ROUX

Remedial Investigation-Alternative Analysis Work Plan

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22 Fillmore Avenue
Tonawanda, New York

June 2025

Prepared for:

JC Tonawanda Tower QOZB LLC

Prepared by:

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Certification

I, Christopher Boron, certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this June 2025 Remedial Investigation/Alternatives Analysis (RI/AA) Work Plan for 22 Fillmore Avenue was prepared in accordance with applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Christopher Z. Boron, P.G.	6/17/2025	
NYS Professional Geologist #001017-01	Date	Signature

CHRISTOPHER Z. BORON
001017-01

1. Introduction

This document presents the proposed scope of work and implementation procedures for completion of a Remedial Investigation (RI) at 22 Fillmore Avenue (Site), located at 22 Fillmore Avenue, Tonawanda, New York (see Figures 1 and 2).

The Applicant, JC Tonawanda Tower QOZB LLC (JC Tonawanda), 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 planned redevelopment for the Site is a mixed-use building, with 128 residential apartments, 8,000 square feet of commercial space, street level parking, and greenspace/landscaping. The RI will be overseen by Roux Environmental Engineering and Geology D.P.C. (Roux; formerly Benchmark Civil/Environmental Engineering & Geology, PLLC and TurnKey Environmental Restoration, LLC who merged with Roux in July 2023), on behalf of the JC Tonawanda. The work will be completed in accordance with NYSDEC DER-10 guidelines (Ref. 1).

1.1 Site Background

The ±1.63-acre Site is located on the west side of Fillmore Avenue and is bordered by East Niagara Street the north; a commercial property identified as the Inner Harbor Yacht Club and Ellicott Creek to the south; Fillmore Avenue to the east; and East Niagara Street and Delaware Street to the west in the City of Tonawanda, Erie County, New York and consists of one (1) tax parcel: SBL No. 39.46-2-1.1.

The Site is currently improved with two (2) structures. An approximate 6,000 square foot vacant building (Building 1) is located within the central eastern portion of the Site (formerly 30 Fillmore Avenue) and an approximate 5,000 square foot vacant building (Building 2) in the southeastern corner of the Site (formerly 40 Fillmore Avenue), both which are planned to be demolished. Building 1 will be demolished prior to the RI activities to allow investigation activities to occur safely. The remainder of the Site is vacant (see Figure 2).

Historic operations across the Site included a coal and wood yard, boiler shop, welding operation, a repair shop, boat storage, junkyard, and former industrial uses. A gasoline underground storage tank (UST) was identified on historic Sanborn maps between the two existing structures to be demolished. Petroleum impacts were identified (NYSDEC Spill No. 220862) along with the presence of urban fill materials were identified through a previous investigation at the Site.

The historic use of the Site as commercial/industrial/junk yard operations including a gasoline UST has impacted the Site as evidenced by petroleum, SVOC, and metals concentrations detected during the previous investigation exceeding applicable regulatory guidelines for the planned re-use of the Site, specifically 6 NYCRR Part 375 Restricted Residential (RRSCOs) (Ref. 2). 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. The primary objectives of this RI are to:

- Collect additional on-Site media samples, under appropriate quality assurance/quality control criteria, to better delineate the nature and extent of contamination; and determine if contamination has and/or has potential to migrate off-site;
- Assess the groundwater flow direction and groundwater quality conditions at the Site;
- Determine if the concentrations of constituents of concern in soil, groundwater, and/or soil gas pose potential unacceptable risks via on-site and off-site qualitative exposure assessment in accordance with DER-10 Appendix 3b; and,
- Provide the data needed to evaluate potential remedial measures and determine appropriate actions to address potential significant risks.

As part of the RI, sampling data will be used to evaluate whether remedial alternatives can meet the cleanup objectives. The intended uses of these data dictate the confidence levels. Two (2) data confidence levels will be employed in the RI: screening level data and definitive level data. In general, screening level confidence will apply to field measurements, including photoionization detector (PID) measurements, groundwater elevation measurements, and field analyses (i.e., pH, temperature, dissolved oxygen (DO), oxygen-reduction potential (ORP), 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, JC Tonawanda, has applied to the New York State BCP as a non-responsible party (Volunteer) per ECL§27-1405. Roux will complete the RI and manage the brownfield cleanup on behalf of JC Tonawanda. Roux will also be responsible to verify and certify that the RI and remedial action(s) were completed in conformance with the approved RI work plan and NYSDEC DER-10 requirements. The NYSDEC Division of Environmental Remediation (Region 9), in consultation with the New York State Department of Health (NYSDOH) shall monitor the remedial investigation and remedial actions to be performed in accordance with the Brownfield Cleanup Agreement, the approved RI Work Plan, and NYSDEC DER-10 guidance (May 2010).

Roux personnel, as well as subcontractors, for this project have not been determined at this time. Once pricing is secured, subcontract agreements are in place, and a field schedule determined, résumés for the selected project team will be provided to the Department, if requested. Roux'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
JC Tonawanda Tower QOZB LLC	Applicant Contact	Joe Carubba	(716) 906-7042
Roux	Project Officer	Thomas H. Forbes, P.E.	(716) 856-0599
Roux	Principal and Project Manager	Christopher Boron	(716) 856-0599
Rupp Pfalzgraf, LLC	Project Attorney	Marc Romanowski	(716) 854-3400
TBD	Analytical Testing	TBD	TBD
TBD	Drilling Services	TBD	TBD
TBD	Excavation Services	TBD	TBD
Data Validation Services	Data Validation	Judy Harry	518-251-4429

2. Site Description

2.1 General

The Site is located on the west side of Fillmore Avenue and is bordered by East Niagara Street the north; a commercial property identified as the Inner Harbor Yacht Club and Ellicott Creek to the south; Fillmore Avenue to the east; and East Niagara Street and Delaware Street to the west. The Site is located in a highly developed mixed use residential and commercial area of the City of Tonawanda, Erie County, New York

The Site is currently improved with two (2) structures. An approximate 6,000 square foot vacant building is located within the central eastern portion of the Site (formerly 30 Fillmore Avenue) and an approximate 5,000 square foot vacant building in the southeastern corner of the Site (formerly 40 Fillmore Avenue), both which are planned to be demolished. The remainder of the Site is vacant (see Figure 2).

2.2 Site Topography and Drainage

The Site is generally flat lying with topographic relief sloping southwest toward Ellicott Creek and an upward sloping embankment in the northwestern covered by trees and brush towards Delaware Street and East Niagara Street. The surface of the Site is covered with a mixed vegetative cover (grass, brush, and small trees), asphalt and stone parking areas, and concrete building slabs. Precipitation (i.e., rain or melting snow) which does not infiltrate into the ground moves toward Ellicott Creek via overland flow. Surface and shallow groundwater flow are likely to the west/southwest toward Niagara River and Ellicott Creek; however, Erie Canal/Tonawanda Creek is also located to the north. Groundwater flow may also be affected by various cycles of development and filling, as well as utilities and foundations.

2.3 Geology and Hydrogeology

2.3.1 Overburden

According to the United States Department of Agriculture (USDA) Web soil survey, Site soils are characterized as Urban land-Niagara complex (Us). This complex consists of nearly level areas of urban land and somewhat poorly drained Niagara soils which consist of silty lake-laid deposits (Ref. 3). Soils within the City of Tonawanda are characterized as urban land (Ud, UmA, Us, Ut, and/or Uv) with the majority of soil surface covered by asphalt, concrete, buildings, or other impervious structures, typical of an urban environment.

The presence of overburden fill material is widespread and common throughout the City of Tonawanda. The previous investigation identified the Site geology consists of fill materials consisting of black fines (cinders) with various amounts of ash, brick, coal, slag, and concrete in the upper 2 to 4 fbgs. Apparent native soil encountered at the test pit locations consisted of olive gray or brown clays or sand, typical of this area, underly the soil/fill at the Site. The geology of the Site will be further investigated as part of the RI activities.

2.3.2 Bedrock

Based on the bedrock geologic map of Erie County, the Site is situated over the Camillus Shale Formation of the Upper Silurian Series (Ref. 4). The Camillus Shale Formation is comprised of gray shale containing large amounts of gypsum. The unit has an approximate thickness of 400 to 700 feet. Bedrock was not encountered during the previous investigation.

2.3.3 Hydrogeology

The Site is located within the Lake Erie-Niagara River major drainage basin, which is typified by little topographic relief, except in the immediate vicinity of major drainage ways. In the Erie-Niagara Basin, the major areas of groundwater are within coarser overburden deposits and limestone and shale bedrock. Groundwater flow in the area of the Site is likely westerly toward Ellicott Creek, consistent with topography in the vicinity of the Site; however, Erie Canal/Tonawanda Creek is located to the north of the Site. Local groundwater flow may be influenced by subsurface features such as utilities and localized subgrade development conditions. Groundwater was encountered at 4 of 12 test pit locations at depths ranging from 6 to 7 fbgs during the previous investigation. Localized on-Site groundwater flow will be investigated during the RI.

2.4 Climate

The City of Tonawanda has a cold continental climate, with moisture from Lake Erie causing increased precipitation. Average annual precipitation is reportedly 39.6 inches and snowfall is 84 inches. Average temperature is 48.5 degrees Fahrenheit. Winds are generally from the southwest (USClimateData.com).

2.5 Population and Land Use

The City of Tonawanda, encompassing 3.8 square miles, has a population of 15,129 (2020 US Census Bureau). The Site is located in Census Tract 74, in an area of the city zoned for residential, commercial, and recreational/community facilities uses.

The current zoning for the Site is C-M, which is General Commercial Services District The surrounding land use is mixed use, including residential, commercial, and recreational/community facilities.

2.6 Utilities and Groundwater Use

The subject property has access to all major public and private utilities, including potable water (Erie County Water Authority), sanitary and storm sewers (City of Tonawanda), electric (National Grid), and natural gas (National Fuel).

Groundwater at the Site is assigned Class “GA” by 6NYCRR Part 701.15. Currently, there are no deed restrictions on the use of groundwater at the Site; however, the City of Tonawanda does not allow the use of groundwater within the City limit and 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 to areas surrounding the Site

2.7 Wetlands and Floodplains

There are no State wetlands or floodplains located on Site or adjacent to the Site; however, the Site is surrounded by regulatory floodways to the north (Erie Canal/Tonawanda Creek) and south (Ellicott Creek). Erie Canal/Tonawanda Creek and Ellicott Creek (adjacent) are also classified as a Federal Riverine habitat (R2UBH) on the National Wetlands Inventory map as provided by the United States Fish and Wildlife Service and United States Geological Survey.

2.8 Previous Investigations

A summary of the investigation that has occurred at the Site is presented below. The previous investigation report is attached in Appendix B.

2.8.1 May 2022 - Phase II Environmental Investigation

TurnKey Environmental Restoration, LLC (TurnKey) completed a Phase II Environmental Investigation for the Site in May 2022. Below is a summary of the analytical results, observations, and conclusions as they relate to the Site:

- Twelve (12) test pits (designated TP-1 through TP-12) were completed across the Site to characterize and collect samples of soil/fill for analysis.

- Environmental impacts have been identified at the Site. VOCs above their respective CP-51 SCLs were identified in addition to visual and olfactory evidence of petroleum contamination in the vicinity of the gasoline UST, and Spill No. 2200862 was assigned by NYSDEC. Petroleum impacts were present on both the 30 and 40 Fillmore Avenue parcels; however, it is unknown if the UST or related piping is still present at the Site.

- Semi-volatile organic compounds (SVOCs) and metals were also detected in the fill material present across the Site (20, 30, and 40 Fillmore Avenue) at concentrations above their respective RRSCOs, which are applicable for the intended reuse of the Site. Fill material varies in depth up to 4 fbgs. The soil/fill material and any other contaminated material generated during redevelopment of the Site will require remediation and handling as contaminated soil. Additional characterization sampling will be required to confirm the soil/fill can be managed as non-hazardous waste.

- Based on the existing data and evidence of a petroleum release, the Site is a candidate for the BCP. The Site meets the definition of a BCP site per the current BCP law which states a “brownfield site or site shall mean any real property where a contaminant is present at levels exceeding the soil cleanup objectives or other health-based or environmental standards, criteria, or guidance adopted by the department that are applicable based on the reasonably anticipated use of the property, in accordance with applicable regulations.”

- Remedial work will be required to address the petroleum contamination identified on the 30 and 40 Fillmore Avenue parcels. Additionally, an electromagnetic survey should be completed to determine if the UST is still present in the ground. If the Site were to be accepted in to the BCP, the additional work required to assess for the presence of the UST and remediation of the petroleum contamination could be completed under the BCP, along with remediation of other soil contamination present at the Site.

A summary of previous investigation analytical results is provided on Table 1 and Figure 3.

In February 2023, six (6) additional test pits were collected in the western portion of the Site to assess the depths to native soil underlying the Site and to collect four (4) native soil samples to assess feasibility of achieving the Part 375 Unrestricted Soil Cleanup Objectives (USCOs).

Some of the test pits were completed along the embankment on the western portion of the Site, which is approximately 4 to 10 feet higher in elevation than the remainder of the Site. Native soil was encountered at depths of approximately 2 to 4 ft (compared to the ground surface elevation of non-embankment areas of the Site) and consistent with previous Phase II findings.

Figure 3 includes the locations of test pits (TP-13 through TP-18). Table 1 includes the results of the native soil samples collected for VOC, SVOC, and metals analysis. The laboratory analytical report for the native soil samples is included in Appendix B.

2.9 Primary Constituents of Potential Concern (COPCs)

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

- ***Soil:*** Petroleum VOCs (pVOCs); SVOCs, specifically polycyclic aromatic hydrocarbons (PAHs); and metals

3. Remedial Investigation Scope of Work

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

Field team personnel will collect environmental samples in accordance with the rationale and protocols described in the QAPP in Section 5. United States Environmental Protection Agency (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. Data submittals will be provided to the NYSDEC in accordance with the most current electronic data deliverables (EDD) protocols.

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

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 2.

3.1 Preparation Activities

3.1.1 Utility Clearance

Prior to any intrusive activities, Dig Safely New York (Call 811) will be contacted by the site contractor a minimum of three (3) 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.

3.1.2 Former 30 Fillmore Avenue Building Demolition

Prior to intrusive activities, the building on the former 30 Fillmore Avenue will be demolished due to its dilapidated condition and allow safe access to investigate beneath the building slab. The City of Tonanwanda has issued a Notice of Condemnation (see Appendix F). A pre-demolition asbestos inspection was completed on the building, also included on Appendix F. Asbestos containing materials were identified in materials that were sampled.

A copy of the City of Tonanwanda Demolition Permit will be provided to the NYSDEC prior to the start of demolition activities, which will be completed in accordance with local, state, and federal laws. Third-party asbestos air monitoring will be performed during the demolition activities. The Department will be notified at least 7 days prior to the start of the demolition activities.

3.2 RI Soil/Fill Investigation

A soil/fill investigation will be completed across the Site to further assess whether additional impacts exist beyond the limits of, and to assess the extent of, known historical contamination. The subsurface soil/fill investigation will include the completion of test pits on exterior portions of the Site and soil borings within the footprints of the current buildings to allow for characterization of subsurface soil/fill material and sample collection. Building 1 will be demolished prior to the start of the RI, to allow RI activities to safely occur. A copy of the demolition permit will be provided to NYSDEC prior to the start of the demolition. Soil borings will occur within Building 2 in its current condition.

A geophysical survey (electromagnetic) will be completed to assess for the presence of a potential UST in the area of petroleum contamination.

A gamma radiation walkover survey will be completed in accessible areas of the Site due to the identification of slag during previous investigations to assess for technologically enhanced naturally occurring radioactive material (TENORM).

The proposed RI sample and survey locations are presented on Figure 4 and Figure 5 and the sampling and analytical program is presented on Table 2.

3.2.1 Geophysical Survey

A geophysical survey will be completed with an EM-61 to assess for the presence of ferrous and nonferrous metallic objects (e.g., metal UST) at the Site. A reference grid will be established to facilitate data acquisition along parallel survey lines spaced approximately 3 feet apart. Data will be recorded digitally by a data logger at a rate of approximately 2 measurements per foot along the survey lines and used to plot an isopleth map. Areas exhibiting responses greater than background likely contain buried metals, and will be identified as anomalies. The anomalies will be assessed with test pits to determine if a potential UST(s) or metallic object is present.

3.2.2 Radiological Walkover Survey

A radiological survey will be completed across the entire Site (see Figure 2) to assess if materials containing gamma radiation are present at levels above background. The survey will consist of a walkover/gamma scan of the ground surface of the Site. The walkover survey will be completed by a firm licensed in the State of New York to perform radiological services.

Background levels to be used for comparative purposes will be established using the criteria set forth in Attachment A of the NYSDEC DMM-5/Management of Soil Contaminated with Technologically-Enhanced Naturally Occurring Radioactive Materials (TENORM) (Ref. 11). The Site is in an urban area (City of Tonawanda) and covered with soil containing fill material, therefore the appropriate background levels will be established in conjunction with NYSDEC.

A Ludlum model #2221 gamma scintillator with a # 44-10 probe (2x2 meter) or equivalent equipment will be used to perform the survey. Areas where elevated readings are noted (generally greater than 1.5 times background level), will be considered indicative of potential radiation impact, noted on a drawing, and will be further assessed.

The additional assessment will consist of evaluation/screening by the NYS licensed radiological consultant.. Areas identified with elevated readings will be assessed via test pits. If slag material is encountered, representative slag material will be sampled for Radium-226 via Method 901.1M using a 21-day ingrowth. The focus of the additional assessment will be on slag material and will not include general soil/fill and/or native soil. The results of the slag analysis will be used to determine potential disposal requirements, as material containing TENORM is prohibited from disposal in NYS per NYCRR Part 363-7.1(o)(7) (Ref. 12).

3.2.3 Surface Soil/Fill Investigation

Five (5) surface soil/fill samples, identified as SS-1 through SS-5, are proposed as part of the RI. The surface soil samples will be collected from 0 to 2 inches below the vegetative cover. Based on the historic investigation, the soil/fill present above the native soil is impacted and will be removed to achieve the planned cleanup objectives (Unrestricted Track 1 cleanup). Additionally, the majority of the Site will be covered with building footprint and/or asphalt parking lot and the limited greenspace/vegetative areas will be constructed during redevelopment. The surface soil/fill samples are planned for areas at the Site with existing soil/greenspace.

3.2.4 Subsurface Soil/Fill Investigation

Subsurface soil/fill exploratory test pits (TP) and soil borings (SB) will be completed as part of the RI. These investigation locations will be completed as follows:

Test Pits – Thirteen (13) TPs, identified as TP-19 through TP-31, as shown on Figure 4, will be excavated across the Site to further delineate the extent of the known PAHs and metals contamination across the Site, and to determine if other impacts requiring remediation are present at the Site. The TPs will also be used to assess the findings of the geophysical survey and radiological walkover survey as discussed above.

TPs will be excavated at least 5 feet into native soil, with up to five (5) of the TPs extending to 15 fbgs or refusal, whichever comes first, to adequately assess subsurface lithologies and conditions at the Site. The TPs will be sampled for PAHs and metals in the depth interval directly below the fill materials. The TP observations and the soil/fill data collected will allow refinement of the impacted soil/fill volumes that will need to be removed.

- Fill material and native soils (i.e., two (2) samples from each TP) from six (6) of the 13 TPs will be sampled for full suite analyses to determine if other impacts beyond the known PAHs and metals are present at the Site.

- Due to the elevated levels of pVOCs and lead detected at TP-1 (3-6 fbgs) and TP-6 (0.5-2 fbgs), this area will be further investigated to determine the limits of the petroleum-impacted soil/fill to be removed as part of remedial action.

Soil Borings – Eight (8) soil borings, identified as SB-1 through SB-4 and MW-1 through MW-4, will be completed to allow for characterization of subsurface soil/fill within the two (2) existing building footprints; and allow monitoring wells MW-1 through MW-4 to be installed (as discussed in Section3.3). Soil borings will be completed in the vicinity of vaults, pits, and/or drains identified within the footprints of the buildings. If the vaults, pits, and/or drains contain solids, sludge, and/or oily materials, these materials will be field screened with a PID and a sample of the material will be collected from the structure.

Soil/fill samples retrieved from the TPs and SBs will be field screened for the presence of total volatile organics using a calibrated PID with a 10.6 eV lamp to identify potential impacts in soil/fill samples for laboratory analysis. If PID measurements are noted above 5 ppm, a sample will be collected for VOC analysis from interval exhibiting the highest measurement.

Upon reaching the completion depth of each location, field visual/olfactory and PID results will be reviewed to determine the interval to be sampled. If either no impacts are identified, or the impacts are ubiquitous from grade to final depth, the soil/fill sample will be collected from the fill materials overlying native soil/fill materials were previously observed to depths of approximately 2 to 4 fbgs. If differentiable impacts are noted within a TP or SB location during the investigation, additional sample interval(s) will be collected. The Department will be made aware of the differing impacts if/when they are encountered. If significant field evidence of impact is encountered (gross contamination), TPs will be expanded, or supplemental step-back TPs will be completed to delineate the extent of the impacts.

Soil/fill generated from the TP excavations and monitoring well installations during the RI will be handled in accordance with DER-10 3.3 (e) 1. Spoils will be staged adjacent to the TP or monitoring well locations and will generally be placed back into the TP or boring hole in the order they were removed. If gross contamination, as defined by Part 375-1.2, is encountered, it will be staged on polyethylene sheeting and covered with polyethylene sheeting for subsequent characterization and disposal.

3.2.5 Soil/Fill Sample Collection and Analysis

Table 2 summarizes the proposed sample collection and analytical program. Waste characterization samples will also be collected for analysis.

Surface Soil

The five (5) surface soil samples will be collected and analyzed as part of the RI, which will include Target Compound List (TCL) SVOCs plus tentatively identified compounds (TICs), Target Analyte List (TAL) metals, TCL polychlorinated biphenyls (PCBs), TCL pesticides/herbicides, polyfluoroalkyl substances (PFAS), and 1,4-dioxane. If elevated PID readings are noted during field screening, VOC samples may be collected in consultation with the Department. The soil/fill samples will be analyzed in accordance with USEPA SW 846 methodology with equivalent Category B deliverables to allow for independent third-party data usability assessment.

Fill Material

One (1) sample from each of the thirteen (13) TPs and four (4) SBs will be collected from the fill materials and analyzed for TCL SVOCs plus TICs and TAL metals. Fill materials from six (6) of the eleven (11) TPs and the two (2) SBs will be analyzed for the full suite of parameters, which includes TCL VOCs plus TICs, TCL SVOCs plus TICs, TAL metals, TCL PCBs, TCL pesticides/herbicides, PFAS, and 1,4-dioxane. If RI soil samples identify additional contaminants of concern beyond the known PAHs and metals, Roux will collect additional end-point confirmatory samples either prior to or during remedial excavation(s).

Native Soil

One (1) native soil sample will be collected from each of the thirteen (13) TPs, four (4) SB locations, and four (4) MW locations from the native material directly beneath fill material and analyzed for TCL SVOCs plus TICs and TAL metals. Native soil from six (6) of the 13 TPs and one (1) of the 4 SBs will be analyzed for the full suite of parameters, which includes TCL VOCs plus TICs, TCL SVOCs plus TICs, TAL metals, TCL PCBs, TCL pesticides/herbicides, PFAS and 1,4-dioxane. These samples will serve as both investigation and end-point confirmatory samples.

En-core samplers will be used to collect RI VOC soil samples as described in Method 5035. Remaining samples will be collected and placed into 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.

Waste Characterization Samples

Ten (10) waste characterization samples will be collected at the time of the investigation and analyzed for toxicity characteristic leaching procedure (TCLP) VOCs, TCLP SVOCs, TCLP metals, PCBs, ignitability, corrosivity, and reactivity to fulfill landfill analytical disposal requirements.

3.3 Groundwater Investigation

Four (4) groundwater monitoring wells, identified as MW-1 through MW-4, will be advanced at the Site to assess groundwater quality data and flow direction. The groundwater wells will be installed into the uppermost water bearing zone. Based on the previous investigation, the upper water beating zone is present approximately 6 to 7 fbgs, which is consistent with the water level of Ellicott Creek, adjacent to the Site, relative to Site grades. If multiple water bearing zones are encountered within the depth of investigation (i.e., 15 fbgs unless soil/fill contamination requires investigation deeper than 15 fbgs) additional monitoring wells may be needed to assess additional water bearing zones and/or groundwater flow direction, based on RI findings. This will be determined in consultation with the Department.

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.

3.3.1 Monitoring Well Installation

The monitoring wells will be installed following the advancement of four (4) soil borings at the locations of MW-1 through MW-4 with a rotary drill rig. Each well boring will be advanced to a target minimum depth of five (5) feet below the first encountered groundwater. In the absence of groundwater contact during boring advancement in overburden soil, the soil boring will be advanced into bedrock, if necessary. 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 well will be constructed with two (2)-inch diameter Schedule (SCH) 40 PVC with a minimum five (5)-foot flush joint SCH 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 two (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. A typical monitoring well detail is provided on Figure 4.

Drill cuttings will be staged on-site on poly sheeting and covered with poly sheeting and will be removed for off-site disposal with the removal of the on-site fill materials during remedial activities. If gross contamination, as defined by Part 375-1.2 is encountered, drill cuttings will be placed in sealed NYSDOT-approved drums and labeled for subsequent characterization and disposal.

3.3.2 Well Development

After installation, but not within 24 hours, newly installed monitoring wells will be developed in accordance with Roux and NYSDEC protocols. Development of the monitoring wells will be accomplished with dedicated disposable high-density polyethylene (HDPE) or PVC bailers via surge and purge methodology. Field parameters including pH, temperature, DO, ORP, specific conductance, and turbidity 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 (3) well volumes will be evacuated from each monitoring well. Development water from the monitoring wells will be containerized in NYSDOT-approved drums and labeled per monitoring well location. Based on the RI groundwater analytical results, it will be determined, in consultation with the Department, if the containerized development water is acceptable for surface discharge or requires subsequent on-Site treatment and/or off-Site disposal.

3.3.3 Groundwater Sample Collection

Prior to sample collection, at least one (1) week after development, static water levels will be measured and recorded from all on-Site monitoring wells to facilitate the preparation of a Site-wide isopotential map. Following water level measurement, field personnel will purge and sample monitoring wells using a submersible pump with dedicated pump tubing following low-flow/minimal drawdown purge and sample collection procedures. In the event of pump failure or the saturated unit does not permit the proper implementation of low-flow sampling, a disposable HDPE or PVC bailer will be used to purge and sample the well. Prior to sample collection via low-flow methodology, groundwater will be evacuated from each well at a low-flow rate (typically less than 0.1 L/min) while maintaining a generally consistent water level. Field measurements for pH, temperature, DO, ORP, specific conductance, turbidity and water level, as well as visual and olfactory field observations will be periodically recorded and monitored for stabilization. Low-flow purging will be considered complete when field parameters stabilize and when turbidity measurements fall below 50 Nephelometric Turbidity Units (NTU) or become stable above 50 NTU regardless of volume purged. Purging via disposable bailer, if necessary, will be considered complete following the removal of three well volumes and field parameter stabilization or to dryness, whichever occurs first. In general, 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.

Groundwater sampling methods will conform with protocols acceptable for the collection of the PFAS in accordance with the NYSDEC's April 2023 Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) (Ref. 5) and Roux's *(PFAS Groundwater/Surface Water Sample Collection Procedures)* Field Operating Procedure (FOP; see Appendix C). Sampling personnel will wear nitrile gloves while handling empty sample containers, filling sample containers, sealing sample containers, and placement into sample coolers. Sample collection methods that will be implemented during the RI include:

Submersible Pump with Dedicated Pump Tubing

> Monitoring wells will be purged and sampled using a non-dedicated plastic submersible pump and dedicated HDPE or PVC 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.

