.0, 350.1, 351.1, 353.2, 410.4, 420.1. Organic Parameters: EPA 608, 624, 625.)

Hazardous and Solid Waste (Inorganic Parameters: EPA 1010A, 1030, 1311, 1312, 6010C, 6020A, 7196A, 7470A, 7471B, 9012B, 9014, 9038, 9040C, 9045D, 9050A, 9065, 9251. Organic Parameters: 8011 (NPW only), 8015C, 8081B, 8082A, 8151A, 8260C, 8270D, 8315A, 8330.)

Maine Department of Human Services Certificate/Lab ID: 2009024.
Drinking Water (Inorganic Parameters: SM9215B, 9222D, 9223B, EPA 180.1, 353.2, SM2120B, 2130B, 2320B, 2510C, 2540C, 4500Cl-D, 4500CN-C, 4500CN-E, 4500F-C, 4500H+B, 4500NO3-F, 5310C, EPA 200.7, EPA 200.8, 245.1, EPA 300.0. Organic Parameters: 504.1, 524.2.)

Wastewater/Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664A, 300.0, 350.1, 351.1, 353.2, 410.4, 420.1, 8315A, 9010C, SM2120B, 2310B, 2320B, 2510B, 2540B, 2540C, 2540D, 426C, 4500Cl-E, 4500CN-C, 4500CN-E, 4500F-B, 4500F-C, 4500H+B, 4500Norg-C, 4500NH3-B, 4500NH3-H, 4500NO2-B, 4500NO3-F, 4500P-B, 4500P-E, 4500S2-D, 4500SO3-B, 5540C, 5210B, 5220D, 5310C, 9010B, 9030B, 9040C, 7470A, 7196A, 2340B, EPA 200.7, 6010C, 200.8, 6020A, 245.1, 1311, 1312, 3005A, Enterolert, 9223B, 9222D. Organic Parameters: 608, 624, 625, 8011, 8081B, 8082A, 8330, 8151A, 8260C, 8270D, 3510C, 3630C, 5030B, ME-DRO, ME-GRO, MA-EPH, MA-VPH.)

Solid Waste/Soil (Inorganic Parameters: 9010B, 9012A, 9014, 9040B, 9045C, 6010C, 6020A, 7471B, 7196A, 9050A, 1010, 1030, 9065, 1311, 1312, 3005A, 3050B, 9038, 9251. Organic Parameters: ME-DRO, ME-GRO, MA-EPH, MA-VPH, 8260C, 8270D, 8330, 8151A, 8081B, 8082A, 3540C, 3546, 3580A, 3620C, 3630C, 5030B, 5035.)

Massachusetts Department of Environmental Protection Certificate/Lab ID: M-MA086.
*Drinking Water (*Inorganic Parameters: (EPA 200.8 for: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl) (EPA 200.7 for: Ba,Be,Ca,Cd,Cr,Cu,Na,Ni) 245.1, (300.0 for: Nitrate-N, Fluoride, Sulfate); (EPA 353.2 for: Nitrate-N, Nitrite-N); (SM4500NO3-F for: Nitrate-N and Nitrite-N); 4500F-C, 4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, 2320B, SM2540C, SM4500H-B. Organic Parameters: (EPA 524.2 for: Trihalomethanes, Volatile Organics); (504.1 for: 1,2-Dibromoethane, 1,2-Dibromo-3-Chloropropane), EPA 332. Microbiology Parameters: SM9215B; ENZ. SUB. SM9223; ColilertQT SM9223B; MF-SM9222D.)

*Non-Potable Water (*Inorganic Parameters:, (EPA 200.8 for: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn); (EPA 200.7 for: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn); 245.1, SM4500H,B, EPA 120.1, SM2510B, 2540C, 2340B, 2320B, 4500CL-E, 4500F-BC, 426C, SM4500NH3-BH, (EPA 350.1 for: Ammonia-N), LACHAT 10-107-06-1-B for Ammonia-N, SM4500NO3-F, 353.2 for Nitrate-N, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, 4500P-B,E, 5220D, EPA 410.4, SM 5210B, 5310C, 4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.
Organic Parameters: (EPA 624 for Volatile Halocarbons, Volatile Aromatics),(608 for: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT,Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs-Water), (EPA 625 for SVOC Acid Extractables and SVOC Base/Neutral Extractables), 600/4-81-045-PCB-Oil. Microbiology Parameters: (ColilertQT SM9223B; Enterolert-QT: SM9222D-MF.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 200307. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM 9222B, 9223B, 9215B, EPA 200.7, 200.8, 300.0, SM4500CN-E, 4500H+B, 4500NO3-F, 2320B, 2510B, 2540C, 4500F-C, 5310C, 2120B, EPA 332.0. Organic Parameters: 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: SM9222D, 9221B, 9222B, 9221E-EC, EPA 3005A, 200.7, 200.8, 245.1, SW-846 6010C, 6020A, 7196A, 7470A, SM3500-CR-D, EPA 120.1, 300.0, 350.1, 350.2, 351.1, 353.2, 410.4, 420.1, 426C, 1664A, SW-846 9010B, 9010C, 9030, 9040B, 9040C, SM2120B, 2310B, 2320B, 2340B, 2540B, 2540D, 4500H+B, 4500CL-E, 4500CN-E, 4500NH3-H, 4500NO3-F, 4500NO2-B, 4500P-E, 4500-S2-D, 4500SO3-B, 5210B, 5220D, 2510B, 2540C, 4500F-C, 5310C, 5540C, LACHAT 10-204-00-1-A, LACHAT 10-107-06-2-D, 3060A. Organic Parameters: SW-846 3510C, 3630C, 5030B, 8260C, 8270D, 8330, EPA 624, 625, 608, SW-846 8082A, 8081B, 8015C, 8151A, 8330, 8270D-SIM.)

Solid & Chemical Materials (Inorganic Parameters: SW-846 6010C, 6020A, 7196A, 7471B, 1010, 1010A, 1030, 9010C, 9012B, 9014, 9030B, 9040C, 9045C, 9045D, 9050, 9065, 9251, 1311, 1312, 3005A, 3050B, 3060A. Organic Parameters: SW-846 3540C, 3546, 3050B, 3580A, 3620D, 3630C, 5030B, 5035, 8260C, 8270D, 8270D-SIM, 8330, 8151A, 8015B, 8015C, 8082A, 8081B.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 2064. ***NELAP Accredited.***
Drinking Water (Organic Parameters: **EPA 524.2:** Di-isopropyl ether (DIPE), Ethyl-t-butyl ether (ETBE), Tert-amyl methyl ether (TAME)).

Non-Potable Water (Organic Parameters: **EPA 8260C:** 1,3,5-Trichlorobenzene. **EPA 8015C(M):** TPH.)

Solid & Chemical Materials (Organic Parameters: **EPA 8260C:** 1,3,5-Trichlorobenzene.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA935. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM9222B, 9221E, 9223B, 9215B, 4500CN-CE, 4500NO3-F, 4500F-C, EPA 300.0, 200.7, 200.8, 245.1, 2540C, SM2120B, 2320B, 2510B, 5310C, SM4500H-B. Organic Parameters: EPA 332, 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: SM5210B, EPA 410.4, SM5220D, 4500Cl-E, EPA 300.0, SM2120B, 2340B, SM4500F-BC, EPA 200.7, 200.8, 351.1, LACHAT 10-107-06-2-D, EPA 353.2, SM4500NO3-F, 4500NO2-B, EPA 1664A, SM5310C, 4500-PE, EPA 420.1, SM4500P-B5+E, 2540B, 2540C, 2540D, EPA 120.1, SM2510B, 9222D, 9221B, 9221C, 9221E, 9222B, 9215B, 2310B, 2320B, 4500NH3-H, 4500-S D, 4500SO4-E, EPA 350.1, 350.2, SW-846 1312, 7470A, 5540C, SM4500H-B, 4500SO3-B, SM3500Cr-D, 4500CN-CE, EPA 245.1, SW-846 9040B, 9040C, 3005A, 3015, EPA 6010B, 6010C, 6020, 6020A, 7196A, 3060A, SW-846 9010C, 9030B. Organic Parameters: SW-846 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 3510C, EPA 608, 624, 625, SW-846 3630C, 5030B, 5030C, 8011, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8330, 1,4-Dioxane by NJ Modified 8270, 8015B, NJ EPH.)

Solid & Chemical Materials (Inorganic Parameters: SW-846, 6010B, 6010C, 6020, 6020A, 7196A, 3060A, 9030B, 1010, 1010A, 1030, 1311, 1312, 3005A, 3050B, 7471A, 7471B, 9010C, 9012B, 9014, 9038, 9040B, 9040C, 9045C, 9045D, 9050A, 9065, 9251. Organic Parameters: SW-846 8015B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8330, 8260B, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 3540C, 3546, 3580A, 3620C, 3630C, 5030B, 5030C, 5035L, 5035H, NJ EPH.)

New York Department of Health Certificate/Lab ID: 11148. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: SM9223B, 9222B, 9215B, EPA 200.8, 200.7, 245.1, SM5310C, EPA 332.0, SM2320B, EPA 300.0, SM2120B, 4500CN-E, 4500F-C, 4500NO3-F, 2540C, SM 2510B. Organic Parameters: EPA 524.2, 504.1.)

Non-Potable Water (Inorganic Parameters: SM9221E, 9222D, 9221B, 9222B, 9215B, 5210B, 5310C, EPA 410.4, SM5220D, 2310B, 2320B, EPA 200.7, 300.0, SM4500CL-E, 4500F-C, SM15 426C, EPA 350.1, SM4500NH3-BH, EPA 351.1, LACHAT 10-107-06-2, EPA 353.2, SM4500-NO3-F, 4500-NO2-B, 4500P-E, 2340B, 2540C, 2540B, 2540D, EPA 200.8, EPA 6010C, 6020A, EPA 7196A, SM3500Cr-D, EPA 245.1, 7470A, SM2120B, 4500CN-CE, EPA 1664A, EPA 420.1, SM14 510C, EPA 120.1, SM2510B, SM4500S-D, SM5540C, EPA 8315A, 3005A, 9010C, 9030B. Organic Parameters: EPA 624, 8260C, 8270D, 8270D-SIM, 625, 608, 8081B, 8151A, 8330A, 8082A, EPA 3510C, 5030B, 5030C, 8015C, 8011.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1010A, 1030, EPA 6010C, 6020A, 7196A, 7471B, 8315A, 9012B, 9014, 9065, 9050A, 9038, 9251, EPA 1311, 1312, 3005A, 3050B, 9010C, 9030B, 9040C, 9045D. Organic Parameters: EPA 8260C, 8270D, 8270D-SIM, 8015C, 8081B, 8151A, 8330A, 8082A, 3540C, 3546, 3580A, 5035A-H, 5035A-L.)

North Carolina Department of the Environment and Natural Resources Certificate/Lab ID : 666. (Inorganic Parameters: SM2310B, 2320B, 4500Cl-E, 4500Cn-E, 9012B, 9014, Lachat 10-204-00-1-X, 1010A, 1030, 4500NO3-F, 353.2, 4500P-E, 4500SO4-E, 300.0, 4500S-D, 5310B, 5310C, 6010C, 6020A, 200.7, 200.8, 3500Cr-B, 7196A, 245.1, 7470A, 7471B, 1311,1312. Organic Parameters: 608, 8081B, 8082A, 624, 8260B, 625, 8270D, 8151A, 8015C, 504.1, MA-EPH, MA-VPH.)

Drinking Water Program Certificate/Lab ID: 25700. (Inorganic Parameters: Chloride EPA 300.0. Organic Parameters: 524.2)

Pennsylvania Department of Environmental Protection Certificate/Lab ID : 68-03671. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: 200.7, 200.8, 300.0, 332.0, 2120B, 2320B, 2510B, 2540C, 4500-CN-CE, 4500F-C, 4500H+-B, 4500NO3-F, 5310C. Organic Parameters: EPA 524.2, 504.1)

Non-Potable Water (Inorganic Parameters: EPA 120.1, 1312, 3005A,3015, 3060A, 200.7, 200.8, 410.4, 1664A, SM2540D, 5210B, 5220D, 4500-P,BE, 245.1, 300.0, 350.1, 350.2, 351.1, 353.2, 420.1, 6010C, 6020A, 7196A, 7470A, 9030B, 2120B, 2310B, 2320B, 2510B, 2540B, 2540C, 3500Cr-D, 426C, 4500CN-CE, 4500Cl-E, 4500F-B, 4500F-C, 4500H+-B, 4500NH3-H, 4500NO2-B, 4500NO3-F, 4500S-D, 4500SO3-B, 5310BCD, 5540C, 9010C, 9040C. Organic Parameters: EPA 3510C, 3630C, 5030B, 625, 624, 608, 8081B, 8082A, 8151A, 8260C, 8270D, 8270D-SIM, 8330, 8015C, NJ-EPH.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 350.1, 1010, 1030, 1311, 1312, 3005A, 3050B, 3060A, 6010C, 6020A, 7196A, 7471B, 9010C, 9012B, 9014, 9040B, 9045D, 9050A, 9065, SM 4500NH3-BH, 9030B, 9038, 9251. Organic Parameters: 3540C, 3546, 3580A, 3620C, 3630C, 5035, 8015C, 8081B, 8082A, 8151A, 8260C, 8270D, 8270D-SIM, 8330, NJ-EPH.)

Rhode Island Department of Health Certificate/Lab ID: LAO00065. ***NELAP Accredited via NJ-DEP.***
Refer to MA-DEP Certificate for Potable and Non-Potable Water.
Refer to NJ-DEP Certificate for Potable and Non-Potable Water.

Texas Commisson on Environmental Quality Certificate/Lab ID: T104704476. ***NELAP Accredited.***
Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664, 200.7, 200.8, 245.1, 245.2, 300.0, 350.1, 351.1, 353.2, 410.4, 420.1, 6010, 6020, 7196, 7470, 9040, SM 2120B, 2310B, 2320B, 2510B, 2540B, 2540C, 2540D, 426C, 4500CL-E, 4500CN-E, 4500F-C, 4500H+B, 4500NH3-H, 4500NO2B, 4500P-E, 4500 S2¯D, 510C, 5210B, 5220D, 5310C, 5540C. Organic Parameters: EPA 608, 624, 625, 8081, 8082, 8151, 8260, 8270, 8330.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 1312, 9012, 9014, 9040, 9045, 9050, 9065.)

Virginia Division of Consolidated Laboratory Services Certificate/Lab ID: 460195. ***NELAP Accredited.***
Drinking Water (Inorganic Parameters: EPA 200.7, 200.8, 300.0, 2510B, 2120B, 2540C, 4500CN-CE, 245.1, 2320B, 4500F-C, 4500NO3-F, 4500H+B, 5310C. Organic Parameters: EPA 504.1, 524.2.)

Non-Potable Water (Inorganic Parameters: EPA 120.1, 1664A, 200.7, 200.8, 245.1, 300.0, 350.1, 351.1, 351.2, 3005A, 3015, 1312, 6010B, 6010C, 3060A, 353.2, 420.1, 2340B, 6020, 6020A, SM4500S-D, SM4500-CN-CE, Lachat 10-204-00-1-X, 7196A, 7470A, 2310B, 2320B, 2510B, 2540B, 2540C, 2540D, 3500Cr-D, 426C, 4500Cl-E, 4500F-B, 4500F-C,

4500NH3-H, 4500NO2-B, 4500NO3-F, 4500 SO3-B, 4500H-B, 4500PE, 510AC, 5210B, 5310B 5310C, 5540C, 9010Cm 9030B, 9040C. Organic Parameters: EPA 3510C, 3630C, 5030B, 8260B, 608, 624, 625, 8011, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8260C, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330,)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1010A, 1030, 3060A, 3050B, 1311, 1312, 6010B, 6010C, 6020, , 7196A, 7471A, 7471B, 6020A, 9010C, 9012B, 9030B, 9014, 9038, 9040C, 9045D, 9251, 9050A, 9065. Organic Parameters: EPA 5030B, 5035, 3540C, 3546, 3550B, 3580A, 3620C, 3630C, 6020A, 8260B, 8260C, 8015B, 8015C, 8081A, 8081B, 8082, 8082A, 8151A, 8270C, 8270D, 8270C-SIM, 8270D-SIM, 8330.)

Department of Defense, L-A-B Certificate/Lab ID: L2217.
Drinking Water (Inorganic Parameters: SM 4500H-B. Organic Parameters: EPA 524.2, 504.1.)

Non-Potable Water (Inorganic Parameters: EPA 200.7, 200.8, 6010C, 6020A, 245.1, 7470A, 9040B, 9010B, 180.1, 300.0, 332.0, 6860, 351.1, 353.2, 9060, 1664A, SM 4500CN-E, 4500H-B, 4500Norg-C, 4500NO3-F, 5310C, 2130B, 2320B, 2340B, 2540C, 5540C, 3005A, 3015, 9056, 7196A, 3500-Cr-D. Organic Parameters: EPA 8015C, 8151A, 8260C, 8270D, 8270D-SIM, 8330A, 8082A, 8081B, 3510C, 5030B, MassDEP EPH, MassDEP VPH.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 200.7, 6010C, 6020A, 7471A, 6860, 1311, 1312, 3050B, 7196A, 9040B, 9045C, 9010C, 9012B, 9251, SM3500-CR-D, 4500CN-CE, 2540G, Organic Parameters: EPA 8015C, 8151A, 8260C, 8270D, 8270D-SIM, 8330A/B-prep, 8082A, 8081B, 3540C, 3546, 3580A, 5035A, MassDEP EPH, MassDEP VPH.)

The following analytes are not included in our current NELAP/TNI Scope of Accreditation:
EPA 524.2: Acetone, 2-Butanone (Methyl ethyl ketone (MEK)), Tert-butyl alcohol, 2-Hexanone, Tetrahydrofuran, 1,3,5-Trichlorobenzene, 4-Methyl-2-pentanone (MIBK), Carbon disulfide, Diethyl ether. **EPA 8260B:** 1,2,4,5-Tetramethylbenzene, 4-Ethyltoluene. **EPA 8260 Non-potable water matrix:** Iodomethane (methyl iodide), Methyl methacrylate. **EPA 8260 Soil matrix:** Tert-amyl methyl ether (TAME), Diisopropyl ether (DIPE), Azobenzene. **EPA 8330A:** PETN, Picric Acid, Nitroglycerine, 2,6-DANT, 2,4-DANT. **EPA 8270C:** Methyl naphthalene, Dimethyl naphthalene, Total Methylnapthalenes, Total Dimethylnaphthalenes, 1,4-Diphenylhydrazine. **EPA 625:** 4-Chloroaniline, 4-Methylphenol. Total Phosphorus in a soil matrix, TKN in a soil matrix, NO2 in a soil matrix, NO3 in a soil matrix. **EPA 9071:** Total Petroleum Hydrocarbons, Oil & Grease.

CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 10/16/13

ALPHA Job #: L1320788

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Client Information

Client: Turnkey
Address: 2558 Hamburg Turnpike Buffalo NY 14218
Phone: 716-856-0599
Fax: 716-856-0583
Email:

☐ These samples have been previously analyzed by Alpha

Project Information

Project Name: 301 Ohio St
Project Location: 301 Ohio
Project #: 0136-013-004
Project Manager: Mike Lesakowski
ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: 10/23/13 Time:

Report Information - Data Deliverables

☐ FAX ☐ EMAIL
☒ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Regulatory Requirements/Report Limits

State /Fed Program	Criteria

Other Project Specific Requirements/Comments/Detection Limits:

SAMPLE HANDLING

Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: TCL VOC+Stars	PAHs	RCRA Metals	Sample Specific Comments	TOTAL # BOTTLES
20788-01	TP-02 (1-3)	10-15-13	1145	Soil	PWW	X	X	X		3
-02	TP-03 (1-3)	↓	1415	↓	↓		X	X		3
-03	TP-04 (1-3)	↓	1430	↓	↓		X	X		3
-04	TP-05 (2-4)	↓	~~1510~~ 1445	↓	↓	X	X	X		3
-05	TP-06 (0-2)	↓	1510	↓	↓		X	X		3
-06	TP-07 (2-4)	↓	1535	↓	↓		X	X		3

Container Type	
Preservative	

Relinquished By:	Date/Time	Received By:	Date/Time
[signature]	10-15-13 1700	James Z. Rickus	10-16-13 1125
James Z. Rickus	10-16-13 1900	Robert Haire	10-16-13 1900
Robert Haire	10-16-13 2115	[signature]	10/16/13 2115
[signature]	10/16/13 23:59	[signature]	10/16/13 23:59

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

APPENDIX C

PREVIOUS INVESTIGATION

RECEIVED

JUN 21 1995

P. V. M.

CC - P.G. -1
J.C. -2

Buffalo Drilling Company, Inc.
10440 Main Street, Clarence, NY 14031

Job No.: 95-198
Date: June 15, 1995

SITE INSPECTION REPORT

An environmental site inspection has been performed and this report has been prepared for the exclusive use of Magnano-Paladino, c/o 10 Ellicott Square Court Corporation and/or its designated agents. The purpose of this environmental site inspection was to identify and evaluate any actual and potential environmental concerns associated with the inspected properties. This report does not constitute a complete Phase I Environmental Site Assessment. The findings and recommendations presented in this report are exclusive to the client and the assessed properties, and are based solely on a visual inspection of the site. Written permission must be obtained from Buffalo Drilling Company, Inc., for use of this report, its findings, and recommendations by other parties, persons or firms.