Disposable Bailer

> If low flow is not feasible (e.g., due to depth to groundwater), wells of any depth (up to 100 fbgs) may be purged and sampled using a disposable HDPE or PVC bailer via direct grab. In general, a bottom filling dedicated 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, DO, ORP, 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, temperature, DO, ORP, specific conductance, turbidity, and water level, as well as visual and olfactory field observations, will be recorded. All collected groundwater samples will be placed in pre-cleaned, pre-preserved laboratory provided sample bottles, cooled to 4°C in the field, and transported under chain-of-custody command to a NYSDOH-approved laboratory for analysis.

3.3.4 Groundwater Sample Analyses

The four (4) groundwater wells will be sampled for TCL plus CP-51 List VOCs plus TICs, TCL SVOCs plus TICs, TAL Metals, PCBs, pesticides, herbicides, 1,4-dioxane, and PFAS. Groundwater samples will be collected and analyzed in accordance with USEPA SW 846 methodology with equivalent NYSDEC Category B deliverables to allow for independent third-party data usability assessment.

Samples collected for 1,4-dioxane will be analyzed via EPA Method 8270 Selective Ion Monitoring (SIM) mode and samples collected for PFAS analysis will be analyzed by using methodologies based on EPA Method 1633 to achieve applicable reporting limits (see Table 3).

Based on the results of the initial round of groundwater samples collected from the Site, Roux will discuss the results and need for additional groundwater sampling with NYSDEC and determine which monitoring wells and/or parameters need to be reevaluated.

3.4 Soil Vapor Investigation

Four (4) soil vapor samples, identified as SV-1 through SV-4, will be collected from within the Site as shown on Figure 4. Soil vapor sampling probes will be installed in general conformance with the NYSDOH Soil Vapor Intrusion Guidance (Ref. 6)

Each soil vapor sampling probe will be manually installed using specialized stainless-steel soil probe rods. Sampling equipment includes 6-inch long sampling screens, ¼-inch inside diameter inert sample tubing and dedicated 6-liter Summa canisters. Soil boreholes will be advanced to a depth up to 5 fbgs (depending on depth to groundwater observed during advancement of soil borings) using ¾-inch inside diameter steel rods. The steel rod will be equipped with an anchor point at the driving end of the rod. The anchor point will be connected to the sampling screen and tubing on the inside of the steel rod. Once the steel rod is advanced to the target depth, the steel rod will be retracted, leaving the anchor point, sampling screen and sampling tubing within the borehole annulus. Glass beads will be poured around the sampling screen in a manner to cover the entire length of the sampling screen (e.g., 1-2 feet depth range). Bentonite or bentonite/soil mixture will be placed above the glass beads to the ground surface to create a seal to prohibit infiltration of ambient air into the sampling area.

Once the sample probes are installed, the probe and tubing will be purged (three (3) volumes) using a calibrated syringe as required by NYSDOH guidance and helium tracer gas will be used during the purging phase (in the same manner as recommended for soil vapor probes) to ensure that the probes are well sealed. Samples will be collected over an approximate 4-hour period. All soil vapor samples will be collected and analyzed by EPA Method TO-15. This method employs a 6-liter, passivated (inert), stainless-steel, evacuated sampling sphere for collecting the air samples. The canister is received from the laboratory, certified clean, evacuated, and prepared for sampling. The pressure in the canister is approximately 50 millitorr (compared to 760 torr of pressure in the atmosphere at sea level).

Each canister will be fitted with a sampling valve that uses a critical orifice and mass flow controller to regulate the airflow into the canister for the selected sampling period. The mass flow controller will maintain a relative constant airflow rate throughout the sampling period. 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.

Samples will be shipped to the laboratory within two days of sampling so that no sample will exceed the 30-day holding time (since receipt from the lab) required by Method TO-15. Full chain of custody will be maintained for all canisters from time of shipping from the laboratory to time of analysis by the laboratory.

An outdoor air sample (OA-1) will also be collected concurrent with the three (3) soil vapor samples. The outdoor field-located air sample will be collected from approximate 3 to 5 feet above ground surface at an upwind location, as determined on the day of soil vapor sampling activities. The outdoor air sample canister will also be equipped with a 4-hour regulator to allow the sample to be collected over the same approximate 4-hour period, as the soil vapor samples.

3.5 Field Specific Quality Assurance/Quality Control Sampling

In addition to the 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, trip blanks, and equipment blanks.

3.6 Decontamination and Investigation-Derived Waste Management

Every attempt will be made to utilize dedicated sampling equipment during the RI, however if non-dedicated equipment is required and/or used, the equipment will be decontaminated, at a minimum, with a non-phosphate detergent (i.e., Alconox®) and potable water mixture, rinsed with distilled water, and air-dried before each use in accordance with Roux's field operating procedures presented in Appendix C. All decontaminated sampling equipment will be kept in a clean environment prior to sample collection. Heavy equipment, such as an excavator (if used) and drilling tools, will be decontaminated by the subcontractor, as necessary.

RI generated drilling spoils, groundwater, decontamination rinse water, or other Investigative-Derived Waste (IDW) not exhibiting gross contamination (i.e., visible product, odor, sheen, etc.) will be either returned to the borehole from which it was removed (soil/fill) or discharged to the ground surface (groundwater and rinse water) if it can infiltrate the ground in the vicinity from which it was generated. IDW materials exhibiting gross contamination will be placed in sealed NYSDOT-approved drums and labeled for subsequent characterization and disposal. All generated IDW drums will be labeled alpha-numerically with regard to contents, origin, and date of generation using a paint stick marker on two sides and the top of each drum. Characterization analytical results of containerized IDW material will be used to determine if spoils can be returned to the ground surface, utilized on-Site, or require treatment and/or off-Site disposal. Drums will be securely staged on-site pending characterization analyses and remedial measures assessment. Field personnel will coordinate the on-site handling and temporary storage of IDW drums, including transportation, characterization sampling, and offsite disposal arrangements, as necessary.

Discarded personal protective equipment (PPE) (i.e., latex gloves, Tyvek, paper towels, etc.) and disposable sampling equipment (i.e., bailers or stainless-steel spoons) will be placed in sealed plastic garbage bags and disposed of as municipal solid waste.

3.7 Site Mapping

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

3.8 Documentation

RI field activities will be documented in a Project Field Book and/or Field Activity Daily Logs. This will provide a record of activities conducted at the Site. Entries will be signed and dated at the end of each day of fieldwork (or as produced) by the Field Team Leader. Field notes will include, at a minimum, the: date and time of all entries, names of personnel on site, weather conditions (temperature, precipitation, etc.), location of activity, and description of activity. Sampling activities will be logged and photographed as necessary to document the activities at the Site. Progress photographs from a set location will be collected to document development activities and intrusive construction activities. Field personnel will, at a minimum, complete the following standard field forms (see Appendix D):

- Chain of Custody Form (per selected laboratory)
- Equipment Calibration Log
- Field Activity Daily Log (FADLs)
- Field Borehole/Monitoring Well Log
- Groundwater Field Form

- Investigative-Derived Waste Container Log (if necessary)
- Photographic Log
- Real-Time Air Monitoring Log
- Tailgate Safety Meeting Form
- Test Pit Excavation Log
- Problem Identification Report (as necessary)
- Corrective Measures Report

4. Quality Assurance Project Plan

A Quality Assurance Project Plan (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 (Ref. 7); the EPA Region II CERCLA Quality Assurance Manual (Ref. 8), 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 Site include: the NYSDEC, NYSDOH, JC Tonawanda (Volunteer), Roux (Volunteer's Consultants), the test pit and drilling subcontractor(s), the independent environmental laboratory, and the independent third-party data validator. Roles, responsibilities, and required qualifications of these organizations are discussed in the following subsections. Resumes are included in Appendix A.

4.2.1 Volunteers

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

4.2.2 Environmental Consultant

Roux is the prime environmental engineering and scientific consultant on this project and responsible for the implementation of the RI Work Plan, including, but not limited to, field operations, laboratory testing, data management, data analysis and reporting. Any one member of Roux'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.

Project Officer (PO): *Thomas H. Forbes, P.E.*

The PO has the responsibility for ensuring conformance with the BCP program requirements. The PO will report directly to the Applicant and the NYSDEC/NYSDOH Project Coordinators and is responsible for project oversight. The PO will:

- Define project objectives and develop a detailed work plan schedule.
- Acquire and apply technical and corporate resources as needed to assure performance within budget and schedule constraints.
- Review the work performed on the project to assure its quality, responsiveness, and timeliness.
- Certify deliverables before their submission to NYSDEC.\

Principal & Project Manager (PM):Christopher Boron, P.G.

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

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

FTL/SSHO: *Paul W. Werthman, P.G.*

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

- Define daily work activities.
- Orient field staff concerning the project's special considerations.
- Monitor and direct subcontractor personnel.
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness.
- 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 Roux's 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, P.E.*

  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

Roux 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 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 (see Table 3).

The general level of QC effort will be one (1) field (blind) duplicate and one (1) 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 (1) trip blank consisting of distilled, deionized water will be included along with each sample delivery group of aqueous VOC samples and one (1) equipment blank will be collected during PFAS sample collection.

4.7 Sampling and Analysis Plan

Methods and protocol to be used to collect environmental samples (i.e., soil/fill and groundwater) for this investigation are described in the Roux Field Operating Procedures (FOPs), summarized on Table 5 and presented electronically in Appendix C.

The number and types of environmental samples to be collected is summarized on Table 2. Sample parameter lists, holding times and sample container requirements are summarized on Table 3. The sampling program and related site activities are discussed below. To the extent allowed by existing physical conditions at the facility, sample collection efforts will adhere to the specific methods presented herein. If alternative sampling locations or procedures are implemented in response to facility specific constraints, each will be selected on the basis of meeting data objectives. Such alternatives will be approved by NYSDEC before implementation and subsequently documented for inclusion in the project file.

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 C, 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 secure 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, 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, 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).

4.7.5 Split Sampling

The Department may split any soil, groundwater, or collect additional air samples at the Department’s expense, during this RI. Roux personnel will cooperate with the Department to facilitate split sampling, as requested.

4.8 Calibration Procedures and Frequency

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

4.8.1 Field Instrument Calibration

Quantitative field data to be obtained during groundwater sampling include pH, turbidity, specific conductance, temperature, and depth to groundwater. Quantitative water level measurements will be obtained with an electronic sounder or steel tape, which require no calibration. Quantitative field data to be obtained during soil sampling include screening for the presence of volatile organic constituents using a PID.

FOPs located in Appendix C 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

Field procedures for collecting and preserving groundwater and soil samples are described in FOPs located in Appendix C. A summary of the FOPs is presented on Table 5.

4.9.1 Field Instrument Calibration

Field procedures for collecting and preserving groundwater and soil samples are described in FOPs located in Appendix C. A summary of the FOPs is presented on Table 5.

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 C. 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* (Ref. 3), and Contract Laboratory Program*, National Functional Guidelines for Inorganic Data Review* (Ref. 4). 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. Investigation Support Documents

5.1 Health and Safety Protocols

Roux 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 E, includes the following site-specific information:

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

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

Health and safety activities will be monitored throughout the field investigation and remediation. 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

Real-time community air monitoring will be performed during the RI and IRM activities at the Site. A CAMP is included within Roux's HASP (see Appendix E). Particulate and VOC monitoring will be performed along the downwind perimeter of the work area during RI test pitting, RI boring, IRM excavation, 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 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. Roux will support NYSDEC's community relations activities, as necessary. A Citizen Participation Plan will be prepared by Roux 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. Reporting

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

6.1 Remedial Investigation Reporting

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

- Introduction and background;
- A description of the site and the investigation areas;
- A description of the field procedures and methods used during the RI;
- The collection of geospatial data and presentation of investigation drawings detailing the investigation locations, potential areas of concern, presence of buildings, and subgrade utilities.
- A discussion of the nature and rationale for any significant variances from the scope of work described in this RI/AA Work Plan;
- The data obtained during the RI and historical investigation, considered by Roux to be of useable quality, including geochemical data, field measurements, validated analytical results, etc;
- Comparative criteria that may be used to calculate cleanup levels during the AA process, such as NYSDEC Soil Cleanup Objectives and other pertinent regulatory standards or criteria;
- A discussion of contaminant fate and transport. This will provide a description of the hydrologic parameters of the Site, and an evaluation of the lateral and vertical movement of groundwater;
- Conclusions regarding the extent and character of environmental impact in the media being investigated;
- The conclusions of the on-site and off-site qualitative human health and environmental exposure assessment, including a Fish and Wildlife Resources Impact Analysis(see Appendix G for Fish & Wildlife Impact Analysis Decision Key and Figure 5), will be completed in accordance with DER-10; and
- Supporting materials for RI data. These will include boring logs, monitoring well construction diagrams, laboratory analytical reports, and similar information.

In addition, Roux will require third-party analytical data review by a qualified, independent data validation expert for the RI and historic investigation data. Specifically, a Data Usability Summary Report (DUSR) will be prepared, with appropriate data qualifiers added to the results. The DUSR will follow NYSDEC format per the NYSDEC's September 1997 DUSR guidelines and May 2010 DER-10 guidance. The DUSR and any necessary qualifications to the data will be appended to the RI report. Validated data will be provided in an electronic data deliverable (EDD) and upload to NYSDEC's EQuIS database.

7.2 Alternatives Analysis (AA)

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 (RAOs) 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 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 375-1.8(f) and DER-10-4.2:

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

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..

7. Project Schedule

Figure 6 presents an estimated project schedule for the RI and major environmental tasks to be performed.

8. References

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

2. New York State Department of Environmental Conservation. *6 NYCRR Part 375 Environmental Remediation Programs*. December 2006.

3. United States Department of Agriculture (USDA), Soil Conservation Service. *Soil Survey of Erie County, New York*. December 1986.

4. Edward Buehler and Irving Tesmer. *Geologic Map of Erie County, N.Y. Bedrock Geology*. 1963.

5. New York State Department of Environmental Conservation. *Sampling, Analysis, and Assessment of Per- And Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs.* April 2023.

6. NYS Department of Health. *The Guidance for Evaluating Soil Vapor Intrusion in the State of New York.* October 2006, and subsequent updates.

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

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

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

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

11. New York State Department of Environmental Conservation. *DMM-5 / Management of Soil Contaminated with Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM).* October 27, 2023.

12. New York State Department of Environmental Conservation. *6 NYCRR Part 363 Landfills.* September 2018.

TABLES

TABLE 1
SUMMARY OF SOIL/FILL SAMPLE ANALYTICAL RESULTS
REMEDIAL INVESTIGATION/INTERIM REMEDIAL MEASURES/ALTERNATIVES ANALYSIS WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Parameter [1]	CP-51 SCLs[2] & Unrestricted SCOs[3] (mg/kg)	Restricted-Residential SCOs[4] (mg/kg)	Commercial SCOs[4] (mg/kg)	Industrial SCOs[4] (mg/kg)	Sample Location (Depth)											
					TP-1 (0-1.5 FT) 30 Fillmore	TP-1 (3-6 FT) 30 Fillmore	TP-3 (1-3.5 FT) 40 Fillmore	TP-4 (0-2 FT) 30 Fillmore	TP-6 (0.5-2 FT) 40 Fillmore	TP-10 (0-2 FT) 30 Fillmore	TP-11 (0-2 FT) 20 Fillmore	TP-12 (0.5-4 FT) 20 Fillmore	TP-13 Native	TP-14 Native	TP-16 Native	TP-18 Native
					Fill								Native			
					4/26/2022								2/2/2023			
TCL Volatile Organic Compounds (VOCs) - mg/kg [5]																
1,3,5-Trimethylbenzene	**8.4**	**52**	**190**	**380**	0.02	**14**	--	--	--	--	--	--	ND	ND	ND	ND
1,2,4-Trimethylbenzene	**3.6**	**52**	**190**	**380**	0.018	**33 D**	--	--	--	--	--	--	ND	ND	ND	ND
Acetone	**0.05**	**100**	**500**	**1000**	ND	ND	--	--	--	--	--	--	0.016	ND	0.0075 J	0.0062 J
Benzene	**0.06**	**4.8**	**44**	**89**	0.0086	0.054	--	--	--	--	--	--	ND	ND	ND	ND
Cyclohexane	**--**	**--**	**--**	**--**	0.0033 J	2.9	--	--	--	--	--	--	ND	ND	ND	ND
Ethylbenzene	**1**	**41**	**390**	**780**	0.0076	**7.3**	--	--	--	--	--	--	ND	ND	ND	ND
Isopropylbenzene (Cumene)	**--**	**--**	**--**	**--**	0.0046	3	--	--	--	--	--	--	ND	ND	ND	ND
Methylcyclohexane	**--**	**--**	**--**	**--**	0.017	32 D	--	--	--	--	--	--	ND	ND	ND	ND
m,p-Xylene	**--**	**--**	**--**	**--**	0.014	18	--	--	--	--	--	--	ND	ND	ND	ND
n-Butylbenzene	**12**	**100**	**500**	**1000**	0.00076 J	2	--	--	--	--	--	--	ND	ND	ND	ND
n-Propylbenzene	**3.9**	**100**	**500**	**1000**	0.0031	**4.9**	--	--	--	--	--	--	ND	ND	ND	ND
o-Xylene	**--**	**--**	**--**	**--**	0.0025	2.1	--	--	--	--	--	--	ND	ND	ND	ND
p-Isopropyltoluene	**--**	**--**	**--**	**--**	0.0021	11	--	--	--	--	--	--	ND	ND	ND	ND
sec-Butylbenzene	**11**	**100**	**500**	**1000**	0.0018	2.3	--	--	--	--	--	--	ND	ND	ND	ND
Styrene	**100**	**100**	**500**	**1000**	ND	ND	--	--	--	--	--	--	0.00025 J	ND	ND	0.00027 J
Toluene	**0.7**	**100**	**500**	**1000**	0.0048	0.32	--	--	--	--	--	--	0.0015	0.0015	0.0012	0.0012
Xylenes, Total	**0.26**	**100**	**500**	**1000**	0.0165	**20.1**	--	--	--	--	--	--	ND	ND	ND	ND
TCL Semi-Volatile Organic Compounds (SVOCs) - mg/kg [5]																
Acenaphthene	**20**	**100**	**500**	**1000**	0.029 J	ND	0.13 J	1.1	ND	ND	0.046 J	0.14 J	ND	ND	ND	ND
Acenaphthylene	**100**	**100**	**500**	**1000**	ND	ND	0.54 J	ND	ND	0.072 J	0.17	0.82	ND	ND	ND	ND
Anthracene	**100**	**100**	**500**	**1000**	0.14	ND	0.32	4.1	0.044 J	0.058 J	0.26	1.4	ND	ND	ND	ND
Benzo(a)anthracene	**1**	**1**	**5.6**	**11**	0.74	ND	**1.5**	**4.8**	0.23	0.34	**1.2**	**3.9**	ND	ND	ND	ND
Benzo(a)pyrene	**1**	**1**	**1**	**1.1**	0.75	ND	**2.2**	**3.2**	0.33	0.35	**1.1**	**4**	ND	ND	ND	ND
Benzo(b)fluoranthene	**1**	**1**	**5.6**	**11**	0.9	ND	**2.2**	**4**	0.32	0.48	**1.5**	**5.1**	ND	ND	ND	ND
Benzo(g,h,i)perylene	**100**	**100**	**500**	**1000**	0.6	ND	1.5	1.7	0.26	0.29	0.7	2.7	ND	ND	ND	ND
Benzo(k)fluoranthene	**0.8**	**3.9**	**56**	**110**	0.33	ND	0.59	**1.2**	0.1 J	0.16	0.43	**1.1**	ND	ND	ND	ND
Chrysene	**1**	**3.9**	**56**	**110**	0.73	ND	**1.3**	**4.1**	0.18	0.37	**1.2**	**4**	ND	ND	ND	ND
Dibenzo(a,h)anthracene	**0.33**	**0.33**	**0.56**	**1.1**	0.11 J	ND	**0.34**	**0.45 J**	0.052 J	0.053 J	0.16	**0.52**	ND	ND	ND	ND
Fluoranthene	**100**	**100**	**500**	**1000**	1.5	ND	2.3	11	0.27	0.72	2.6	8.6 D	ND	ND	ND	ND
Fluorene	**30**	**100**	**500**	**1000**	0.032 J	ND	0.1 J	2.1	ND	0.023 J	0.062 J	0.24	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	**0.5**	**0.5**	**5.6**	**11**	**0.64**	ND	**1.8**	**2**	0.3	0.31	**0.82**	**3**	ND	ND	ND	ND
Naphthalene	**12**	**100**	**500**	**1000**	0.25	2.1	0.29	0.63 J	ND	0.13 J	0.21	0.33	ND	ND	ND	ND
Phenanthrene	**100**	**100**	**500**	**1000**	0.57	ND	1.2	14	0.14	0.37	1.2	7.4	ND	ND	ND	ND
Pyrene	**100**	**100**	**500**	**1000**	1.2	ND	1.9	7.9	0.24	0.6	2.1	8.6	ND	ND	ND	ND
TAL Metals - mg/kg [6]																
Aluminum	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	9410	8480	9950	8090
Antimony	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	0.359 J	0.809 J	1.12 J	0.628 J
Arsenic	**13**	**16**	**16**	**16**	6.51	4.24	3.59	4.82	5.06	5.27	7.8	2.8	1.72	6.91	10.6	6.53
Barium	**350**	**400**	**400**	**10000**	84.9	29.5	90.1	40.3	60.2	157	127	56.6	58.3	31.9	23.9	21.6
Beryllium	**7.2**	**72**	**590**	**2700**	--	--	--	--	--	--	--	--	0.282 J	0.466 J	0.453 J	0.35 J
Cadmium	**2.5**	**4.3**	**9.3**	**60**	0.482 J	0.273 J	0.254 J	0.61	0.322 J	1.06	1.82	0.252 J	ND	ND	ND	ND
Calcium	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	1570	2040	2120	1700
Chromium	**30**	**180**	**1,500**	**6,800**	5.4	8.72	3.14	16.9	8.48	12.3	24.4	**54.8**	10	12.5	14.5	11.8
Cobalt	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	5.31	10.4	7.45	6.31
Copper	**50**	**270**	**270**	**10000**	--	--	--	--	--	--	--	--	10.9	19.2	21.6	14.3
Iron	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	9430	19600	23400	16600
Lead	**63**	**400**	**1,000**	**3,900**	**158**	**405**	**320**	40.4	**537**	**699**	**228**	40.8	6.71	18.5	11.2	8.64
Magnesium	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	1780	2820	2780	2360
Manganese	**1,600**	**2,000**	**10,000**	**10,000**	--	--	--	--	--	--	--	--	66.3 J	135	176	164
Mercury	**0.18**	**0.81**	**2.8**	**5.7**	**0.218**	ND	**0.184**	0.091	0.145	**1.37**	**0.452**	0.118	ND	ND	ND	ND
Nickel	**30**	**310**	**310**	**10000**	--	--	--	--	--	--	--	--	14	17.9	17.6	14.4
Potassium	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	599	532	375	301
Selenium	**3.9**	**180**	**1,500**	**6,800**	ND	0.141 J	1.26 J	0.405 J	0.377 J	0.233 J	0.295 J	ND	ND	ND	ND	ND
Silver	**2**	**180**	**1,500**	**6,800**	ND	ND	ND	ND	ND	ND	0.423 J	ND	ND	ND	ND	ND
Sodium	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	42.3 J	183 J	41.4 J	40.5 J
Thallium	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	ND	ND	ND	ND
Vanadium	**--**	**--**	**--**	**--**	--	--	--	--	--	--	--	--	11.8	19.6	26.8	19.2
Zinc	**109**	**10,000**	**10,000**	**10,000**	--	--	--	--	--	--	--	--	39.2	65.1	66.7	56

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 Commisioner's Policy (CP) 51 / Soil Cleanup Guidance Soil Cleanup Levels (SLCs).
3. Values per 6NYCRR Part 375 Unrestricted Soil Cleanup Objectives (SCOs).
4. Values per 6NYCRR Part 375 Restricted Soil Cleanup Objectives (SCOs).
5. Sample results were reported by the laboratory in micograms per kilogram (ug/kg) and converted to milligram per kilogram (mg/kg) for comparison to SCOs.
6. Sample results from 4/26/2022 were analyzed for Resource Conservation and Recovery Act (RCRA) metals only.

Definitions:

ND = Parameter not detected above laboratory detection limit.
-- = Sample not analyzed for parameter and/or no SCO available.
J = Estimated value; result is less than the sample quantitation limit but greater than zero.
D = Indicates a dilution, re-analysis, re-extraction, or additional initial metals/anion analysis of the sample.

🟩 **Bold**	= Result exceeds Unrestricted SCOs
🟦 **Bold**	= Result exceeds Restricted-Residential SCOs
🟨 **Bold**	= Result exceeds Commercial SCOs
🟥 **Bold**	= Result exceeds Industrial SCOs

TABLE 2
SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
REMEDIAL INVESTIGATION/INTERIM REMEDIAL MEASURES/ALTERNATIVES ANALYSIS WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Matrix	Investigation Location			Parameter[1]							
				Estimated Number of Samples	Full List VOCs + TICs[2,3]	TCL SVOCs + TICs[3,4]	TAL Metals[5]	PCBs	Pesticides	Herbicides	PFAS[6]
Surface Soil	SS-1		Exterior (Approx 0 to 2-inches)	1		1	1	1	1	1	1
	SS-2			1		1	1	1	1	1	1
	SS-3			1		1	1	1	1	1	1
	SS-4			1		1	1	1	1	1	1
	SS-5			1		1	1	1	1	1	1
Subsurface Soil/Fill	TP-19	Fill	Overburden Fill (Approx. 0-4 fbgs) Native Soil (Approx. >4 fbgs)	1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	TP-20	Fill		1		1	1				
		Native		1		1	1				
	TP-21	Fill		1		1	1				
		Native		1		1	1				
	TP-22	Fill		1		1	1				
		Native		1		1	1				
	TP-23	Fill		1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	TP-24	Fill		1		1	1				
		Native		1		1	1				
	TP-25	Fill		1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	TP-26	Fill		1		1	1				
		Native		1		1	1				
	TP-27	Fill		1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	TP-28	Fill		1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	TP-29	Fill		1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	TP-30	Fill		1	1	1	1				
		Native		1	1	1	1				
	TP-31	Fill		1		1	1				
		Native		1		1	1				
	SB-1	Fill	Interior Building 1	1		1	1				
		Native		1		1	1				
	SB-2	Fill		1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	SB-3	Fill	Interior Building 2	1		1	1				
		Native		1		1	1				
	SB-4	Fill		1	1	1	1	1	1	1	1
		Native		1	1	1	1	1	1	1	1
	MW-1		Native Soil (Appox. >4fbgs)	1	1	1	1	1	1	1	1
	MW-2			1	1	1	1	1	1	1	1
	MW-3			1	1	1	1	1	1	1	1
	MW-4			1	1	1	1	1	1	1	1
QA/QC	Soil		MS	3	2	3	3	2	2	2	2
			MSD	3	2	3	3	2	2	2	2
			Blind Dup	3	2	3	3	2	2	2	2
			TOTAL SOIL SAMPLES:	**52**	**28**	**52**	**52**	**31**	**31**	**31**	**31**
Soil Vapor (TO-15 Method)	SV-1		North	1	1						
	SV-2		West	1	1						
	SV-3		South	1	1						
	SV-4		East	1	1						
	OA-1		Ambient, Upwind	1	1						
			TOTAL SOIL VAPOR SAMPLES:	**5**	**5**	**--**	**--**	**--**	**--**	**--**	**--**
Groundwater[7, 8]	MW-1		North	1	1	1	1	1	1	1	1
	MW-2		West	1	1	1	1	1	1	1	1
	MW-3		South	1	1	1	1	1	1	1	1
	MW-4		Southeast	1	1	1	1	1	1	1	1
QA/QC	Groundwater		MS	1	1	1	1	1	1	1	1
			MSD	1	1	1	1	1	1	1	1
			Blind Dup	1	1	1	1	1	1	1	1
			Trip Blank	1	1						
			Equipment Blank	1							1
			TOTAL GROUNDWATER SAMPLES:	**9**	**8**	**7**	**7**	**7**	**7**	**7**	**8**

Notes:

1. Analyses will be performed via USEPA SW-846 methodology with equivalent Category B deliverables package.
2. Full List VOCs = TCL plus CP-51 List VOCs via Method 8260. Additional soil/fill samples will be collected for VOC analysis at investigation locations if elevated PID readings are detected in the field.
3. Tentatively Identified Compounds (TICs) will be analyzed per DER-10 for the RI samples.
4. 1,4-Dioxane will be analyzed in soil and groundwater samples. Groundwater samples to be analyzed using EPA Method 8270 SIM per NYSDEC guidelines.
5. Groundwater samples will be filtered in the laboratory for dissolved metals analysis.
6. PFAS = Analysis via EPA Method 1633 for soils and groundwater. PFAS to be analyzed in two up-gradient wells and two down-gradient wells based on field observations.
7. GW field parameters including: pH, specific conductance, temperature, DO, ORP, and turbidity will be collected and recorded.
8. Full suite on specified RI wells (MW-1, MW-3, and MW-4) on assumption that groundwater flows in a westerly direction. Emerging contaminant likely follows a similar suite; however, groundwater flow direction will be verified as part of RI activities. If there is insufficient groundwater for a full suite analysis from the monitoring wells, a decreased list of parameters will be proposed, in consultation with the Department
9. All locations shall be sampled and archived by the laboratory for potential analysis / reanalysis.

Acronyms:

VOCs = volatile organic compounds
PFAS = perfluoroalkyl acids
SVOCs = semi-volatile organic compounds
TCL = Target Compound List
TAL = Target Analyte List
TICs = Tentatively Identified Compounds
PCBs = Polychlorinated Biphenyls
TBD = to be determined
QA/QC = quality assurance/quality control samples
MS = matrix spike
MSD = matrix spike duplicate

TABLE 3
SAMPLE CONTAINER, VOLUME, PRESERVATION & HOLDING TIME REQUIREMENTS
REMEDIAL INVESTIGATION/INTERIM REMDIAL MEASURES/ALTERNATIVES ANALYSIS WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Matrix	Parameter [1]	Method [1]	Container Type	Minimum Volume	Preservation (Cool to 2-4 °C for all samples)	Holding Time from Sample Date
Soil	TCL + CP-51 VOCs	8260B	EnCore/WMG	5 gm / 4 oz.	Cool to 2-4 °C, Zero Headspace	48 - hours / 14 days
	TCL SVOCs	8270C	WMG	16 oz.	Cool to 2-4 °C	14 days extrac./40 days
	TAL Metals [2]	6010	WMG	4 oz.	Cool to 2-4 °C	6 months/Hg 28 days
	Pesticides	8081	WMG	8oz	Cool to 2-4 °C	14 days extrac./40 days
	Herbicides	8151	WMG	8oz	Cool to 2-4 °C	14 days extrac./40 days
	PCBs	8082	WMG	4 oz.	Cool to 2-4 °C	14 days extrac./40 days
	PFAS	1633	HDPE/Polypropylene	4 oz.	Cool to 2-4 °C	14 days extrac./40 days
Groundwater	TCL + CP-51 VOCs	8260B	glass vial	3 - 4 oz.	HCl to pH<2, Zero Headspace, Cool to 2-4 °C	14 days
	TCL SVOCs	8270C	amber glass	1000 ml	Cool to 2-4 °C	7 days extrac./40 days
	TAL Metals [2]	6010	plastic	600 ml	HNO_3 to pH<2, Cool to 2-4 °C	6 months/Hg 28 days
	Pesticides	8081B	amber glass	1000 ml	Cool to 2-4 °C	14 days extrac./40 days
	Herbicides	8151A	amber glass	1000 ml	Cool to 2-4 °C	14 days extrac./40 days
	PCBs	8082	amber glass	1000 ml	Cool to 2-4 °C	7 days extrac./40 days
	PFAS	1633	HDPE/Polypropylene	2 - 500 mL	Trizma, Cool to 2-4 °C	14 days
	1,4-Dioxane	8270 SIM	amber glass	2 - 500 mL	Cool to 2-4 °C	7 days extrac./40 days
Soil Vapor	TCL VOCs	TO-15	Summa Cannister	6 liters	None	Analyze within 14 days of sample date of collection

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

Notes:
1. EPA-approved methods published in Reference 1 above may be used.
2. Mercury sampling in soil/groundwater via EPA methods 7471/7470 respectively.

Acronyms:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
TCL = Target Compound List
TAL = Target Analyte List
PCBs = Polychlorinated Biphenyls
PFAS = Per- and Polyfluoroalkyl Substances
WMG = Wide Mouth Glass

TABLE 4
CRITERIA FOR USE OF OFF-SITE SOIL AS BACKFILL
RI/IRM/AA WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

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

TABLE 4
CRITERIA FOR USE OF OFF-SITE SOIL AS BACKFILL
RI/IRM/AA WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Parameter	Allowable Concentration for Use of Off-Site Soil[1]
Volatile Organic Compounds (mg/kg)	
Trimethylbenzene-1,2,4	3.6
Trimethylbenzene-1,3,5	8.4
Vinyl chloride	0.02
Xylene (mixed)	0.26
Semi-Volatile Organic Compounds (mg/kg)	
Acenaphthene	20
Acenaphthylene	100
Anthracene	100
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	100
Benzo(k)fluoranthene	0.8
Chrysene	1
Dibenz(a,h)anthracene	0.33
Fluoranthene	100
Fluorene	30
Indeno(1,2,3-cd)pyrene	0.5
m-Cresol(s)	0.33
Naphthalene	12
o-Cresol(s)	0.33
p-Cresol(s)	0.33
Pentachlorophenol	0.8
Phenanthrene	100
Phenol	0.33
Pyrene	100

TABLE 4
CRITERIA FOR USE OF OFF-SITE SOIL AS BACKFILL
RI/IRM/AA WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Parameter	Allowable Concentration for Use of Off-Site Soil[1]
Metals (mg/kg)	
Arsenic	13
Barium	350
Beryllium	7.2
Cadmium	2.5
Chromium, Hexavalent[2]	1
Chromium, Trivalent[2]	30
Copper	50
Cyanide	27
Lead	63
Manganese	1600
Mercury (total)	0.18
Nickel	30
Selenium	3.9
Silver	2
Zinc	109
PCBs/Pesticides (mg/kg)	
2,4,5-TP Acid (Silvex)	3.8
4,4'-DDE	0.0033
4,4'-DDT	0.0033
4,4'-DDD	0.0033
Aldrin	0.005
Alpha-BHC	0.02
Beta-BHC	0.036
Chlordane (alpha)	0.094
Delta-BHC	0.04
Dibenzofuran	7
Dieldrin	0.005
Endosulfan I	2.4
Endosulfan II	2.4

TABLE 4
CRITERIA FOR USE OF OFF-SITE SOIL AS BACKFILL
RI/IRM/AA WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Parameter	Allowable Concentration for Use of Off-Site Soil[1]
PCBs/Pesticides (mg/kg)	
Endosulfan sulfate	2.4
Endrin	0.014
Heptachlor	0.042
Lindane	0.1
Polychlorinated biphenyls	0.1

Notes:

1. Values per DER-10 Appendix 5 - Allowable Constituent Levels for Imported Fill or Soil for Unrestricted Use.
2. The SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.

TABLE 5
SUMMARY OF FIELD OPERATING PROCEDURES
RI/IRM/AA WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

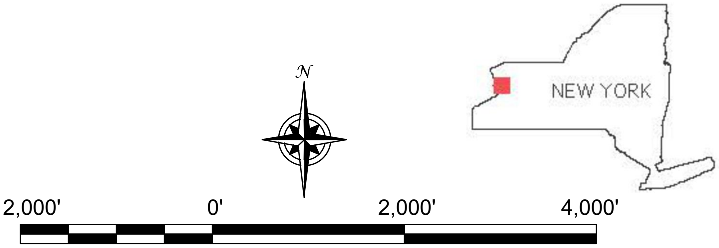
FOP Number	Description
001.1	Abandonment of Borehole Procedures
003.0	Air Rotary Drilling Procedure
004.6	Soil Vapor Sample Collection Procedure
006.0	Calibration and Maintenance of Combustible Gas/Oxygen Meter
007.0	Calibration and Maintenance of Portable Dissolved Oxygen Meter
008.0	Calibration and Maintenance of Portable Field pH/Eh Meter
009.0	Calibration and Maintenance of Portable Field Turbidity Meter
010.0	Calibration and Maintenance of Portable Flame Ionization Detector
011.1	Calibration and Maintenance of Portable Photoionization Detector
012.0	Calibration and Maintenance of Portable Specific Conductance Meter
013.0	Composite Sample Collection Procedure for Non-Volatile Organic Analysis
014.0	Constant Rate Pump Test Procedure
015.0	Documentation Requirements for Drilling and Well Installation
016.0	Downhole Geophysical Survey
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
023.1	Groundwater Purging Procedures Prior to Sample Collection
024.1	Groundwater Sample Collection Procedures
024.3	Groundwater Sample Collection Procedures for PFAS
025.0	Hand Augering Procedure
026.1	Hollow Stem Auger (HSA) Drilling Procedures
031.2	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
039.1	NAPL Detection and Sample Collection Procedure
040.1	Non-Disposable and Non-Dedicated Sampling Equipment Decontamination
041.0	Overburden Casing Installation Procedure
046.0	Sample Labeling, Storage and Shipment Procedures
047.0	Screening of Soil Samples for Organic Vapors During Drilling Activities
048.0	Screening of Soil Samples for Organic Vapors During UST Removal Activities
054.2	Soil Description Procedures Using The Visual-Manual Method
057.0	Soil Sample Collection for VOC Analysis - EnCore Sampling

TABLE 5
SUMMARY OF FIELD OPERATING PROCEDURES
RI/IRM/AA WORK PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

FOP Number	Description
058.0	Split-Spoon Sampling Procedures
063.2	Surface and Subsurface Soil Sampling Procedures
065.1	Test Pit Excavation and Logging Procedures
070.0	Well/Piezometer Construction Materials and Design
073.2	Real-Time Air Monitoring During Intrusive Activities
074.0	Underground Storage Tank Excavation & Removal Procedures
076.0	"Before Going Into the Field" Procedure
077.0	Temporary Well (Piezometer) Construction Procedures
078.0	Geoprobe Drilling Procedures
079.0	Stockpile Sampling Procedures for Chemical Analysis
082.0	Waste Sampling Procedures
084.0	Calibration and Maintenance of Portable Particulate Meter
085.0	Field Quality Control Procedures
088.0	Underground Piping Decommissioning Procedures
090.0	Outdoor Ambient Air VOC Sample Collection Procedure

Notes:
1. FOPs are identified by the sequential FOP number and revision number.
For example, FOP number 011.1 indicates FOP 11, revision 1.

FIGURES



SCALE: 1 INCH = 2,000 FEET
SCALE IN FEET
(approximate)

Title:

SITE LOCATION AND VICINITY MAP

REMEDIAL INVESTIGATION WORK PLAN

22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Prepared for:

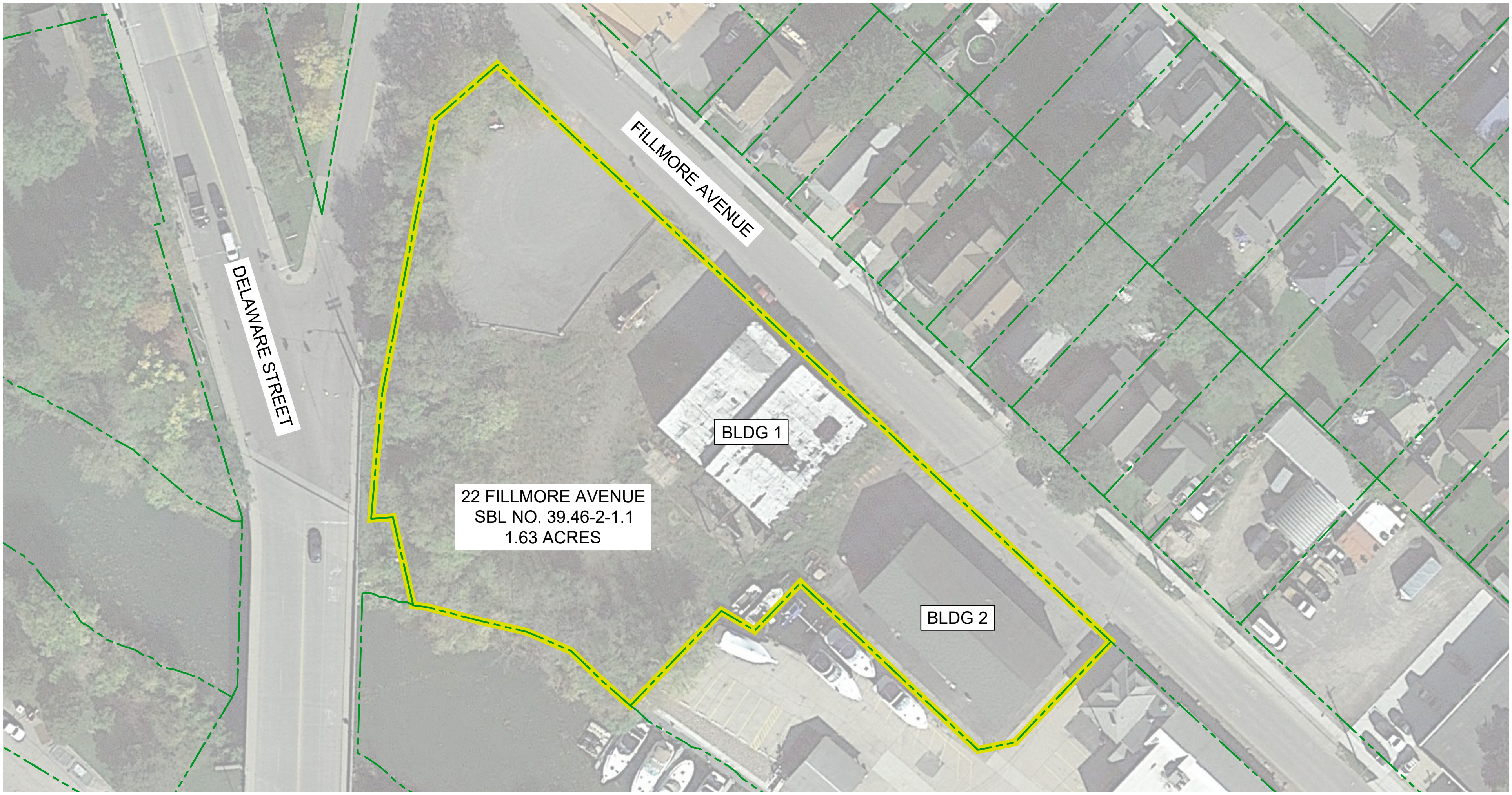
JC TONAWANDA TOWER QOZB LLC

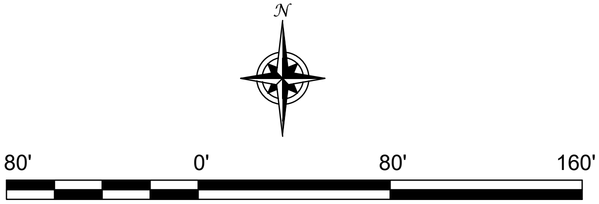
ROUX

			FIGURE
	Compiled by: RFL	Date: APRIL 2024	
	Prepared by: CMS	Scale: AS SHOWN	
	Project Mgr: CZB	Project: 4349.0001B000	1
	File: FIGURE 1; SITE LOCATION AND VICINITY MAP.DWG		

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\FIGURE 1; SITE LOCATION AND VICINITY MAP.DWG

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\FIGURE 2; SITE PLAN (AERIAL).DWG





SCALE: 1 INCH = 80 FEET

SCALE IN FEET

(approximate)

LEGEND:

- 🟨 BCP SITE BOUNDARY
- - - - PARCEL BOUNDARIES

NOTES:

1. IMAGE TAKEN FROM GOOGLE EARTH 2021.

Title:

SITE PLAN (AERIAL)

REMEDIAL INVESTIGATION WORK PLAN

BCP SITE NO. C915395
22 FILLMORE AVENUE
TONAWANDA, NEW YORK

Prepared for:

JC TONAWANDA TOWER QOZB LLC

ROUX

Compiled by: RFL	Date: APRIL 2024	FIGURE
Prepared by: CS/CNK	Scale: AS SHOWN	2
Project Mgr: CZB	Project: 4349.0001B000	
File: FIGURE 2; SITE PLAN (AERIAL).DWG		

TP-12 (0.5-4 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	3.9
BENZO(A)PYRENE	4
BENZO(B)FLUORANTHENE	5.1
BENZO(K)FLUORANTHENE	1.1
CHRYSENE	4
DIBENZO(A,H)ANTHRACENE	0.52
INDENO(1,2,3-CD)PYRENE	3
CHROMIUM	54.8

TP-11 (0-2 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	1.2
BENZO(A)PYRENE	1.1
BENZO(B)FLUORANTHENE	1.5
CHRYSENE	1.2
INDENO(1,2,3-CD)PYRENE	0.82
LEAD	228
MERCURY	0.452

TP-4 (0-2 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	4.8
BENZO(A)PYRENE	3.2
BENZO(B)FLUORANTHENE	4
BENZO(K)FLUORANTHENE	1.2
CHRYSENE	4.1
DIBENZO(A,H)ANTHRACENE	0.45
INDENO(1,2,3-CD)PYRENE	2

TP-10 (0-2 FT)	4/26/2022
PARAMETER	MG/KG
LEAD	699
MERCURY	1.37

TP-6 (0.5-2 FT)	4/26/2022
PARAMETER	MG/KG
LEAD	537

TP-1 (0-1.5 FT)	4/26/2022
PARAMETER	MG/KG
INDENO(1,2,3-CD)PYRENE	0.64
LEAD	158
MERCURY	0.218
TP-1 (3-6 FT)	4/26/2022
PARAMETER	MG/KG
1,3,5-TRIMETHYLBENZENE	14
1,2,4-TRIMETHYLBENZENE	33
ETHYLBENZENE	7.3
N-PROPYLBENZENE	4.9
TOTAL XYLENES	20.1
LEAD	405

TP-3 (1-3.5 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	1.5
BENZO(A)PYRENE	2.2
BENZO(B)FLUORANTHENE	2.2
CHRYSENE	1.3
DIBENZO(A,H)ANTHRACENE	0.34
INDENO(1,2,3-CD)PYRENE	1.8
LEAD	320
MERCURY	0.184

LEGEND:

━━	BCP SITE BOUNDARY
- - -	PARCEL BOUNDARIES
TP-1 ⊞	PHASE II TEST PIT LOCATIONS
⬚	APPROXIMATE HISTORIC LOCATIONS (PER HISTORIC SANBORN MAPS)
🟩	EXCEEDS UNRESTRICTED USE SCOs
🟦	EXCEEDS RESTRICTED-RESIDENTIAL USE SCOs
🟨	EXCEEDS COMMERCIAL USE SCOs
🟥	EXCEEDS INDUSTRIAL USE SCOs

NOTES:
1. IMAGE TAKEN FROM GOOGLE EARTH 2021.
2. RESULTS COMPARED TO 6 NYCRR PART 375 SOIL CLEANUP OBJECTIVES (SCOs).

N

80' 0' 80' 160'

SCALE: 1 INCH = 80 FEET
SCALE IN FEET
(approximate)

Title:
HISTORIC INVESTIGATION LOCATIONS AND AREAS OF CONCERN

REMEDIAL INVESTIGATION WORK PLAN

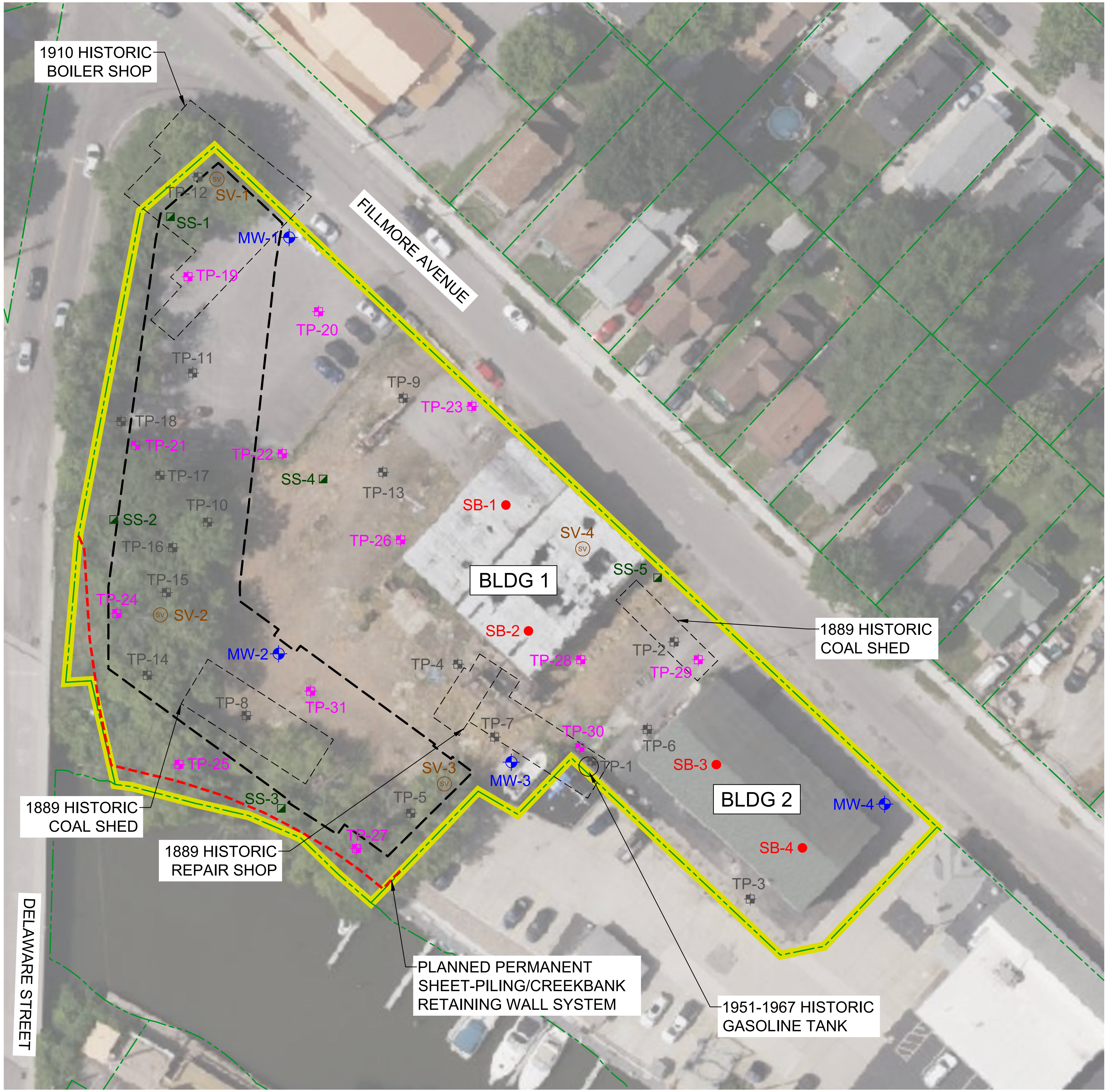
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Prepared for:
JC TONAWANDA TOWER QOZB LLC

ROUX

Compiled by: RFL	Date: MAY 2025	FIGURE
Prepared by: RFL/CNK	Scale: AS SHOWN	3
Project Mgr: CZB	Project: 4349.0001B000	
File: FIGURE 3; INVESTIGATION LOCATIONS AND AREAS OF CONCERN_REV.DWG		

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\FIGURE 3; INVESTIGATION LOCATIONS AND AREAS OF CONCERN_REV.DWG

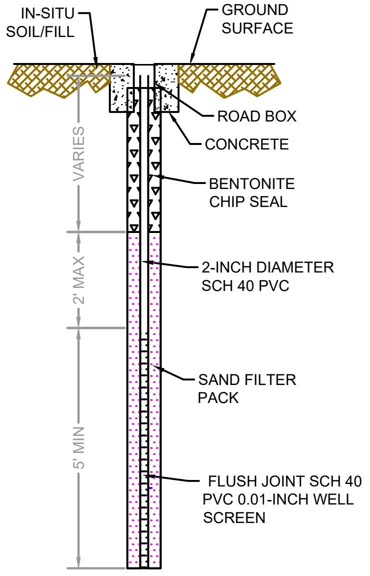


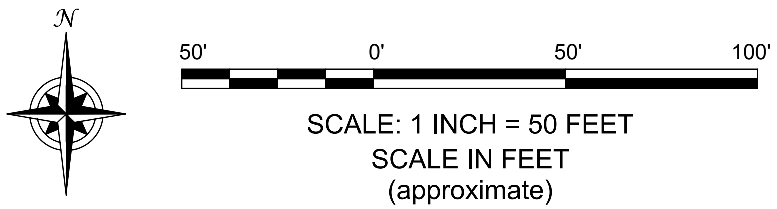
LEGEND:

🟨	BCP SITE BOUNDARY
— - —	PARCEL BOUNDARIES
TP-1 ⊞	PHASE II TEST PIT LOCATIONS (BY TURNKEY)
TP-29 ⊞	RI TEST PIT LOCATIONS (11)
SB-1 ●	RI SOIL BORING LOCATIONS (4)
MW-1 ⊕	RI MONITORING WELL LOCATIONS (4)
SS-1 ◪	RI SURFACE SAMPLE LOCATIONS (5)
SV-1 ⓈⓋ	RI SOIL VAPOR SAMPLE LOCATIONS (3)
⊏ ⊐	APPROXIMATE PLANNED BUILDING LOCATION
⊏ – ⊐	APPROXIMATE HISTORIC LOCATIONS (PER HISTORIC SANBORN MAPS)
– – –	APPROXIMATE PLANNED SHEET PILE LOCATION

NOTES:
1. AERIAL IMAGE FROM MICROSOFT BING MAPS USING AUTODESK AUTOCAD GEOLOCATION INTERFACE DECEMBER 2023.
2. PHASE II INVESTIGATION LOCATIONS COMPLETED BY TURNKEY ENVIRONMENTAL RESTORATION, LLC (TURNKEY) ON APRIL 26, 2022.