REPORT PREPARED FOR:

- Name:	Magnano-Paladino c/o 10 Ellicott Square Court Corp.
- Street:	210 Ellicott Square Building
- Municipality, State, Zip Code:	Buffalo, New York 14203
- Client Contact:	Paul Moretta
- Telephone Number:	(716) 854-0060
- P.O. No:	8432MP

INSPECTED PROPERTY INFORMATION:

- Address:	282-301 Ohio Street
- Municipality:	Buffalo
- County, State, Zip State:	Erie, New York, 14204
- Tax Account No.:	N/A
- Parcel Size (acres):	N/A
- Site Location Map:	Refer to Attachment #1

PRELIMINARY SITE INSPECTION SUMMARY:

ENVIRONMENTAL CONCERN(S): [X] Identified [ ] Not Identified

FURTHER INVESTIGATION(S): [X] Identified [ ] Not Recommended

CONCERNS LISTED BASED ON SITE INSPECTION:

[X] ASBESTOS [ ] RADON [ ] LEAD [ ] WETLANDS

[ ] FLOODPLAINS [ ] ARCHAEOLOGICAL/HISTORICAL SITES

Buffalo Drilling Company, Inc.
10440 Main Street, Clarence, NY 14031

Job No.: 95-198
Date: June 15, 1995

STATEMENT OF PERFORMANCE

Buffalo Drilling Company, Inc. has performed a preliminary site inspection and subsurface investigation program on the properties. The listed environmental concerns are based solely on the results of the site inspection and include an examination of the properties for the presence/absence of suspected asbestos containing material, radon, lead based paint, lead in drinking water, and structural condition of the building(s).

In addition, a limited subsurface investigation was also undertaken by BDC and included the advancement of six preliminary test borings on the properties (refer to Attachment #3). In general, subsurface conditions were found to consist of random fill layers that ranged in thickness from three to fifteen feet (i.e., boring B-2 and B-4, respectively). The fill consists of loose to very dense sands, gravels, brick fragments, cinders, slag, concrete, and silt materials. Below the fill materials, a stiff natural layer of clay and silt was encountered in all borings, except B-4, to completion depths. A silty sand layer was encountered in all borings, except B-4, interbedded in the silt and clay layer. This silty sand layer may be associated with the former meandering of the Buffalo River floodplain at these boring locations.

Groundwater was encountered during or at completion of drilling operations in all of the borings, except at boring B-6. The water level measurement at these boring locations was approximately 9.6 to 10.0 feet below ground surface.

Photoionization screening (PID) of the soil samples collected from the soil borings generally indicated that elevated levels of total ionizable compounds were recorded in the soils from borings B-1, B-2, and B-4 (refer to Attachment #3, Figure #2, and Table 1). Elevated PID readings were also recorded on the soil samples collected from boring B-3 (see below). A slight organic (i.e., topsoil or humus) odor was sensed in the soil samples from borings B-2 and B-4. No visual or olfactory evidence was sensed in the remaining soil samples from the above listed borings, except B-3, which would be considered to be environmentally significant.

THE FOLLOWING ENVIRONMENTAL CONCERN(S) AND RECOMMENDATION(S) ARE IDENTIFIED BASED ON THE SITE INSPECTION OF THE PROPERTIES:

1) Potential Residual Contamination: A soil boring advanced on the 301 Ohio Street property, boring B-3, encountered olfactory evidence on the soil samples that are characterized as a petroleum hydrocarbon-type (i.e., gasoline) odor. An

oily sheen was also observed on the soil samples from this boring location. Photoionization screening (PID) of the soil samples collected from boring B-3 generally indicated that elevated levels of total ionizable compounds were recorded. Based on the aforementioned results, petroleum hydrocarbon contamination is suspected at this boring location.

<u>Recommendations:</u> It is recommended that an additional investigation be conducted in the area of boring B-3 to determine the characteristics and extent of the potential contaminants.

2) <u>Suspected Asbestos Containing Materials (SACM):</u> SACM that were observed in poor condition, included the following:

<u>282 Ohio Street:</u>

- vinyl floor tiles, 12" x 12", gray, white, beige, black, and red, located in the first floor tavern, kitchen, and restaurant, and the second and third floor apartments (approximately five to ten percent of the inspected tiles are damaged).

- rolled linoleum floor covering, located in the second and third floor apartments (approximately five percent damaged).

- thermal pipe insulation (i.e., lagging) located in the basement (approximately five to ten percent damaged).

No representations are made for the presence/absence of SACM in the uninspected building at 301 Ohio Street (i.e., Bulkmatic Transport Company).

<u>Recommendations:</u> It is the understanding of BDC that this building is scheduled for demolition. Thus, it is recommended that the SACM be sampled and analyzed for the presence/absence of asbestos prior to the scheduled demolition. If these materials contain asbestos, it is recommended that they be abated (i.e., removed, encapsulated, renovated, etc.) to limit the release of asbestos fibers. It is also recommended that a trained and licensed contractor, familiar with New York State Department of Labor Industrial Code Rule 56, be retained to complete the abatement, if any.

3) **Material Storage:** Six pails of suspected waste oil/grease were observed on the northern side of the Bulkmatic Transport Company building. Minor staining was also observed on the concrete surface in the vicinity of the pails.

Recommendations: It is recommended that the pails be characterized (i.e., sampled and analyzed) and properly disposed. It is also recommended that the staining be cleaned-up.

4) **Past Usage:** Based solely on a review of historic topographic maps available to BDC, the vacant parking lot appears to have previously been occupied by a large building and several railroad spur lines. The Bulkmatic site also appears to have been occupied by a former building (not the currently existing building) and a railroad spur line. No representations are made with respect to the past usage of the properties or potential environmental concerns associated with the former structures.

1.0 HISTORICAL RECORDS/DATA REVIEW

At the request of the owner, this section was not completed for this site inspection report. This section of a complete Phase I Environmental Site Assessment includes the property history and available site information such as building department records, aerial photographs, fire insurance maps, directories, abstract of title, wetland and floodplain data, and site geology.

2.0 PUBLIC DOMAIN INFORMATION SOURCES

At the request of the owner, this section was not completed for this site inspection report. This section of a complete Phase I Environmental Site Assessment includes data base searches and information provided by such agencies as the USEPA, the NYSDEC, county, and local government regulatory agencies.

3.0 SUMMARY OF SITE INSPECTION

Date of Inspection:	May 18, 1995
Inspector(s):	Andrew J. Kucserik
Ground Cover:	None
Weather Conditions:	Sunny 45°F
Photographs:	N/A

3.1 CURRENT USES OF PROPERTY: [ ] Yes [X] No Observed Concern

The inspected properties currently consist of a restaurant/apartment complex known as the Harbor Inn located at 282 Ohio Street, a bulk flour transport service, tractor trailer repair facility (i.e., Bulkmatic Transport Company) located at 301 Ohio Street, and a vacant parking lot leased by Buffalo Structural Steel. The Harbor Inn has been located on this site for the past forty years. This building consists of eight apartments located on the second and third floors, presently unoccupied, and a first floor kitchen, restaurant, and tavern. As per the client's request, the interior of this building was inspected.

The Bulkmatic facility has reportedly occupied this site for the past three years and is used for the repair of tractor trailer trucks. An UST was reportedly recently removed from this site in May 1995. As per the client's request, the building on this property was not inspected.

The vacant parking lot was reportedly used by Marine Midland Bank as an employee parking lot. Currently, Buffalo Structural Steel used the lot for temporary parking of its tractor trailers.

3.2 PAST USES OF PROPERTY: [ ] Yes [X] No Observed Concern

Refer to Section 2.0. Based solely on a review of historic topographic maps available to BDC, the vacant parking lot appears to have previously been occupied by a large building and several railroad spur lines. The Bulkmatic site also appears to have been occupied by a former building (not the currently existing building) and a railroad spur line. No representations are made with respect to the past usage of the properties or potential environmental concerns associated with the former structures.

3.3 EXTERIOR CONDITIONS:

3.3.1 Topography: [ ] Yes [X] No Observed Concern

The inspected properties are relatively level with respect to the adjacent roadways. According to the owner of the Harbor Inn site, the western portion of this site was previously occupied by residential buildings that have been demolished. The local topography on this site is slightly hummocky due to the presence of the fill materials associated with the former buildings.

The Bulkmatic site is also relatively level, and is located adjacent to the Buffalo River. The southeastern portion of the site is slightly elevated with respect to the main parking lot area of the site and is grass covered. The vacant parking lot is level, and is also located adjacent to the Buffalo River.

3.3.2 Roads, Streets, Parking: [ ] Yes [X] No Observed Concern

Roadways and streets to the inspected properties and parking on the inspected properties were confirmed by a visual inspection of the properties.

3.3.3 Solid Waste Containers: [ ] Yes [X] No Observed Concern

3.3.4 Fill: [X] Yes [ ] No Observed Concern

In addition, a limited subsurface investigation was also undertaken by BDC and included the advancement of six preliminary test borings on the properties. In general, subsurface conditions were found to consist of random fill layers that ranged in thickness from three to fifteen feet (i.e., boring B-2 and B-4, respectively). The fill consists of loose to very dense sands, gravels, brick fragments, cinders, slag, concrete, and silt materials. Below the fill materials, a stiff natural layer of clay and silt was encountered in all borings, except B-4, to completion depths. A silty sand layer was encountered in all borings, except B-4, interbedded in the silt and clay layer. This silty sand layer may be associated with the former meandering of the Buffalo River floodplain at these boring locations.

Groundwater was encountered during or at completion of drilling operations in all of the borings, except at boring B-6. The water level measurement at these boring locations was approximately 9.6 to 10.0 feet below ground surface.

Photoionization screening (PID) of the subsurface samples generally indicated that elevated levels of organic vapors were recorded in the soils from borings B-1, B-2, B-3, and B-4 (refer to Attachment #3, Figure #3, and Table 1). Olfactory evidence was sensed in the soil samples from boring B-3 that are characterized as a petroleum hydrocarbon-type (i.e., gasoline) odor. An oily sheen was also observed on the soil samples from the boring B-3 location. Based on the PID results, and the visual and olfactory evidence from boring location B-3, petroleum hydrocarbon contamination is suspected at this boring location.

A slight organic (i.e., topsoil or humus) odor was sensed in the soil samples from borings B-2 and B-4. No visual or olfactory evidence was sensed in the remaining soil samples from the borings which would be considered to be environmentally significant.

3.3.5 Debris/Dumping/Mounds: [ ] Yes [X] No Observed Concern

A mound of demolition debris was observed at the property located at 282 Ohio Street, presumably associated with the previous demolition of the former residential buildings. No staining, spillage, or discoloration were observed on the ground surface due to this mound.

3.3.6 Spillage/Pools: [ ] Yes [X] No Observed Concern

3.3.7 Stained Soil/Pavement: [ ] Yes [X] No Observed Concern

3.3.8 Stressed Vegetation: [ ] Yes [X] No Observed Concern

3.3.9 Pits/Ponds/Lagoons: [ ] Yes [X] No Observed Concern

There are no surface water bodies on the inspected properties. Pits, ponds, and lagoons were not observed on the adjoining properties.

3.3.10 Septic Systems: [ ] Yes [X] No Observed Concern

According to the current owner of the structure located at 282 Ohio Street, the on-site building has been serviced by the municipal sewer and storm water system for at least the past 40 years.

3.3.11 Wells: [ ] Yes [X] No Observed Concern

Potable, domestic, irrigation, dry, injection, monitoring, and/or abandoned wells for water or other uses were not observed.

3.4 INSPECTED BUILDING CONDITION:

3.4.1	Number:	One
	Description:	Masonry and wood frame
	Stories:	Three
	Approximate Age:	60 years
	Ancillary Structures:	None

The building at 301 Ohio Street was not inspected.

3.4.2 Structural: [ ] Yes [X] No Observed Concern

3.4.3 Suspected Asbestos: [X] Yes [ ] No Observed Concern

Suspected Asbestos Containing Materials (SACM) that were observed in poor condition, included the following:

<u>282 Ohio Street:</u>

- vinyl floor tiles, 12" x 12", gray, white, beige, black, and red, located in the first floor tavern, kitchen, and restaurant, and the second and third floor apartments (approximately five to ten percent of the inspected tiles are damaged).

- rolled linoleum floor covering, located in the second and third floor apartments (approximately five percent damaged).

- thermal pipe insulation (i.e., lagging) located in the basement (approximately five to ten percent damaged).

No representations are made for the presence/absence of SACM in the uninspected building at 301 Ohio Street (i.e., Bulkmatic).

<u>Recommendations:</u> It is the understanding of BDC that this building is scheduled for demolition. Thus, it is recommended that the SACM be sampled and analyzed for the presence/absence of asbestos prior to the scheduled demolition. If these materials contain asbestos, it is recommended that they be abated (i.e., removed, encapsulated, renovated, etc.) to limit the release of asbestos fibers. It is also recommended that a

trained and licensed contractor, familiar with New York State Department of Labor Industrial Code Rule 56, be retained to complete the abatement, if any.

3.4.4 Lead-Based Paint: [ ] Yes [X] No Observed Concern

The building located at 282 Ohio Street is reportedly scheduled for demolition.

3.4.5 Lead in Drinking Water: [ ] Yes [X] No Observed Concern

The building located at 282 Ohio Street is reportedly scheduled for demolition.

3.4.6 Radon Accumulation Spaces: [ ] Yes [X] No Observed Concern

The building located at 282 Ohio Street is reportedly scheduled for demolition.

3.5 UTILITIES:

3.5.1 Transformers/PCB's: [ ] Yes [X] No Observed Concern

A utility pole with three pole-mounted electrical transformers was observed on the eastern side of the building located at 301 Ohio Street. No staining, spillage, discoloration or markings/labels were observed on the transformer units or the ground surface beneath the units during the site inspection.

3.5.2 Floor Drains/Sump Pits: [ ] Yes [X] No Observed Concern

A floor drain was observed in the basement of the building located at 282 Ohio Street. No staining, spillage, or discoloration were observed on the concrete or water surface of the floor drain.

3.5.3 Services: [ ] Yes [X] No Observed Concern

a. Potable Water:	City of Buffalo
b. Sanitary Sewer and Date Installed:	City of Buffalo
c. Storm Sewer:	City of Buffalo
d. Building Cooling:	N/A
- Type of Unit(s):	No
- Fueled by:	N/A
e. Building Heating:	Yes
- Type of Unit(s):	Furnace / forced air
- Fueled by:	Natural gas

3.5.4 Wastewater Discharges: None

3.5.6 Air Emissions: None

3.6 OPERATIONS/EQUIPMENT:

3.6.1 Storage Tanks: [ ] Yes [X] No Observed Concern

No USTs/ASTs were observed on the inspected properties. As previously stated, a UST was recently removed from the parking lot located at 301 Ohio Street. A soil boring advanced at this location be BDC indicated that at least fifteen feet of granular fill was encountered. Elevated readings were recorded during the PID scanning of the soil samples from this boring; however, no visual or olfactory evidence was sensed in association with the PID readings. No evidence of tanks was observed on the properties located at 282 Ohio Street or the vacant parking lot.

3.6.2 Materials Storage/Drums: [X] Yes [ ] No Observed Concern

a. Substance: Waste grease/oil
b. Type/No. of Containers: 6 @ 5-gallon plastic pails
c. Storage Conditions: On ground surface

Six pails were observed on the northern side of the Bulkmatic building. Minor staining was also observed on the concrete surface in the vicinity of the pails. It is recommended that the pails be characterized (i.e., sampled and analyzed) and properly disposed. It is also recommended that the staining be cleaned-up.

3.6.3 Materials Use: [ ] Yes [X] No Observed Concern

No concerns were observed for the property located at 282 Ohio Street.

3.6.4 Spillage/Staining/Pools: [X] Yes [ ] No Observed Concern

Refer to Section 3.6.2.

3.6.5 Facility Equipment: [ ] Yes [X] No Observed Concern

No concerns were observed for the property located at 282 Ohio Street.

END OF SECTION

4.0 INTERVIEWS

4.1 Name: Edward Malloy
Title: None
Relationship to Property: [X] Owner [ ] User [ ] Occupant
Property: 282 Ohio Street
Date of Interview: May 18, 1995

ENVIRONMENTAL CONCERNS(S): [ ] Identified [X] Not Identified

Mr. Malloy indicated that he has no knowledge of past or current environmental concerns associated with the inspected property. Mr. Malloy provided access to the building located on this property.

According to Mr. Malloy, he has been the owner of this property for the past forty years. Furthermore, the adjacent residential buildings were demolished at an unknown date. According to Mr. Malloy, the demolition debris was placed into the former basements of these buildings.

Mr. Malloy stated that no USTs or ASTs existed or currently exist on the property.

END OF SECTION

Buffalo Drilling Company, Inc.
10440 Main Street, Clarence, NY 14031

Job No.: 95-198
Date: June 15, 1995

CERTIFICATION and SIGNATURES of ENVIRONMENTAL PROFESSIONALS

This Environmental Site Inspection Report is certified to be prepared in accordance with sound environmental investigatory practices.

Report Preparer: Andrew J. Kucserik

Andrew J. Kucserik, C.P.G.
Senior Geologist

Report Reviewer: JS Barron

James S. Barron, P.E.
President

END OF SECTION

ACRONYMS/ABBREVIATIONS

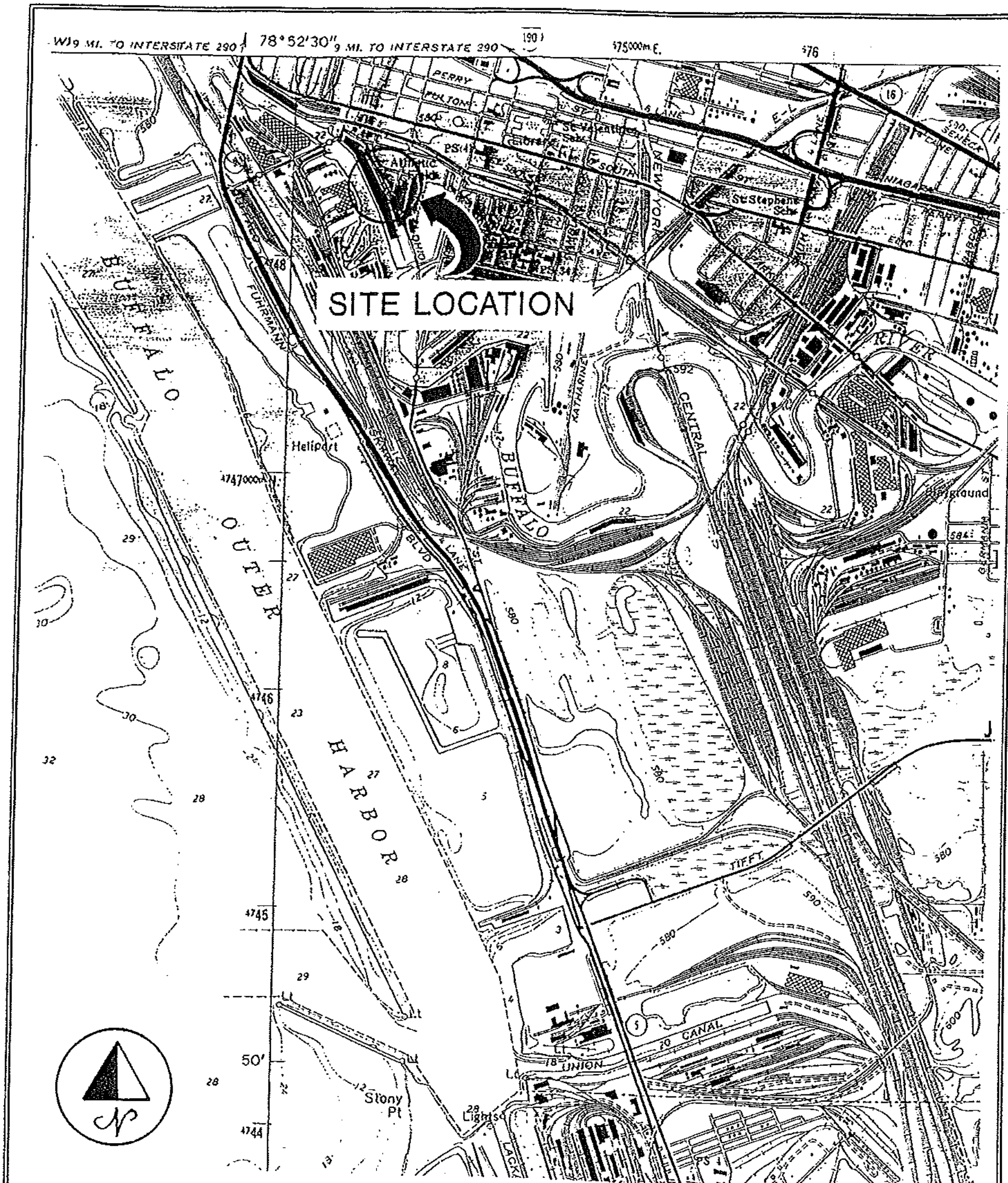
AST	- Aboveground Storage tank
ASTM	- American Society for Testing and Materials
BDC	- Buffalo Drilling Company, Inc.
BCE	- Barron Consulting Engineers, P.C.
CERCLA	- Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	- Comprehensive Environmental Response, Compensation and Liability Information System
EPA	- (U.S.) Environmental Protection Agency
EPCRA	- Emergency Planning and Community Right to Know Act
ECDEP	- Erie County Department of Environment and Planning
ECDOH	- Erie County Department of Health
ECSD	- Erie County Sewer District
ECWA	- Erie County Water Authority
ERNS	- Emergency Response and Notification System
FOIA	- Freedom of Information Act
FOIL	- Freedom of Information Law
LQG	- Large Quantity Generator
LUST	- Leaking Underground Storage Tanks
MSDS	- Material Data Safety Sheets
N/A	- Not Available, Not Applicable
N/R	- Not Reviewed, Not Researched
NPDES	- National Pollution Discharge Elimination System
NPL	- National Priorities List
NYSDEC	- New York State Department of Environmental Conservation
NYSDOH	- New York State Department of Health
NYSDOL	- New York State Department of Labor
OSHA	- Occupational Safety and Health Administration
PBS	- Petroleum Bulk Storage
PCB(s)	- Polychlorinated Biphenyl(s)
RCRA	- Resource Conservation and Recovery Act
SACM	- Suspected Asbestos Containing Materials
SARA	- Superfund Amendments and Reauthorization Act of 1986
SCS	- Soil Conservation Service (by County)
SPDES	- State Pollution Discharge Elimination System
SQG	- Small Quantity Generator
TSDF	- Treatment, Storage and Disposal Facility
USDA	- United States Department of Agriculture
USGS	- United States Geological Survey
UST	- Underground Storage Tanks
USEPA	- United States Environmental Protection Agency

END OF SECTION

ATTACHMENT #1
MAPS, FIGURES, AND OWNERSHIP DOCUMENTATION

Date or I.D. No.	Description
Figure 1	Site Location map

END OF ATTACHMENT #1



BUFFALO DRILLING COMPANY, INC. 10440 Main Street Clarence, New York 14031		U.S.G.S. SITE LOCATION MAP SITE INSPECTION 282 - 301 Ohio Street & Vacant Lot Buffalo, New York	
DATE: 6/14/95	JOB NO.: 95-198	SCALE: 1" = 2000'	FIGURE: 1

ATTACHMENT #2
REGULATORY DOCUMENTATION

Date or I.D. No.	Description
-	Refer to Section 2.0.