MONITORING WELL DETAIL
NTS





SCALE: 1 INCH = 50 FEET
SCALE IN FEET
(approximate)

Title: **PLANNED REMEDIAL INVESTIGATION SAMPLE LOCATIONS**

REMEDIAL INVESTIGATION WORK PLAN

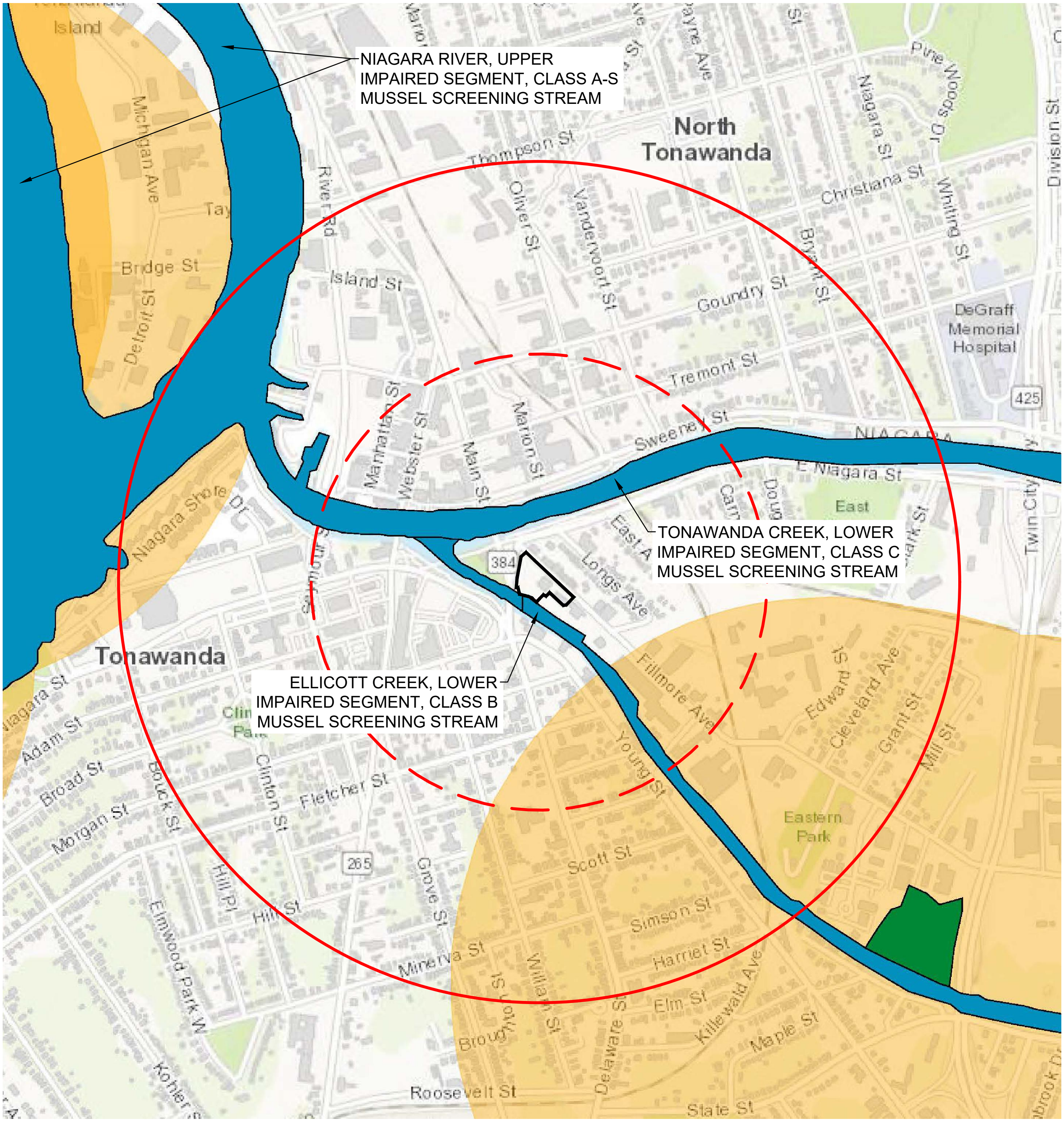
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Prepared for:
JC TONAWANDA TOWER QOZB LLC

ROUX

Compiled by: RFL	Date: MAY 2025	FIGURE
Prepared by: RFL/CNK	Scale: AS SHOWN	4
Project Mgr: CZB	Project: 4349.0001B000	
File: FIGURE 4; PLANNED REMEDIAL INVESTIGATION SAMPLE LOCATIONS_REV.DWG		

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\FIGURE 4; PLANNED REMEDIAL INVESTIGATION SAMPLE LOCATIONS_REV.DWG



1,000'   0   1,000'

LEGEND:

— BCP SITE BOUNDARY

– – 0.25 MILE RADIUS FROM SITE BOUNDARY

— 0.5 MILE RADIUS FROM SITE BOUNDARY

🟩 FEDERALLY REGULATED FRESHWATER FORESTED/SHRUB WETLAND

🟨 RARE PLANTS AND ANIMALS

N

NOTES:
1. IMAGE SOURCE NYSDEC ENVIRONMENTAL RESOURCE MAPPER (DOWNLOADED APRIL 2025)

Title:

FISH & WILDLIFE RESOURCE MAP

REMEDIAL INVESTIGATION WORK PLAN

22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Prepared for:

JC TONAWANDA TOWER QOZB LLC

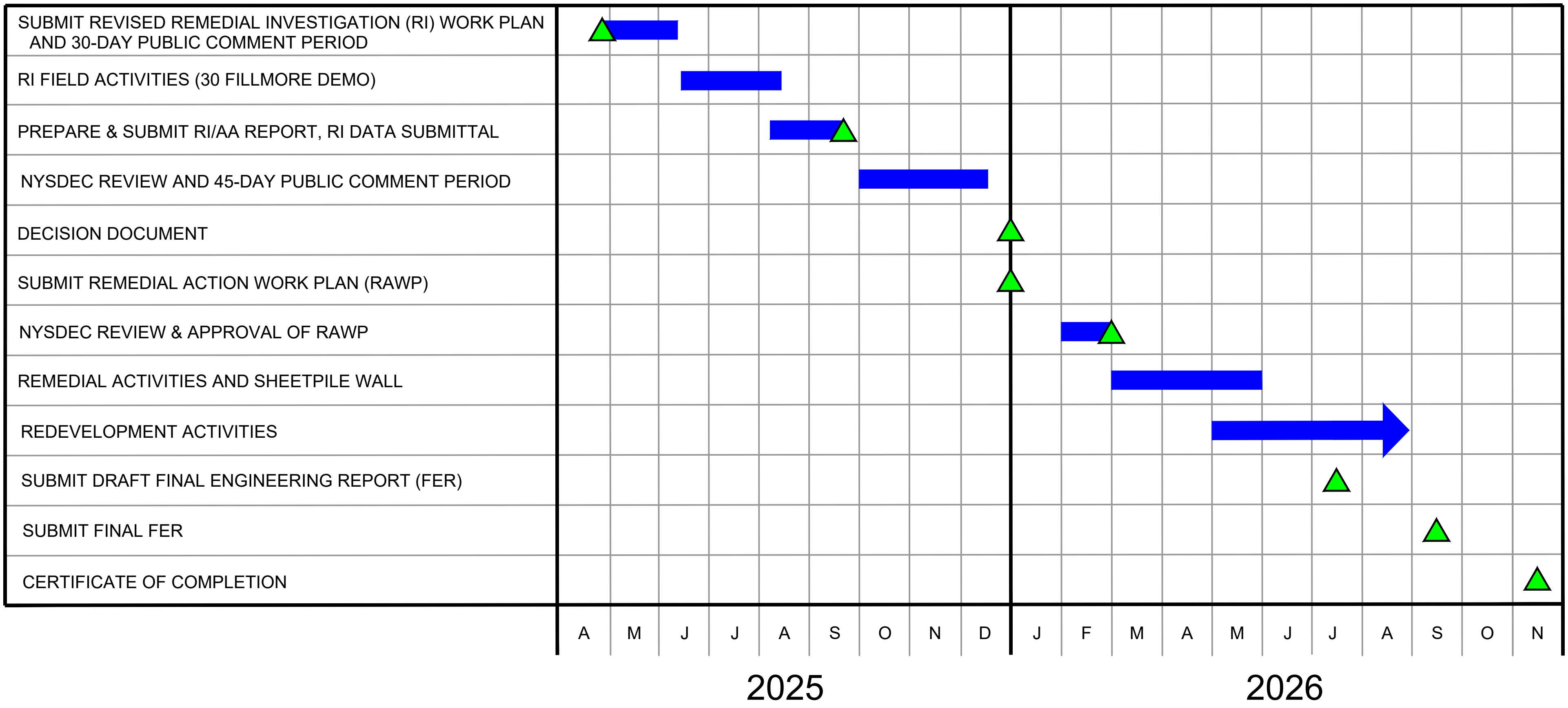
ROUX

Compiled by: CNK	Date: APRIL 2025	FIGURE
Prepared by: CNK	Scale: AS SHOWN	5
Project Mgr: CZB	Project: 4349.0001B000	
File: FIGURE 5; FISH & WILDLIFE RESOURCE MAP.DWG		

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\FIGURE 5; FISH & WILDLIFE RESOURCE MAP.DWG

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\FIGURE 6; PRELIMINARY PROJECT SCHEDULE.DWG

PROJECT TASKS:



Title:

PRELIMINARY PROECT SCHEDULE

REMEDIAL INVESTIGATION WORK PLAN

22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Prepared for:

JC TONAWANDA TOWER QOZB LLC

ROUX

Compiled by: CNK	Date: APRIL 2025	FIGURE
Prepared by: CNK	Scale: AS SHOWN	6
Project Mgr: CZB	Project: 4349.0001B000	
File: FIGURE 6; PRELIMINARY PROJECT SCHEDULE.DWG		

APPENDICES

A. Professional Profiles
B. Previous Investigations
C. Field Operating Procedures (FOPs)
D. Project Documentation Forms
E. Health and Safety Plan (HASP) including CAMP
F. Former 30 Fillmore Avenue Building Documentation
G. Fish & Wildlife Impact Analysis Decision Key

APPENDIX A

Professional Profiles

PROFESSIONAL PROFILE

Christopher Boron, PG

Principal Geologist

OFFICE
Buffalo, NY

YEARS OF EXPERIENCE
Roux: 10 Years
Other Firm: 16 Years

EDUCATION
BS, Geology, State University of New York at Fredonia, 1995

PROFESSIONAL LICENSES
New York State Professional Geologist. Certification Number: 001017-01

TRAINING
OSHA 40 Hour HAZWOPER Training

PROFESSIONAL AFFILIATIONS
Member, Buffalo Association of Professional Geologists

EXPERIENCE SUMMARY

Professional Geologist in New York State with 26 years of environmental assessment/investigation, remediation, and due diligence experience. Over the past 10 years, a significant portion of my work has been on investigation and remediation projects in the New York Brownfield Cleanup Program and NYSDEC Spills Program.

Principal Geologist at Roux (07/2023-present); Sr. Project Manager at Benchmark Civil/Environmental Engineering & Geology (merged with Roux in 07/2023; time from 07/2014-07/2023 considered Roux herein); Sr. Project Manager at GZA GeoEnvironmental of NY (2009-07/2014); Project Manager at GZA GeoEnvironmental of NY (2003-2009;) Assistant Project Manager at GZA GeoEnvironmental of NY (2002-2003); Project Geologist (1998-2002).

TECHNICAL SPECIALTIES

Site characterization/remedial investigations, feasibility studies/alternatives analysis, and remediation under the New York State Department of Environmental Conservation (NYSDEC) Inactive Hazardous Waste Site (Superfund) Program, Voluntary Cleanup Program (VCP), New York State Brownfield Cleanup Program (BCP), Environmental Restoration Program, and NYSDEC Petroleum Spills Division.

REPRESENTATIVE PROJECTS

Mt. Olive Senior Manor BCP Site; Buffalo, New York (2021-Present: Roux): Principal Geologist. Management of investigation, remediation, and redevelopment of an affordable housing/assisted living facility on Buffalo's Eastside under the NYSDEC Brownfield Cleanup Program (BCP). Project involvement began with due diligence and included all phases of the NYSDEC BCP including BCP application; work plan preparation; on-site remedial investigations; pre-design investigation, remediation involving removal of approximately 10,000 tons of contaminated soil/fill and weathered bedrock and implementation of an enhanced reductive dichlorination groundwater remedy to address chlorinated volatile organic compounds (CVOCs) identified in the bedrock groundwater; and preparation of a Site Management Plan (SMP) and Final Engineering Report (FER). Post-Certificate of Completion (2023) soil vapor intrusion assessment was completed prior to occupancy, to determine that active sub-slab depressurization system was not necessary; and performance monitoring ongoing for CVOCs in bedrock groundwater.

Main & Hertel BCP Site; Buffalo, New York (2018-Present: Roux): Principal Geologist/Sr. Project Manager. Management of supplemental investigation, interim remedial measures, remediation, and environmental oversight of redevelopment for a mixed use residential housing and commercial development on an approximate 4.4-acre site, formerly used to manufacture industrial metal finishing and metal plating products in the City of Buffalo. Site was remediated to a Track 4 Restricted Residential cleanup under the NYSDEC BCP. Project involvement began after the remedial investigation was completed by another consultant and issues arose with the progress of the project. Responsibilities included preparation and implementation of Interim Remedial Measures (IRM) to address hazardous building materials contaminated from previous operations prior to building demolition, delineation, and removal of soil/fill contamination throughout Site to allow construction activities to begin, and preparation of an approvable IRM/Alternative Analysis (AA) report. A Remedial Action Work Plan (RAWP) was prepared and implemented which involved implementation of an enhanced reductive dichlorination groundwater remedy to address CVOCs identified in fractured bedrock, and oversight of earthwork construction activities during redevelopment. The groundwater remedy has reduced source area groundwater concentrations by 90%. SMP and FER were prepared and approved by NYSDEC. Post-Certificate of Completion (2024) indoor air assessment was completed prior to occupancy; and performance monitoring ongoing for CVOCs in bedrock groundwater.

RiverBend Area 1 VCP Site; Buffalo, New York (2015-2018: Roux): Senior Project Manager responsible for management of the implementation of SMP requirements during redevelopment of an 87-acre site formerly owned and operated by two steel manufacturing companies from 1906 to the 1980s. Redevelopment consisted of the construction of a 1.2 million-square-foot Tesla facility for battery manufacturing. During the 26-month long project, responsibilities included: oversight of subsurface activities to assess soil/fill for potential impacts, on-site reuse, or off-site disposal; verify import materials used for construction of the cover system (engineering control) were suitable for use; assistance with interior water damage/mold related issues during building construction; stormwater pollution prevention plan (SWPPP) inspections and reporting; implementation of the community air monitoring program (CAMP); observation the cover system installation; and assistance with management of technology enhanced naturally occurring radioactive material (TENORM) that was encountered. TENORM was identified in the slag material generated during redevelopment and required the development of an on-site reuse work plan and NYSDEC Part 380 variance application, which was the first ever written and employed in New York State. Approximately 34,000 cubic yards of soil/fill containing slag were generated, stockpile, assess for on-site reuse or off-site disposal. The Variance and Reuse Plan saved the project approximately $10 million dollars in off-site disposal costs.

Former Trico Plant BCP Site; Buffalo, New York (2016-Present: Roux): Senior Project Manager/ Principal Geologist. Management of investigation, remediation and environmental oversight during redevelopment of a 2.1 acres property containing a 617,000 square foot manufacturing building that was formerly used for windshield wiper manufacturing in the City of Buffalo. This was remediated to a Track 4 Restricted Residential use under the NYSDEC BCP. Responsibilities included preparation of investigation and remedial work plans, oversight of technical field staff and subcontractors during investigation and remediation, SMP and FER preparation. Remedial actions included removal and management PCB-impacted (non-hazardous and TSCA) building materials, injection of groundwater amendments to further aid in the breakdown of CVOCs in the groundwater, removal of hydraulic lifts, treatment, and discharge of approximately 150,000 gallons of water present in a sub-basement, and management of impacted soil/fill generated during redevelopment (building foundation alterations). The Site received its Certificate of Completion in 2019, and SMP implementation during redevelopment has occurred from October 2022 through April 2024. The redevelopment as residential apartments opened in September 2024. Post-COC monitoring and annual reporting is on-going.

Former Days Inn Superfund Site; Corning, New York (2016-Present: Roux): Senior Project Manager/ Principal Geologist. Management of redevelopment of a contaminated hotel site in downtown Corning, NY. Prior to our involvement, fill material (ash, slag, glass cullet, refractory brick associated with glass manufacturing waste) deemed unsuitable for construction of the hotel was identified, inadvertently excavated from the Site, and taken to eight (8) off-site properties for reuse. Subsequent testing at the Site determined that the fill material contained hazardous levels of metals and elevated SVOCs and could not be used as fill material. NYSDEC, though an Order on Consent, required the extent of on-site fill material investigated; and materials that were taken off-site would require excavation and landfill disposal. Responsibilities included: preparation and implementation of the on-site Site Investigation Work Plan; oversight of field staff and subcontractors; preparation of the Site Investigation/Alternatives Analysis (SI/AA) Report; preparation and implementation of the On-Site and Off-Site IRM Work Plans; preparation of the on-site SMP and FER; implementation of SMP and documentation of activities during redevelopment activities; and preparation of the Off-site CCRs documenting remediation at the 8 off-site properties (e.g., excavation, removal, landfill disposal of over 5,000 tons of fill contain glass manufacturing waste). The NYSDEC Consent Order for the Site was terminated. The hotel construction was completed and opened in July 2018. Annual inspections and reporting are on-going.

1585 Hertel Avenue BCP Site; Buffalo, New York (2017-2018: Roux): Senior Project Manager. Management of investigation and remediation of a former gasoline and service station in the City of Buffalo to an Unrestricted Use cleanup under the BCP. Site was developed with of a five-story mixed residential apartment and commercial use building. Project involvement began with due diligence and included all phases of the NYSDEC BCP including BCP application; work plan preparation; on-site remedial investigations; removal of approximately 3,000 tons of contaminated soil/fill to achieve Part 375 Unrestricted Soil Cleanup Objectives (USCOs), removal of six USTs and their associated contents, two hydraulic lifts, and preparation of the FER. Certificate of Completion was issued in 2018 and building construction began in 2019.

1176 South Park Site 3 BCP Site; Buffalo, New York (2017-2019: Roux): Senior Project Manager. Preparation of Remedial Investigation and Interim Remedial Measures Work Plans, implementation of the RI and IRM, and preparation of the RI/IRM/AA Report for 9-acres Site under the BCP. The Site was formerly owned by LTV Corp/Republic Steel and used for pig-iron storage and No. 6 fuel oil storage via two, 5.5-million-gallon ASTs. The fuel oil was used for the blast furnaces located on the LTV Corp./Republic Street facility, south of the Site, across South Park Avenue. The ASTs were removed in 1981 and subject to a partial cleanup. The Site is being cleaned up to a restricted-commercial use which will involve completion of IRMs to address sources of contamination, preparation of an environmental easement restricting site usage and SMP, and installation of a cover system to prevent exposure to remaining contamination. Remedial action to date involved excavation of 500 tons of impacted soil (PCB, SVOC, and petroleum impacted soil). Additional remedial actions are planned pending redevelopment plan development. Redevelopment activities to date include construction of a 9,000 square foot commercial/retail building which opened in November 2017, construction of a site road, installation of subsurface stormwater drainage system, and installation of a portion of the final engineered cover system.

3 Gates Circle BCP Site; Buffalo, New York (2014-Present: Roux): Senior Project Manager**/**Principal Geologist. The 9-acres campus of the former Millard Fillmore Gates Circle Hospital was entered into the BCP. My responsibilities involved preparation of the Remedial Investigation Work Plan, management of the Remedial Investigation, preparation of the Investigation/Alternatives Analysis (RI/AA) Report, management of remedial actions, and preparation of the SMP and FER. Remedial action involved excavation of over 3,000 tons of impacted soil (SVOC, mercury and No. 6 fuel oil impacts) and groundwater management/treatment during excavation activities. Site was remediated to a Track 4 Restricted Residential use and received a COC in 2015. Implementation and documentation pre the SMP have been occurring during on-going redevelopment activities. Redevelopment activities have included a 5-story assisted living facility, construction of two roads, and installation of a portion of the final engineered cover system. Redevelopment activities are expected to continue for the next 5 years.

Petroleum Cleanup & UST Decommissioning; Williamsville, New York (2024: Roux): Principal Geologist. A NYSDEC PBS Notice of Violation was issued to the property owner for inactive USTs. A Phase II investigation identified petroleum contamination associated with pump island area and a NYSDEC Spill No. was assigned to the Site. I was responsible for management of remedial action plan preparation and implementation which involved self-performing the removal of 2 USTs, existing pump island and piping, former pump island piping, approximately 1,300 tons of non-hazardous petroleum impacted soil, and restoration of the Site. Spill was closed NYSDEC in 2024.

1155 Main Street BCP Site; Buffalo, New York (2018-2021: Roux): Senior Project Manager. Management of investigation and remediation of a 1.55-acre Site formerly used as a gasoline service station and other commercial occupants in the City of Buffalo under the BCP for construction of a 5-story mixed use residential apartment and commercial building. Project involvement began with due diligence and included all phases of the NYSDEC BCP including BCP application; work plan preparation, on-site remedial investigations; removal of approximately 27,750 tons of contaminated soil/fill to achieve Part 375 Unrestricted Soil Cleanup Objectives (USCOs) and preparation of the SMP and FER. Due to low-level CVOCs in the groundwater, a sub-slab piping network was designed into the building foundation to allow vacuum fan installations, if needed. A Certificate of Completion was issued in 2018 and building construction began in 2019. A post-COC Soil Vapor Intrusion assessment was completed and determined that SVI was not a concern. The SMP and Environmental Easement were terminated.

Michigan and Best Development BCP Site; Buffalo, New York (2016-2022: Roux): Senior Project Manager. Management of investigation and remediation of a 0.715-acre Site formerly with residential and commercial uses in the City of Buffalo under the BCP for construction of a 3-story residential apartment building. Project involvement began with due diligence and included all phases of the NYSDEC BCP including BCP application; work plan preparation, on-site remedial investigations; an Interim Remedial Measure to treat/stabilize 315 tons of hazardous lead impacted fill material to be removed and disposed as non-hazardous, removal of an addition 10,000 tons of contaminated soil/fill to achieve Part 375 Unrestricted Soil Cleanup Objectives (USCOs); and preparation of the FER. A Certificate of Completion was issued in 2022 and building construction began in 2023.

APPENDIX B

Previous Investigations

TABLE 1
SUMMARY OF NATIVE SUBSURFACE SOIL ANALYTICAL RESULTS
SUPPLEMENTAL ENVIRONMENTAL INVESTIGATION
20-40 FILLMORE AVENUE
TONAWANDA, NEW YORK

Parameter[1]	Unrestricted Use SCOs[2]	Restricted-Residential Use SCOs[2]	Commerical Use SCOs[2]	Industrial Use SCOs[2]	Sample Location			
					TP-13 Native 2/2/2023	TP-14 Native 2/2/2023	TP-16 Native 2/2/2023	TP-18 Native 2/2/2023
Volatile Organic Compounds (VOCs) - mg/kg[4]								
Acetone	**0.05**	**100**	**500**	**1,000**	0.016	ND	0.0075 J	0.0062 J
Styrene	**100**	**100**	**500**	**1,000**	0.00025 J	ND	ND	0.00027 J
Toluene	**0.7**	**100**	**500**	**1,000**	0.0015	0.0015	0.0012	0.0012
Semi-Volatile Organic Compounds (SVOCs) - mg/kg[4]								
Acenaphthene	**20**	**100**	**500**	**1,000**	ND	ND	ND	ND
Acenaphthylene	**100**	**100**	**500**	**1,000**	ND	ND	ND	ND
Anthracene	**100**	**100**	**500**	**1,000**	ND	ND	ND	ND
Benzo(a)anthracene	**1**	**1**	**5.6**	**11**	ND	ND	ND	ND
Benzo(a)pyrene	**1**	**1**	**1**	**1.1**	ND	ND	ND	ND
Benzo(b)fluoranthene	**1**	**1**	**5.6**	**11**	ND	ND	ND	ND
Benzo(k)fluoranthene	**0.8**	**3.9**	**56**	**110**	ND	ND	ND	ND
Chrysene	**1**	**3.9**	**56**	**110**	ND	ND	ND	ND
Dibenzo(a,h)anthracene	**0.33**	**0.33**	**0.56**	**1.1**	ND	ND	ND	ND
Fluoranthene	**100**	**100**	**500**	**1,000**	ND	ND	ND	ND
Fluorene	**30**	**100**	**500**	**1,000**	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	**0.5**	**0.5**	**5.6**	**11**	ND	ND	ND	ND
Phenanthrene	**100**	**100**	**500**	**1,000**	ND	ND	ND	ND
Pyrene	**100**	**100**	**500**	**1,000**	ND	ND	ND	ND
Total PAHs	--	--	--	--	ND	ND	ND	ND
Metals - mg/kg								
Aluminum	--	--	--	--	9410	8480	9950	8090
Antimony	--	--	--	--	0.359 J	0.809 J	1.12 J	0.628 J
Arsenic	**13**	**16**	**16**	**16**	1.72	6.91	10.6	6.53
Barium	**350**	**400**	**400**	**10,000**	58.3	31.9	23.9	21.6
Beryllium	**7.2**	**72**	**590**	**2,700**	0.282 J	0.466 J	0.453 J	0.35 J
Cadmium	**2.5**	**4.3**	**9.3**	**60**	ND	ND	ND	ND
Calcium	--	--	--	--	1570	2040	2120	1700
Chromium[5]	**30**	**180**	**1,500**	**6,800**	10	12.5	14.5	11.8
Cobalt	--	--	--	--	5.31	10.4	7.45	6.31
Copper	**50**	**270**	**270**	**10,000**	10.9	19.2	21.6	14.3
Iron	--	--	--	--	9430	19600	23400	16600
Lead	**63**	**400**	**1,000**	**3,900**	6.71	18.5	11.2	8.64
Magnesium	--	--	--	--	1780	2820	2780	2360
Manganese	**1,600**	**2,000**	**10,000**	**10,000**	66.3 J	135	176	164
Mercury	**0.18**	**0.81**	**2.8**	**5.7**	ND	ND	ND	ND
Nickel	**30**	**310**	**310**	**10,000**	14	17.9	17.6	14.4
Potassium	--	--	--	--	599	532	375	301
Selenium	**3.9**	**180**	**1,500**	**6,800**	ND	ND	ND	ND
Silver	**2**	**180**	**1,500**	**6,800**	ND	ND	ND	ND
Sodium	--	--	--	--	42.3 J	183 J	41.4 J	40.5 J
Thallium	--	--	--	--	ND	ND	ND	ND
Vanadium	--	--	--	--	11.8	19.6	26.8	19.2
Zinc	**109**	**10,000**	**10,000**	**10,000**	39.2	65.1	66.7	56

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 6NYCRR Part 375 Soil Cleanup Objectives (SCOs).
3. Sample results were reported by the laboratory in micograms per kilogram (ug/kg) and converted to milligram per kilogram (mg/kg) for comparison to SCOs.
4. SCOs provided for trivalent chromium

Definitions:
mg/kg = milligrams per kilogram
ND = Parameter not detected above laboratory detection limit
-- = No SCO available, or parameter not tested for.
J = Result is less than the RL but greater or equal to the MDL and the concentration is an approximate value, indicates estimated value for TICs.

🟩 **BOLD**	= Result exceeds Unrestricted Use SCOs
🟦 **BOLD**	= Result exceeds Restricted Residential Use SCOs
🟨 **BOLD**	= Result exceeds Commercial Use SCOs
🟥 **BOLD**	= Result exceeds Industrial Use SCOs

ANALYTICAL REPORT

Lab Number:	L2305824
Client:	Benchmark & Turnkey Companies 2558 Hamburg Turnpike Suite 300 Buffalo, NY 14218
ATTN:	Chris Boron
Phone:	(716) 856-0599
Project Name:	22 FILLMORE AVENUE SITE
Project Number:	B0659-022-001-003
Report Date:	02/07/23

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Project Name: 22 FILLMORE AVENUE SITE
Project Number: B0659-022-001-003

Lab Number: L2305824
Report Date: 02/07/23

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2305824-01	TP-13 NATIVE	SOIL	TONAWANDA, NEW YORK	02/02/23 08:25	02/02/23
L2305824-02	TP-14 NATIVE	SOIL	TONAWANDA, NEW YORK	02/02/23 09:20	02/02/23
L2305824-03	TP-16 NATIVE	SOIL	TONAWANDA, NEW YORK	02/02/23 10:40	02/02/23
L2305824-04	TP-18 NATIVE	SOIL	TONAWANDA, NEW YORK	02/02/23 13:00	02/02/23

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 NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. 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. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. 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. 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 Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data 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.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) 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 Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

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.

Total Metals

L2305824-01 through 04: The sample has elevated detection limits for all elements, with the exception of mercury, due to the dilution required by the sample matrix.

The WG1740577-1 Method Blank, associated with L2305824-01 through -04, has a concentration above the reporting limit for iron. Since the associated sample concentrations are either greater than 10x the blank concentration or non-detect to the RL for this target analyte, no corrective action is required. Any results detected below the reporting limit are qualified with a "B".

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: Caitlin Walukevich Caitlin Walukevich

Title: Technical Director/Representative Date: 02/07/23

ORGANICS

VOLATILES

SAMPLE RESULTS

Lab ID: L2305824-01
Client ID: TP-13 NATIVE
Sample Location: TONAWANDA, NEW YORK

Date Collected: 02/02/23 08:25
Date Received: 02/02/23
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8260D
Analytical Date: 02/05/23 16:03
Analyst: JIC
Percent Solids: 84%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	5.9	2.7	1
1,1-Dichloroethane	ND		ug/kg	1.2	0.17	1
Chloroform	ND		ug/kg	1.8	0.16	1
Carbon tetrachloride	ND		ug/kg	1.2	0.27	1
1,2-Dichloropropane	ND		ug/kg	1.2	0.15	1
Dibromochloromethane	ND		ug/kg	1.2	0.16	1
1,1,2-Trichloroethane	ND		ug/kg	1.2	0.31	1
Tetrachloroethene	ND		ug/kg	0.59	0.23	1
Chlorobenzene	ND		ug/kg	0.59	0.15	1
Trichlorofluoromethane	ND		ug/kg	4.7	0.82	1
1,2-Dichloroethane	ND		ug/kg	1.2	0.30	1
1,1,1-Trichloroethane	ND		ug/kg	0.59	0.20	1
Bromodichloromethane	ND		ug/kg	0.59	0.13	1
trans-1,3-Dichloropropene	ND		ug/kg	1.2	0.32	1
cis-1,3-Dichloropropene	ND		ug/kg	0.59	0.18	1
Bromoform	ND		ug/kg	4.7	0.29	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	0.59	0.20	1
Benzene	ND		ug/kg	0.59	0.20	1
Toluene	1.5		ug/kg	1.2	0.64	1
Ethylbenzene	ND		ug/kg	1.2	0.16	1
Chloromethane	ND		ug/kg	4.7	1.1	1
Bromomethane	ND		ug/kg	2.4	0.68	1
Vinyl chloride	ND		ug/kg	1.2	0.39	1
Chloroethane	ND		ug/kg	2.4	0.53	1
1,1-Dichloroethene	ND		ug/kg	1.2	0.28	1
trans-1,2-Dichloroethene	ND		ug/kg	1.8	0.16	1
Trichloroethene	ND		ug/kg	0.59	0.16	1
1,2-Dichlorobenzene	ND		ug/kg	2.4	0.17	1

SAMPLE RESULTS

Lab ID:	L2305824-01	Date Collected:	02/02/23 08:25
Client ID:	TP-13 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:

Volatile Organics by GC/MS - Westborough Lab

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
1,3-Dichlorobenzene	ND		ug/kg	2.4	0.17	1
1,4-Dichlorobenzene	ND		ug/kg	2.4	0.20	1
Methyl tert butyl ether	ND		ug/kg	2.4	0.24	1
p/m-Xylene	ND		ug/kg	2.4	0.66	1
o-Xylene	ND		ug/kg	1.2	0.34	1
cis-1,2-Dichloroethene	ND		ug/kg	1.2	0.20	1
Styrene	0.25	J	ug/kg	1.2	0.23	1
Dichlorodifluoromethane	ND		ug/kg	12	1.1	1
Acetone	16		ug/kg	12	5.6	1
Carbon disulfide	ND		ug/kg	12	5.4	1
2-Butanone	ND		ug/kg	12	2.6	1
4-Methyl-2-pentanone	ND		ug/kg	12	1.5	1
2-Hexanone	ND		ug/kg	12	1.4	1
Bromochloromethane	ND		ug/kg	2.4	0.24	1
1,2-Dibromoethane	ND		ug/kg	1.2	0.33	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	3.5	1.2	1
Isopropylbenzene	ND		ug/kg	1.2	0.13	1
1,2,3-Trichlorobenzene	ND		ug/kg	2.4	0.38	1
1,2,4-Trichlorobenzene	ND		ug/kg	2.4	0.32	1
Methyl Acetate	ND		ug/kg	4.7	1.1	1
Cyclohexane	ND		ug/kg	12	0.64	1
1,4-Dioxane	ND		ug/kg	94	41.	1
Freon-113	ND		ug/kg	4.7	0.82	1
Methyl cyclohexane	ND		ug/kg	4.7	0.71	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,2-Dichloroethane-d4	96		70-130
Toluene-d8	100		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	94		70-130

Project Name:	22 FILLMORE AVENUE SITE	**Lab Number:**	L2305824
Project Number:	B0659-022-001-003	**Report Date:**	02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-02	Date Collected:	02/02/23 09:20
Client ID:	TP-14 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8260D
Analytical Date: 02/05/23 16:29
Analyst: JIC
Percent Solids: 81%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	5.8	2.7	1
1,1-Dichloroethane	ND		ug/kg	1.2	0.17	1
Chloroform	ND		ug/kg	1.7	0.16	1
Carbon tetrachloride	ND		ug/kg	1.2	0.27	1
1,2-Dichloropropane	ND		ug/kg	1.2	0.14	1
Dibromochloromethane	ND		ug/kg	1.2	0.16	1
1,1,2-Trichloroethane	ND		ug/kg	1.2	0.31	1
Tetrachloroethene	ND		ug/kg	0.58	0.23	1
Chlorobenzene	ND		ug/kg	0.58	0.15	1
Trichlorofluoromethane	ND		ug/kg	4.7	0.81	1
1,2-Dichloroethane	ND		ug/kg	1.2	0.30	1
1,1,1-Trichloroethane	ND		ug/kg	0.58	0.19	1
Bromodichloromethane	ND		ug/kg	0.58	0.13	1
trans-1,3-Dichloropropene	ND		ug/kg	1.2	0.32	1
cis-1,3-Dichloropropene	ND		ug/kg	0.58	0.18	1
Bromoform	ND		ug/kg	4.7	0.29	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	0.58	0.19	1
Benzene	ND		ug/kg	0.58	0.19	1
Toluene	1.5		ug/kg	1.2	0.63	1
Ethylbenzene	ND		ug/kg	1.2	0.16	1
Chloromethane	ND		ug/kg	4.7	1.1	1
Bromomethane	ND		ug/kg	2.3	0.68	1
Vinyl chloride	ND		ug/kg	1.2	0.39	1
Chloroethane	ND		ug/kg	2.3	0.53	1
1,1-Dichloroethene	ND		ug/kg	1.2	0.28	1
trans-1,2-Dichloroethene	ND		ug/kg	1.7	0.16	1
Trichloroethene	ND		ug/kg	0.58	0.16	1
1,2-Dichlorobenzene	ND		ug/kg	2.3	0.17	1

SAMPLE RESULTS

Lab ID:	L2305824-02	Date Collected:	02/02/23 09:20
Client ID:	TP-14 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichlorobenzene	ND		ug/kg	2.3	0.17	1
1,4-Dichlorobenzene	ND		ug/kg	2.3	0.20	1
Methyl tert butyl ether	ND		ug/kg	2.3	0.23	1
p/m-Xylene	ND		ug/kg	2.3	0.65	1
o-Xylene	ND		ug/kg	1.2	0.34	1
cis-1,2-Dichloroethene	ND		ug/kg	1.2	0.20	1
Styrene	ND		ug/kg	1.2	0.23	1
Dichlorodifluoromethane	ND		ug/kg	12	1.1	1
Acetone	ND		ug/kg	12	5.6	1
Carbon disulfide	ND		ug/kg	12	5.3	1
2-Butanone	ND		ug/kg	12	2.6	1
4-Methyl-2-pentanone	ND		ug/kg	12	1.5	1
2-Hexanone	ND		ug/kg	12	1.4	1
Bromochloromethane	ND		ug/kg	2.3	0.24	1
1,2-Dibromoethane	ND		ug/kg	1.2	0.32	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	3.5	1.2	1
Isopropylbenzene	ND		ug/kg	1.2	0.13	1
1,2,3-Trichlorobenzene	ND		ug/kg	2.3	0.38	1
1,2,4-Trichlorobenzene	ND		ug/kg	2.3	0.32	1
Methyl Acetate	ND		ug/kg	4.7	1.1	1
Cyclohexane	ND		ug/kg	12	0.63	1
1,4-Dioxane	ND		ug/kg	93	41.	1
Freon-113	ND		ug/kg	4.7	0.81	1
Methyl cyclohexane	ND		ug/kg	4.7	0.70	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	96		70-130

SAMPLE RESULTS

Lab ID:	L2305824-03	Date Collected:	02/02/23 10:40
Client ID:	TP-16 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8260D
Analytical Date: 02/05/23 16:55
Analyst: JIC
Percent Solids: 83%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	6.0	2.8	1
1,1-Dichloroethane	ND		ug/kg	1.2	0.17	1
Chloroform	ND		ug/kg	1.8	0.17	1
Carbon tetrachloride	ND		ug/kg	1.2	0.28	1
1,2-Dichloropropane	ND		ug/kg	1.2	0.15	1
Dibromochloromethane	ND		ug/kg	1.2	0.17	1
1,1,2-Trichloroethane	ND		ug/kg	1.2	0.32	1
Tetrachloroethene	ND		ug/kg	0.60	0.24	1
Chlorobenzene	ND		ug/kg	0.60	0.15	1
Trichlorofluoromethane	ND		ug/kg	4.8	0.84	1
1,2-Dichloroethane	ND		ug/kg	1.2	0.31	1
1,1,1-Trichloroethane	ND		ug/kg	0.60	0.20	1
Bromodichloromethane	ND		ug/kg	0.60	0.13	1
trans-1,3-Dichloropropene	ND		ug/kg	1.2	0.33	1
cis-1,3-Dichloropropene	ND		ug/kg	0.60	0.19	1
Bromoform	ND		ug/kg	4.8	0.30	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	0.60	0.20	1
Benzene	ND		ug/kg	0.60	0.20	1
Toluene	1.2		ug/kg	1.2	0.65	1
Ethylbenzene	ND		ug/kg	1.2	0.17	1
Chloromethane	ND		ug/kg	4.8	1.1	1
Bromomethane	ND		ug/kg	2.4	0.70	1
Vinyl chloride	ND		ug/kg	1.2	0.40	1
Chloroethane	ND		ug/kg	2.4	0.54	1
1,1-Dichloroethene	ND		ug/kg	1.2	0.29	1
trans-1,2-Dichloroethene	ND		ug/kg	1.8	0.16	1
Trichloroethene	ND		ug/kg	0.60	0.16	1
1,2-Dichlorobenzene	ND		ug/kg	2.4	0.17	1

SAMPLE RESULTS

Lab ID:	L2305824-03	Date Collected:	02/02/23 10:40
Client ID:	TP-16 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichlorobenzene	ND		ug/kg	2.4	0.18	1
1,4-Dichlorobenzene	ND		ug/kg	2.4	0.20	1
Methyl tert butyl ether	ND		ug/kg	2.4	0.24	1
p/m-Xylene	ND		ug/kg	2.4	0.67	1
o-Xylene	ND		ug/kg	1.2	0.35	1
cis-1,2-Dichloroethene	ND		ug/kg	1.2	0.21	1
Styrene	ND		ug/kg	1.2	0.24	1
Dichlorodifluoromethane	ND		ug/kg	12	1.1	1
Acetone	7.5	J	ug/kg	12	5.8	1
Carbon disulfide	ND		ug/kg	12	5.5	1
2-Butanone	ND		ug/kg	12	2.7	1
4-Methyl-2-pentanone	ND		ug/kg	12	1.5	1
2-Hexanone	ND		ug/kg	12	1.4	1
Bromochloromethane	ND		ug/kg	2.4	0.25	1
1,2-Dibromoethane	ND		ug/kg	1.2	0.34	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	3.6	1.2	1
Isopropylbenzene	ND		ug/kg	1.2	0.13	1
1,2,3-Trichlorobenzene	ND		ug/kg	2.4	0.39	1
1,2,4-Trichlorobenzene	ND		ug/kg	2.4	0.33	1
Methyl Acetate	ND		ug/kg	4.8	1.1	1
Cyclohexane	ND		ug/kg	12	0.65	1
1,4-Dioxane	ND		ug/kg	96	42.	1
Freon-113	ND		ug/kg	4.8	0.83	1
Methyl cyclohexane	ND		ug/kg	4.8	0.72	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	97		70-130

Project Name:	22 FILLMORE AVENUE SITE	**Lab Number:**	L2305824
Project Number:	B0659-022-001-003	**Report Date:**	02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-04	Date Collected:	02/02/23 13:00
Client ID:	TP-18 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8260D
Analytical Date: 02/05/23 17:21
Analyst: JIC
Percent Solids: 84%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	5.8	2.6	1
1,1-Dichloroethane	ND		ug/kg	1.2	0.17	1
Chloroform	ND		ug/kg	1.7	0.16	1
Carbon tetrachloride	ND		ug/kg	1.2	0.26	1
1,2-Dichloropropane	ND		ug/kg	1.2	0.14	1
Dibromochloromethane	ND		ug/kg	1.2	0.16	1
1,1,2-Trichloroethane	ND		ug/kg	1.2	0.31	1
Tetrachloroethene	ND		ug/kg	0.58	0.22	1
Chlorobenzene	ND		ug/kg	0.58	0.15	1
Trichlorofluoromethane	ND		ug/kg	4.6	0.80	1
1,2-Dichloroethane	ND		ug/kg	1.2	0.30	1
1,1,1-Trichloroethane	ND		ug/kg	0.58	0.19	1
Bromodichloromethane	ND		ug/kg	0.58	0.12	1
trans-1,3-Dichloropropene	ND		ug/kg	1.2	0.31	1
cis-1,3-Dichloropropene	ND		ug/kg	0.58	0.18	1
Bromoform	ND		ug/kg	4.6	0.28	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	0.58	0.19	1
Benzene	ND		ug/kg	0.58	0.19	1
Toluene	1.2		ug/kg	1.2	0.62	1
Ethylbenzene	ND		ug/kg	1.2	0.16	1
Chloromethane	ND		ug/kg	4.6	1.1	1
Bromomethane	ND		ug/kg	2.3	0.67	1
Vinyl chloride	ND		ug/kg	1.2	0.39	1
Chloroethane	ND		ug/kg	2.3	0.52	1
1,1-Dichloroethene	ND		ug/kg	1.2	0.27	1
trans-1,2-Dichloroethene	ND		ug/kg	1.7	0.16	1
Trichloroethene	ND		ug/kg	0.58	0.16	1
1,2-Dichlorobenzene	ND		ug/kg	2.3	0.16	1

SAMPLE RESULTS

Lab ID:	L2305824-04	Date Collected:	02/02/23 13:00
Client ID:	TP-18 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichlorobenzene	ND		ug/kg	2.3	0.17	1
1,4-Dichlorobenzene	ND		ug/kg	2.3	0.20	1
Methyl tert butyl ether	ND		ug/kg	2.3	0.23	1
p/m-Xylene	ND		ug/kg	2.3	0.64	1
o-Xylene	ND		ug/kg	1.2	0.34	1
cis-1,2-Dichloroethene	ND		ug/kg	1.2	0.20	1
Styrene	0.27	J	ug/kg	1.2	0.22	1
Dichlorodifluoromethane	ND		ug/kg	12	1.0	1
Acetone	6.2	J	ug/kg	12	5.5	1
Carbon disulfide	ND		ug/kg	12	5.2	1
2-Butanone	ND		ug/kg	12	2.6	1
4-Methyl-2-pentanone	ND		ug/kg	12	1.5	1
2-Hexanone	ND		ug/kg	12	1.4	1
Bromochloromethane	ND		ug/kg	2.3	0.24	1
1,2-Dibromoethane	ND		ug/kg	1.2	0.32	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	3.4	1.2	1
Isopropylbenzene	ND		ug/kg	1.2	0.12	1
1,2,3-Trichlorobenzene	ND		ug/kg	2.3	0.37	1
1,2,4-Trichlorobenzene	ND		ug/kg	2.3	0.31	1
Methyl Acetate	ND		ug/kg	4.6	1.1	1
Cyclohexane	ND		ug/kg	12	0.63	1
1,4-Dioxane	ND		ug/kg	92	40.	1
Freon-113	ND		ug/kg	4.6	0.80	1
Methyl cyclohexane	ND		ug/kg	4.6	0.70	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,2-Dichloroethane-d4	98		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	98		70-130
Dibromofluoromethane	96		70-130

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260D
Analytical Date: 02/05/23 15:37
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-04 Batch: WG1741385-5					
Methylene chloride	ND		ug/kg	5.0	2.3
1,1-Dichloroethane	ND		ug/kg	1.0	0.14
Chloroform	ND		ug/kg	1.5	0.14
Carbon tetrachloride	ND		ug/kg	1.0	0.23
1,2-Dichloropropane	ND		ug/kg	1.0	0.12
Dibromochloromethane	ND		ug/kg	1.0	0.14
1,1,2-Trichloroethane	ND		ug/kg	1.0	0.27
Tetrachloroethene	ND		ug/kg	0.50	0.20
Chlorobenzene	ND		ug/kg	0.50	0.13
Trichlorofluoromethane	ND		ug/kg	4.0	0.70
1,2-Dichloroethane	ND		ug/kg	1.0	0.26
1,1,1-Trichloroethane	ND		ug/kg	0.50	0.17
Bromodichloromethane	ND		ug/kg	0.50	0.11
trans-1,3-Dichloropropene	ND		ug/kg	1.0	0.27
cis-1,3-Dichloropropene	ND		ug/kg	0.50	0.16
Bromoform	ND		ug/kg	4.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/kg	0.50	0.17
Benzene	ND		ug/kg	0.50	0.17
Toluene	ND		ug/kg	1.0	0.54
Ethylbenzene	ND		ug/kg	1.0	0.14
Chloromethane	ND		ug/kg	4.0	0.93
Bromomethane	ND		ug/kg	2.0	0.58
Vinyl chloride	ND		ug/kg	1.0	0.34
Chloroethane	ND		ug/kg	2.0	0.45
1,1-Dichloroethene	ND		ug/kg	1.0	0.24
trans-1,2-Dichloroethene	ND		ug/kg	1.5	0.14
Trichloroethene	ND		ug/kg	0.50	0.14
1,2-Dichlorobenzene	ND		ug/kg	2.0	0.14
1,3-Dichlorobenzene	ND		ug/kg	2.0	0.15

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260D
Analytical Date: 02/05/23 15:37
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-04 Batch: WG1741385-5					
1,4-Dichlorobenzene	ND		ug/kg	2.0	0.17
Methyl tert butyl ether	ND		ug/kg	2.0	0.20
p/m-Xylene	ND		ug/kg	2.0	0.56
o-Xylene	ND		ug/kg	1.0	0.29
cis-1,2-Dichloroethene	ND		ug/kg	1.0	0.18
Styrene	ND		ug/kg	1.0	0.20
Dichlorodifluoromethane	ND		ug/kg	10	0.92
Acetone	ND		ug/kg	10	4.8
Carbon disulfide	ND		ug/kg	10	4.6
2-Butanone	ND		ug/kg	10	2.2
4-Methyl-2-pentanone	ND		ug/kg	10	1.3
2-Hexanone	ND		ug/kg	10	1.2
Bromochloromethane	ND		ug/kg	2.0	0.20
1,2-Dibromoethane	ND		ug/kg	1.0	0.28
1,2-Dibromo-3-chloropropane	ND		ug/kg	3.0	1.0
Isopropylbenzene	ND		ug/kg	1.0	0.11
1,2,3-Trichlorobenzene	ND		ug/kg	2.0	0.32
1,2,4-Trichlorobenzene	ND		ug/kg	2.0	0.27
Methyl Acetate	ND		ug/kg	4.0	0.95
Cyclohexane	ND		ug/kg	10	0.54
1,4-Dioxane	ND		ug/kg	80	35.
Freon-113	ND		ug/kg	4.0	0.69
Methyl cyclohexane	ND		ug/kg	4.0	0.60

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260D
Analytical Date: 02/05/23 15:37
Analyst: AJK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01-04 Batch: WG1741385-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	94		70-130
Toluene-d8	101		70-130
4-Bromofluorobenzene	97		70-130
Dibromofluoromethane	92		70-130

Lab Control Sample Analysis

Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE

Project Number: B0659-022-001-003

Lab Number: L2305824

Report Date: 02/07/23

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: WG1741385-3 WG1741385-4								
Methylene chloride	88		88		70-130	0		30
1,1-Dichloroethane	96		96		70-130	0		30
Chloroform	86		86		70-130	0		30
Carbon tetrachloride	92		92		70-130	0		30
1,2-Dichloropropane	93		93		70-130	0		30
Dibromochloromethane	90		91		70-130	1		30
1,1,2-Trichloroethane	83		85		70-130	2		30
Tetrachloroethene	103		102		70-130	1		30
Chlorobenzene	92		93		70-130	1		30
Trichlorofluoromethane	109		109		70-139	0		30
1,2-Dichloroethane	87		89		70-130	2		30
1,1,1-Trichloroethane	92		92		70-130	0		30
Bromodichloromethane	83		85		70-130	2		30
trans-1,3-Dichloropropene	88		89		70-130	1		30
cis-1,3-Dichloropropene	84		86		70-130	2		30
Bromoform	87		92		70-130	6		30
1,1,2,2-Tetrachloroethane	84		87		70-130	4		30
Benzene	90		90		70-130	0		30
Toluene	92		93		70-130	1		30
Ethylbenzene	92		92		70-130	0		30
Chloromethane	116		114		52-130	2		30
Bromomethane	90		88		57-147	2		30
Vinyl chloride	100		98		67-130	2		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE

Project Number: B0659-022-001-003

Lab Number: L2305824

Report Date: 02/07/23

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: WG1741385-3 WG1741385-4								
Chloroethane	88		88		50-151	0		30
1,1-Dichloroethene	99		102		65-135	3		30
trans-1,2-Dichloroethene	93		94		70-130	1		30
Trichloroethene	90		89		70-130	1		30
1,2-Dichlorobenzene	91		92		70-130	1		30
1,3-Dichlorobenzene	92		94		70-130	2		30
1,4-Dichlorobenzene	92		94		70-130	2		30
Methyl tert butyl ether	89		91		66-130	2		30
p/m-Xylene	93		94		70-130	1		30
o-Xylene	95		96		70-130	1		30
cis-1,2-Dichloroethene	89		90		70-130	1		30
Styrene	93		93		70-130	0		30
Dichlorodifluoromethane	119		117		30-146	2		30
Acetone	110		117		54-140	6		30
Carbon disulfide	**163**	Q	**163**	Q	59-130	0		30
2-Butanone	100		103		70-130	3		30
4-Methyl-2-pentanone	82		87		70-130	6		30
2-Hexanone	89		94		70-130	5		30
Bromochloromethane	89		92		70-130	3		30
1,2-Dibromoethane	88		91		70-130	3		30
1,2-Dibromo-3-chloropropane	81		86		68-130	6		30
Isopropylbenzene	92		94		70-130	2		30
1,2,3-Trichlorobenzene	93		95		70-130	2		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE
Lab Number: L2305824
Project Number: B0659-022-001-003
Report Date: 02/07/23

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: WG1741385-3 WG1741385-4								
1,2,4-Trichlorobenzene	95		96		70-130	1		30
Methyl Acetate	100		102		51-146	2		30
Cyclohexane	113		113		59-142	0		30
1,4-Dioxane	102		105		65-136	3		30
Freon-113	105		105		50-139	0		30
Methyl cyclohexane	95		95		70-130	0		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	94		95		70-130
Toluene-d8	103		102		70-130
4-Bromofluorobenzene	97		99		70-130
Dibromofluoromethane	93		95		70-130

SEMIVOLATILES

SAMPLE RESULTS

Lab ID:	L2305824-01	Date Collected:	02/02/23 08:25
Client ID:	TP-13 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270E	Extraction Date:	02/03/23 19:02
Analytical Date:	02/04/23 12:20		
Analyst:	CMM		
Percent Solids:	84%		

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	160	20.	1
Fluoranthene	ND		ug/kg	120	23.	1
Naphthalene	ND		ug/kg	200	24.	1
Benzo(a)anthracene	ND		ug/kg	120	22.	1
Benzo(a)pyrene	ND		ug/kg	160	48.	1
Benzo(b)fluoranthene	ND		ug/kg	120	33.	1
Benzo(k)fluoranthene	ND		ug/kg	120	32.	1
Chrysene	ND		ug/kg	120	20.	1
Acenaphthylene	ND		ug/kg	160	30.	1
Anthracene	ND		ug/kg	120	38.	1
Benzo(ghi)perylene	ND		ug/kg	160	23.	1
Fluorene	ND		ug/kg	200	19.	1
Phenanthrene	ND		ug/kg	120	24.	1
Dibenzo(a,h)anthracene	ND		ug/kg	120	23.	1
Indeno(1,2,3-cd)pyrene	ND		ug/kg	160	27.	1
Pyrene	ND		ug/kg	120	20.	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
Nitrobenzene-d5	91		23-120
2-Fluorobiphenyl	78		30-120
4-Terphenyl-d14	77		18-120

SAMPLE RESULTS

Lab ID:	L2305824-02	Date Collected:	02/02/23 09:20
Client ID:	TP-14 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270E	Extraction Date:	02/03/23 19:02
Analytical Date:	02/04/23 12:44		
Analyst:	CMM		
Percent Solids:	81%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	160	21.	1
Fluoranthene	ND		ug/kg	120	23.	1
Naphthalene	ND		ug/kg	200	25.	1
Benzo(a)anthracene	ND		ug/kg	120	23.	1
Benzo(a)pyrene	ND		ug/kg	160	50.	1
Benzo(b)fluoranthene	ND		ug/kg	120	34.	1
Benzo(k)fluoranthene	ND		ug/kg	120	33.	1
Chrysene	ND		ug/kg	120	21.	1
Acenaphthylene	ND		ug/kg	160	32.	1
Anthracene	ND		ug/kg	120	40.	1
Benzo(ghi)perylene	ND		ug/kg	160	24.	1
Fluorene	ND		ug/kg	200	20.	1
Phenanthrene	ND		ug/kg	120	25.	1
Dibenzo(a,h)anthracene	ND		ug/kg	120	24.	1
Indeno(1,2,3-cd)pyrene	ND		ug/kg	160	28.	1
Pyrene	ND		ug/kg	120	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	67		23-120
2-Fluorobiphenyl	59		30-120
4-Terphenyl-d14	59		18-120