END OF ATTACHMENT #2

Buffalo Drilling Company, Inc.
10440 Main Street, Clarence, NY 14031

Job No.: 95-198
Date: June 15, 1995

ATTACHMENT #3
SITE INSPECTION AND PHOTOGRAPHIC DOCUMENTATION

Date or I.D. No.	Description
June 15, 1995	Preliminary Subsurface Investigation Report, 282 - 301 Ohio Street, Buffalo, New York
Table 1	Photoionization Detector (PID) Summary of Organic Vapor Screening Results

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END OF ATTACHMENT #3

BUFFALO DRILLING COMPANY
INC.
10440 MAIN STREET
CLARENCE, NEW YORK
14031
(716) 759-7821
FAX (716) 759-7823

June 15, 1995 JOB NO: 95-198

Magnano - Paladino
210 Ellicott Square Building
Buffalo, New York 14203-2545

ATTN: Mr. Paul Moretta

RE: Preliminary Subsurface Exploration Report for 282 - 301 Ohio Street, Buffalo, New York

Gentlemen:

This report presents findings of the preliminary subsurface investigation program for the above referenced project. The project site is illustrated in Figure No. 1, entitled "Boring Location Plan," which includes: approximate locations of six test borings drilled by Buffalo Drilling Company, Inc. (BDC) on May 23 and 24, 1995; and additional site details.

EXPLORATION METHODS

A truck mounted Diedrich D-50 rotary drill rig was used to drill the test borings to depths of approximately 15 feet below ground surface using 4-1/4 inch inside diameter (ID), continuous flight hollow stem augers. Soil samples were recovered by driving a standard split-spoon sampler (2 foot long by 1-3/8 inch inside diameter) 24 inches using a 140 pound hammer falling 30 inches each blow (ASTM D1586). The number of blows for 12 inches of penetration is defined as the Standard Penetration Test (SPT) N-value.

Retrieved soil samples were initially classified and logged in the field by the driller and a portion of each soil sample was placed and sealed in a glass jar. The boring logs, included as Appendix A, were prepared based on the field log and a second visual classification of the retained soil samples in the laboratory by a B.S. degreed geologist.

Classification of soil samples, as noted on the logs, is based on the Unified Soil Classification System. Refer to Appendix B entitled "Geotechnical Reference Standards" for an explanation of the terminology used for soil descriptions.

SUBSURFACE CONDITIONS

The site is addressed as 282 - 301 Ohio Street, located in Buffalo, New York. Currently the site is occupied by a restaurant and a commercial facility. In general, subsurface conditions consist of an upper random fill layer underlain by naturally deposited clay, and silty sands.

Granular and cohesive fill materials, generally extending to depths of three to nine feet below ground surface, were encountered at all test boring locations. It is noted that the fill depth at test boring location B-4 extended the full length drilled of 15 feet below ground surface. The slightly to moderately plastic, medium stiff cohesive fill is composed of a silt and clay intermixed with varying amounts of sand, gravel, and brick. The granular fill consisted of a loose to very dense mixture of sand, and gravel with lesser amounts of silt, brick, cinders, rubble, concrete, and slag. Moisture contents of the fill units ranged from moist to saturated.

Several of the borings were extended into a unit of naturally deposited stiff to very stiff silty clay, intermixed with trace amounts of sand and organic matter (roots). Plasticities and moisture contents of this unit were noted as moderately plastic and moist, respectively. This unit extended the full length drilled in boring location B-6 only.

A wet silty sand was encountered underlying the silty clay or fill material in most of the boring locations. This loose to medium dense granular unit extended to an approximate depth of ten feet below ground surface.

Samples retrieved below the silty sand consisted of medium stiff to hard silty clay, which extended the full length drilled. Moisture contents throughout the cohesive unit were noted as moist.

Groundwater was encountered at several boring locations at approximately ten feet below ground surface. Note that groundwater measurements were taken at the completion of drilling efforts and may not represent the actual static groundwater depth. Lastly, it is noted that fluctuations in groundwater level may occur due to factors other than those present during field operations.

Thank you for the opportunity to assist on this project. Please call at your earliest convenience, if questions should arise.

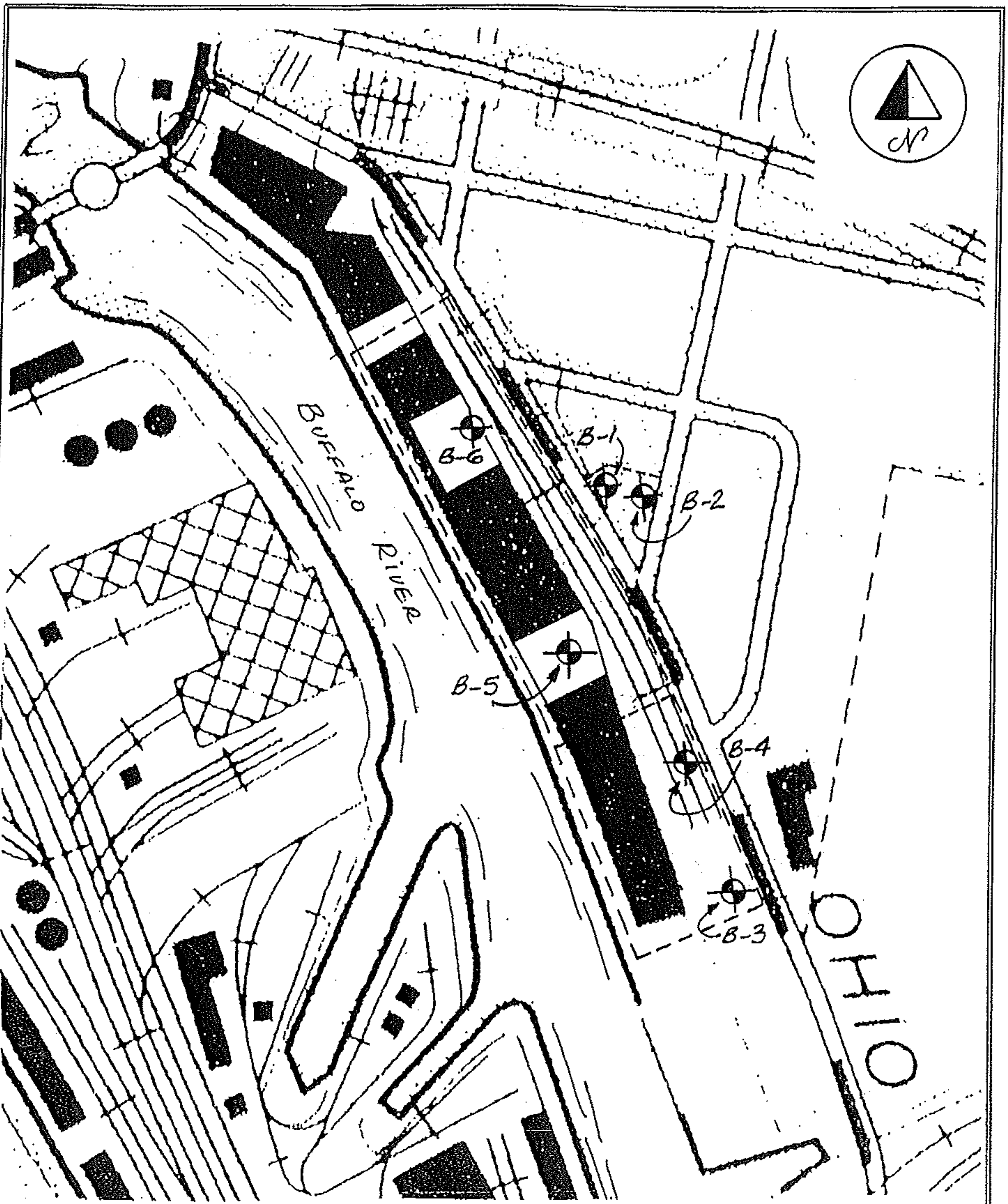
Very truly yours,
BUFFALO DRILLING COMPANY, INC.

J S Barron

James S. Barron, P.E.
President

Michele M. Patterson

Michele M. Patterson
Geologist



BUFFALO DRILLING COMPANY, INC. 10440 Main Street Clarence, New York 14031		BORING LOCATION MAP SITE INSPECTION 282 - 301 Ohio Street & Vacant Lot Buffalo, New York	
DATE: 6/14/95	JOB NO.: 95-198	SCALE: 1" = 250'	FIGURE: 2

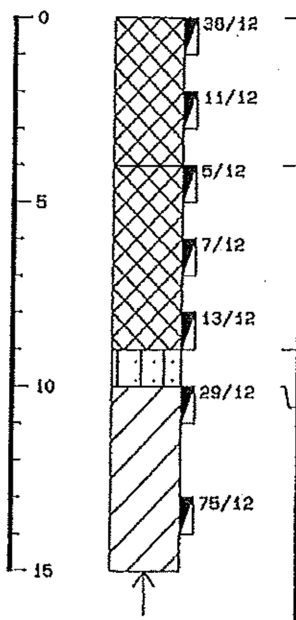
APPENDIX A

TEST BORING LOGS

TEST BORING LOG

TEST BORING NO: B-1
PROJECT: Ohio Street, Buffalo, New York JOB NO: 95-198
DRILLER: D. Robinson TYPE OF DRILL RIG: Diedrich D50
SAMPLING METHOD: ASTM D1586 SIZE AND TYPE OF BIT: 4 1/4" ID auger
DATE STARTED: 5/24/95 COMPLETED: 5/24/95
SURFACE ELEV (FT): 0 GROUNDWATER DEPTH (FT): No water at completion

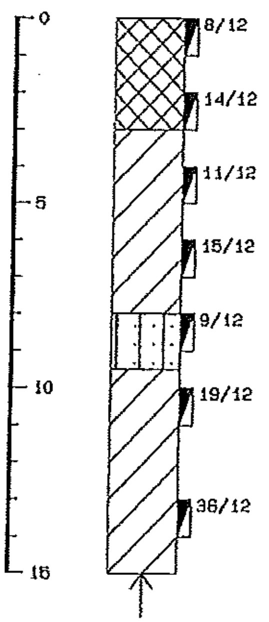
ELEV. / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL AND ROCK DESCRIPTION	REMARKS	BLOW/ .5 FT.	N VALUE	%REC (RQD)
0	38/12	Grey, dense f/c Sand, some Gravel, some Silt, little Brick, moist (FILL)	S-1: 0-2'	8-9-29-67	38	40
	11/12	...grade: med. dense, little Silt, tr. Brick	S-2: 2-4'	10-6-5-6	11	10
	5/12	Brown, med. stiff Clay, some Silt, tr. f/c Sand, mod. plastic, moist (FILL)	S-3: 4-6'	2-3-2-3	5	40
5	7/12	...grade: grey, and Silt, little f/m Sand	S-4: 6-8'	2-3-4-4	7	30
	13/12	...grade: stiff, tr. Brick	S-5: 8-10'	5-6-7-6	13	50
		Brown, med. dense f/c SAND and Silt, wet (SM)				
10	29/12	Brown, v. stiff CLAY, some Silt, tr. f/c Sand, mod. plastic, moist (CL)	S-6: 10-12'	6-10-19-27	29	50
	75/12	...grade: hard	S-7: 13-15'	17-21-54-30	75	70
15						



1. Bottom of hole 15.0 feet.

TEST BORING LOG

TEST BORING NO: B-2
PROJECT: Ohio Street, Buffalo, New York JOB NO: 95-198
DRILLER: D. Robinson TYPE OF DRILL RIG: Diedrich D50
SAMPLING METHOD: ASTM D1586 SIZE AND TYPE OF BIT: 4 1/4" ID auger
DATE STARTED: 5/23/95 COMPLETED: 5/23/95
SURFACE ELEV (FT): 0 GROUNDWATER DEPTH (FT): No water at completion



ELEV. / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL AND ROCK DESCRIPTION	REMARKS	BLOW/ .5 FT.	N VALUE	%REC (RQD)
0	8/12	Dk. grey, loose f/c Sand, little Cinders, little Silt, little Gravel, little Rubble, tr. Brick, moist (FILL)	S-1: 0-2'	4-4-4-4	8	60
	14/12		S-2: 2-4'	4-6-8-9	14	40
	11/12	...grade: med. dense, tr. Slag	S-3: 4-6'	4-5-6-6	11	50
5	15/12	Brown, v. stiff CLAY and Silt tr. f/c Sand, mod. plastic, moist (CL)	S-4: 6-8'	5-7-8-9	15	40
	9/12	...grade: stiff, tr. Organic matter (Roots) ...grade: v. stiff	S-5: 8-10'	3-4-5-6	9	50
10	19/12	Grey, loose f. SAND and Silt, tr. Clay, wet (SM)	S-6: 10-12'	5-8-11-16	19	20
15	36/12	Brown, v. stiff CLAY, some Silt, tr. f/c Sand, mod. plastic, moist (CL) ...grade: hard	S-7: 13-15'	8-16-20-26	36	90

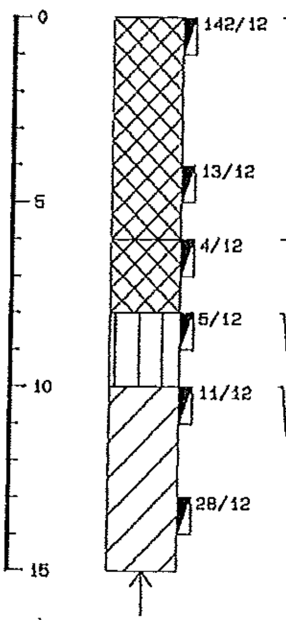
1. Bottom of hole 15.0 feet.

BUFFALO DRILLING CO., INC.

TEST BORING LOG

TEST BORING NO: B-3
PROJECT: Ohio Street, Buffalo, New York JOB NO: 95-198
DRILLER: D. Robinson TYPE OF DRILL RIG: Diedrich D50
SAMPLING METHOD: ASTM D1586 SIZE AND TYPE OF BIT: 4 1/4" ID auger
DATE STARTED: 5/23/95 COMPLETED: 5/23/95
SURFACE ELEV (FT): 0 GROUNDWATER DEPTH (FT): 10' at completion

ELEV. / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL AND ROCK DESCRIPTION	REMARKS	BLOW/ .5 FT.	N VALUE	%REC (RQD)
0	142/12	Grey, v. dense f/c Sand, little Gravel, little Slag, tr. Brick, tr. Cinders, wet (FILL)	S-1: 0-2'	1-46-96	100+	10
5	13/12	...grade: some Gravel, some Silt, tr. Slag	S-2: 4-6'	12-7-6-4	13	20
	4/12	Dk. grey, med. stiff Silt, some f/c Sand, little Clay, tr. Gravel, sl. plastic, wet (FILL)	S-3: 6-8'	3-2-2-3	4	30
	5/12		S-4: 8-10'	5-3-2-7	5	60
10	11/12	Grey, med. stiff SILT, some Clay, tr. f/c Sand, mod. plastic, moist (ML)	S-5: 10-12'	6-6-5-10	11	80
		Brown, stiff CLAY, some Silt, tr. f/c Sand, mod. plastic, moist (CL)				
15	28/12	...grade: v. stiff, tr. Gravel	S-6: 13-15'	9-11-17-21	28	80

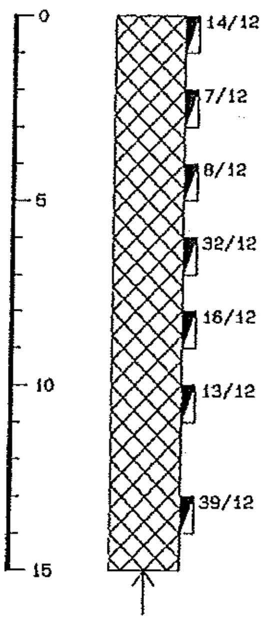


1. Oil sheen noted in sample S-2 and S-3.
2. Bottom of hole 15.0 feet.

BUFFALO DRILLING CO., INC.

TEST BORING LOG

TEST BORING NO: B-4
PROJECT: Ohio Street, Buffalo, New York JOB NO: 95-198
DRILLER: D. Robinson TYPE OF DRILL RIG: Diedrich D50
SAMPLING METHOD: ASTM D1586 SIZE AND TYPE OF BIT: 4 1/4" ID auger
DATE STARTED: 5/23/95 COMPLETED: 5/23/95
SURFACE ELEV (FT): 0 GROUNDWATER DEPTH (FT): 10' at completion



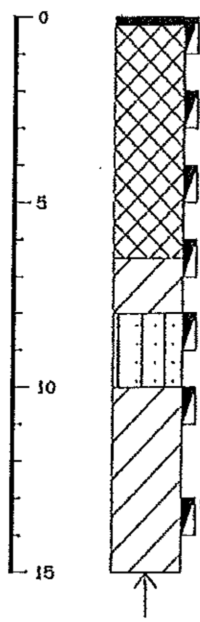
ELEV. / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL AND ROCK DESCRIPTION	REMARKS	BLOW/ .5 FT.	N VALUE	%REC (RQD)
0	14/12	Brown-grey, med. dense f/c Sand and Gravel, little Silt, tr. Concrete, tr. Brick, moist (FILL)	S-1: 0-2'	9-7-7-6	14	20
	7/12	...grade: loose, wet	S-2: 2-4'	3-4-3-6	7	10
	8/12	Same as S-2	S-3: 4-6'	5-5-3-4	8	30
5	32/12	...grade: dense	S-4: 6-8'	8-16-16-17	32	10
	16/12	...grade: med. dense, saturated	S-5: 8-10'	35-10-6-6	16	40
10	13/12	Same as S-5	S-6: 10-12'	6-6-7-8	13	60
	39/12	...grade: dense	S-7: 13-15'	13-17-22-30	39	10
15						

1. Bottom fo hole 15.0 feet.

BUFFALO DRILLING CO., INC.