SAMPLE RESULTS

Lab ID: L2305824-03
Client ID: TP-16 NATIVE
Sample Location: TONAWANDA, NEW YORK

Date Collected: 02/02/23 10:40
Date Received: 02/02/23
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8270E
Analytical Date: 02/04/23 13:09
Analyst: CMM
Percent Solids: 83%

Extraction Method: EPA 3546
Extraction Date: 02/03/23 19:02

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	160	21.	1
Fluoranthene	ND		ug/kg	120	23.	1
Naphthalene	ND		ug/kg	200	24.	1
Benzo(a)anthracene	ND		ug/kg	120	22.	1
Benzo(a)pyrene	ND		ug/kg	160	48.	1
Benzo(b)fluoranthene	ND		ug/kg	120	34.	1
Benzo(k)fluoranthene	ND		ug/kg	120	32.	1
Chrysene	ND		ug/kg	120	21.	1
Acenaphthylene	ND		ug/kg	160	31.	1
Anthracene	ND		ug/kg	120	39.	1
Benzo(ghi)perylene	ND		ug/kg	160	23.	1
Fluorene	ND		ug/kg	200	19.	1
Phenanthrene	ND		ug/kg	120	24.	1
Dibenzo(a,h)anthracene	ND		ug/kg	120	23.	1
Indeno(1,2,3-cd)pyrene	ND		ug/kg	160	28.	1
Pyrene	ND		ug/kg	120	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	66		23-120
2-Fluorobiphenyl	59		30-120
4-Terphenyl-d14	59		18-120

SAMPLE RESULTS

Lab ID:	L2305824-04	Date Collected:	02/02/23 13:00
Client ID:	TP-18 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270E	Extraction Date:	02/03/23 19:02
Analytical Date:	02/04/23 13:33		
Analyst:	CMM		
Percent Solids:	84%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	160	20.	1
Fluoranthene	ND		ug/kg	120	22.	1
Naphthalene	ND		ug/kg	200	24.	1
Benzo(a)anthracene	ND		ug/kg	120	22.	1
Benzo(a)pyrene	ND		ug/kg	160	48.	1
Benzo(b)fluoranthene	ND		ug/kg	120	33.	1
Benzo(k)fluoranthene	ND		ug/kg	120	31.	1
Chrysene	ND		ug/kg	120	20.	1
Acenaphthylene	ND		ug/kg	160	30.	1
Anthracene	ND		ug/kg	120	38.	1
Benzo(ghi)perylene	ND		ug/kg	160	23.	1
Fluorene	ND		ug/kg	200	19.	1
Phenanthrene	ND		ug/kg	120	24.	1
Dibenzo(a,h)anthracene	ND		ug/kg	120	23.	1
Indeno(1,2,3-cd)pyrene	ND		ug/kg	160	27.	1
Pyrene	ND		ug/kg	120	20.	1

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

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270E
Analytical Date: 02/04/23 07:57
Analyst: CMM

Extraction Method: EPA 3546
Extraction Date: 02/03/23 16:38

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01-04 Batch: WG1740748-1					
Acenaphthene	ND		ug/kg	130	17.
Fluoranthene	ND		ug/kg	98	19.
Naphthalene	ND		ug/kg	160	20.
Benzo(a)anthracene	ND		ug/kg	98	18.
Benzo(a)pyrene	ND		ug/kg	130	40.
Benzo(b)fluoranthene	ND		ug/kg	98	28.
Benzo(k)fluoranthene	ND		ug/kg	98	26.
Chrysene	ND		ug/kg	98	17.
Acenaphthylene	ND		ug/kg	130	25.
Anthracene	ND		ug/kg	98	32.
Benzo(ghi)perylene	ND		ug/kg	130	19.
Fluorene	ND		ug/kg	160	16.
Phenanthrene	ND		ug/kg	98	20.
Dibenzo(a,h)anthracene	ND		ug/kg	98	19.
Indeno(1,2,3-cd)pyrene	ND		ug/kg	130	23.
Pyrene	ND		ug/kg	98	16.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	77		25-120
Phenol-d6	77		10-120
Nitrobenzene-d5	76		23-120
2-Fluorobiphenyl	69		30-120
2,4,6-Tribromophenol	68		10-136
4-Terphenyl-d14	74		18-120

Lab Control Sample Analysis

Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE

Project Number: B0659-022-001-003

Lab Number: L2305824

Report Date: 02/07/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-04 Batch: WG1740748-2 WG1740748-3								
Acenaphthene	57		56		31-137	2		50
Fluoranthene	58		57		40-140	2		50
Naphthalene	60		55		40-140	9		50
Benzo(a)anthracene	61		60		40-140	2		50
Benzo(a)pyrene	64		62		40-140	3		50
Benzo(b)fluoranthene	62		62		40-140	0		50
Benzo(k)fluoranthene	62		60		40-140	3		50
Chrysene	60		58		40-140	3		50
Acenaphthylene	58		55		40-140	5		50
Anthracene	60		58		40-140	3		50
Benzo(ghi)perylene	61		60		40-140	2		50
Fluorene	59		57		40-140	3		50
Phenanthrene	59		57		40-140	3		50
Dibenzo(a,h)anthracene	60		59		40-140	2		50
Indeno(1,2,3-cd)pyrene	68		66		40-140	3		50
Pyrene	58		57		35-142	2		50

Lab Control Sample Analysis
Batch Quality Control

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-04 Batch: WG1740748-2 WG1740748-3								

Surrogate	*LCS %Recovery*	*Qual*	*LCSD %Recovery*	*Qual*	*Acceptance Criteria*
2-Fluorophenol	70		64		25-120
Phenol-d6	67		62		10-120
Nitrobenzene-d5	68		62		23-120
2-Fluorobiphenyl	59		55		30-120
2,4,6-Tribromophenol	56		56		10-136
4-Terphenyl-d14	59		58		18-120

METALS

Project Name:	22 FILLMORE AVENUE SITE	**Lab Number:**	L2305824
Project Number:	B0659-022-001-003	**Report Date:**	02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-01	Date Collected:	02/02/23 08:25
Client ID:	TP-13 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 84%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Aluminum, Total	9410		mg/kg	9.14	2.47	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Antimony, Total	0.359	J	mg/kg	4.57	0.347	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Arsenic, Total	1.72		mg/kg	0.914	0.190	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Barium, Total	58.3		mg/kg	0.914	0.159	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Beryllium, Total	0.282	J	mg/kg	0.457	0.030	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Cadmium, Total	ND		mg/kg	0.914	0.090	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Calcium, Total	1570		mg/kg	9.14	3.20	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Chromium, Total	10.0		mg/kg	0.914	0.088	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Cobalt, Total	5.31		mg/kg	1.83	0.152	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Copper, Total	10.9		mg/kg	0.914	0.236	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Iron, Total	9430		mg/kg	4.57	0.825	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Lead, Total	6.71		mg/kg	4.57	0.245	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Magnesium, Total	1780		mg/kg	9.14	1.41	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Manganese, Total	66.3		mg/kg	0.914	0.145	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Mercury, Total	ND		mg/kg	0.086	0.056	1	02/03/23 23:01	02/06/23 18:34	EPA 7471B	1,7471B	ZNK
Nickel, Total	14.0		mg/kg	2.28	0.221	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Potassium, Total	599		mg/kg	228	13.2	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Selenium, Total	ND		mg/kg	1.83	0.236	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Silver, Total	ND		mg/kg	0.457	0.258	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Sodium, Total	42.3	J	mg/kg	183	2.88	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Thallium, Total	ND		mg/kg	1.83	0.288	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Vanadium, Total	11.8		mg/kg	0.914	0.185	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW
Zinc, Total	39.2		mg/kg	4.57	0.268	2	02/03/23 22:13	02/05/23 12:56	EPA 3050B	1,6010D	EGW

Project Name: 22 FILLMORE AVENUE SITE **Lab Number:** L2305824
Project Number: B0659-022-001-003 **Report Date:** 02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-02	Date Collected:	02/02/23 09:20
Client ID:	TP-14 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		
Percent Solids:	81%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Aluminum, Total	8480		mg/kg	9.73	2.63	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Antimony, Total	0.809	J	mg/kg	4.87	0.370	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Arsenic, Total	6.91		mg/kg	0.973	0.202	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Barium, Total	31.9		mg/kg	0.973	0.169	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Beryllium, Total	0.466	J	mg/kg	0.487	0.032	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Cadmium, Total	ND		mg/kg	0.973	0.095	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Calcium, Total	2040		mg/kg	9.73	3.41	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Chromium, Total	12.5		mg/kg	0.973	0.093	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Cobalt, Total	10.4		mg/kg	1.95	0.162	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Copper, Total	19.2		mg/kg	0.973	0.251	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Iron, Total	19600		mg/kg	4.87	0.879	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Lead, Total	18.5		mg/kg	4.87	0.261	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Magnesium, Total	2820		mg/kg	9.73	1.50	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Manganese, Total	135		mg/kg	0.973	0.155	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Mercury, Total	ND		mg/kg	0.084	0.055	1	02/03/23 23:01	02/06/23 18:37	EPA 7471B	1,7471B	ZNK
Nickel, Total	17.9		mg/kg	2.43	0.236	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Potassium, Total	532		mg/kg	243	14.0	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Selenium, Total	ND		mg/kg	1.95	0.251	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Silver, Total	ND		mg/kg	0.487	0.275	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Sodium, Total	183	J	mg/kg	195	3.06	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Thallium, Total	ND		mg/kg	1.95	0.306	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Vanadium, Total	19.6		mg/kg	0.973	0.198	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW
Zinc, Total	65.1		mg/kg	4.87	0.285	2	02/03/23 22:13	02/05/23 14:05	EPA 3050B	1,6010D	EGW

Project Name:	22 FILLMORE AVENUE SITE	**Lab Number:**	L2305824
Project Number:	B0659-022-001-003	**Report Date:**	02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-03	Date Collected:	02/02/23 10:40
Client ID:	TP-16 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 83%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Aluminum, Total	9950		mg/kg	9.53	2.57	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Antimony, Total	1.12	J	mg/kg	4.76	0.362	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Arsenic, Total	10.6		mg/kg	0.953	0.198	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Barium, Total	23.9		mg/kg	0.953	0.166	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Beryllium, Total	0.453	J	mg/kg	0.476	0.031	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Cadmium, Total	ND		mg/kg	0.953	0.093	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Calcium, Total	2120		mg/kg	9.53	3.34	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Chromium, Total	14.5		mg/kg	0.953	0.092	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Cobalt, Total	7.45		mg/kg	1.90	0.158	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Copper, Total	21.6		mg/kg	0.953	0.246	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Iron, Total	23400		mg/kg	4.76	0.860	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Lead, Total	11.2		mg/kg	4.76	0.255	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Magnesium, Total	2780		mg/kg	9.53	1.47	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Manganese, Total	176		mg/kg	0.953	0.152	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Mercury, Total	ND		mg/kg	0.081	0.053	1	02/03/23 23:01	02/06/23 18:40	EPA 7471B	1,7471B	ZNK
Nickel, Total	17.6		mg/kg	2.38	0.230	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Potassium, Total	375		mg/kg	238	13.7	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Selenium, Total	ND		mg/kg	1.90	0.246	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Silver, Total	ND		mg/kg	0.476	0.270	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Sodium, Total	41.4	J	mg/kg	190	3.00	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Thallium, Total	ND		mg/kg	1.90	0.300	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Vanadium, Total	26.8		mg/kg	0.953	0.193	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW
Zinc, Total	66.7		mg/kg	4.76	0.279	2	02/03/23 22:13	02/05/23 14:09	EPA 3050B	1,6010D	EGW

Project Name:	22 FILLMORE AVENUE SITE	**Lab Number:**	L2305824
Project Number:	B0659-022-001-003	**Report Date:**	02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-04	Date Collected:	02/02/23 13:00
Client ID:	TP-18 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 84%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Aluminum, Total	8090		mg/kg	9.08	2.45	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Antimony, Total	0.628	J	mg/kg	4.54	0.345	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Arsenic, Total	6.53		mg/kg	0.908	0.189	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Barium, Total	21.6		mg/kg	0.908	0.158	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Beryllium, Total	0.350	J	mg/kg	0.454	0.030	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Cadmium, Total	ND		mg/kg	0.908	0.089	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Calcium, Total	1700		mg/kg	9.08	3.18	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Chromium, Total	11.8		mg/kg	0.908	0.087	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Cobalt, Total	6.31		mg/kg	1.82	0.151	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Copper, Total	14.3		mg/kg	0.908	0.234	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Iron, Total	16600		mg/kg	4.54	0.820	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Lead, Total	8.64		mg/kg	4.54	0.243	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Magnesium, Total	2360		mg/kg	9.08	1.40	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Manganese, Total	164		mg/kg	0.908	0.144	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Mercury, Total	ND		mg/kg	0.088	0.057	1	02/03/23 23:01	02/06/23 18:43	EPA 7471B	1,7471B	ZNK
Nickel, Total	14.4		mg/kg	2.27	0.220	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Potassium, Total	301		mg/kg	227	13.1	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Selenium, Total	ND		mg/kg	1.82	0.234	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Silver, Total	ND		mg/kg	0.454	0.257	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Sodium, Total	40.5	J	mg/kg	182	2.86	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Thallium, Total	ND		mg/kg	1.82	0.286	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Vanadium, Total	19.2		mg/kg	0.908	0.184	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW
Zinc, Total	56.0		mg/kg	4.54	0.266	2	02/03/23 22:13	02/05/23 14:12	EPA 3050B	1,6010D	EGW

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1740577-1										
Aluminum, Total	ND		mg/kg	4.00	1.08	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Antimony, Total	ND		mg/kg	2.00	0.152	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Arsenic, Total	ND		mg/kg	0.400	0.083	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Barium, Total	ND		mg/kg	0.400	0.070	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Beryllium, Total	ND		mg/kg	0.200	0.013	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Cadmium, Total	ND		mg/kg	0.400	0.039	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Calcium, Total	ND		mg/kg	4.00	1.40	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Chromium, Total	ND		mg/kg	0.400	0.038	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Cobalt, Total	ND		mg/kg	0.800	0.066	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Copper, Total	ND		mg/kg	0.400	0.103	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Iron, Total	2.88		mg/kg	2.00	0.361	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Lead, Total	ND		mg/kg	2.00	0.107	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Magnesium, Total	ND		mg/kg	4.00	0.616	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Manganese, Total	ND		mg/kg	0.400	0.064	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Nickel, Total	ND		mg/kg	1.00	0.097	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Potassium, Total	ND		mg/kg	100	5.76	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Selenium, Total	ND		mg/kg	0.800	0.103	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Silver, Total	ND		mg/kg	0.200	0.113	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Sodium, Total	ND		mg/kg	80.0	1.26	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Thallium, Total	ND		mg/kg	0.800	0.126	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Vanadium, Total	ND		mg/kg	0.400	0.081	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW
Zinc, Total	0.540	J	mg/kg	2.00	0.117	1	02/03/23 22:13	02/05/23 13:05	1,6010D	EGW

Prep Information

Digestion Method: EPA 3050B

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1740578-1										
Mercury, Total	ND		mg/kg	0.083	0.054	1	02/03/23 23:01	02/06/23 18:07	1,7471B	ZNK

Method Blank Analysis
Batch Quality Control

Prep Information

Digestion Method: EPA 7471B

Lab Control Sample Analysis
Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE
Lab Number: L2305824
Project Number: B0659-022-001-003
Report Date: 02/07/23

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1740577-2 SRM Lot Number: D116-540								
Aluminum, Total	82		-		45-155	-		
Antimony, Total	160		-		2-205	-		
Arsenic, Total	111		-		82-119	-		
Barium, Total	100		-		82-118	-		
Beryllium, Total	110		-		82-118	-		
Cadmium, Total	109		-		82-118	-		
Calcium, Total	107		-		81-119	-		
Chromium, Total	104		-		81-118	-		
Cobalt, Total	104		-		83-117	-		
Copper, Total	106		-		83-117	-		
Iron, Total	106		-		58-142	-		
Lead, Total	107		-		83-117	-		
Magnesium, Total	95		-		75-125	-		
Manganese, Total	112		-		82-118	-		
Nickel, Total	106		-		82-118	-		
Potassium, Total	88		-		68-131	-		
Selenium, Total	110		-		78-122	-		
Silver, Total	107		-		79-121	-		
Sodium, Total	101		-		71-130	-		
Thallium, Total	109		-		80-120	-		
Vanadium, Total	107		-		78-122	-		

Lab Control Sample Analysis

Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE

Project Number: B0659-022-001-003

Lab Number: L2305824

Report Date: 02/07/23

Parameter	LCS %Recovery	LCSD %Recovery	%Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1740577-2 SRM Lot Number: D116-540					
Zinc, Total	110	-	80-120	-	
Total Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1740578-2 SRM Lot Number: D116-540					
Mercury, Total	86	-	58-142	-	

Matrix Spike Analysis
Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE
Project Number: B0659-022-001-003
Lab Number: L2305824
Report Date: 02/07/23

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1740577-3 QC Sample: L2305841-01 Client ID: MS Sample												
Aluminum, Total	10500	181	12300	**996**	Q	-	-		75-125	-		20
Antimony, Total	1.07J	45.2	41.6	92		-	-		75-125	-		20
Arsenic, Total	3.36	10.8	15.6	113		-	-		75-125	-		20
Barium, Total	94.5	181	275	100		-	-		75-125	-		20
Beryllium, Total	0.374	4.52	4.74	97		-	-		75-125	-		20
Cadmium, Total	0.244J	4.79	4.24	88		-	-		75-125	-		20
Calcium, Total	12400	904	13700	**144**	Q	-	-		75-125	-		20
Chromium, Total	18.0	18.1	36.4	102		-	-		75-125	-		20
Cobalt, Total	6.13	45.2	44.6	85		-	-		75-125	-		20
Copper, Total	31.5	22.6	51.5	88		-	-		75-125	-		20
Iron, Total	14000	90.4	15600	**1770**	Q	-	-		75-125	-		20
Lead, Total	87.1	47.9	128	85		-	-		75-125	-		20
Magnesium, Total	5600	904	5850	**28**	Q	-	-		75-125	-		20
Manganese, Total	339	45.2	406	**148**	Q	-	-		75-125	-		20
Nickel, Total	14.1	45.2	51.2	82		-	-		75-125	-		20
Potassium, Total	2350	904	3460	123		-	-		75-125	-		20
Selenium, Total	ND	10.8	11.5	106		-	-		75-125	-		20
Silver, Total	ND	27.1	26.0	96		-	-		75-125	-		20
Sodium, Total	206	904	1130	102		-	-		75-125	-		20
Thallium, Total	0.438J	10.8	10.6	98		-	-		75-125	-		20
Vanadium, Total	24.3	45.2	69.6	100		-	-		75-125	-		20

Matrix Spike Analysis
Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE
Project Number: B0659-022-001-003

Lab Number: L2305824
Report Date: 02/07/23

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	MSD Found	MSD %Recovery	Recovery Limits	RPD	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1740577-3 QC Sample: L2305841-01 Client ID: MS Sample									
Zinc, Total	116	45.2	155	86	-	-	75-125	-	20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1740578-3 QC Sample: L2305963-01 Client ID: MS Sample									
Mercury, Total	0.959	1.62	2.55	98	-	-	80-120	-	20

Lab Duplicate Analysis

Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE
Project Number: B0659-022-001-003

Lab Number: L2305824
Report Date: 02/07/23

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1740577-4 QC Sample: L2305841-01 Client ID: DUP Sample						
Lead, Total	87.1	92.1	mg/kg	6		20
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1740578-4 QC Sample: L2305963-01 Client ID: DUP Sample						
Mercury, Total	0.959	1.31	mg/kg	**31**	Q	20

Project Name: 22 FILLMORE AVENUE SITE
Project Number: B0659-022-001-00

Lab Serial Dilution Analysis
Batch Quality Control

Lab Number: L2305824
Report Date: 02/07/23

Parameter	Native Sample	Serial Dilution	Units	% D	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1740577-6 QC Sample: L2305841-01 Client ID: DUP Sample						
Lead, Total	87.1	89.3	mg/kg	3		20

INORGANICS
&
MISCELLANEOUS

SAMPLE RESULTS

Lab ID: L2305824-01
Client ID: TP-13 NATIVE
Sample Location: TONAWANDA, NEW YORK

Date Collected: 02/02/23 08:25
Date Received: 02/02/23
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	84.0		%	0.100	NA	1	-	02/03/23 07:21	121,2540G	ROI

Project Name:	22 FILLMORE AVENUE SITE	**Lab Number:**	L2305824
Project Number:	B0659-022-001-003	**Report Date:**	02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-02	Date Collected:	02/02/23 09:20
Client ID:	TP-14 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	81.1		%	0.100	NA	1	-	02/03/23 07:21	121,2540G	ROI

SAMPLE RESULTS

Lab ID:	L2305824-03	Date Collected:	02/02/23 10:40
Client ID:	TP-16 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	82.7		%	0.100	NA	1	-	02/03/23 07:21	121,2540G	ROI

Project Name:	22 FILLMORE AVENUE SITE	**Lab Number:**	L2305824
Project Number:	B0659-022-001-003	**Report Date:**	02/07/23

SAMPLE RESULTS

Lab ID:	L2305824-04	Date Collected:	02/02/23 13:00
Client ID:	TP-18 NATIVE	Date Received:	02/02/23
Sample Location:	TONAWANDA, NEW YORK	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	83.9		%	0.100	NA	1	-	02/03/23 07:21	121,2540G	ROI

Lab Duplicate Analysis

Batch Quality Control

Project Name: 22 FILLMORE AVENUE SITE

Project Number: B0659-022-001-003

Lab Number: L2305824

Report Date: 02/07/23

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-04 QC Batch ID: WG1740456-1 QC Sample: L2305824-01 Client ID: TP-13 NATIVE						
Solids, Total	84.0	83.7	%	0		20

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	*Custody Seal*
A	Absent

Container Information

Container ID	*Container Type*	*Cooler*	*Initial pH*	*Final pH*	*Temp deg C*	*Pres*	*Seal*	*Frozen Date/Time*	*Analysis(*)*
L2305824-01A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)
L2305824-01B	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		BE-TI(180),BA-TI(180),AS-TI(180),AG-TI(180),CR-TI(180),NI-TI(180),AL-TI(180),TL-TI(180),ZN-TI(180),CU-TI(180),SE-TI(180),PB-TI(180),SB-TI(180),CO-TI(180),V-TI(180),FE-TI(180),MG-TI(180),HG-T(28),MN-TI(180),NA-TI(180),CA-TI(180),CD-TI(180),K-TI(180)
L2305824-01C	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		NYTCL-PAH(14),TS(7)
L2305824-01X	Vial MeOH preserved split	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)
L2305824-01Y	Vial Water preserved split	A	NA		3.2	Y	Absent	**04-FEB-23 11:20**	NYTCL-8260-R2(14)
L2305824-01Z	Vial Water preserved split	A	NA		3.2	Y	Absent	**04-FEB-23 11:20**	NYTCL-8260-R2(14)
L2305824-02A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)
L2305824-02B	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		BE-TI(180),AS-TI(180),BA-TI(180),AG-TI(180),AL-TI(180),TL-TI(180),CR-TI(180),NI-TI(180),ZN-TI(180),PB-TI(180),CU-TI(180),SB-TI(180),SE-TI(180),V-TI(180),CO-TI(180),FE-TI(180),HG-T(28),MN-TI(180),MG-TI(180),CA-TI(180),K-TI(180),CD-TI(180),NA-TI(180)
L2305824-02C	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		NYTCL-PAH(14),TS(7)
L2305824-02X	Vial MeOH preserved split	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)
L2305824-02Y	Vial Water preserved split	A	NA		3.2	Y	Absent	**04-FEB-23 11:20**	NYTCL-8260-R2(14)
L2305824-02Z	Vial Water preserved split	A	NA		3.2	Y	Absent	**04-FEB-23 11:20**	NYTCL-8260-R2(14)
L2305824-03A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)
L2305824-03B	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		BE-TI(180),BA-TI(180),AS-TI(180),AG-TI(180),NI-TI(180),TL-TI(180),AL-TI(180),CR-TI(180),SE-TI(180),PB-TI(180),ZN-TI(180),CU-TI(180),SB-TI(180),V-TI(180),CO-TI(180),HG-T(28),MG-TI(180),FE-TI(180),MN-TI(180),K-TI(180),CD-TI(180),CA-TI(180),NA-TI(180)
L2305824-03C	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		NYTCL-PAH(14),TS(7)
L2305824-03X	Vial MeOH preserved split	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)

*Values in parentheses indicate holding time in days

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2305824-03Y	Vial Water preserved split	A	NA		3.2	Y	Absent	**04-FEB-23 11:20**	NYTCL-8260-R2(14)
L2305824-03Z	Vial Water preserved split	A	NA		3.2	Y	Absent	**04-FEB-23 11:20**	NYTCL-8260-R2(14)
L2305824-04A	Vial Large Septa unpreserved (4oz)	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)
L2305824-04B	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		BE-TI(180),AS-TI(180),BA-TI(180),AG-TI(180),TL-TI(180),AL-TI(180),CR-TI(180),NI-TI(180),ZN-TI(180),SB-TI(180),SE-TI(180),PB-TI(180),CU-TI(180),V-TI(180),CO-TI(180),FE-TI(180),HG-T(28),MG-TI(180),MN-TI(180),K-TI(180),CA-TI(180),NA-TI(180),CD-TI(180)
L2305824-04C	Glass 120ml/4oz unpreserved	A	NA		3.2	Y	Absent		NYTCL-PAH(14),TS(7)
L2305824-04X	Vial MeOH preserved split	A	NA		3.2	Y	Absent		NYTCL-8260-R2(14)
L2305824-04Y	Vial Water preserved split	A	NA		3.2	Y	Absent	04-FEB-23 11:20	NYTCL-8260-R2(14)
L2305824-04Z	Vial Water preserved split	A	NA		3.2	Y	Absent	04-FEB-23 11:20	NYTCL-8260-R2(14)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

DL - 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 limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

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).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

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.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

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. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

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.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

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.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

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.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

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. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

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.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

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.

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

Data Qualifiers

	Identified Compounds (TICs).
M	- Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
ND	- Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.
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.
V	- The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)
Z	- The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: 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
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

ALPHA ANALYTICAL

NEW YORK CHAIN OF CUSTODY

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page 1 of 1

Date Rec'd in Lab: 2/3/~~20~~ 23 mk 2/3

ALPHA Job #: L2305824

Client Information

Client: Turnkey Environmental Restoration
Address: 2558 Hamburg Tpke
Suite 300 Buffalo, NY
Phone: (716) 864-2726
Fax:
Email: cboron@bm-tk.com

Project Information

Project Name: 22 Fillmore Avenue Site
Project Location: Tonawanda, New York
Project #: B0659-022-001-003
(Use Project name as Project #) ☐
Project Manager: Chris Boron
ALPHAQuote #:

Turn-Around Time

Standard ☐
Rush (only if pre approved) ☒
Due Date:
# of Days: 3-day TAT

Deliverables

☐ ASP-A ☐ ASP-B
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

Billing Information

☐ Same as Client Info
PO #

Regulatory Requirement

☐ NY TOGS ☐ NY Part 375
☐ AWQ Standards ☐ NY CP-51
☐ NY Restricted Use ☐ Other
☐ NY Unrestricted Use
☐ NYC Sewer Discharge

Disposal Site Information

Please identify below location of applicable disposal facilities.