TEST BORING LOG

TEST BORING NO: B-5
PROJECT: Ohio Street, Buffalo, New York JOB NO: 95-198
DRILLER: D. Robinson TYPE OF DRILL RIG: Diedrich D50
SAMPLING METHOD: ASTM D1586 SIZE AND TYPE OF BIT: 4 1/4" ID auger
DATE STARTED: 5/24/95 COMPLETED: 5/24/95
SURFACE ELEV (FT): 0 GROUNDWATER DEPTH (FT): 10.0' at completion



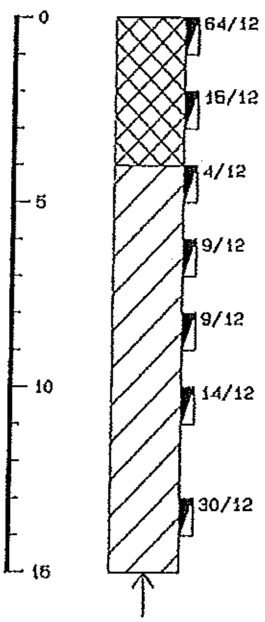
ELEV. / DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	SOIL AND ROCK DESCRIPTION	REMARKS	BLOW/ .5 FT.	N VALUE	%REC (RQD)
	88/12	Asphalt Grey, v. dense f/c Sand and Gravel, tr. Silt, saturated (FILL)	S-1: 0-2'	27-58-30-20	88	10
	13/12	...grade: med. dense	S-2: 2-4'	10-8-5-7	13	20
	6/12	...grade: loose, tr. Brick	S-3: 4-6'	2-3-3-3	6	10
	10/12		S-4: 6-8'	5-5-5-5	10	20
	7/12	Grey, stiff CLAY and Silt, tr. f/c Sand, mod. plastic, moist (CL) Brown, loose f/c SAND and Silt, saturated (SM)	S-5: 8-10'	3-3-4-4	7	60
	26/12	Brown, v. stiff CLAY, some Silt, tr. f/c Sand, mod. plastic, moist (CL)	S-6: 10-12'	8-12-14-17	26	70
	55/12	...grade: hard	S-7: 13-15'	12-17-38-37	55	80

1. Bottom of hole 15.0 feet.

BUFFALO DRILLING CO., INC.

TEST BORING LOG

TEST BORING NO: B-6
PROJECT: Ohio Street, Buffalo, New York — JOB NO: 95-198
DRILLER: D. Robinson — TYPE OF DRILL RIG: Diedrich D50
SAMPLING METHOD: ASTM D1586 — SIZE AND TYPE OF BIT: 4 1/4" ID auger
DATE STARTED: 5/24/95 — COMPLETED: 5/24/95
SURFACE ELEV (FT): 0 — GROUNDWATER DEPTH (FT): No water at completion



SOIL AND ROCK DESCRIPTION	REMARKS	BLOW/ .5 FT.	N VALUE	%REC (RQD)
Grey, dense f/c Sand and Gravel, little Brick, tr. Slag, tr. Silt, wet (FILL)	S-1: 0-2'	20-52-12-11	64	20
...grade: med. dense, some Silt, little Gravel tr. Brick	S-2: 2-4'	10-8-7-8	15	40
Grey, med. stiff CLAY and Silt, tr. f/c Sand, mod. plastic, moist (CL)	S-3: 4-6'	1-2-2-3	4	30
...grade: stiff	S-4: 6-8'	3-4-5-6	9	60
...grade: brown, some Silt	S-5: 8-10'	7-5-4-6	9	80
Same as S-5	S-6: 10-12'	4-5-9-10	14	90
...grade: hard	S-7: 13-15'	8-16-14-19	30	80

1. Bottom of hole 15.0 feet.

BUFFALO DRILLING CO., INC.

APPENDIX B

GEOTECHNICAL REFERENCE STANDARDS

GEOTECHNICAL REFERENCE STANDARDS
SUMMARY OF LOGGING TECHNIQUES

Depth (ft.)	Blows per .5 ft.	Sample No.	N	% REC (RQD)	SOIL AND ROCK DESCRIPTION	REMARKS

Depth– The depth column provides the verticle scale of the boring log in feet below ground surface.

The number of blows obtained from each of the 0.5 ft. intervals of sampler penetration.

NOTE: WR represents the static weight of drill rods. WH represents the static weight of rods and hammer.

Sample Identification Number– Disturbed samples are identified with "S" preceding the sample number. Undisturbed samples (shelby tube) samples are identified with "U" preceding the sample number. Rock core samples are identified with "C" preceding the core run.

N-value– The Standard Penetration Test N-value, as specified by ASTM D1586 is defined as the number of blows required by a 140-pound hammer falling 30 inches each blow to drive a 2 inch outside diameter split spoon sampler 12 inches.

% Recovery– The length of sample recovered divided by the total length sampled. The result is numerically expressed as percent.

(RQD)– The "Rock Quality Designation". The total length of pieces>4 inches divided by the total length of core run.

TERMINOLOGY USED FOR SOIL DESCRIPTION

Density Description of Granular Soil

Number of Blows per ft., N.	Relative Density
0-4	Very loose
4-10	Loose
10-30	Medium
30-50	Dense
Over 50	Very dense

Description of Percentage or Proportions Used in Soil Sample Classification

Trace	0-10%
Little	10-20%
Some	20-35%
And	35-50%

Consistency Description of Cohesive Soil

Number of Blows per ft., N.	Consistency
Below 2	Very soft
2-4	Soft
4-8	Medium
8-15	Stiff
15-30	Very stiff
Over 30	Hard

Abbreviations Used In Soil Sample Classification

f - fine	v - very
m - medium	gr - gray
c - coarse	bn - brown
f/m - fine to medium	yel - yellow
f/c - fine to coarse	sl - slight
tr - trace	

Grain Size

Boulder -	greater than 12 inch diameter
Cobble -	passing 12 inch, retained on 3 inch
Gravel -	passing 3 inch, retained on No. 4 sieve
Sand -	Coarse - passing No. 4 sieve, retained on No. 10 sieve Medium - passing No. 10 sieve, retained on No. 40 sieve Fine - passing No. 40 sieve, retained on No. 200 sieve
Silt -	0.074 mm to 0.005 mm
Clay -	smaller than 0.005 mm

Plasticity

Non-plastic -	A 1/8 inch thread cannot be rolled at any water content.
Slight plasticity -	The thread can barely be rolled.
Moderate Plasticity -	Thread is easy to roll and little time is required to reach plastic limit.
Plastic -	Considerable time is required to reach plastic limit. Thread can be re-rolled several times after reaching the plastic limit.

Moisture

Dry -	Absence of moisture, dusty, dry to the touch.
Moist -	Small quantity of moisture. Soil usually above groundwater level.
Wet -	Moisture noticeable to the touch. Soil may be below groundwater level.
Saturated -	Visible free water, usually soil is below groundwater level.

TERMINOLOGY USED FOR ROCK DESCRIPTION

Bedding

Parting	Less than 0.02 ft.
Band	0.02 to 0.2 ft.
Thin bed	0.2 to 0.5 ft.
Medium bed	0.5 to 1.0 ft.
Thick bed	1.0 to 2.0 ft.
Massive	Over 2.0 ft.

Hardness

Very Soft or Plastic	- Can be indented w/ thumb
Soft	- Can be scratched with fingernail
Moderately Hard	- Can be scratched easily with knife; cannot be scratched with fingernail
Hard	- Difficulty to scratch with knife
Very hard	- Cannot be scratched with knife

Crystallinity or Texture

Dense - Crystals are so small they cannot be distinguished with the naked eye.

Very Fine Crystalline - Crystals barely discernible with the naked eye.

Crystalline - Crystals are medium size -up to 1/8 inch diameter.

Very Coarsely Crystalline - Crystals larger than 1/8 inch diameter.

Voids

Pourous -	Smaller than a pinhead. Their presence is indicated by the degree of absorbency.
Pitted -	Pinhead size to 1/4 inch. If only thin walls separate the individual pits, the core may be described as honeycombed.
Vug -	1/4 inch to the diameter of the core. The upper limit will vary with core size.
Cavity -	Larger than the diameter of the core.

Remarks – Denotes exact depth of recovery and general documentation of drilling efforts.

Notes – Description and classification are based on visual inspection of samples and boring operations.

The stratum lines shown on the boring logs are based upon interpretation and may not represent precise subsurface conditions.

Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. Fluctuations in the water level may occur due to other factors than those present at the time measurements taken.

SOIL CLASSIFICATION CHART
(Unified Soil Classification System)

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material larger than No. 200 sieve	GRAVELS- More than 50% of coarse fraction larger than No. 4 sieve	Clean Gravels (little or no fines)		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		Gravels with appreciable amounts of fines		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS- Less than 50% of coarse fraction larger than No. 4 sieve	Clean sands (little or no fines)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		Sand with appreciable amounts of fines		SM	Silty sands, silt-sand mixtures
				SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS Less than 50% of material larger than No. 200 sieve	SILTS AND CLAYS Low plasticity Liquid Limit < 50%			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravely clays, sandy clays, silty clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS High plasticity Liquid limit > 50%			MH	Inorganic silts, micaceous or diatomaceous fine sand or silty soils
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
	Highly Organic Soils			Pt	Peat, humus, swamp soils with organic contents
	Miscellaneous Fill			FILL	Miscellaneous fill may belong in any division but is identified as FILL

TABLE NO. 1
PHOTOIONIZATION DETECTOR
SUMMARY OF ORGANIC VAPOR SCREENING

CLIENT: Magnano - Paladino	SAMPLES REC'D BY: BDC
PROJECT: 282-301 Ohio St., Buffalo, NY	SAMPLE METHOD: ASTM D1586
JOB NO: 95-198	TEST DATE: 5/26/95

TOTAL IONIZABLES PRESENT

SAMPLE I.D.		DEPTH (ft.)	PID READING (ppm)
Background		in air	0.0
B-1	S-1	0-2	10.9
	S-2	2-4	15.2
	S-3	4-6	13.2
	S-4	6-8	5.2
	S-5	8-10	8.8
	S-6	10-12	8.8
	S-7	13-15	5.2
B-2	S-1	0-2	7.2
	S-2	2-4	5.2
	S-3	4-6	4.7
	S-4	6-8	10.0 (a)
	S-5	8-10	4.2
	S-6	10-12	0.0
	S-7	13-15	0.0

SAMPLE I.D.		DEPTH (ft.)	PID READING (ppm)
B-3	S-1	0-2	28.0
	S-2	2-4	---
	S-3	0-2	104 (b)(c)
	S-4	2-4	95 (c)
	S-5	4-6	31.7 (c)
	S-6	6-8	14.6
	S-7	8-10	12.0
B-4	S-1	0-2	15.0 (a)
	S-2	2-4	25.0
	S-3	4-6	15.0
	S-4	6-8	7.0
	S-5	8-10	11.3
	S-6	10-12	14.0
	S-7	13-15	13.2
Background		in air	0.0

NOTES:

(a) Slight organic (topsoil) odor.

(b) Gasoline odor

(c) Oily sheen on sample

TABLE NO. 1
PHOTOIONIZATION DETECTOR
SUMMARY OF ORGANIC VAPOR SCREENING

CLIENT:	Magnano - Paladino	SAMPLES REC'D BY:	BDC
PROJECT:	282-301 Ohio St., Buffalo, NY	SAMPLE METHOD:	ASTM D1586
JOB NO:	95-198	TEST DATE:	5/26/95

TOTAL IONIZABLES PRESENT

SAMPLE I.D.		DEPTH (ft.)	PID READING (ppm)
Background		in air	0.0
B-5	S-1	0-2	3.4
	S-2	2-4	0.0
	S-3	4-6	0.0
	S-4	6-8	0.0
	S-5	8-10	2.3
	S-6	10-12	2.3
	S-7	13-15	3.5
B-6	S-1	0-2	0.0
	S-2	2-4	0.0
	S-3	4-6	0.0
	S-4	6-8	7.1
	S-5	8-10	0.0
	S-6	10-12	0.0
	S-7	14-16	0.0

SAMPLE I.D.	DEPTH (ft.)	PID READING (ppm)
Background	in air	0.0

NOTES:

1. Screening of the headspace of samples containers was done using a Photovac Inc. (Microtip HL-200) hand held air monitor/ photoionization detector (PID) equipped with a 10.6 eV bulb.
2. The PID was calibrated, prior to sample screening using isobutylene in air at equivalent concentration of 56.2 ppm benzene in air.
3. The detected concentration in sample headspace does not represent actual concentration in soil but rather a relative measure of total ionizables present with an ionization potential less than 10.6 eV.
4. Soil samples were allowed to acclimate to room temperature (22 deg. C) prior to headspace screening. Readings were obtained by inserting the sample line into the sample container through a hole in the lid.

APPENDIX C

SITE-SPECIFIC HEALTH AND SAFETY PLAN

SITE HEALTH AND SAFETY PLAN
for
BROWNFIELD CLEANUP PROGRAM
RI ACTIVITIES

399 OHIO STREET SITE
BUFFALO, NEW YORK

May 2014 0136-013-011

Prepared for:

1093 GROUP, LLC

399 OHIO STREET SITE
HEALTH AND SAFETY PLAN FOR RI ACTIVITIES

ACKNOWLEDGEMENT

Plan Reviewed by (initial):

Corporate Health and Safety Director: Thomas H. Forbes

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

399 OHIO STREET SITE
HEALTH AND SAFETY PLAN FOR RI ACTIVITIES

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HEALTH AND SAFETY PLAN FOR RI ACTIVITIES

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APPENDICES

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) activities at the 399 Ohio Street Site located in the City of Buffalo, New York. This HASP presents procedures for TurnKey-Benchmark employees who will be involved with RI 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 an approximate 5 acre portion of the 7.26 acre property, located 399 Ohio Street in the City of Buffalo, New York (see Figures 1 and 2). The Site is bound by recreational property (River Fest Park) with commercial/industrial properties beyond to the north, the Buffalo Scholastic Rowing Association boathouse to the south, Ohio Street with commercial, residential, and vacant property beyond to the east, and the Buffalo River to the west with industrial and commercial beyond

The 399 Ohio Street Site has a long history of industrial and commercial operation which has contaminated the Site. The Site has been utilized for various commercial operations including a bulk flour transport service, New York Central Railroad Freight Warehouses, Niagara Elevators, and the Plimpton Fire Proof Elevator. Portions of the property have been utilized as a tractor trailer repair facility, bus terminal and maintenance (Blue Bird Bus Lines), and NYSDOT maintenance facility.

Operations included multiple rail spurs, truck parking, material handling and shipping equipment use and maintenance, and the use and storage of waste greases, hydraulic oils, and lubricants common among commercial automotive repair operations.

1.3 Known and Suspected Environmental Conditions

The 399 Ohio Street Site has a long history of industrial and commercial operation which has contaminated the Site. The Site has been utilized for various commercial operations including a bulk flour transport service, New York Central Railroad Freight Warehouses, Niagara Elevators, and the Plimpton Fire Proof Elevator. Portions of the property have been utilized as a tractor trailer repair facility, bus terminal and maintenance (Blue Bird Bus Lines), and NYSDOT maintenance facility.

Operations included multiple rail spurs, truck parking, material handling and shipping equipment use and maintenance, the likely application of pesticides and rodenticides related to the storage of raw food materials, and the use and storage of waste greases, hydraulic oils, and lubricants common among commercial automotive repair operations.

- Previous investigations completed on the Site (see Attachment 4) identified multiple recognized environmental conditions (RECs) including:
- Petroleum contamination was noted in historic soil borings on Site.
- Past use of the property included automotive repair operations, including multiple USTs, pump island, and ASTs.
- Storage of 55-gallon drums of suspect oil
- Presence of floor drain in the maintenance pit and trench drench drains in the floor, with unknown discharge points
- Staining noted proximate waste oil/grease storage area.
- Railroad spurs were noted historically on Site. Rail operations are frequently associated with elevated levels of semi-volatile organic compounds (SVOCs) and metals.
- City of Buffalo municipal historic permit records indicate the potential for at least three (3) USTs on Site.

- NYSDEC PBS database records indicate that two (2) ASTs had been located on Site.

Results of the limited Phase II Environmental Investigation indicated:

- Elevated SVOCs across the Site above 6NYCRR Part 375 Unrestricted, Restricted Residential and Commercial Use SCOs.
- Elevated metals, including arsenic, cadmium, chromium, lead, silver, and mercury were detected across the Site above their respective 6NYCRR Part 375 Unrestricted, Residential, Restricted Residential, and Commercial Use SCOs. The RI will be performed in support of the BCP to determine the nature and extent of impacts from known and suspected environmental conditions on this parcel.

1.4 Parameters of Interest

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

- **Inorganic Compound –** The inorganic COPC potentially present at elevated concentrations are arsenic, cadmium, and lead.

- **Semi-Volatile Organic Compounds (SVOCs) –** SVOCs present at elevated concentrations include the Polycyclic Aromatic Hydrocarbons (PAHs) acenaphthene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo(a,h)anthracene. Although PAHs are commonly found in urban soil environments, they are present at the Site at concentrations that are significantly elevated compared to typical "background" levels.

1.5 Overview of RI Activities

TurnKey-Benchmark personnel will be on-site to observe and perform RI activities. The field activities to be completed as part of the RI are described below. Planned RI activities are more fully described in the RI Work Plan for the Site (Ref. 2).

Remedial Investigation Activities

1. **Subsurface Soil/fill Sampling:** TurnKey-Benchmark personnel plan to: excavate twelve (12) test pits and complete two (2) soil borings to collect subsurface soil samples, 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.

2.0 ORGANIZATIONAL STRUCTURE

This chapter 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 establishes 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***. 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. Richard L. Dubisz.*** 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 and groundwater. Soil and groundwater may be impacted by SVOCs (PAHs) and/or inorganic compounds due to historic use a bulk flour transport service, tractor trailer repair facility, New York Central Railroad Freight Warehouses, Niagara Elevators, and the Plimpton Fire Proof Elevator. 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. **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; and dibenzo(a,h)anthracene. 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.

2. **Arsenic (CAS #7440-38-2)** is a naturally occurring element and is usually found combined with one or more elements, such as oxygen or sulfur. Inhalation is a more important exposure route than ingestion. First phase exposure symptoms include nausea, vomiting, diarrhea and pain in the stomach. Prolonged contact is corrosive to the skin and mucus membranes. Arsenic is considered a Group A human carcinogen by the USEPA. Exposure via inhalation is associated with an increased risk of lung cancer. Exposure via the oral route is associated with an increased risk of skin cancer.

3. **Cadmium** is a natural element and is usually combined with one or more elements, such as oxygen, chloride, or sulfur. Breathing high levels of cadmium severely damages the lungs and can cause death. Ingestion of high levels of cadmium severely irritates the stomach, leading to vomiting and diarrhea. Long term exposure to lower levels of cadmium leads to a buildup of this substance in the kidneys and possible kidney disease. Other potential long term effects are lung damage and fragile bones. Cadmium is suspected to be a human carcinogen.

4. **Lead (CAS #7439-92-1)** can affect almost every organ and system in our bodies. The most sensitive is the central nervous system, particularly in children. Lead also damages kidneys and the immune system. The effects are the same whether it is breathed or swallowed. Lead may decrease reaction time, cause weakness in fingers, wrists or ankles and possibly affect memory. Lead may cause anemia.

With respect to the anticipated RI 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 field activities at the 399 Ohio 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 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 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 WNY, an occupational health care provider under contract with TurnKey-Benchmark. Health Works WNY's local facility is located at 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 exists 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 by NYSDOH Generic Community Air Monitoring Plan (Ref. 3) 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 explosimeter will be used to monitor levels of both combustible gases and oxygen during RI activities. Action levels based on the instrument readings shall be as follows:

- Less than 10% LEL - Continue engineering operations with caution.
- 10-25% LEL - Continuous monitoring with extreme caution, determine source/cause of elevated reading.
- Greater than 25% LEL - Explosion hazard, evaluate source and leave the Work Zone.
- 19.5% - 21% oxygen - proceed with extreme caution; attempt to determine potential source of oxygen displacement.
- Less than 19.5% oxygen - leave work zone immediately.
- 21-25% oxygen - Continue engineering operations with caution.
- Greater than 25% oxygen - Fire hazard potential, leave 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^3 - Continue field operations.
- 50-150 mg/m^3 - Don dust/particulate mask or equivalent
- Greater than 150 mg/m^3 - 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 with the organic vapor analyzer, combustible gas meter, and particulate monitor 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):

- **ORGANIC VAPOR PERIMETER MONITORING:**
    - 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.

- 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.

- **Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures**
  - When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.
  - If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure (s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
  - If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.
  - Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored Response levels and actions should be pre-determined, as necessary, for each site.

Additionally, if following the cessation of work and efforts to abate the emission source are unsuccessful, and if sustained organic vapor levels exceed 25 ppm above background within the 20-foot zone for more than 30 minutes, then the **Major Vapor Emission Response Plan** (see below) will automatically be placed into effect.

- **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. 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 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.

- **<u>EXPLOSIVE VAPORS:</u>**
  - <u>Sustained</u> atmospheric concentrations of greater than 10% LEL in the work area - Initiate combustible gas monitoring at the downwind portion of the Site perimeter.
  - <u>Sustained</u> atmospheric concentrations of greater than 10% LEL at the downwind Site perimeter – Halt work and contact local Fire Department.

- **<u>AIRBORNE PARTICULATE COMMUNITY AIR MONITORING</u>**

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 less than 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 (ug/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 ug/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^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 ug/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 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 nest 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 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. The zone will be delineated by flagging tape. 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 a 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

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

Decontamination of all tools used for sample collection purposes will be conducted by TurnKey-Benchmark personnel. 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 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. TurnKey Environmental Restoration, LLC. Limited Phase II Subsurface Environmental Investigation Report, 301 Ohio Street, Buffalo, New York. November 2013

2. TurnKey Environmental Restoration, LLC. *Remedial Investigation Work Plan, 399 Ohio Street Site, Buffalo, New York.* Prepared for 1093 Group, LLC in May 2014.

3. New York State Department of Health. *Generic Community Air Monitoring Plan, Appendix 1A, DER-10 Technical Guidance for Site Investigation and Remediation.* May 2010.

TABLES

TABLE 1

TOXICITY DATA FOR CONSTITUENTS OF POTENTIAL CONCERN

399 OHIO STREET SITEd

BUFFALO, NEW YORK

Parameter	Synonyms	CAS No.	Code	Concentration Limits		
				PEL	TLV	IDLH
Semi-volatile Organic Compounds (SVOCs)[2]: ppm						
Benzo(a)anthracene	*none*	56-55-3	*none*	--	--	--
Benzo(a)pyrene	*none*	50-32-8	*none*	--	--	--
Benzo(b)fluoranthene	*none*	205-99-2	*none*	--	--	--
Dibenzo(a,h)anthracene	*none*	53-70-3	*none*	--	--	--
Inorganic Compounds: mg/m[2]						
Arsenic	*none*	7440-38-2	Ca	0.01	0.01	5
Cadmium	*none*	7440-43-9	Ca	0.005	0.01	9
Lead	*none*	7439-92-1	*none*	0.05	0.15	100

Ca = NIOSH considers constituent to be a potential occupational carcinogen.
TLV = Threshold Limit Value, established by American Conference of Industrial Hygienists (ACGIH), equals the maximum exposure concentration allowable for 8 hours/day @ 40 hours/week.
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-STEL or Short Term Exposure Limits are 15 minute exposures that should not be exceeded for even an instant. It is not a stand alone value but is accompanied by the TLV-TWA.
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 maximium exposure conconcentration allowable for 8 hours per day @ 40 hours per week

TABLE 2

POTENTIAL ROUTES OF EXPOSURE TO THE CONSTITUENTS OF POTENTIAL CONCERN

399 OHIO STREET SITE

BUFFALO, NEW YORK

Activity [1]	Direct Contact with Soil/Fill	Inhalation of Vapors or Dust	Direct Contact with Groundwater
Remedial Investigation Tasks			
Subsurface Soil Sampling	x	x	
Monitoring Well Installation/Development and Sampling	x	x	x

Notes:

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

TABLE 3

REQUIRED LEVELS OF PROTECTION
FOR RI ACTIVITIES

399 OHIO STREET SITE

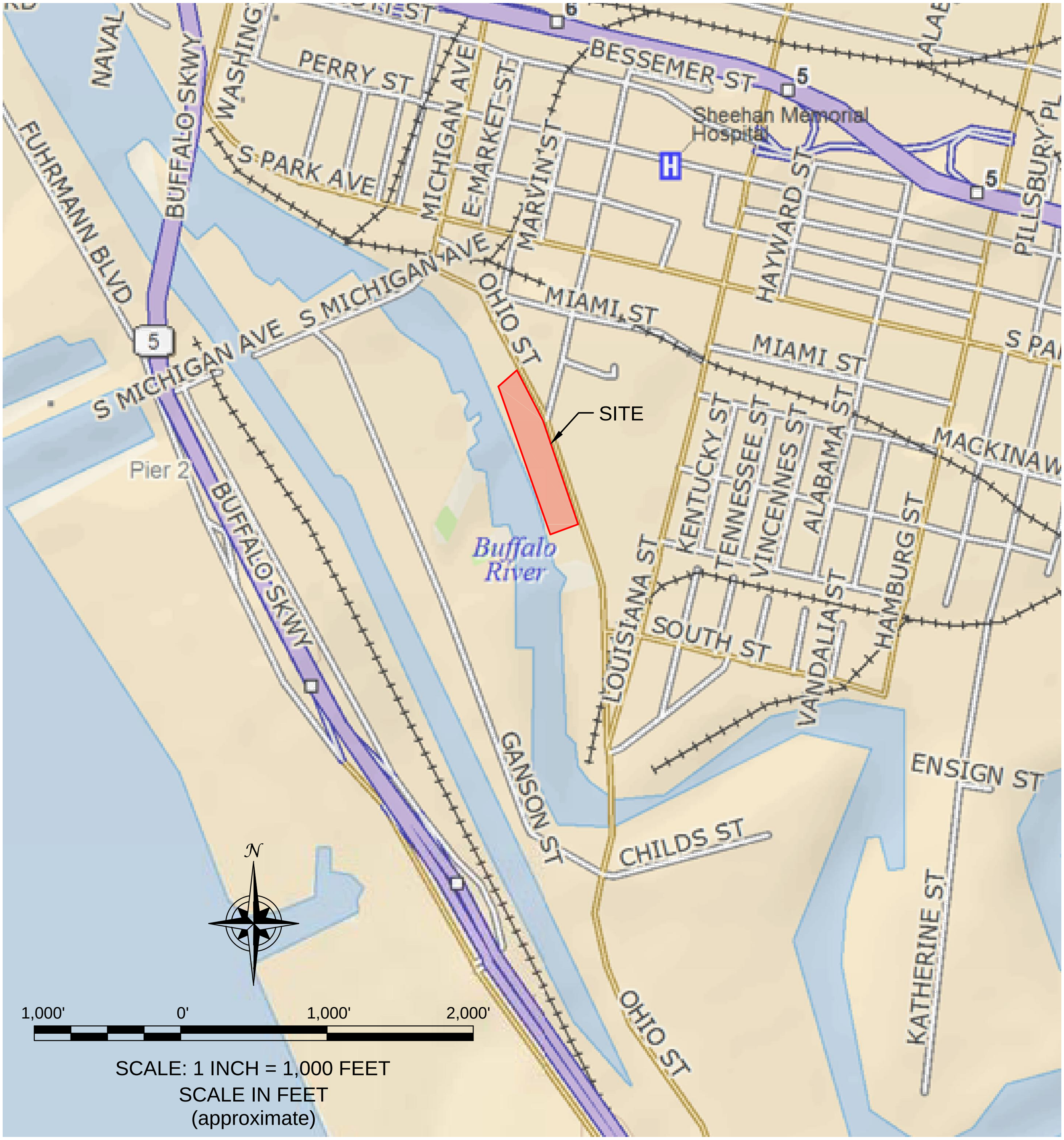
BUFFALO, NEW YORK

Activity	Respiratory Protection [1]	Clothing	Gloves [2]	Boots [2, 3]	Other Required PPE/Modifications [2, 4]
Remedial Investigation Tasks					
Suburface Soil Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
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

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 equiped with organic compound/acid gas/dust cartridge.
2. HH = hardhat; L= Latex; L/N = latex inner glove, nitrile outer glove; N = Nitrile; 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



SITE LOCATION AND VICINITY MAP

TURNKEY ENVIRONMENTAL RESTORATION, LLC
2558 HAMBURG TURNPIKE
SUITE 300
BUFFALO, NY 14218
(716) 856-0635

HEALTH AND SAFETY PLAN FOR RI ACTIVITIES

399 OHIO STREET SITE

BUFFALO, NEW YORK

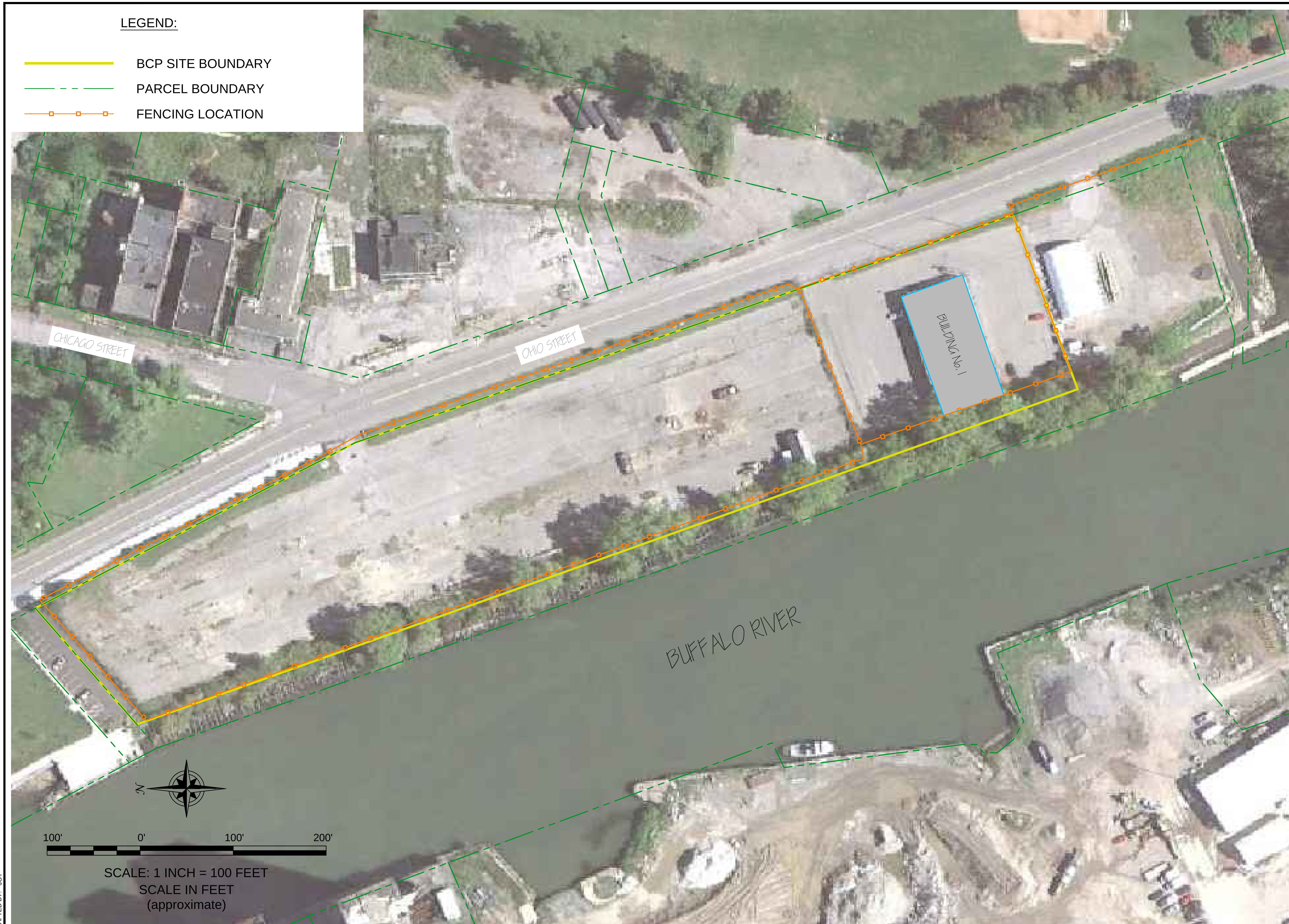
PREPARED FOR

1093 GROUP, LLC

PROJECT NO.: 0136-013-011

DATE: JANUARY 2014

DRAFTED BY: JGT



DATE: JANUARY 2014
DRAFTED BY: JGT

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

TURNKEY ENVIRONMENTAL RESTORATION, LLC

JOB NO.: 0136-013-011

SITE PLAN (AERIAL)

HEALTH AND SAFETY PLAN FOR RI ACTIVITIES

399 OHIO STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

1093 GROUP, LLC

FIGURE 2

APPENDIX A

EMERGENCY RESPONSE PLAN

EMERGENCY RESPONSE PLAN for BROWNFIELD CLEANUP PROGRAM RI ACTIVITIES

399 OHIO STREET SITE BUFFALO, NEW YORK

May 2014 0136-013-011

Prepared for:

1093 GROUP, LLC

399 OHIO STREET SITE
HEALTH AND SAFETY PLAN FOR RI ACTIVITIES
APPENDIX A: EMERGENCY RESPONSE PLAN

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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) activities at the 399 Ohio 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
2. Fire, due to flammability of Kensol 61 product in subsurface

Source of Emergency:

1. Slip/trip/fall
2. Fire

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 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: ***Richard L. Dubisz***
Work: (716) 856-0635
Mobile: (716) 998-4334

BUFFALO GENERAL HOSPITAL (ER):	(716) 859-5600
FIRE:	911
AMBULANCE:	911
BUFFALO POLICE:	911
STATE EMERGENCY RESPONSE HOTLINE:	(800) 457-7362
NATIONAL RESPONSE HOTLINE:	(800) 424-8802
NYSDOH:	(518) 402-7860
NYSDEC:	(716) 851-7220
NYSDEC 24-HOUR SPILL HOTLINE:	(800) 457-7252

The Site location is:
399 Ohio Street Site
399 Ohio Street
Buffalo, New York 14204
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 an adequate method of internal communication is understood by all personnel entering the site. 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 site. If any worker cannot be accounted for, notification is given to the SSHO (***Bryan Hann*** or ***Richard Dubisz***) 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 or 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 Buffalo General Hospital.

- Ingestion: Decontaminate and transport to Buffalo General 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 Buffalo General 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 North along Ohio St. toward Chicago St.
- Turn left to stay on Ohio St.
- Turn right onto Michigan Ave.
- Turn left onto High St. Follow signs to ER at 100 High St on the right.

9.0 EMERGENCY RESPONSE CRITIQUE & RECORD KEEPING

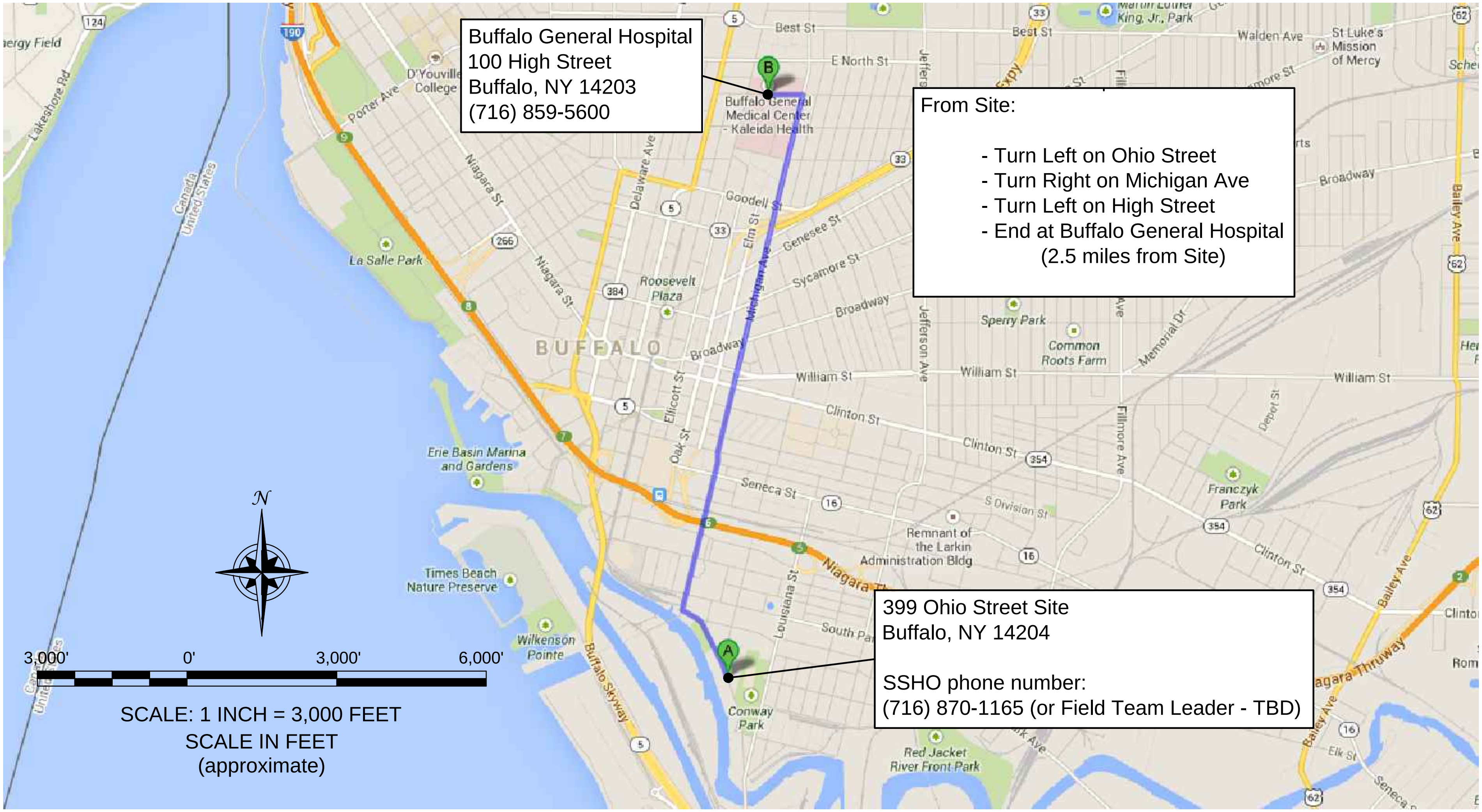
Following an emergency, the SSHO and Project Manager shall review the effectiveness of this Emergency Response Plan (ERP) in addressing notification, control and evacuation requirements. Updates and modifications to this ERP shall be made accordingly. It shall be the responsibility of each contractor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



HOSPITAL ROUTE MAP

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

EMERGENCY RESPONCE PLAN FOR BCP RI ACTIVITIES

399 OHIO STREET SITE

BUFFALO, NEW YORK

PREPARED FOR

1093 GROUP, LLC

PROJECT NO.: 0136-013-011

DATE: JANUARY 2014

DRAFTED BY: JGT

FIGURE 1

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

Other precautions:

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

SIGNATURES

Orginating Employee: Date:

Project Manager: Date:

Part 2 Approval: Date:

APPENDIX C

NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN

Appendix C1
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

December 2009

Appendix C2
Fugitive Dust and Particulate Monitoring

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX D

PROJECT DOCUMENTATION FORMS

TurnKey Environmental Restoration, LLC

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

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

DAILY LOG	DATE			
	REPORT NO.			
	PAGE	OF		

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

PROBLEM IDENTIFICATION REPORT

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Problem Description:

Problem Location (reference test location, sketch on back of form as appropriate):

Problem Causes:

Suggested Corrective Measures or Variances:

Linked to Corrective Measures Report No. *or Variance Log No.*

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

DAILY LOG	DATE			
	REPORT NO.			
	PAGE	OF		

CORRECTIVE MEASURES REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesing Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

APPENDIX E

FIELD OPERATING PROCEDURES

(PROVIDED ELECTRONICALLY)

TurnKey Environmental Restoration, LLC

FIELD OPERATING PROCEDURES

Calibration & Maintenance of Portable Dissolved Oxygen Meter

FOP 007.0

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 ± 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.

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)

TurnKey Environmental Restoration, LLC

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	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		[illegible] μS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID	[illegible]		open air zero		MIBK re factor =
						_____ ppm Iso. Gas		
☐ Particulate meter	mg/m^3					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/[illegible]					background area		
☐								

ADDITIONAL REMARKS:

PREPARED BY: ______________________ **DATE:** ______________________

FIELD OPERATING PROCEDURES

TurnKey Environmental Restoration, LLC

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.

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)

- 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 meeting system 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)

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	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		µS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID			open air zero		MIBK re
						_____ ppm Iso. Gas		factor =
☐ Particulate meter	mg/m^3					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/H					background area		
☐								

ADDITIONAL REMARKS:

PREPARED BY: **DATE:**

FIELD OPERATING PROCEDURES

Calibration and Maintenance of Portable Field Turbidity Meter

FOP 009.0

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 ± 2% of reading below 499 NTU or ± 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.