Disposal Facility:
☐ NJ ☐ NY
☐ Other:

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:

Please specify Metals or TAL.

ANALYSIS

Sample Filtration
☐ Done
☐ 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	VOCs via 8260	PAHs via 8270	TAL Metals via 6010/7471						Sample Specific Comments	Total Bottles
05824-01	TP-13 Native	02-02-23	0825	Soil	EDS	X	X	X							3
02	TP-14 Native	↓	0920	↓	↓	X	X	X							5
03	TP-16 Native		1040			X	X	X							3
04	TP-18 Native		1300			X	X	X							3

Container Type	A	A	A
Preservative	A	A	A

Preservative Code:
A = None
B = HCl
C = HNO_3
D = H_2SO_4
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Relinquished By:	Date/Time	Received By:	Date/Time
	2/2/23 1422	MAL	2/2/23 1422
MAL	2/2/23 1422		2/3/23 0000

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-25 HC (rev. 30-Sept-2013)

www.benchmarkturnkey.com

TurnKey Environmental Restoration, LLC

Strong Advocates, Effective Solutions, Integrated Implementation

May 24, 2022

Mr. Michael Conroe
ELLI Manager LLC
15 Cobblestone Court
Orchard Park, New York 14127

Re: Phase II Environmental Investigation
20 to 40 Fillmore Avenue
Tonawanda, New York

Dear Mr. Conroe:

TurnKey Environmental Restoration, LLC (TurnKey) has prepared this letter report to summarize the results of the Phase II Environmental Investigation (Phase II) activities at 20, 30, and 40 Fillmore Avenue, Tonawanda, New York (Site, see Figures 1 and 2) for ELLI Manager LLC (ELLI). The purpose of the Phase II was to evaluate potential environmental impacts at the Site associated with historic uses and an underground storage tank (UST), in addition to determine if the Site may be a candidate for the New York State Brownfield Cleanup Program (BCP).

As part of the Phase II, TurnKey reviewed Sanborn Maps (see Attachment 1), New York State Department of Environmental Conservation (NYSDEC) online records (DECinfo Locator ny.gov), and submitted Freedom of Information Act (FOIA) request to NYSDEC. The following information was identified:

- The Site was formally used as a coal and wood storage yard, boiler shop, welding operation, repair shop, and boat storage facility.
- A "G.T." indicating a gas tank was noted in the same location on both the 1951 and 1967 Sanborn Maps on the 30 Fillmore Avenue parcel (see Figure 2).
- A former NYSDEC Spill Number 9975702 associated with petroleum contamination identified along the embankment adjacent to the Site when the New York State Department of Transportation (NYSDOT) was performing upgrades to the bridge on Delaware Avenue. The spill was listed as No Further Action Required in March 2004, when soil disposal documentation was located in a different NYSDEC spill file. It is believed that NYSDOT managed soil that was necessary to complete the bridge work. It is unclear if the petroleum contamination associated with this spill was on the Site.

Phase II Environmental Investigation

The Phase II investigation activities consisted of 12 test pit (TP) locations, which are shown on Figure 3.

The TPs were completed using a mini-excavator and were completed to depths that ranged from 4 to 7.5 feet below ground surface (fbgs). Excavated soil/fill was brought to the ground surface for field characterization and to collect of soil/fill samples by TurnKey's geologist. Soil/fill generated during the test pits were placed on the ground adjacent to the test pit location and used to backfill the excavations back to ground surface, generally in the order in which it was removed.

TurnKey personnel made visual and olfactory observations, and scanned soil/fill samples retrieved from the investigation locations for total volatile organic vapors with a photoionization detector (PID) that is capable of detecting the presence of contaminants that emit volatile organic compounds (VOCs) such as petroleum products and solvents.

PID measurements above background (i.e., 0 parts per million (ppm)) were observed at TP-1 (0 to 7 fbgs), TP-6 (0 to 6 fbgs) and TP-7 (2 to 7 fbgs) which exhibited a field screening result of ranging from 2 to 1,000 parts per million (ppm) in addition to petroleum odors and staining (see Table 1). The three (3) test pit locations were completed in the vicinity of the UST noted on the 1951 and 1967 Sanborn maps shown on Figure 2. Based on the elevated PID field screening results and evidence of a petroleum release noted at TP-1, -6, and -7, NYSDEC was notified, and Spill No. 2200862 was assigned to the 30 Fillmore Avenue parcel, although evidence of petroleum impacts was also noted at TP-6 which was completed on the 40 Fillmore Avenue parcel.

Field observations, including lithology, depths, photoionization detection (PID) screening results, etc., at test pit locations are summarized in Table 1 - Summary of Subsurface Field Conditions.

Sample Analysis

Table 2 is a summary of the eight (8) soil/fill samples collected from seven (7) TP locations submitted to the laboratory along with the analysis completed. The soil/fill samples were placed in pre-cleaned laboratory provided sample jars, cooled to 4°C in the field, and transported under chain-of-custody to the laboratory for analysis by Alpha Analytical, Inc. in Westbrough, Massachusetts. Analysis included VOCs via EPA Method 8260 (two (2) samples), semi-volatile organic compounds (SVOCs) polycyclic aromatic hydrocarbon (PAH)-list via EPA Method 8270 (eight (8) samples) and RCRA 8 metals via EPA Method 6010/7471 (eight (8) samples).

Subsurface Conditions

The subsurface conditions encountered at the Site consisted of fill material overlying apparent native soil. Table 1 is a summary of the subsurface conditions encountered at the investigation locations. The fill materials were encountered across the Site in the upper 2 to 4 fbgs consisting of black fines (cinders) with various amounts of ash, brick, slag and concrete which was overlying clays and sands. Groundwater was encountered at three (3) test pit locations at depth of 6 to 7 fbgs. A sheen was observed on the water at TP-7.

Evidence of a petroleum release was observed at TP-1, TP-6, and TP-7 completed in the vicinity of the UST identified on the Sanborn maps; however, evidence of the UST or associated piping were not observed at the test pit locations.

Soil/Fill Analytical Results

The results of the analytical samples collected and analyzed as part of the Phase II investigation are summarized on Table 3. The laboratory analytical report is included in Attachment 3.

Based on the planned mixed residential and commercial use redevelopment, the applicable soil cleanup objectives (SCOs) would be 6NYCRR Part 375 Restricted-Residential Use Soil Cleanup Objectives (RRSCOs). Exceedances of the RRSCOs, as well as Commercial SCOs (CSCOs) and Industrial SCOs (ISCOs), were noted in the eight (8) sample analyzed during this investigation and within each of the three (3) parcels that make up the Site. Additionally, because evidence of a petroleum release was observed and Spill No. 2200862 was assigned, the NYSDEC Commissioner's Policy (CP) – 51 / Soil Cleanup Guidance, Soil Cleanup Levels (SCLs) for Gasoline Contaminated Soils were also used for comparative purposes.

Volatile Organic Compounds

VOCs were detected in both of the samples analyzed for VOCs during the Phase II. Petroleum-related compounds (ethylbenzene, toluene, xylene, 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene) were detected above their respective CP-51 SCLs at TP-1, 3 to 6 feet in the area of the UST where petroleum impacts were observed.

Semi-Volatile Organic Compounds

SVOCs were detected at or above their respective Part 375 RRSCOs (i.e., the applicable SCOs for the intended Site reuse) at five (5) investigation locations, TP-1, TP-3, TP-4, TP-11, and TP-12. The exceedances were identified in the soil/fill material as shown on Figure 4.

- Benzo(a)anthracene exceeded its RRSCO at four (4) locations, TP-3, TP-4, TP-11, and TP-12.
- Benzo(a)pyrene exceeded its ISCO at four (4) locations, TP-3, TP-4, TP-11, and TP-12.
- Benzo(b)fluoranthene exceeded its RRSCO at four (4) locations, TP-3, TP-4, TP-11, and TP-12.
- Chrysene exceeded its RRSCO at two (2) location, TP-4 and TP-12.

- Indeno(1,2,3-cd)pyrene exceeded its RRSCO at five (5) locations, TP-1, TP-3, TP-4, TP-11, and TP-12.

Metal Analytes

Metal analytes were detected above their respective RRSCOs at three (3) investigation locations, TP-1, TP-6, and TP-10.

- Lead exceeded its RRSCO at three (3) locations, TP-1, TP-6, and TP-10.
- Mercury exceeded its RRSCO at one (1) location, TP-10.

Conclusions

Environmental impacts have been identified at the Site. Petroleum impacts (VOCs above CP-51 SCLs, visual and olfactory evidence of petroleum contamination) were identified in the vicinity of the gasoline UST and Spill No. 2200862 was assigned by NYSDEC. Petroleum impacts were present on both the 30 and 40 Fillmore Avenue parcels; however, it is unknown if the UST or related piping is still present at the Site.

SVOCs and metals were also detected in the fill material present across the Site (20, 30, and 40 Fillmore Avenue) at concentrations above their respective RRSCOs, which are applicable for the intended reuse of the Site. Fill material varies in depth up to 4 fbgs. The soil/fill material and any other contaminated material generated during redevelopment of the Site will require remediation as contaminated soil. Additional sampling will be required to confirm the soil/fill can be handled/disposed as non-hazardous waste.

Based on the existing data and evidence of a petroleum release, the Site is a candidate for the BCP. The Site meets the definition of a BCP site per the current BCP law which states a "brownfield site or site shall mean any real property where a contaminant is present at levels exceeding the soil cleanup objectives or other health-based or environmental standards, criteria, or guidance adopted by the department that are applicable based on the reasonably anticipated use of the property, in accordance with applicable regulations."

Remedial work will be required to address the petroleum contamination identified on the 30 and 40 Fillmore Avenue parcels. Additionally, an electromagnetic survey should be completed to determine if the UST is still present in the ground. If the Site were to be accepted in to the BCP, the additional work required to assess for the presence of the UST and remediation of the petroleum contamination could be completed under the BCP, along with remediation of other soil contamination present at the Site.

A copy of this letter report should be provided to NYSDEC regarding Spill No. 220862 for their files. If ELLI intends to pursue potential BCP eligibility, NYSDEC Spills Group should be made aware of this decision

Please contact us if you have any questions or require additional information.

Sincerely,
TurnKey Environmental Restoration, LLC

Christopher Boron
Sr. Project Manager

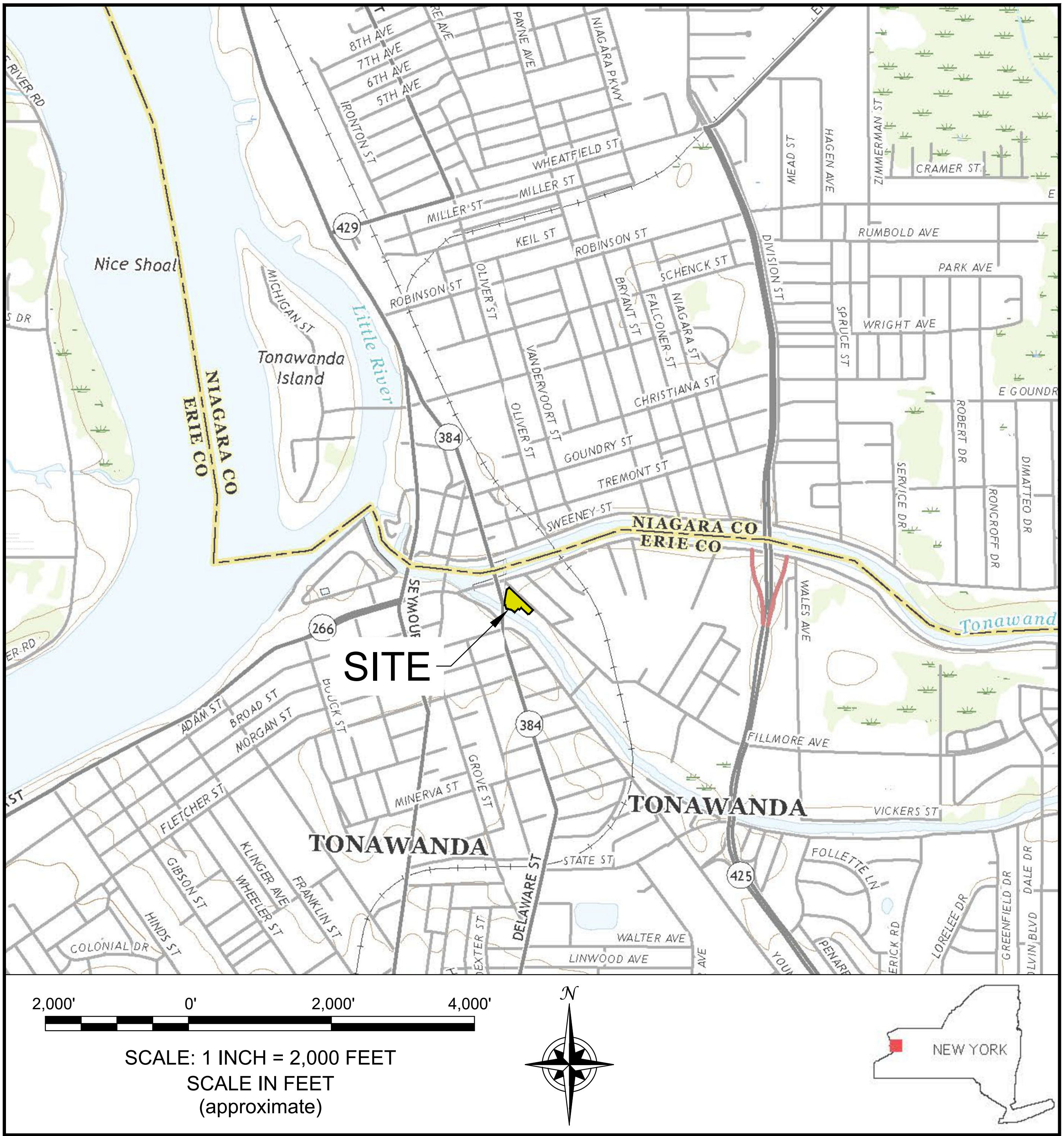
Michael Lesakowski
President

Attachments:
Figure 1 – Site Location & Vicinity Map
Figure 2 – Site Plan
Figure 3 – Investigation Locations
Figure 4 – Summary of Analytical Data
Table 1 – Summary of Subsurface Field Observations
Table 2 – Summary of Phase II Sampling and Analysis Program
Table 3 – Summary of Soil/Fill Sample Analytical Results
Attachment 1- Sanborn Maps
Attachment 2 – NYSDEC Spill File
Attachment 3 - Analytical Data Report

File: 0621-022-001

FIGURES

FIGURE 1



SCALE: 1 INCH = 2,000 FEET
SCALE IN FEET
(approximate)

TURNKEY
ENVIRONMENTAL
RESTORATION, LLC

2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

PROJECT NO.: T0621-022-001

DATE: MAY 2022

DRAFTED BY: CNK

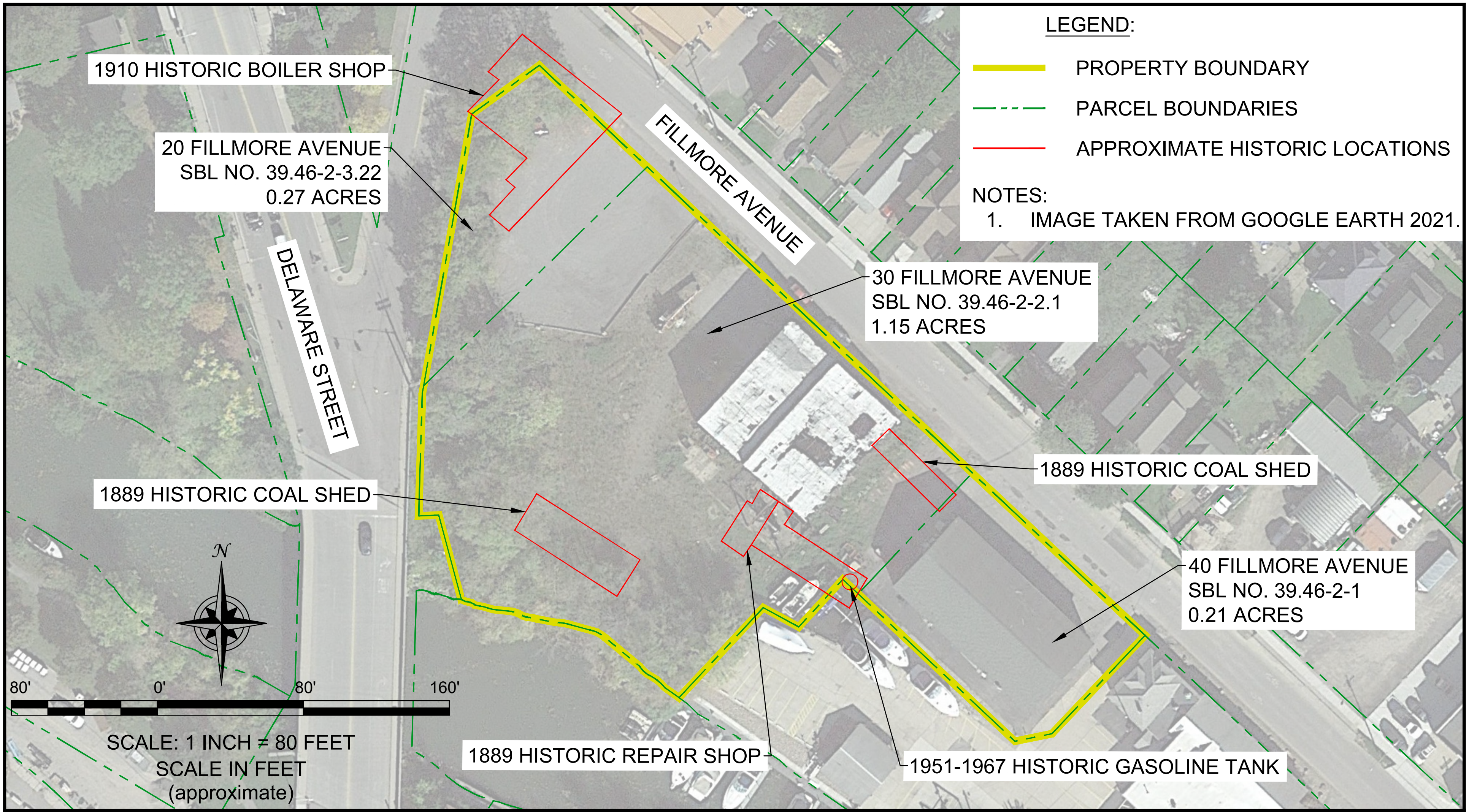
SITE LOCATION AND VICINITY MAP

PHASE II ENVIRONMENTAL INVESTIGATION REPORT

20 TO 40 FILLMORE AVENUE
TONAWANDA, NEW YORK
PREPARED FOR
ELLI MANAGER LLC

F:\CAD\TurnKey\ELLI Manager LLC\20-40 Fillmore Avenue\Phase II\Figure 1; Site Location and Vicinity Map.dwg, 5/19/2022 10:50:15 AM, DWG To PDF.pc3

F:\CAD\TurnKey\ELLI Manager LLC\20-40 Fillmore Avenue\Phase II\Figure 2; Site Plan with Historic Sanborn Features.dwg, 5/19/2022 10:55:16 AM, DWG To PDF.pc3



LEGEND:

🟨	PROPERTY BOUNDARY
— - —	PARCEL BOUNDARIES
🟥	APPROXIMATE HISTORIC LOCATIONS

NOTES:

1. IMAGE TAKEN FROM GOOGLE EARTH 2021.

TurnKey Environmental Restoration, LLC

2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

PROJECT NO.: T0621-022-001

DATE: MAY 2022

DRAFTED BY: TJM/CNK

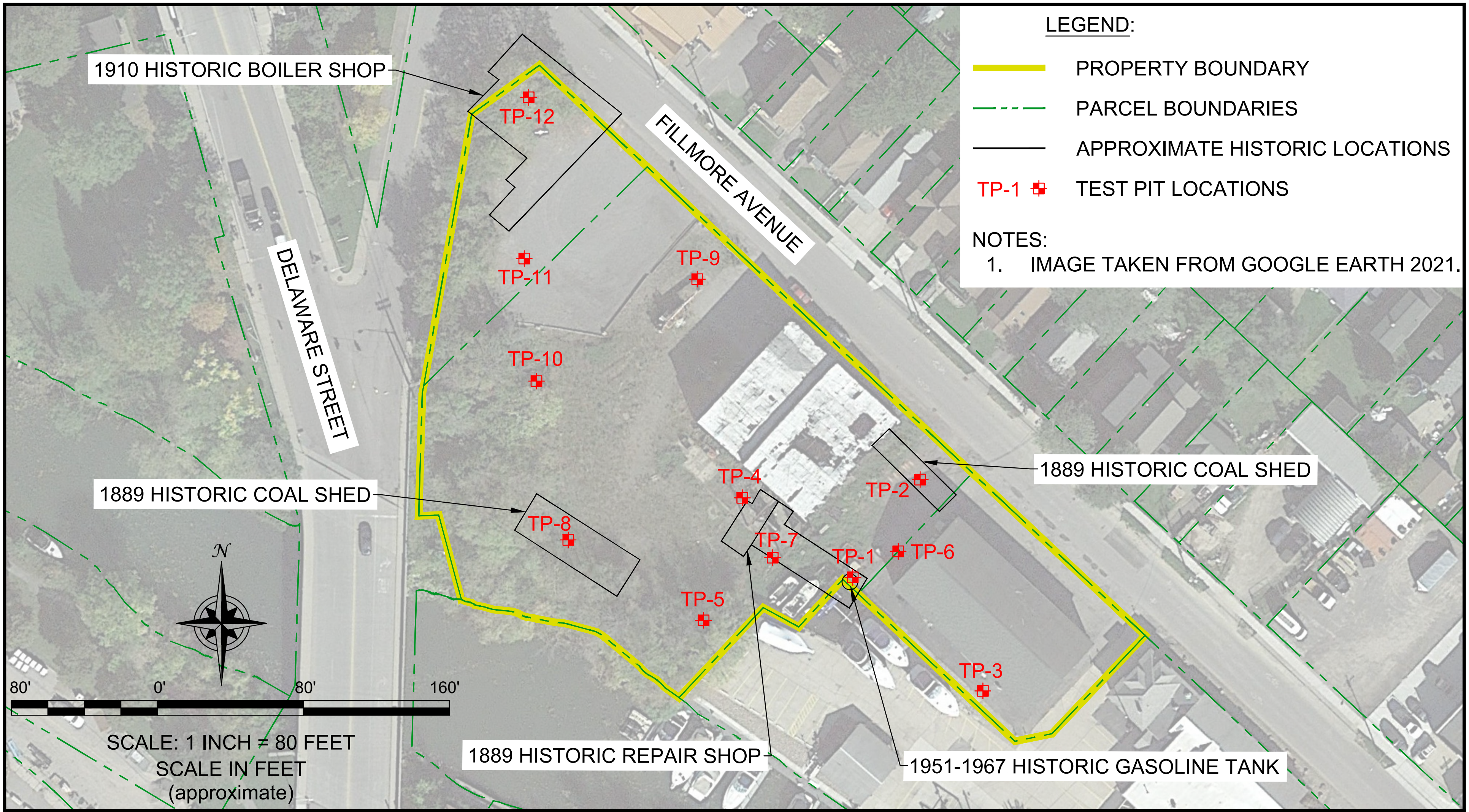
SITE PLAN WITH HISTORIC SANBORN FEATURES

PHASE II ENVIRONMENTAL INVESTIGATION REPORT

20 TO 40 FILLMORE AVENUE
TONAWANDA, NEW YORK
PREPARED FOR
ELLI MANAGER LLC

FIGURE 2

F:\CAD\TurnKey\ELLI Manager LLC\20-40 Fillmore Avenue\Phase II\Figure 3; Phase II Investigation Locations.dwg, 5/20/2022 11:09:19 AM, DWG To PDF.pc3



TurnKey Environmental Restoration, LLC

2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218, (716) 856-0599

PROJECT NO.: T0621-022-001

DATE: MAY 2022

DRAFTED BY: CNK

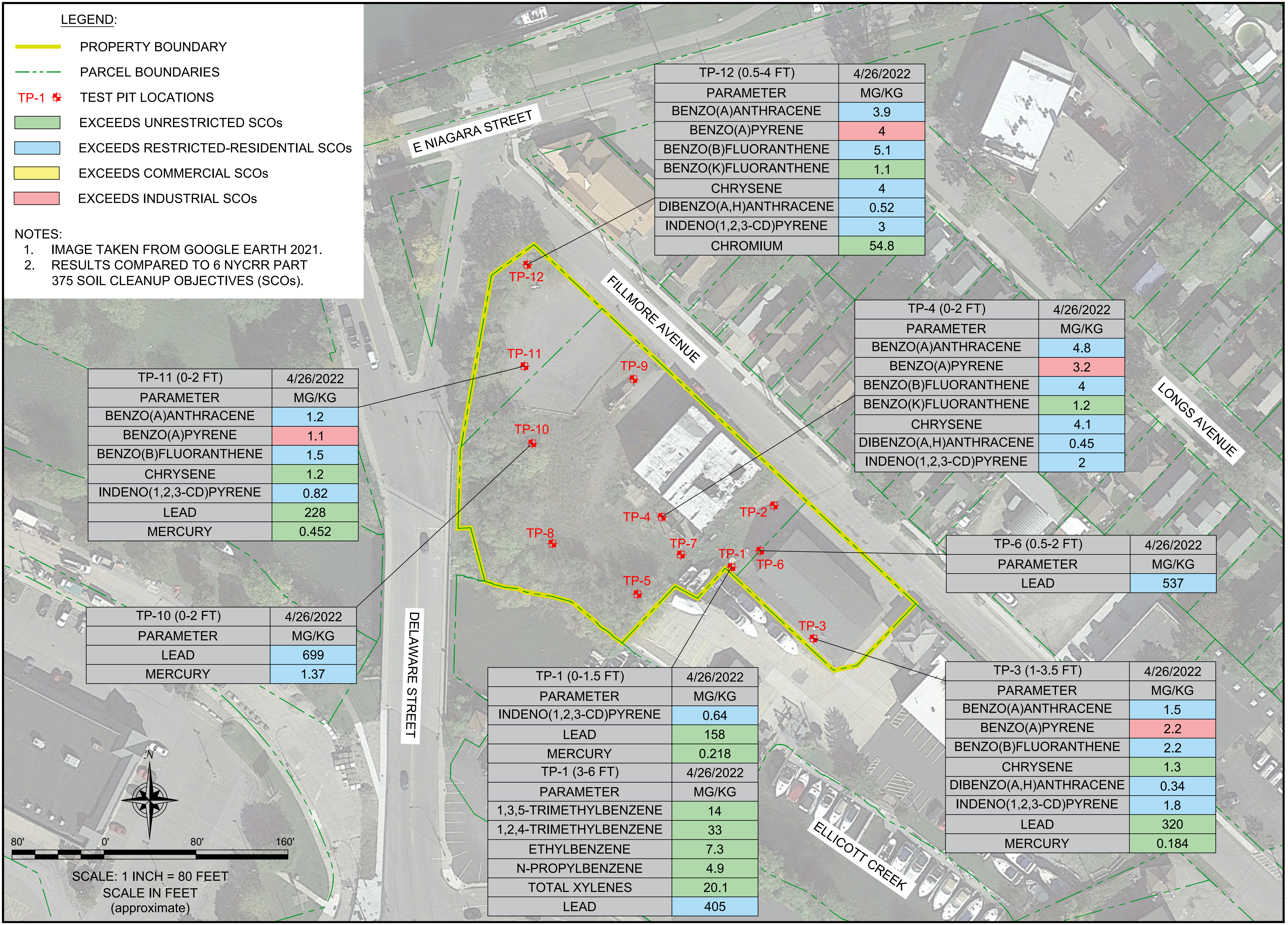
PHASE II INVESTIGATION LOCATIONS

PHASE II ENVIRONMENTAL INVESTIGATION REPORT

20 TO 40 FILLMORE AVENUE
TONAWANDA, NEW YORK
PREPARED FOR
ELLI MANAGER LLC

FIGURE 3

F:\CAD\TurnKey\ELLI Manager LLC\20-40 Fillmore Avenue\Phase II\Figure 4; Phase II Investigation Locations and Exceedances.dwg, 5/20/2022 11:44:26 AM, DWG To PDF.pc3