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*)

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 (→) 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 ≥ 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

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

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 11of 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 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)

TurnKey Environmental Restoration, LLC

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	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		μS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID			open air zero		MIBK re factor =
						_____ ppm Iso. Gas		
☐ Particulate meter	mg/m^3					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/H					background area		
☐								

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 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 ºC 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 ± 10% or ± 2 ppm. Response time is less than three seconds to 90 percent of full-scale. The operating temperature range is 0 to 40º 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

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)

- 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)

TABLE 1

SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
A		
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		
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	

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	
C		

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
α -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	

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	
D		
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

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	
E		
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	

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	
Ethylenelmine	9.2	
Ethynylbenzene	8.82	
F		
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-trifluororethane)	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	
H		
1-Hexene	9.46	

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	
I		
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	

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	
K		
Ketene	9.61	
L		
2,3-Lutidine	8.85	
2,4-Lutidine	8.85	
2,6-Lutidine	8.85	
M		
2-Methyl furan	8.39	
2-Methyl napthalene	7.96	
1-Methyl napthalene	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

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	
α -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	
N		
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	

TABLE 1

SUMMARY OF IONIZATION POTENTIALS

Chemical Name	Ionization Potential (eV)	Cannot be Read by 10.6 eV PID
O		
Octane	9.82	
Oxygen	12.08	X
Ozone	12.08	X
P		
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	

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	
Q		
Quinone	10.04	
S		
Stibine	9.51	
Styrene	8.47	
Sulfur dioxide	12.3	X
Sulfur hexafluoride	15.33	X
Sulfur monochloride	9.66	
Sulfuryl fluoride	13	X
T		
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

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	
V		
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	
W		
Water	12.59	X
X		
2,4-Xylidine	7.65	
m-Xylene	8.56	
o-Xylene	8.56	
p-Xylene	8.45	

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	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		[illegible] μS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID	[illegible]		open air zero		MIBK re factor =
						_____ ppm Iso. Gas		
☐ Particulate meter	mg/m^3					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/H					background area		
☐								

ADDITIONAL REMARKS:

PREPARED BY: **DATE:**

SAMPLE

Field Operating Procedures

Calibration and Maintenance of Portable Specific Conductance Meter

FOP 012.0

CALIBRATION AND MAINTENANCE OF PORTABLE SPECIFIC CONDUCTANCE METER

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 ± 1 percent of full-scale, with repeatability of ± 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.

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

- 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.

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)

TURNKEY ENVIRONMENTAL RESTORATION, LLC

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	SETTI
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	970600014560		< 0.4		
						20		
						100		
						800		
☐ Sp. conductance meter	uS/mS		Myron L Company Ultra Meter 6P	606987		µS @ 25 °C		
☐ PID	ppm		Photovac 2020 PID	[illegible]		open air zero		MIBK re factor =
						____ ppm Iso. Gas		
☐ Particulate meter	mg/m^3					zero air		
☐ Oxygen	%					open air		
☐ Hydrogen sulfide	ppm					open air		
☐ Carbon monoxide	ppm					open air		
☐ LEL	%					open air		
☐ Radiation Meter	uR/H					background area		
☐								

ADDITIONAL REMARKS:

PREPARED BY: **DATE:**

SAMPLE

FIELD OPERATING PROCEDURES

Documentation Requirements for Drilling and Well Installation

DOCUMENTATION REQUIREMENTS FOR DRILLING AND WELL INSTALLATION

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.

- 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.

- 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.

- 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.

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)

DAILY LOG			
DATE			
NO.			
SHEET	OF		

FIELD ACTIVITY DAILY LOG

PROJECT NAME:	PROJECT NO.
PROJECT LOCATION:	CLIENT:
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	
TIME	DESCRIPTION

SAMPLE

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS: A.M.: P.M.:	IMPORTANT TELEPHONE CALLS:
BM/TK PERSONNEL ON SITE:	
SIGNATURE	DATE:

TurnKey Environmental Restoration, LLC

FIELD BOREHOLE LOG

PROJECT:		**Log of Boring No.:**		
BORING LOCATION:		ELEVATION AND DATUM:		
DRILLING CONTRACTOR:		DATE STARTED:		DATE FINISHED:
DRILLING METHOD:		TOTAL DEPTH:		SCREEN INTERVAL:
DRILLING EQUIPMENT:		DEPTH TO WATER:	FIRST: COMPL.:	CASING:
SAMPLING METHOD:		LOGGED BY:		
HAMMER WEIGHT:	DROP:	RESPONSIBLE PROFESSIONAL:		REG. NO.

Depth (fbgs)	SAMPLES: Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery	PID Scan (ppm)	SAMPLE DESCRIPTION USCS Classification: Color, Moisture Condition, % of Soil Type, Texture, Plasticity, Fabric, Bedding, Weathering/Fracturing, Odor, Other SURFACE ELEVATION (FMSL):	REMARKS

ABANDONMENT:				
Volume of cement/bentonite grout required:	V = pr2 x 7.48 =	gallons	borehole depth =	ft.
Volume of cement/bentonite grout installed:		gallons	borehole diameter =	ft.
Has bridging of grout occurred?	☐ yes ☐ no		borehole radius =	ft.
If yes, explain resolution:				
Method of installation:				
Project No:	**TurnKey Environmental Restoration, LLC**		Figure	

FIELD BOREHOLE/MONITORING WELL INSTALLATION LOG

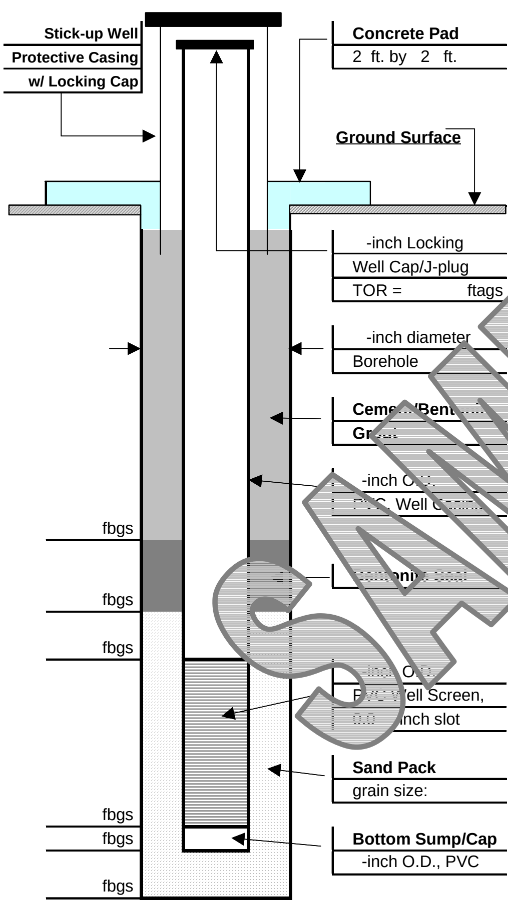
PROJECT:		**Log of Well No.:**			
BORING LOCATION:		ELEVATION AND DATUM:			
DRILLING CONTRACTOR:		DATE STARTED:		DATE FINISHED:	
DRILLING METHOD:		TOTAL DEPTH:		SCREEN INTERVAL:	
DRILLING EQUIPMENT:		DEPTH TO WATER:	FIRST:	COMPL.:	CASING:
SAMPLING METHOD:		LOGGED BY:			
HAMMER WEIGHT:	DROP:	RESPONSIBLE PROFESSIONAL:			REG. NO.

Depth (fbgs)	SAMPLES: Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery	PID Scan (ppm)	SAMPLE DESCRIPTION USCS Classification: Color, Moisture Condition, % of Soil Type, Texture, Plasticity, Fabric, Bedding, Weathering/Fracturing, Odor, Other SURFACE ELEVATION (FMSL):	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Project No:	**TurnKey Environmental Restoration, LLC**	Figure

STICK-UP MONITORING WELL 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)
Drilling Method:	
Soil Sample Collection Method:	
Drilling Fluid:	
Fluid Loss During Drilling:	gallons (approximate)

Materials of Well Construction

Casing:	
Screen:	
Sump:	
Sand Pack:	
Annular Seal:	

Well Development

Well Purpose:	
Techneque(s):	
Date Completed:	
BM/TK Personnel:	
Total Volume Purge:	gallons
Static Water Level (SWL):	fbTOR
Pump Depth: bottom of well	
Purge Duration:	minutes
Yeild:	gpm
Specific Capacity:	gpm/ft

Comments: saturated thickness: SWL - stickup = fbgs

Total Depth = fbTOR Total Depth - SWL = feet

stick-up = feet

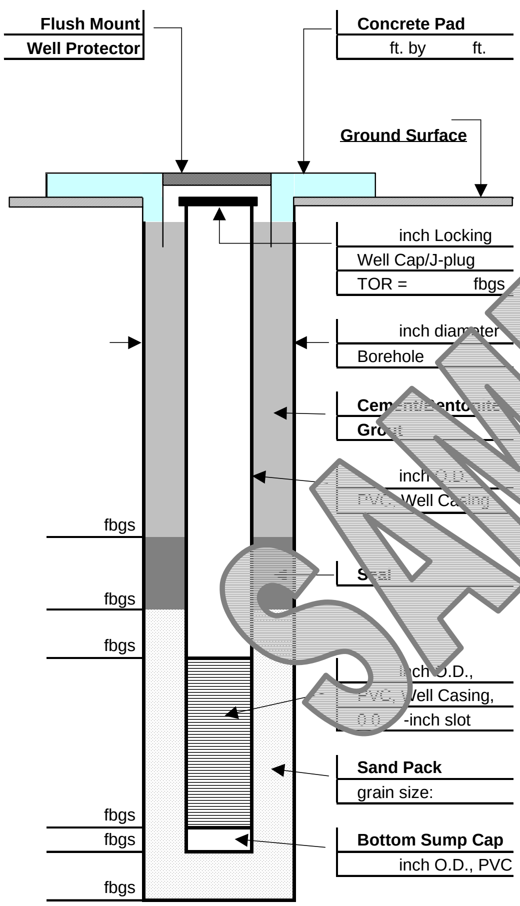
Total Depth = fbgs

PREPARED BY: DATE:

TurnKey Environmental Restoration, LLC

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)
Drilling Method:	
Soil Sample Collection Method:	
Drilling Fluid:	
Fluid Loss During Drilling:	gallons (approximate)

Materials of Well Construction
Casing:
Screen:
Sump:
Sand Pack:
Annular Seal:

Well Development	
Well Purpose:	
Techneque(s):	
Date Completed:	
BM/TK Personnel:	
Total Volume Purge:	gallons
Static Water Level:	fbTOR
Pump Depth:	
Purge Duration:	minutes
Yeild:	gpm
Specific Capacity:	gpm/ft

Comments:

PREAPRED BY: DATE:

DAILY DRILLING REPORT

CONTRACTOR:	DATE:
DRILLING EQUIPMENT:	PROJECT:
CREW MEMBERS:	JOB NUMBER:
SITE NAME:	BM PERSONNEL:

CATEGORY	Total Hours	a.m. 6	7	8	9	10	11	12 p.m.	1	2	3	4	5	6	7	8	9	10	11	12 a.m.	1	2	3	4	5	6
MOB / DEMOB																										
DRILLING																										
WELL INSTALLATION																										
DEVELOPMENT / TESTING																										
GROUTING																										
STEAM / DECON																										
DOWN TIME (explain below)																										
STANDBY (explain below)																										
CLEANUP																										
PREP FOR DRILLING																										
LUNCH																										
OTHER:																										

REMARKS:

DRILLING & WELL MATERIALS: Describe nature, quantity, size, etc.

ITEM OR SERVICE	QUANTITIES	LOCATION					TOTALS
Starting depth (fbgs)							--
Ending depth (fbgs)							--
Total footage drilled (feet)							
Drilling Method (HSA, air rotary, cable etc.)							--
Auger/Bit size							--
CSSS starting depth (fbgs)							--
CSSS ending depth (fbgs)							--
Total CSSS footage							
-inch Schedule 40 PVC screen, slot size =							
-inch Schedule 40 PVC riser							
-inch Schedule 40 PVC screen, slot size =							
-inch Schedule 40 PVC riser							
-inch Schedule 40 PVC screen, slot size =							
-inch Schedule 40 PVC riser							
Sand pack, size =							
Bentonite pellets/chips, size =							
Cement/beontonite grout							
☐ Protective casing ☐ Flushmount road box							
Lockable J-plug							
Lock							

PERSONNEL TIME LOG:

POSITION	NAME	HOURS
Observer		
Drillers		

DRILLER (optional):	BM REP.

TurnKey Environmental Restoration, LLC

Field Operating Procedures

Drill Site Selection Procedure

FOP 017.0

DRILL SITE SELECTION PROCEDURE

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

FOP 018.0

DRILLING AND EXCAVATION EQUIPMENT DECONTAMINATION PROCEDURES

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.

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

TurnKey Environmental Restoration, LLC

Field Operating Procedures

Establishing Horizontal and Vertical Control

FOP 021.0

ESTABLISHING HORIZONTAL AND VERTICAL CONTROL

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.

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.

TurnKey Environmental Restoration, LLC

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.

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

WATER LEVEL MONITORING RECORD

Project Name:	Client:
Project No.:	Location:
Field Personnel:	Date:
Weather:	

Well No.	Time	Top of Riser Elevation (fmsl)	Static Depth to Water (fbTOR)	Groundwater Elevation (fmsl)	Total Depth (fbTOR)	Last Total Depth Measurement (fbTOR)

Comments/Remarks:

PREAPRED BY: DATE:

FIELD OPERATING PROCEDURES

Groundwater Sample Collection Procedures

FOP 024.0

GROUNDWATER SAMPLE COLLECTION PROCEDURES

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

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).

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)

Specific Conductance	μmhos/cm or μS or mS
pH	pH units
Temperature	^{o}C or ^{o}F
Turbidity	NTU
Eh (*optional*)	mV
PID VOCs (*optional*)	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.

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

- 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 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.

- 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 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

TurnKey Environmental Restoration, LLC

GROUNDWATER FIELD FORM

Project Name: Date:

Location: Project No.: Field Team:

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose: ☐ Development ☐ Sampling			
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	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								
Sample Information:									
	S1								
	S2								

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose: ☐ Development ☐ Sampling			
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	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								
Sample Information:									
	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

FOP 026.1

HOLLOW STEM AUGER (HSA) DRILLING PROCEDURES

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.

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 <u>bit</u> (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, 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

<u>TurnKey FOPs:</u>

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

TurnKey Environmental Restoration, LLC

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?		

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 **TurnKey Policy: Maintain 20 feet clearance**		
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:

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:

TurnKey Environmental Restoration, LLC

Field Operating Procedures

Low-Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedure

LOW FLOW (MINIMAL DRAWDOWN) GROUNDWATER PURGING & SAMPLING PROCEDURES

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.

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.

9. Lower the purge pump or tubing (i.e., low-flow electrical submersible, peristaltic, etc.) <u>slowly</u> 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.

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 ± 0.1 units for pH, ± 3% for specific conductance, ± 10 mV for Eh, and ± 10% for turbidity and dissolved oxygen. These stabilization guidelines are provided for rough estimates only,

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

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.

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

TurnKey Environmental Restoration, LLC

GROUNDWATER FIELD FORM

Project Name: Date:

Location: Project No.: Field Team:

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose:	☐ Development	☐ Sampling	
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	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								
Sample Information:									
	S1								
	S2								

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose:	☐ Development	☐ Sampling	
Total Depth (fbTOR):			Purge Volume (gal):			Purge Method:			
Time	Water Level (fbTOR)	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								
Sample Information:									
	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

Management of Investigation-Derived Waste (IDW)

MANAGEMENT OF INVESTIGATION-DERIVED WASTE (IDW)

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.

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:

- 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

INVESTIGATION DERIVED WASTE CO

Project Name: Location:

Project Number: Personnel:

Container		Contents	Date		Staging Location	Date Sampled	Co
Number	Description		Started	Ended			

Prepared By:

Signed:

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.)

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.

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)

REFERENCES

<u>TurnKey FOPs:</u>

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

FIELD BOREHOLE/MONITORING WELL INSTALLATION LOG

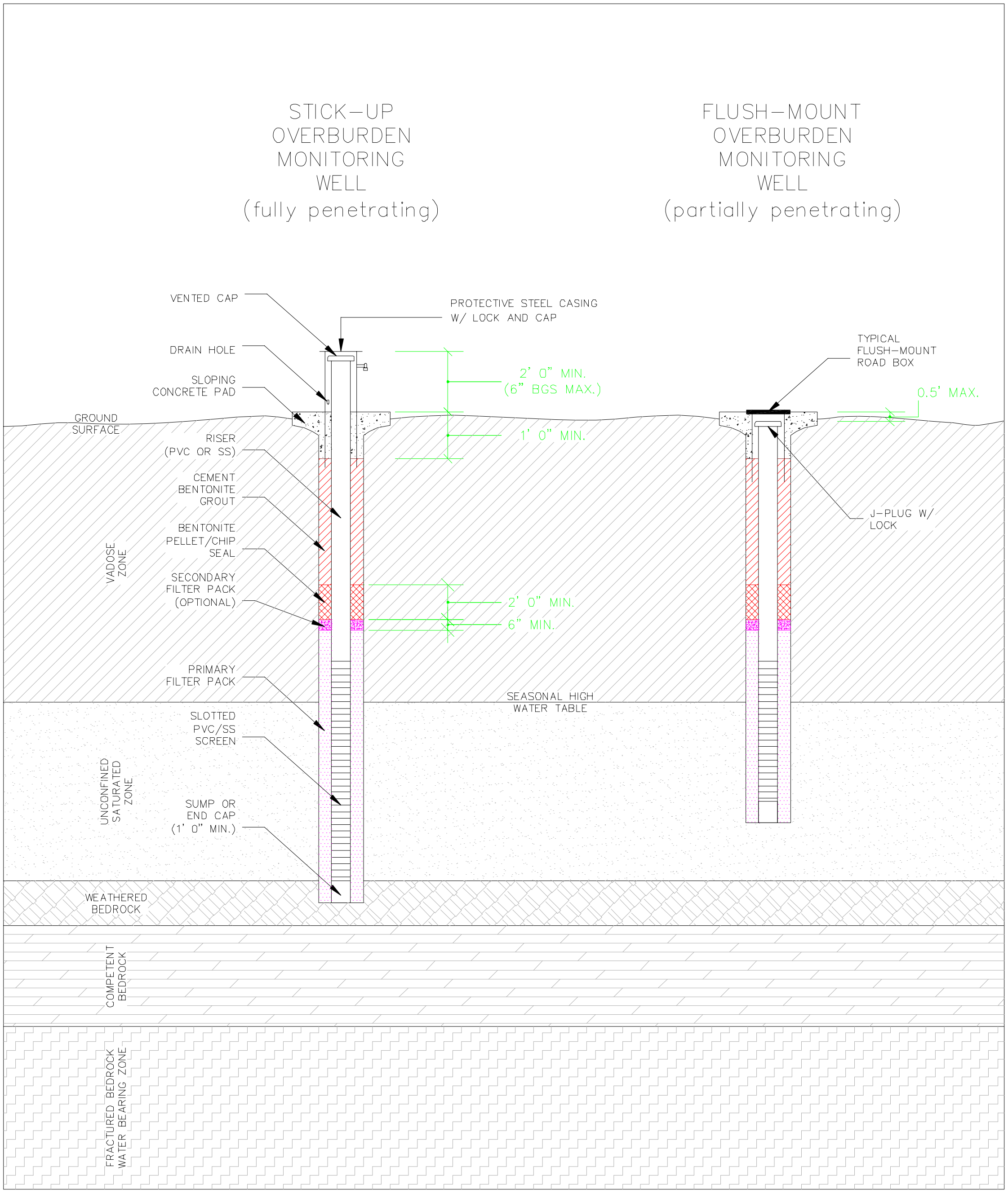
PROJECT:	**Log of Well No.:**	
BORING LOCATION:	ELEVATION AND DATUM:	
DRILLING CONTRACTOR:	DATE STARTED:	DATE FINISHED:
DRILLING METHOD:	TOTAL DEPTH:	SCREEN INTERVAL:
DRILLING EQUIPMENT:	DEPTH TO WATER: FIRST: COMPL.:	CASING:
SAMPLING METHOD:	LOGGED BY:	
HAMMER WEIGHT: DROP:	RESPONSIBLE PROFESSIONAL:	REG. NO.

Depth (fbgs)	SAMPLES					PID Scan (ppm)	SAMPLE DESCRIPTION	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS
	Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery		USCS Classification: Color, Moisture Condition, % of Soil Type, Texture, Plasticity, Fabric, Bedding, Weathering/Fracturing, Odor, Other	
							SURFACE ELEVATION (FMSL):	

Project No:	**TurnKey Environmental Restoration, LLC**	Figure

SAMPLE

FIGURE 1


STICK-UP OVERBURDEN MONITORING WELL (fully penetrating)
FLUSH-MOUNT OVERBURDEN MONITORING WELL (partially penetrating)
VENTED CAP
PROTECTIVE STEEL CASING W/ LOCK AND CAP
DRAIN HOLE
SLOPING CONCRETE PAD
GROUND SURFACE
RISER (PVC OR SS)
CEMENT BENTONITE GROUT
BENTONITE PELLET/CHIP SEAL
SECONDARY FILTER PACK (OPTIONAL)
PRIMARY FILTER PACK
SLOTTED PVC/SS SCREEN
SUMP OR END CAP (1' 0" MIN.)
2' 0" MIN. (6" BGS MAX.)
1' 0" MIN.
2' 0" MIN.
6" MIN.
TYPICAL FLUSH-MOUNT ROAD BOX
0.5' MAX.
J-PLUG W/ LOCK
SEASONAL HIGH WATER TABLE
VADOSE ZONE
UNCONFINED SATURATED ZONE
WEATHERED BEDROCK
COMPETENT BEDROCK
FRACTURED BEDROCK WATER BEARING ZONE

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

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:
        - Dissolved Oxygen: ± 0.3 mg/L
        - Turbidity: ± 10%
        - Specific Conductance: ± 3%
        - ORP: ± 10 mV
        - pH: ± 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

<u>TurnKey FOPs:</u>
040 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination

GROUNDWATER WELL DEVELOPMENT LOG

Project Name:	WELL NUMBER:
Project Number:	Sample Matrix:
Client:	Weather:

WELL DATA:

DATE: | TIME:

Casing Diameter (inches):	Casing Material:
Screened interval (fbTOR):	Screen Material:
Static Water Level (fbTOR):	Bottom Depth (fbTOR):
Elevation Top of Well Riser (fmsl):	Datum Ground Surface: Mean Sea Level
Elevation Top of Screen (fmsl):	Stick-up (feet):

PURGING DATA:

DATE: | START TIME: | END TIME:

VOLUME CALCULATION:

(A) Total Depth of Well (fbTOR):	
(B) Casing Diameter (inches):	
(C) Static Water Level (fbTOR):	
One Well Volume (V, gallons): $V = 0.0408 [(B)^2 \times \{ (A) - (C) \}]$	

*Use the table to the right to calculate one well volume.

Field Personnel:

Volume Calculation

Well Diameter	Volume gal/ft
1"	0.041
2"	0.163
3"	0.367
4"	0.653
5"	1.020
6"	1.469
8"	2.611

Stabilization Criteria

Parameter	Criteria
DO	+/- 0.3 mg/L
Turbidity	+/- 10%
SC	+/- 3%
ORP	+/- 10 mV
pH	+/- 0.1 unit

EVACUATION STABILIZATION TEST DATA:

Time	Water Level (fbTOR)	Accumulated Volume (gallons)	pH (units)	Temperature (degrees C)	Specific Conductance (mS/cm)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor

REMARKS:

PREPARED BY:

FIELD OPERATING PROCEDURES

TurnKey Environmental Restoration, LLC

Sample Labeling, Storage, and Shipment Procedures

FOP 046.0

SAMPLE LABELING, STORAGE & SHIPMENT PROCEDURES

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:

Sample I.D. Example: GW051402047	
GW	**Sample matrix** GW = groundwater; SW = surface water; SUB = subsurface soil; SS = surface soil; SED = sediment; L = leachate; A = air
05	Month of sample collection
14	Day of sample collection
02	Year of sample collection
047	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 47th sample retained for analysis during the field investigation, collected on May 14, 2002.

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.

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.

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

SOIL/SEDIMENT
SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Depth (feet)		Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, depth changes, important matrix observations or description, gravel thickness, etc.)
			from	to						

Equipment Rinsate Blanks *- Pour clean deionized water over or through decontaminated sampling equipment into sample containers. Collect at a frequency of 1 per sampling method per day. Analyze for all those parameters analyzed for in the samples collected the same day. TAL Metals can be substituted by only the Metals analyzed for that day (except Hexavalent Chromium which needs a separate container). Match equipment used for constituents of concern to rinsate analyte. Note deionized water lot # or distilled water manufacturers info & date.*

MS/MSD/MSB *- Collect at a frequency of 1 per 20 samples of each matrix per day. Analyze for all those parameters analyzed for the samples collected the same day.*

Field Blank *- Pour clean deionized water (used as final decon rinse water) into sample containers while at the sampling site. Collect field blanks at a frequency of 1 per lot of deionized water. Note water lot number and dates in use for decon in 'Comments' section.*

Investigation Derived Waste (IDW) Characterization samples *- One composited sample from all drums of decon fluids and soil. Please note number of drums and labels on collection log.*

Notes:

1. See QAPP for sampling frequency and actual number of QC samples.
2. CWM - clear, wide-mouth glass jar with Teflon-lined cap.
3. HDPE - high density polyethylene bottle.
4. MS/MSD/MSB - Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blank.
5. BD - Blind Duplicate - indicate location of duplicate.

GROUNDWATER/SURFACE WATER SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Depth (feet)		Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, depth changes, important matrix observations or description, gravel thickness, etc.)
			from	to						

Equipment Rinsate Blanks *- Pour clean deionized water over or through decontaminated sampling equipment into sample containers. Collect at a frequency of 1 per sampling method per day. Analyze for all those parameters analyzed for in the samples collected the same day. TAL Metals can be substituted by only the Metals analyzed for that day (except Hexavalent Chromium which needs a separate container). Match equipment used for constituents of concern to rinsate analyte. Note deionized water lot # or distilled water manufacturers info & date.*

MS/MSD/MSB *- Collect at a frequency of 1 per 20 samples of each matrix per day. Analyze for all those parameters analyzed for the samples collected the same day.*

Field Blank *- Pour clean deionized water (used as final decon rinse water) into sample containers while at the sampling site. Collect field blanks at a frequency of 1 per lot of deionized water. Note water lot number and dates in use for decon in 'Comments' section.*

Investigation Derived Waste (IDW) Characterization samples *- One composited sample from all drums of decon fluids and soil. Please note number of drums and labels on collection log.*

Notes:

1. See QAPP for sampling frequency and actual number of QC samples.
2. CWM - clear, wide-mouth glass jar with Teflon-lined cap.
3. HDPE - high density polyethylene bottle.
4. FD - Field Duplicate.
5. MS/MSD/MSB - Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blank.
6. BD - Blind Duplicate.

TurnKey Environmental Restoration, LLC

WIPE SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.)

Notes:
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 wipe samples.
7. Rinsates should be taken at a rate of 1 per day during wipe sampling. Only take when reusable equipment is used.
8. Wipe sample FB collected by wiping unused glove (and any other sampling equipment coming into 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 at a rate of 1 FD per 20 samples.
10. **EH :** Extract and Hold

AIR SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, important observations or descriptions, etc.)

Notes:

1. See QAPP for sampling frequency and actual number of QC samples.
2. SC - Summa Canister.
3. TB - Tedlar Bag (quantity).
4. No Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blanks, Field Duplicates, Field Blanks or Rinsates collected for air samples.

CHAIN OF CUSTODY RECORD

Project No.	Project Name					Number of Containers	VOCs	SVOCs	Metals						REMARKS
Samplers (Signature)															
No.	Date	Time	comp	grab	Sample Identification										

Possible Hazard Identification: ☐ Non-hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: Return to Client ☐ Disposal by Lab ☐ Archive ____________(mos.)

Turnaround Time Required: Normal ☐ Rush ☐

QC Level: I. ☐ II. ☐ III. ☐ Project Specific (specify):__________________

Relinquished by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	REMARKS:
Relinquished by: (Signature)	Date	Time	Relinquished by: (Signature)	Date	Time	

SAMPLE

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 ½ to ¾ 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.

6. Place field screening sample (i.e., jar or bag) in a location where the ambient temperature is at least 70^{o} 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

<u>TurnKey FOPs:</u>
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*

FIELD BOREHOLE LOG

PROJECT:		**Log of Boring No.:**	
BORING LOCATION:		ELEVATION AND DATUM:	
DRILLING CONTRACTOR:		DATE STARTED:	DATE FINISHED:
DRILLING METHOD:		TOTAL DEPTH:	SCREEN INTERVAL:
DRILLING EQUIPMENT:		DEPTH TO WATER: / FIRST: / COMPL.:	CASING:
SAMPLING METHOD:		LOGGED BY:	
HAMMER WEIGHT:	DROP:	RESPONSIBLE PROFESSIONAL:	REG. NO.

Depth (fbgs)	SAMPLES: Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery	PID Scan (ppm)	SAMPLE DESCRIPTION USCS Classification: Color, Moisture Condition, % of Soil Type, Texture, Plasticity, Fabric, Bedding, Weathering/Fracturing, Odor, Other SURFACE ELEVATION (FMSL):	REMARKS

ABANDONMENT:

Volume of cement/bentonite grout required:	V = pr2 x 7.48 =	gallons	borehole depth = ft.
Volume of cement/bentonite grout installed:		gallons	borehole diameter = ft.
Has bridging of grout occurred?	☐ yes ☐ no		borehole radius = ft.
If yes, explain resolution:			
Method of installation:			
Project No:	**TurnKey Environmental Restoration, LLC**		Figure

FIELD GEOPROBE BOREHOLE \ TEMPORARY WELL INSTALLATION LOG

PROJECT:		Log of Temp. Well No.:	
BORING LOCATION:		ELEVATION AND DATUM:	
DRILLING CONTRACTOR:		DATE STARTED:	DATE FINISHED:
DRILLING METHOD:		TOTAL DEPTH:	SCREEN INTERVAL:
DRILLING EQUIPMENT:		DEPTH TO WATER: FIRST: COMPL.:	CASING:
SAMPLING METHOD:		LOGGED BY:	
HAMMER WEIGHT:	DROP:	RESPONSIBLE PROFESSIONAL:	REG. NO.

Depth (fbgs)	SAMPLES: Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery	PID Scan (ppm)	SAMPLE DESCRIPTION USCS Classification: Color, Moisture Condition, % of Soil Type, Texture, Plasticity, Fabric, Bedding, Weathering/Fracturing, Odor, Other SURFACE ELEVATION (FMSL):	WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Project No:	**TurnKey Environmental Restoration, LLC**	Figure

FIELD OPERATING PROCEDURES

Soil Description Procedures Using The Visual-Manual Method

FOP 054.2

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.

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.

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

        - 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

- 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 difficultly 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

  - 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 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 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 was 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 ½ to ¾ 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:

- 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

- 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

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 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. It 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.

  - 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, 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/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

- 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).*

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

FIGURE 1

FIELD GUIDE FOR SOIL AND STRATIGRAPHIC ANALYSIS

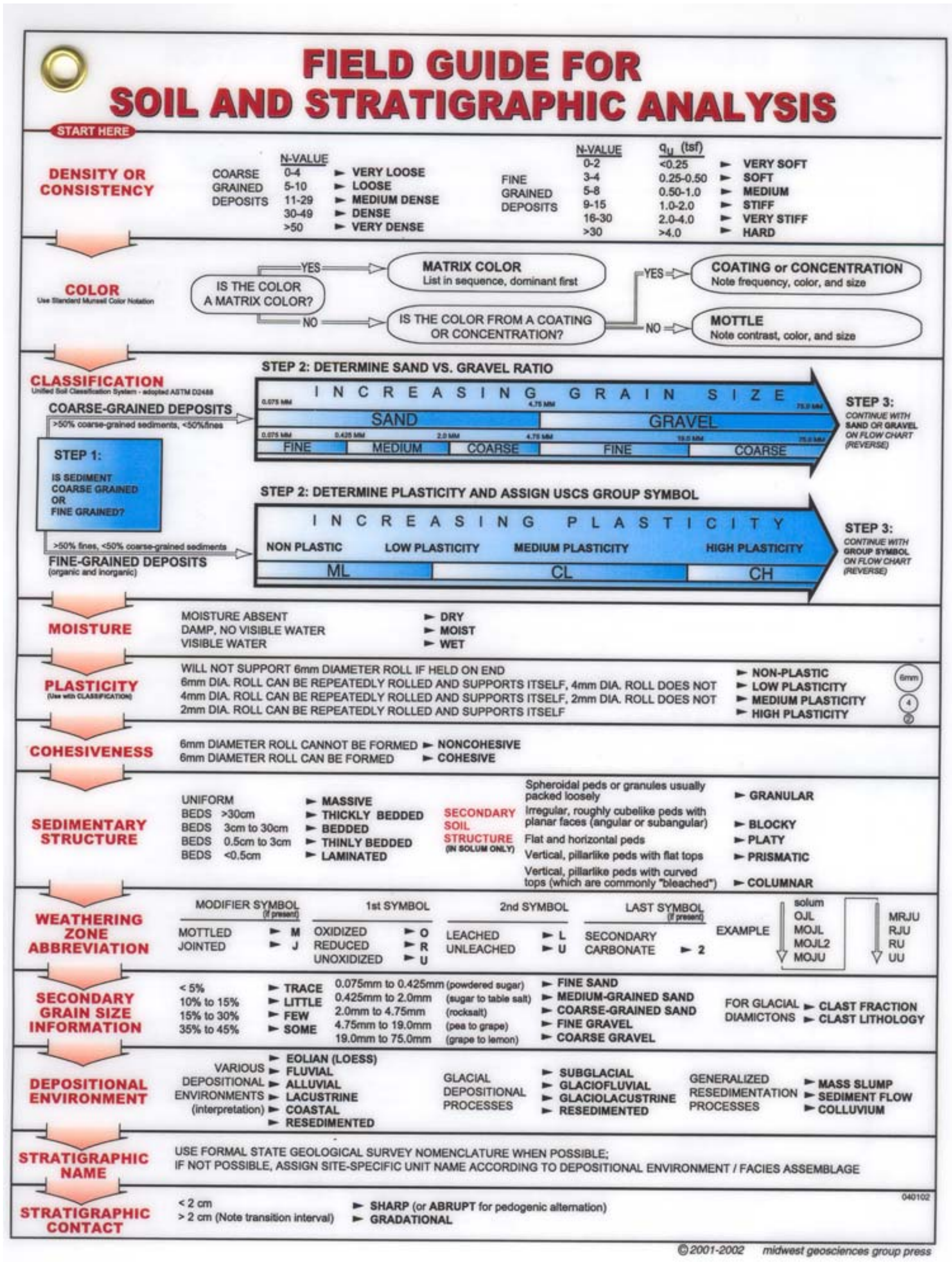


FIGURE 2

USCS SOIL CLASSIFICATION FLOW CHART (MODIFIED FROM ASTM D2488)

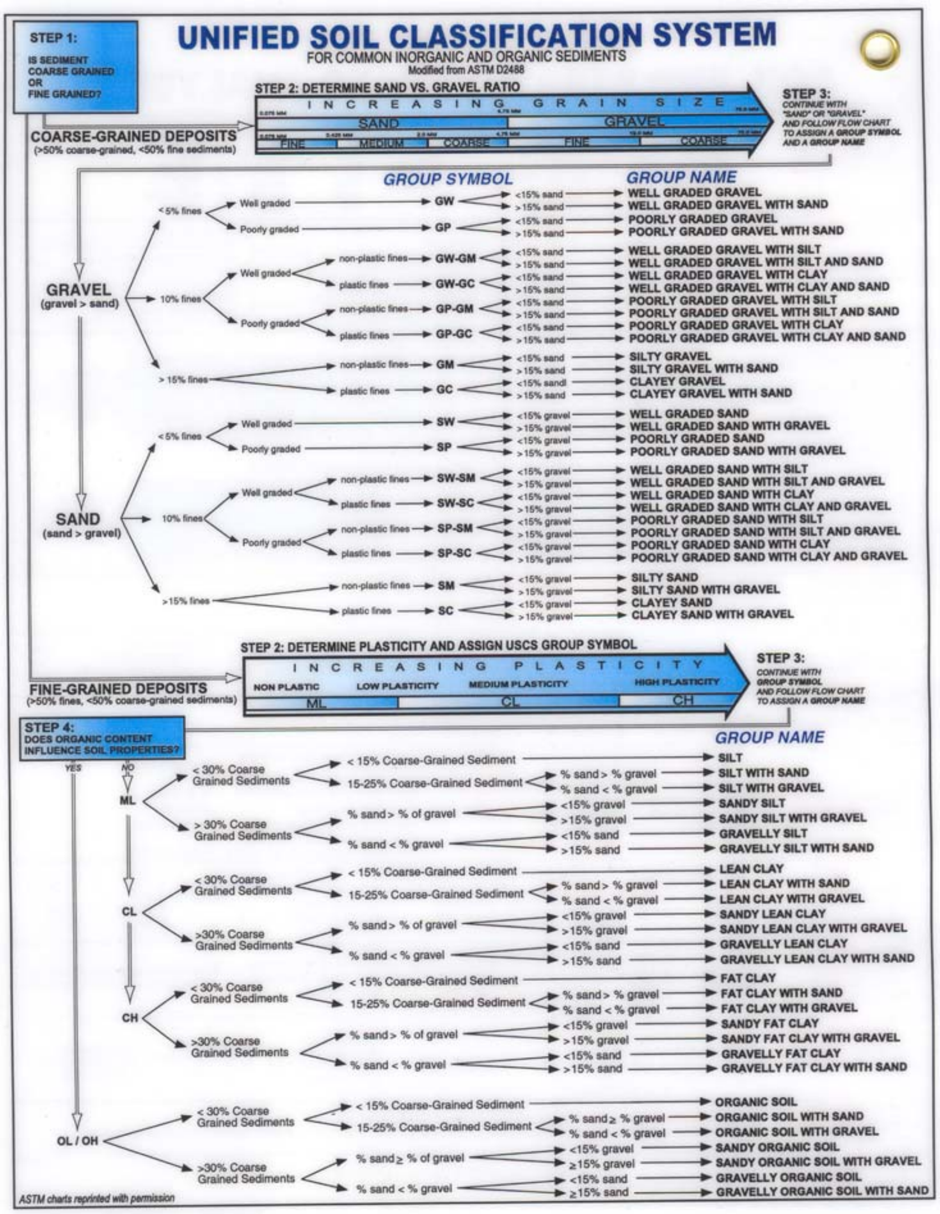


FIGURE 3

ILLUSTRATION OF PARTICLE SIZES

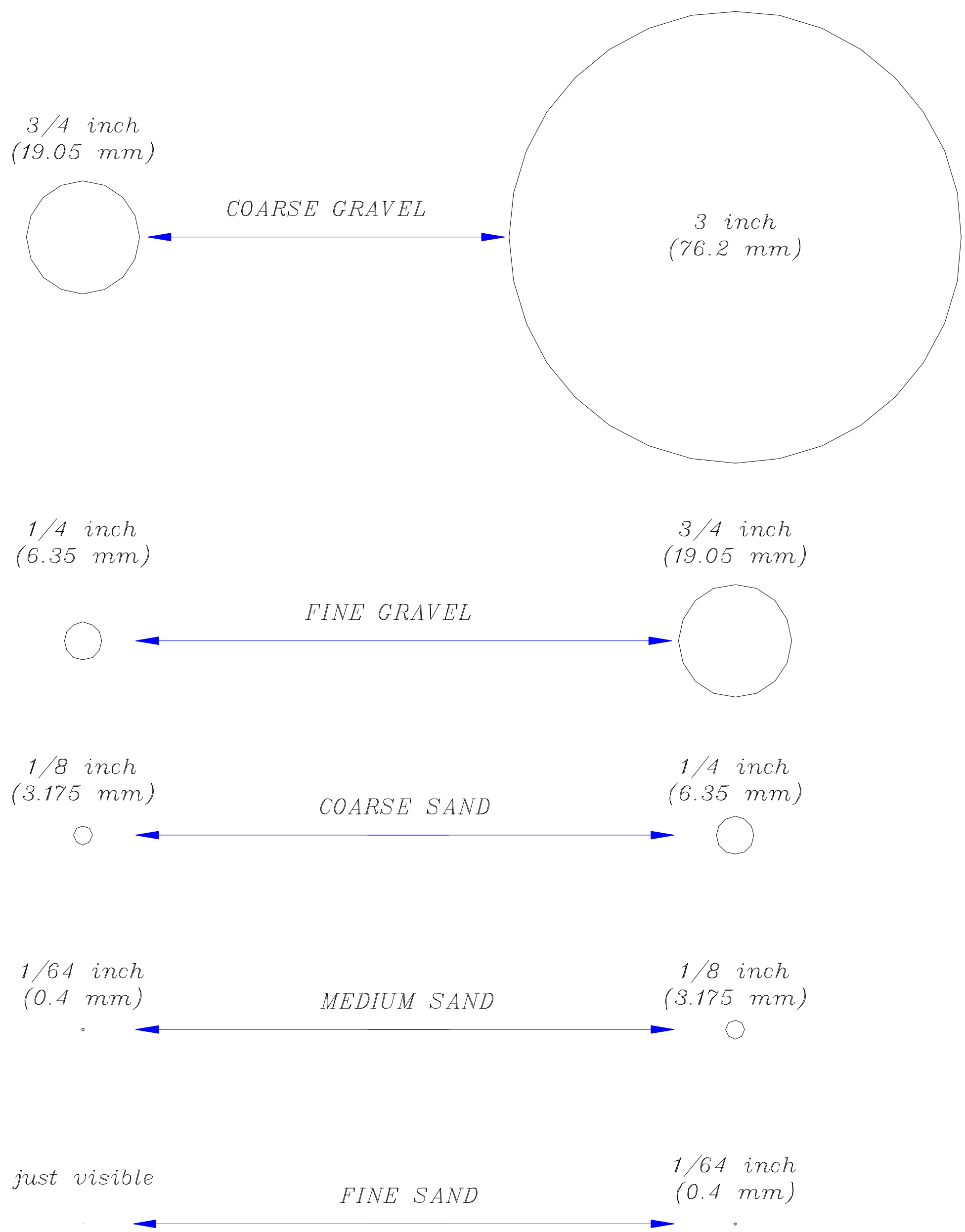


FIGURE 4

GRAIN-SIZE SCALE (MODIFIED WENTWORTH SCALE)

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* (φ) scale, a modification of the Wentworth scale created by W. C. Krumbein, is a logarithmic scale computed by the equation: $\varphi = -\log_2(\text{grain size in mm})$.

φ 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	½–1 mm	0.020–0.039 in	Coarse sand
2 to 1	¼–½ mm	0.010–0.020 in	Medium sand
3 to 2	125–250 µm	0.0049–0.010 in	Fine sand
4 to 3	62.5–125 µm	0.0025–0.0049 in	Very fine sand
8 to 4	3.90625–62.5 µm	0.00015–0.0025 in	Silt
> 8	< 3.90625 µm	< 0.00015 in	Clay
<10	< 1 µm	< 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 φ).

Project No: **Borehole Number:**

Project:

Client: Logged By:

Site Location: Checked By:

TurnKey Environmental Restoration, LLC
726 Exchange Street, Suite 624
Buffalo, NY
(716) 856-0635

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		Ground Surface							
0.0									

SAMPLE

Drilled By: Hole Size:
Drill Rig Type: Stick-up:
Drill Method: Datum:

Drill Date(s): Sheet: 1 of 1

FIELD OPERATING PROCEDURES

Split-Spoon Sampling Procedures

SPLIT-SPOON SAMPLING PROCEDURES

PURPOSE

This guideline presents the methods for using a split-spoon sampler (see Figure 1) for collecting soil samples from a boring and for estimating the relative in-situ compressive strength of subsurface materials (ASTM D 1586). Representative samples for lithologic description, geochemical analysis, and geotechnical testing will be collected from the subsurface materials using the split-spoon sampler.

PROCEDURE

1. Place plastic sheeting on a sturdy surface to prevent the split-spoon and its contents from coming in contact with the surface (several layers of sheeting may be placed on the surface so that they may be removed between each sample or as needed).

2. Lower the sampling string to the base of the borehole. Measure the portion of the sampling string that extends above surrounding grade (i.e. the stickup). The depth of sampling will equal the total length of the string (sampler plus rods) minus the stickup length.

3. Measure sampling depths to an accuracy of 0.1 feet. If field measurements indicate the presence of more than 0.3 feet of disturbed materials in the base of the borehole (i.e. slough), the sampler will be used to remove this material, after which a second sampling trip will be made.

4. Select additional sampler components as required (i.e., leaf spring core retainer for clays or a sand trap for non-cohesive sands). If a retainer or trap is not used, a spacer ring will be used to hold the liners in position inside the sampler.

5. For driving samples, attach the drive head sub and hammer to the drill rods without the weight resting on the rods. For pushing samples using the rig hydraulics, skip to Step 9.

6. Mark four 6-inch intervals on the drill rods relative to a reference point on the drill rig. With the sampler resting on the bottom of the hole, drive the sampler with the 140 lb. hammer falling freely over a 30-inch fall until 24 inches have been penetrated or 50 blows applied.

7. Record the number of blows per 6 inches. Determine the "N" value by adding the blows for the 6 to 12-inch and 12 to 18-inch intervals of each sample drive.

8. After penetration is complete, remove the sampling string. Avoid removing sampling string by hitting up on the string with the hammer as this can cause the sample to fall from the bottom of the split-spoon sampler. The sampling string should be removed via cable lifting or rig hydraulics. If sample retention has been poor, let the sampling string rest in place for at least 3 minutes, then rotate clockwise at least 3 times before removing from the borehole.

9. For pushed samples (i.e., using rig hydraulics), mark four 6-inch intervals on the drill rods relative to a reference point on the rig. Use the rig pull-down to press the sampler downward until 24 inches have been penetrated or no further progress can be made with the full weight of the rig on the sampler.

10. Remove the split-spoon sampler from the sampling string and place on the plastic-covered surface.

11. Open the split-spoon sampler only when the TurnKey field geologist is prepared to describe and manage the sample.

12. Describe the sample in accordance with the Unified Soil Classification System in accordance with the TurnKey's FOP: Soil Description Procedures Using the Unified Soil Classification System (USCS).

13. Record all information in accordance with TurnKey's FOP: Documentation Requirements for Drilling and Well Installation.

14. Collect a portion of the sample for field screening as described in the TurnKey's FOP: Screening of Soil Samples for Organic Vapors During Drilling Activities.

15. If applicable, collect soil samples for volatile organic constituents (VOCs). If applicable, collect sample for semi-volatile, metals, geotechnical, or other off-site analysis.

16. The samples will be labeled, stored and shipped in accordance with the TurnKey's FOP: Sample Labeling, Storage and Shipment Procedures.

ATTACHMENTS

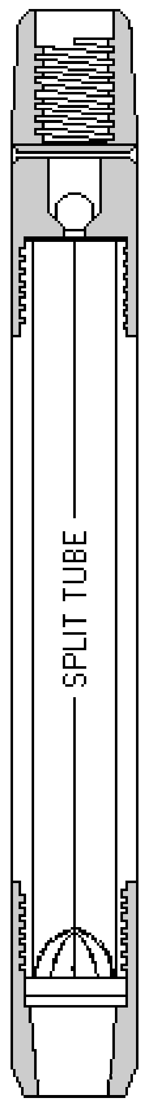
Figure 1; Split Spoon Sampler Schematic

REFERENCES

<u>TurnKey FOPs:</u>
015 Documentation Requirements for Drilling and Well Installation
046 Sample Labeling, Storage and Shipment Procedures
047 Screening of Soil Samples for Organic Vapors During Drilling Activities
054 Soil Description Procedures Using the Unified Soil Classification System (USCS)

FIGURE 1

SPLIT SPOON SAMPLER SCHEMATIC



FIELD OPERATING PROCEDURES

Surface and Subsurface Soil Sampling Procedures

SURFACE AND SUBSURFACE SOIL SAMPLING PROCEDURES

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.

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.

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. <u>Volatile Organic Compound (VOCs)</u>: 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. <u>All Other Parameters</u>: 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

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

<u>TurnKey FOPs:</u>

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*

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:

SOIL/SEDIMENT
SAMPLE COLLECTION SUMMARY LOG

Field ID	Location	QC Type	Depth (feet)		Analytical Parameters	Containers	Date	Time	Sampler Initials	Comments (e.g. problems encountered, ref. to variance, location changes, depth changes, important matrix observations or description, gravel thickness, etc.)
			from	to						

Equipment Rinsate Blanks *- Pour clean deionized water over or through decontaminated sampling equipment into sample containers. Collect at a frequency of 1 per sampling method per day. Analyze for all those parameters analyzed for in the samples collected the same day. HSL Metals can be substituted by only the Metals analyzed for that day (except Hexavalent Chromium which needs a separate container). Match equipment used for constituents of concern to rinsate analyte. Note deionzied water lot # or distilled water can be substit info & date.*

MS/MSD/MSB *- Collect at a frequency of 1 per 20 samples of each matrix per day. Analyze for all those parameters analyzed for the samples collected the same day.*

Field Blank *- Pour clean deionized water (used as final decon rinse water) into sample containers while at the sampling site. Collect field blanks at a frequency of 1 per lot of deionized water. Note water lot number and dates in use for decon in 'Comments' section.*

Investigation Derived Waste (IDW) Characterization samples *- One composited sample from all drums of decon fluids and soil. Please note number of drums and labels on collection log.*

Notes:

1. See QAPP for sampling frequency and actual number of QC samples.
2. CWM - clear, wide-mouth glass jar with Teflon-lined cap.
3. HDPE - high density polyethylene bottle.
4. MS/MSD/MSB - Matrix Spike, Matrix Spike Duplicate, Matrix Spike Blank.
5. BD - Blind Duplicate - indicate location of duplicate.

REAL TIME AI

Date:
Project Name:
Project Number:
Project Location:
Client:
Purpose of Air Monitoring:

WEATHER CONDITIONS:

Time of Day:	A.M.
Ambient Air Temp.:	
Wind Direction:	
Wind Speed:	
Precipitation:	

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Locatio
			PID (ppm)	LEL (%)	H2S (ppm)	O2 (%)	CO (ppm)	Particulates (mg/m^3)	Other	

SAMPLE

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By:

TurnKey Environmental Restoration, LLC

FIELD OPERATING PROCEDURES

Test Pit Excavation and Logging Procedures

TEST PIT EXCAVATION & LOGGING PROCEDURES

PURPOSE

This procedure describes the methods for completing test pits, trenches, and other excavations that may be performed to expose subsurface soils or materials. In most cases, these pits will be mechanically excavated, using a backhoe, trackhoe, or other equipment. Because pits and other excavations can represent a substantial physical hazard, it requires a particular focus on safety procedures. The Project Health and Safety Plan identifies practices related to excavation permits, entry, and control that must be incorporated into excavation activities.

EXCAVATION PROCEDURE

1. Review project objectives and the Project Health and Safety Plan (HASP).

2. Perform excavation equipment safety checks with the operator. Specific concerns should include, but not limited to, no leaking hydraulic lines, fire extinguisher on board of the excavation equipment, operator experience etc.

3. Conduct tailgate health and safety meeting with project team and excavation operator(s) by completing the Tailgate Safety Meeting Form (sample attached).

4. Calibrate air-monitoring equipment in accordance with the appropriate TurnKey's Field Operating Procedures or manufacturers recommendations for calibration of field meters.

5. Conduct air monitoring as required by the HASP and/or Project Work Plan. Record all results on the Real Time Air Monitoring Log (sample attached).

6. Mobilize the excavation equipment to the site and position over the required location.

7. Select excavation locations, which provide necessary information for achieving objectives. Check locations with owner/operator to ensure excavation

operations will not interfere with site operations, and select appropriate access routes.

8. Stake locations in the field and measure distance from locations to nearest landmarks. Survey location, if required.

9. Obtain clearances from appropriate utilities and, if buried waste/metallic objects are suspected, screen location with appropriate geophysical methods, as necessary.

10. Decontaminate excavation equipment in accordance with TurnKey's Drilling and Excavation Equipment Decontamination procedures.

11. Excavate pits. In uncontrolled areas, excavate only as many test pits as can be backfilled during the same day. Generally, allow equal time for excavation and backfilling. To the extent practicable, no pits should be left open overnight in an uncontrolled area. If sudden weather changes or other unforeseen events necessitate this, pits will be covered and/or barricaded and flagged with caution/hazard tape. These pits should be backfilled as soon as possible.

12. The TurnKey field geologist or experienced professional should determine the depth of excavation. The depth is generally limited by the safe reach of the selected equipment, but may also be limited by the stability of the excavated materials (i.e. wall stability).

13. Excavate the test pits in compliance with applicable safety regulations. In no case should a pit deeper than 4 feet be entered without first stabilizing the sidewalls by using forms, or by terracing or sloping (2:1 slope maximum) the sidewalls.

14. Excavated spoils must be placed no closer than 2 feet from the open excavation.

15. Collect soil samples from pit sidewalls in accordance with TurnKey's Surface and Subsurface Soil Sampling Procedures. If the test pit is greater than 4 feet in depth, it will not be entered for sampling. In this event, collect samples

using the backhoe bucket, then fill sample containers from the center of the bucket using the stainless steel sampling equipment (i.e., spoon, spade, trowel etc.) or drive a Shelby tube or EnCore™ sampler for VOCs.

16. Record excavation observations in the Project Field Book or Test Pit Excavation Log form (sample attached). Information recorded should include:

    - Physical dimension of the pit;
    - A scaled sketch of one side of the pit showing any lithologic contacts, zones of groundwater seepage, other special features (jointing, boulders, cobbles, zones of contamination, color abnormalities, etc.)
    - General information such as project number, pit designation number, depth, date, name of responsible professional (i.e., geologist), type of excavating equipment utilized, time of excavation and backfilling, method of collecting samples and amount of sample collected (if applicable);
    - Rate of groundwater inflow, depth to groundwater and time of measurement; and
    - Unified Soil Classification System (USCS) designation of each distinctive unit.

17. Photograph each excavation, highlighting unique or important features. Use a ruler or other suitable item for scale. Include a label with the pit designation so the developed picture will be labeled.

18. Backfill pit to match the existing grade compacting in 2 to 3 foot lifts. Since the excavated material should be cover soil, the excess soil will be placed back into the hole. The TurnKey Field Team Leader will provide direction on whether excavated soils may be used as fill, or these materials are to be containerized as investigation derived waste.

ATTACHMENTS

Tailgate Safety Meeting Form (sample)
Real Time Air Monitoring Log (sample)
Test Pit Excavation Log (sample)

REFERENCES

<u>TurnKey FOPs:</u>

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
018 Drilling and Excavation Equipment Decontamination
063 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:

REAL TIME AII

Date:

Project Name:

Project Number:

Project Location:

Client:

Purpose of Air Monitoring:

WEATHER CONDITIONS:

Time of Day:	A.M.
Ambient Air Temp.:	
Wind Direction:	
Wind Speed:	
Precipitation:	

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Locatioi
			PID (ppm)	LEL (%)	H2S (ppm)	O2 (%)	CO (ppm)	Particulates (mg/m³)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By:

TurnKey Environmental Restoration, LLC

TEST PIT EXCAVATION LOG

Project:	TEST PIT I.D.:
Project No.:	Excavation Date:
Client:	Excavation Method:
Location:	Logged / Checked By:

Test Pit Location: *NOT TO SCALE*

Test Pit Cross Section:

Grade - 0'
2'
4'
6'
8'
10'

TIME	Length: (approx.)
Start:	Width: (approx.)
End:	Depth: (approx.)

Depth (fbgs)	USCS Symbol & Soil Description	PID Scan (ppm)	Photos Y / N	Samples Collected (fbgs)

COMMENTS:

GROUNDWATER ENCOUNTERED:	yes	no	If yes, depth to GW:
VISUAL IMPACTS:	yes	no	Describe:
OLFACTORY OBSERVATIONS:	yes	no	Describe:
NON-NATIVE FILL ENCOUNTERED:	yes	no	
OTHER OBSERVATIONS:	yes	no	Describe:
SAMPLES COLLECTED:	yes	no	Sample I.D.:
			Sample I.D.:
			Sample I.D.:

SAMPLE

TurnKey Environmental Restoration, LLC

Field Operating Procedures

Real-Time Air Monitoring During Intrusive Activities

FOP 073.2

REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

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, 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).

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 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 perimeter locations for 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 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 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.

- 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.

- **<u>Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures</u>**

    - When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure (s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen SUlfide, carbon monoxide) may also need to be monitored Response levels and actions should be pre-determined, as necessary, for each site.

Additionally, if following the cessation of work and efforts to abate the emission source are unsuccessful, and if sustained organic vapor levels exceed 25 ppm above background within the 20-foot zone for more than 30 minutes, then the **Major Vapor Emission Response Plan** (see below) will automatically be placed into effect.

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. 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 sequence if the Major Vapor Emission Response Plan is activated:

Contact	Phone
Police/Fire Department	911
New York State DOH	(518) 402-7860
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:

- 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.
- 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 ($\mu g/m^3$) 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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 $\mu g/m^3$ 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.

<u>Visual Assessment</u>

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.

<u>Supplemental Dust Suppression</u>

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^3 of the upwind level, and in preventing visible dust migration off-site.

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 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

TurnKey Environmental Restoration, LLC

REAL TIME AII

Date:

Project Name:

Project Number:

Project Location:

Client:

Purpose of Air Monitoring:

WEATHER CONDITIONS:

Time of Day:	A.M.
Ambient Air Temp.:	
Wind Direction:	
Wind Speed:	
Precipitation:	

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Locatioı
			PID (ppm)	LEL (%)	H2S (ppm)	O2 (%)	CO (ppm)	Particulates (mg/m^3)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By:

Field Operating Procedures

TurnKey Environmental Restoration, LLC

"Before Going Into the Field" Procedure

"BEFORE & AFTER" PROJECT PROCEDURES FOR FIELD PERSONNEL

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.

"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 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" 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" 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 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

Calibration & Maintenance of Portable Particulate Meter

FOP 084.0

CALIBRATION AND MAINTENANCE OF PORTABLE PARTICULATE METER

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^3 to 400 mg/m^3. 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 ± 2% of reading ± precision over the temperature range of -4° to 158° F (-10° to 50° C) and 10 to 95% relative humidity (non-condensing). The precision is ± 1% of reading or ± 0.001 mg/m^3, whichever is greater (1-second averaging) and ± 0.3% of reading or ± 0.0003 mg/m^3, whichever is greater (10-second averaging).

INSTRUMENT PANEL VIEW

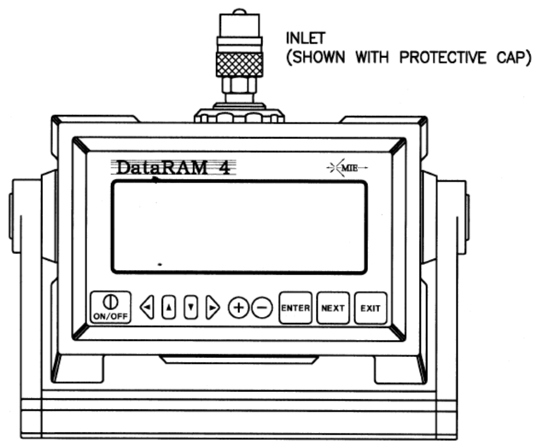


FIGURE 1. FRONT-PANEL VIEW OF DataRAM

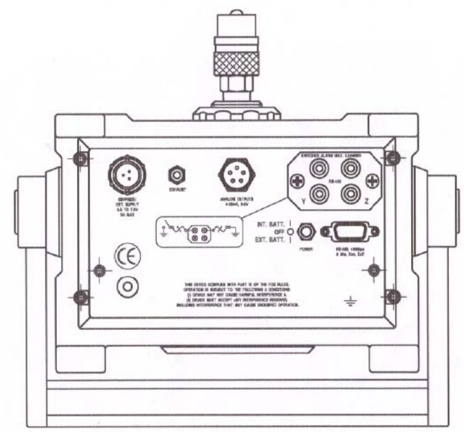


FIGURE 2. BACK-PANEL VIEW OF DataRAM

MAINTENANCE

General Guidelines

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.

Unless a MALFUNCTION message is displayed, or other operational problems occur, the DataRAM 4 should be returned to the factory once every two years for routine check out, test, cleaning and calibration check.

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

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).

<u>Instrument Storage</u>
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.

<u>Filter Replacement</u>
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.

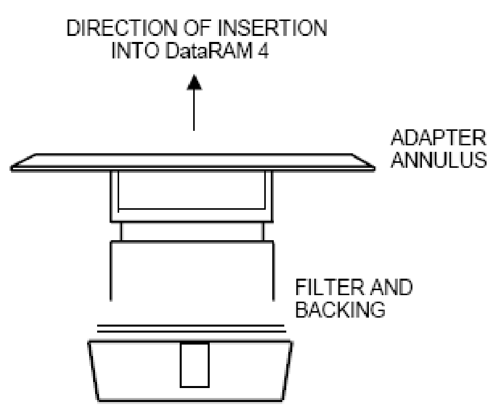
> *HEPA Filter Cartridge Replacement*
> The DataRAM 4 is shipped from the factory with the HEPA filter cartridge installed. This cartridge can be identified by its metallic cover. Remove this cartridge. Clean the internal black rubber gasket against which the cartridge is normally compressed. Install 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.

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 leafage. 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



Cleaning of Optical Sensing Chamber

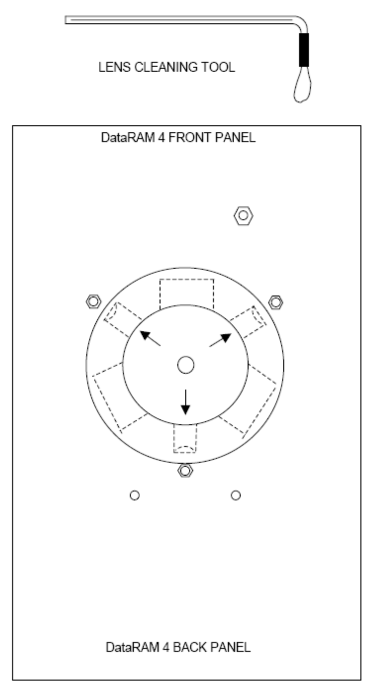
Although the DataRAM 4 incorporates filtered air shielding of the critical optical sensing surfaces, continued sampling of airborne particles at high concentrations may result in gradual build-up of contamination on those interior surfaces of the sensing chamber components. This may cause an excessively 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).

- 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).



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 ±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.

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 µm
- Geometric standard deviation of lognormal size distribution: 2.5
- Bulk density: 2.60 to 2.65 g/cm3
- 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 F

ELECTRONIC COPY OF WORK PLAN