LEGEND:

—	PROPERTY BOUNDARY
— - -	PARCEL BOUNDARIES
TP-1 ✚	TEST PIT LOCATIONS
🟩	EXCEEDS UNRESTRICTED SCOs
🟦	EXCEEDS RESTRICTED-RESIDENTIAL SCOs
🟨	EXCEEDS COMMERCIAL SCOs
🟥	EXCEEDS INDUSTRIAL SCOs

NOTES:

1. IMAGE TAKEN FROM GOOGLE EARTH 2021.
2. RESULTS COMPARED TO 6 NYCRR PART 375 SOIL CLEANUP OBJECTIVES (SCOs).

TP-12 (0.5-4 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	3.9
BENZO(A)PYRENE	4
BENZO(B)FLUORANTHENE	5.1
BENZO(K)FLUORANTHENE	1.1
CHRYSENE	4
DIBENZO(A,H)ANTHRACENE	0.52
INDENO(1,2,3-CD)PYRENE	3
CHROMIUM	54.8

TP-4 (0-2 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	4.8
BENZO(A)PYRENE	3.2
BENZO(B)FLUORANTHENE	4
BENZO(K)FLUORANTHENE	1.2
CHRYSENE	4.1
DIBENZO(A,H)ANTHRACENE	0.45
INDENO(1,2,3-CD)PYRENE	2

TP-11 (0-2 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	1.2
BENZO(A)PYRENE	1.1
BENZO(B)FLUORANTHENE	1.5
CHRYSENE	1.2
INDENO(1,2,3-CD)PYRENE	0.82
LEAD	228
MERCURY	0.452

TP-6 (0.5-2 FT)	4/26/2022
PARAMETER	MG/KG
LEAD	537

TP-10 (0-2 FT)	4/26/2022
PARAMETER	MG/KG
LEAD	699
MERCURY	1.37

TP-1 (0-1.5 FT)	4/26/2022
PARAMETER	MG/KG
INDENO(1,2,3-CD)PYRENE	0.64
LEAD	158
MERCURY	0.218
TP-1 (3-6 FT)	4/26/2022
PARAMETER	MG/KG
1,3,5-TRIMETHYLBENZENE	14
1,2,4-TRIMETHYLBENZENE	33
ETHYLBENZENE	7.3
N-PROPYLBENZENE	4.9
TOTAL XYLENES	20.1
LEAD	405

TP-3 (1-3.5 FT)	4/26/2022
PARAMETER	MG/KG
BENZO(A)ANTHRACENE	1.5
BENZO(A)PYRENE	2.2
BENZO(B)FLUORANTHENE	2.2
CHRYSENE	1.3
DIBENZO(A,H)ANTHRACENE	0.34
INDENO(1,2,3-CD)PYRENE	1.8
LEAD	320
MERCURY	0.184

SCALE: 1 INCH = 80 FEET
SCALE IN FEET
(approximate)

DATE: MAY 2022
DRAFTED BY: CNK

TurnKey Environmental Restoration, LLC
2558 HAMBURG TURNPIKE, SUITE 300, BUFFALO, NY 14218,
(716) 856-0599

JOB NO.: T0621-022-001

PHASE II INVESTIGATION LOCATIONS AND EXCEEDANCES

PHASE II ENVIRONMENTAL INVESTIGATION REPORT

20 TO 40 FILLMORE AVENUE
TONAWANDA, NEW YORK
PREPARED FOR
ELLI MANAGER LLC

FIGURE 4

DISCLAIMER:
PROPERTY OF TURNKEY ENVIRONMENTAL RESTORATION., LLC. IMPORTANT: THIS DRAWING PRINT IS LOANED FOR MUTUAL ASSISTANCE AND AS SUCH IS SUBJECT TO RECALL AT ANY TIME. INFORMATION CONTAINED HEREON IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY FORM FOR THE BENEFIT OF PARTIES OTHER THAN NECESSARY SUBCONTRACTORS & SUPPLIERS WITHOUT THE WRITTEN CONSENT OF TURNKEY ENVIRONMENTAL RESTORATION., LLC.

TABLES

TABLE 1
SUMMARY OF SUBSURFACE FIELD OBSERVATIONS
PHASE II ENVIRONMENTAL INVESTIGATION REPORT
20-40 FILLMORE AVENUE
TONAWANDA, NEW YORK

Location	Date	Fill Present	Odors	Water Present	Depth of Test Pit (fbgs)	Thickness of Fill (ft)	PID Measurements (ppm)	Sample Depth (ft)	Depth and Soil Description
TP-1	04/26/22	Yes	Yes	No	7	1.5	30.7	0-1.5	**0 to 1.5 ft: FILL** - Black cinder and coal fill with slag
							700-1000	3-6	**1.7 to 7 ft: CLAY** - Olive gray/Brown, clay, petroleum odor
TP-2	04/26/22	Yes	No	No	4.5	1.5	0		**0-0.5 ft: STONE** - Stone with cinders
							0.8		**0.5-2 ft: FILL** - Brown, loose, partial combusted material
							0		**2-4.5 ft: FINE SAND** - Brown, moist, mostly fine sand with some silt
TP-3	04/26/22	Yes	No	Yes	6	2.5	0		**0-4 in: ASPHALT**
							0		**4-12 in: STONE SUBBASE**
							0	1-3.5	**1-3.5 ft: FILL** - Black, mostly fines mixed with slag
							0		**3.5-6 ft: CLAY** - Olive/gray clay, mottled, with some fine sand, water at 6 ft
TP-4	4/26/2022	Yes	No	No	7.5	2.0	0	0-2	**0-2 ft: FILL** - Black, mostly fines, some sand, with cinders, brick, partial combusted material, and coal
							0		**2-3 ft: CLAY** - Olive gray clay
							0		**3-7.5: CLAY** - Brown clay with some fine sand
TP-5	4/26/2022	Yes	No	No	6	2	0		**0-2 ft: FILL** - Black, mostly fines with cinders, brick, block, little fine gravel
							0		**2-6 ft: CLAY** - Brown, moist, mostly clay with some find sand, mottling

TurnKey Environmental Restoration, LLC

TABLE 1
SUMMARY OF SUBSURFACE FIELD OBSERVATIONS
PHASE II ENVIRONMENTAL INVESTIGATION REPORT
20-40 FILLMORE AVENUE
TONAWANDA, NEW YORK

Location	Date	Fill Present	Odors	Water Present	Depth of Test Pit (fbgs)	Thickness of Fill (ft)	PID Measurements (ppm)	Sample Depth (ft)	Depth and Soil Description
TP-6	4/26/2022	Yes	Yes	No	6	2.5	0	0.5-2	**0-2.5 ft: FILL** - cinder and ash fill
							1.8		**2.5-4 ft: CLAY** - olive gray clay
							36.8		**4-6 ft: FINE SAND** - Brown/gray, moist, fine sand with silt and clay, petroleum odor
TP-7	4/26/2022	Yes	Yes	Yes	7	2.0	0		**0-2 ft: FILL** - Black, cinder fill
							12.5		**2-4 ft: CLAY** - Olive gray, clay with some fine sand, slight petroleum odor
							268		**4-7: FINE SAND** - Olive gray mostly fine sand with some silt and clay, petroleum odor, slight sheen on water at 7 ft
TP-8	04/26/22	Yes	No	Yes	6.5	1.5	0		**0-1.5 ft: FILL** - Dark brown/black, moist, mostly fine sand with some silt, with cinders, brick, and slag
							0		**1.5-6.5 ft CLAY** - Brown/olive gray, mostly clay with some fine sand and silt, water at 6 ft
TP-9	4/26/2022	Yes	No	Yes	7	3.0	0		**0-3 ft: FILL** - Black/reddish brown fill with cinders, brick, and ash
							0		**3-7 ft: CLAY** - Brown clay with some fine sand and silt, iron mottling, water at 6.5 ft
TP-10	4/26/2022	Yes	No	No	2	2.0	0	0-2	**0-2 ft: FILL** - Black fines with concrete block
TP-11	4/26/2022	Yes	No	No	6	4.0	0	0-2	**0-4 ft: FILL** - Black/dark brown fine sand and clay, with brick, roots, and metal debris
							0		**4-6 ft: CLAY** - Brown, clay with some fine sand and silt
TP-12	4/26/2022	Yes	No	No	4	4.0	0	0.5-4	**0-4 ft: FILL** - Ash fill with sandstone block

Definitions:
fbgs = feet below ground surface
PID = photoionization detector
ppm = parts per million

TABLE 2
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
PHASE II ENVIRONMENTAL INVESTGATION REPORT
20-40 FILLMORE AVENUE
TONAWANDA, NEW YORK

Sample Location	Sample Depth	Soil Type	Analysis		
			TCL VOCs	TCL SVOCs base-neutrals only (PAHs)	RCRA 8 Metals
Subsurface Soil/Fill Samples					
TP-1	0 - 1.5 ft	Fill	1	1	1
TP-1	3 - 6 ft	Clay	1	1	1
TP-3	1 - 3.5 ft	Fill		1	1
TP-4	0 - 2 ft	Fill		1	1
TP-6	0.5 - 2 ft	Fill		1	1
TP-10	0 - 2 ft	Fill		1	1
TP-11	0 - 2 ft	Fill		1	1
TP-12	0.5 - 4 ft	Fill		1	1

Definitions:

ft = feet
TCL VOC - Total Compound List
VOC = Volatile Organic Compound
SVOC = Semi-Volatile Organic Compound
RCRA = Resource Conservation & Recovery Act
PAHs = Polycyclic aromatic hydrocarbons

TABLE 3
SUMMARY OF SOIL/FILL SAMPLE ANALYTICAL RESULTS
PHASE II ENVIRONMENTAL INVESTIGATION REPORT
20-40 FILLMORE AVENUE
TONAWANDA, NEW YORK

Parameter [1]	CP-51 SCLs[2] & Unrestricted SCOs[3] (mg/kg)	Restricted-Residential SCOs[4] (mg/kg)	Commercial SCOs[4] (mg/kg)	Industrial SCOs[4] (mg/kg)	Sample Location (Depth)							
					TP-1 (0-1.5 FT) 30 Fillmore	TP-1 (3-6 FT) 30 Fillmore	TP-3 (1-3.5 FT) 40 Fillmore	TP-4 (0-2 FT) 30 Fillmore	TP-6 (0.5-2 FT) 40 Fillmore	TP-10 (0-2 FT) 30 Fillmore	TP-11 (0-2 FT) 20 Fillmore	TP-12 (0.5-4 FT) 20 Fillmore
					4/26/2022	**4/26/2022**	**4/26/2022**	**4/26/2022**	**4/26/2022**	**4/26/2022**	**4/26/2022**	**4/26/2022**
TCL Volatile Organic Compounds (VOCs) - mg/kg[4]												
1,3,5-Trimethylbenzene	**8.4**	**52**	**190**	**380**	0.02	**14**	--	--	--	--	--	--
1,2,4-Trimethylbenzene	**3.6**	**52**	**190**	**380**	0.018	**33 D**	--	--	--	--	--	--
Benzene	**0.06**	**4.8**	**44**	**89**	0.0086	0.054	--	--	--	--	--	--
Cyclohexane	**--**	**--**	**--**	**--**	0.0033 J	2.9	--	--	--	--	--	--
Ethylbenzene	**1**	**41**	**390**	**780**	0.0076	**7.3**	--	--	--	--	--	--
Isopropylbenzene (Cumene)	**--**	**--**	**--**	**--**	0.0046	3	--	--	--	--	--	--
Methylcyclohexane	**--**	**--**	**--**	**--**	0.017	32 D	--	--	--	--	--	--
m,p-Xylene	**--**	**--**	**--**	**--**	0.014	18	--	--	--	--	--	--
n-Butylbenzene	**12**	**100**	**500**	**1000**	0.00076 J	2	--	--	--	--	--	--
n-Propylbenzene	**3.9**	**100**	**500**	**1000**	0.0031	**4.9**	--	--	--	--	--	--
o-Xylene	**--**	**--**	**--**	**--**	0.0025	2.1	--	--	--	--	--	--
p-Isopropyltoluene	**--**	**--**	**--**	**--**	0.0021	11	--	--	--	--	--	--
sec-Butylbenzene	**11**	**100**	**500**	**1000**	0.0018	2.3	--	--	--	--	--	--
Toluene	**0.7**	**100**	**500**	**1000**	0.0048	0.32	--	--	--	--	--	--
Xylenes, Total	**0.26**	**100**	**500**	**1000**	0.0165	**20.1**						
TCL Semi-Volatile Organic Compounds (SVOCs) - mg/kg[4]												
Acenaphthene	**20**	**100**	**500**	**1000**	0.029 J	ND	0.13 J	1.1	ND	ND	0.046 J	0.14 J
Acenaphthylene	**100**	**100**	**500**	**1000**	ND	ND	0.54 J	ND	ND	0.072 J	0.17	0.82
Anthracene	**100**	**100**	**500**	**1000**	0.14	ND	0.32	4.1	0.044 J	0.058 J	0.26	1.4
Benzo(a)anthracene	**1**	**1**	**5.6**	**11**	0.74	ND	**1.5**	**4.8**	0.23	0.34	**1.2**	**3.9**
Benzo(a)pyrene	**1**	**1**	**1**	**1.1**	0.75	ND	**2.2**	**3.2**	0.33	0.35	**1.1**	**4**
Benzo(b)fluoranthene	**1**	**1**	**5.6**	**11**	0.9	ND	**2.2**	**4**	0.32	0.48	**1.5**	**5.1**
Benzo(g,h,i)perylene	**100**	**100**	**500**	**1000**	0.6	ND	1.5	1.7	0.26	0.29	0.7	2.7
Benzo(k)fluoranthene	**0.8**	**3.9**	**56**	**110**	0.33	ND	0.59	**1.2**	0.1 J	0.16	0.43	**1.1**
Chrysene	**1**	**3.9**	**56**	**110**	0.73	ND	**1.3**	**4.1**	0.18	0.37	**1.2**	**4**
Dibenzo(a,h)anthracene	**0.33**	**0.33**	**0.56**	**1.1**	0.11 J	ND	**0.34**	**0.45 J**	0.052 J	0.053 J	0.16	**0.52**
Fluoranthene	**100**	**100**	**500**	**1000**	1.5	ND	2.3	11	0.27	0.72	2.6	8.6 D
Fluorene	**30**	**100**	**500**	**1000**	0.032 J	ND	0.1 J	2.1	ND	0.023 J	0.062 J	0.24
Indeno(1,2,3-cd)pyrene	**0.5**	**0.5**	**5.6**	**11**	**0.64**	ND	**1.8**	**2**	0.3	0.31	**0.82**	**3**
Naphthalene	**12**	**100**	**500**	**1000**	0.25	2.1	0.29	0.63 J	ND	0.13 J	0.21	0.33
Phenanthrene	**100**	**100**	**500**	**1000**	0.57	ND	1.2	14	0.14	0.37	1.2	7.4
Pyrene	**100**	**100**	**500**	**1000**	1.2	ND	1.9	7.9	0.24	0.6	2.1	8.6
TAL Metals - mg/kg												
Arsenic	**13**	**16**	**16**	**16**	6.51	4.24	3.59	4.82	5.06	5.27	7.8	2.8
Barium	**350**	**400**	**400**	**10000**	84.9	29.5	90.1	40.3	60.2	157	127	56.6
Cadmium	**2.5**	**4.3**	**9.3**	**60**	0.482 J	0.273 J	0.254 J	0.61	0.322 J	1.06	1.82	0.252 J
Chromium	**30**	**180**	**1,500**	**6,800**	5.4	8.72	3.14	16.9	8.48	12.3	24.4	**54.8**
Lead	**63**	**400**	**1,000**	**3,900**	**158**	**405**	**320**	40.4	**537**	**699**	**228**	40.8
Mercury	**0.18**	**0.81**	**2.8**	**5.7**	**0.218**	ND	**0.184**	0.091	0.145	**1.37**	**0.452**	0.118
Selenium	**3.9**	**180**	**1,500**	**6,800**	ND	0.141 J	1.26 J	0.405 J	0.377 J	0.233 J	0.295 J	ND
Silver	**2**	**180**	**1,500**	**6,800**	ND	ND	ND	ND	ND	ND	0.423 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 Commisioner's Policy (CP) 51 / Soil Cleanup Guidance Soil Cleanup Levels (SLCs).
3. Values per 6NYCRR Part 375 Unrestricted Soil Cleanup Objectives (SCOs).
4. Values per 6NYCRR Part 375 Restricted Soil Cleanup Objectives (SCOs).
5. Sample results were reported by the laboratory in micograms per kilogram (ug/kg) and converted to milligram per kilogram (mg/kg) for comparison to SCOs.

Definitions:

ND = Parameter not detected above laboratory detection limit.
-- = Sample not analyzed for parameter and/or no SCO available.
J = Estimated value; result is less than the sample quantitation limit but greater than zero.
D = Indicates a dilution, re-analysis, re-extraction, or additional initial metals/anion analysis of the sample.

🟩 **Bold**	= Result exceeds Unrestricted SCOs
🟦 **Bold**	= Result exceeds Restricted-Residential SCOs
🟨 **Bold**	= Result exceeds Commercial SCOs
🟥 **Bold**	= Result exceeds Industrial SCOs

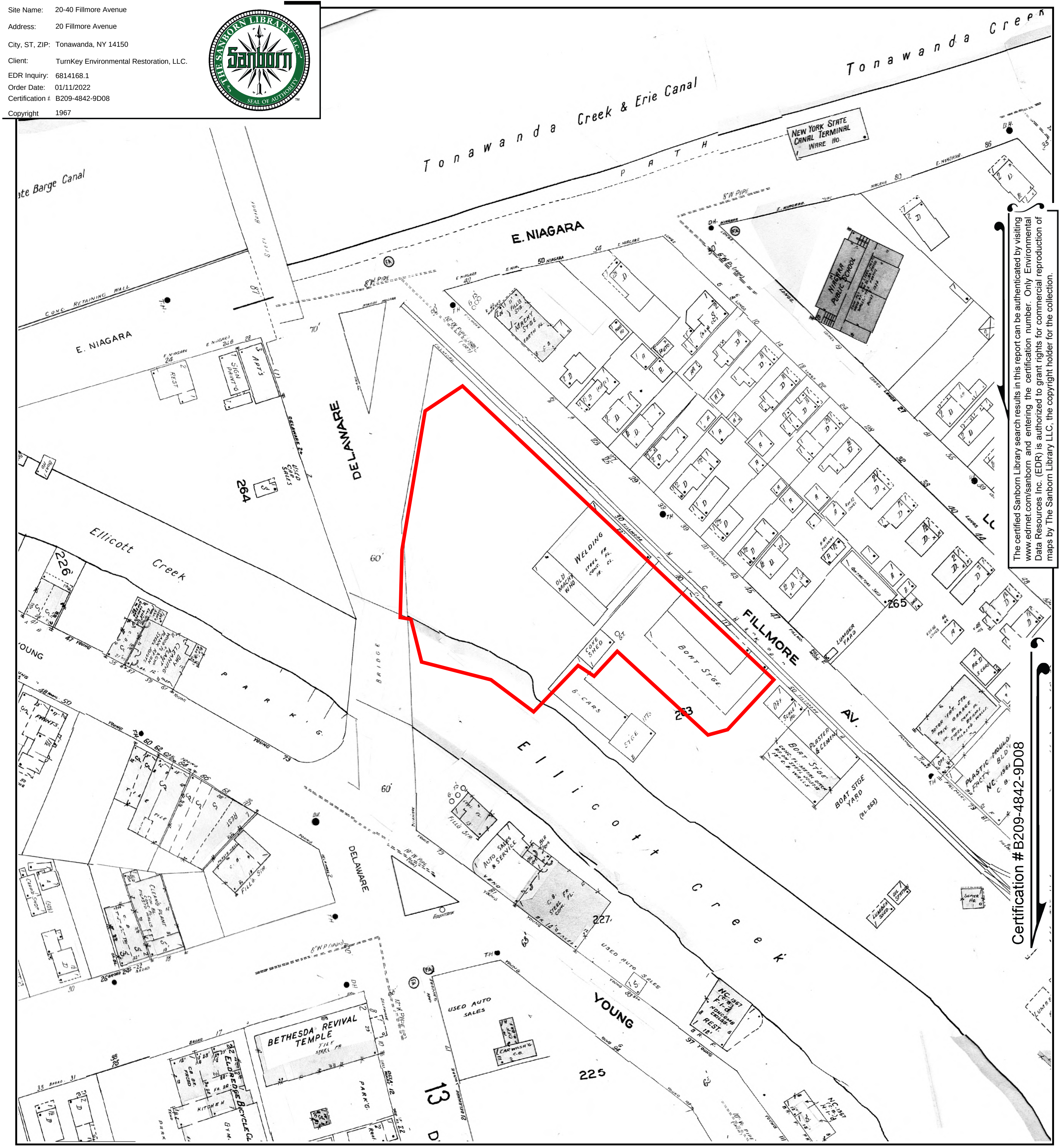
ATTACHMENT 1

Sanborn Maps

Certified Sanborn® Map

1967

Site Name: 20-40 Fillmore Avenue
Address: 20 Fillmore Avenue
City, ST, ZIP: Tonawanda, NY 14150
Client: TurnKey Environmental Restoration, LLC.
EDR Inquiry: 6814168.1
Order Date: 01/11/2022
Certification # B209-4842-9D08
Copyright 1967



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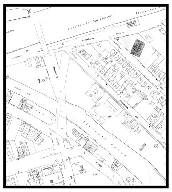
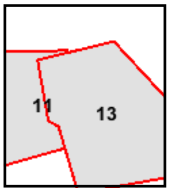




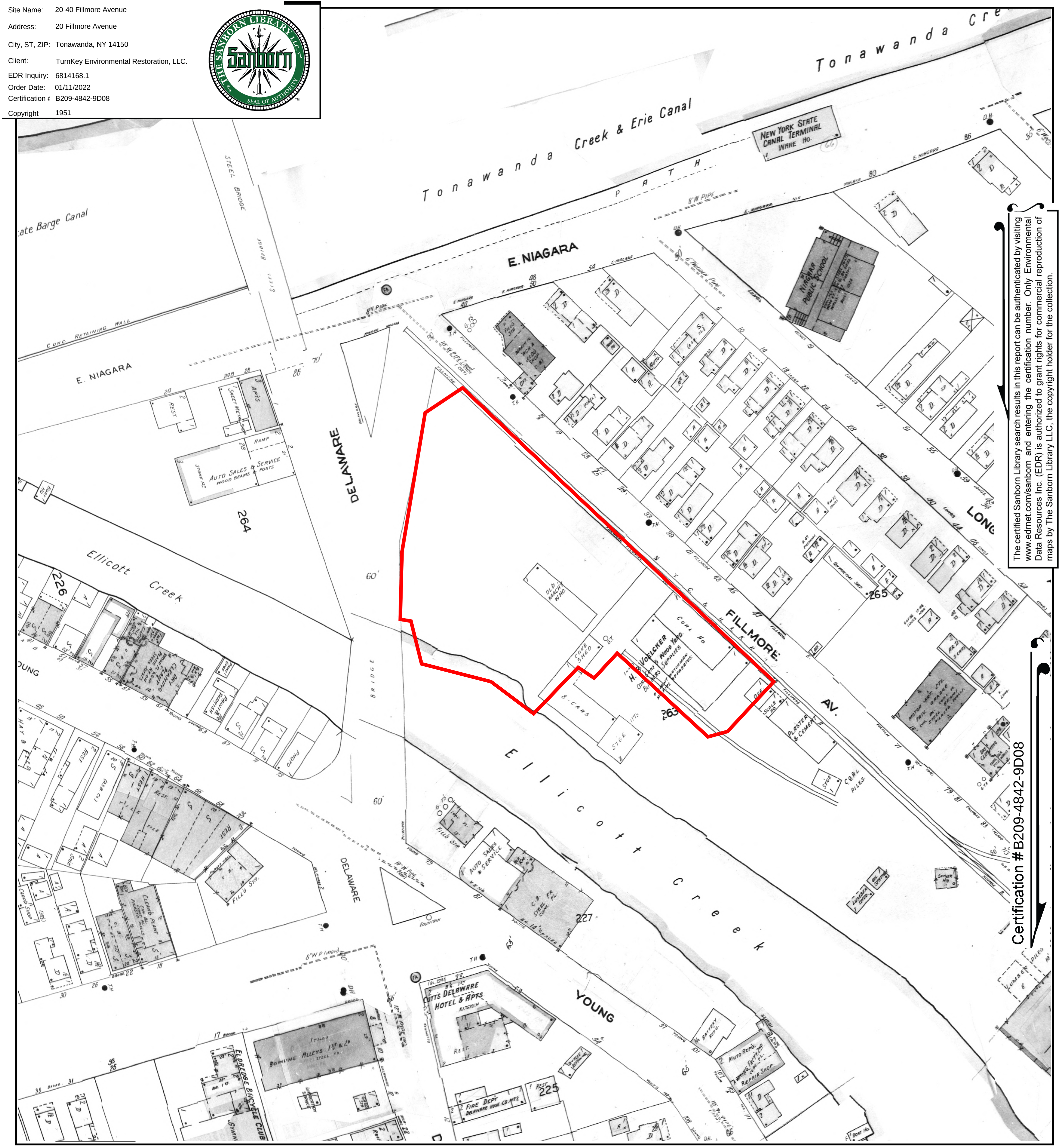
Volume 1, Sheet 13
Volume 1, Sheet 11

N

Certified Sanborn® Map

1951

Site Name: 20-40 Fillmore Avenue
Address: 20 Fillmore Avenue
City, ST, ZIP: Tonawanda, NY 14150
Client: TurnKey Environmental Restoration, LLC.
EDR Inquiry: 6814168.1
Order Date: 01/11/2022
Certification # B209-4842-9D08
Copyright 1951



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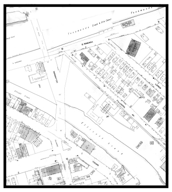
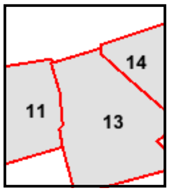




Volume 1, Sheet 14
Volume 1, Sheet 13
Volume 1, Sheet 11

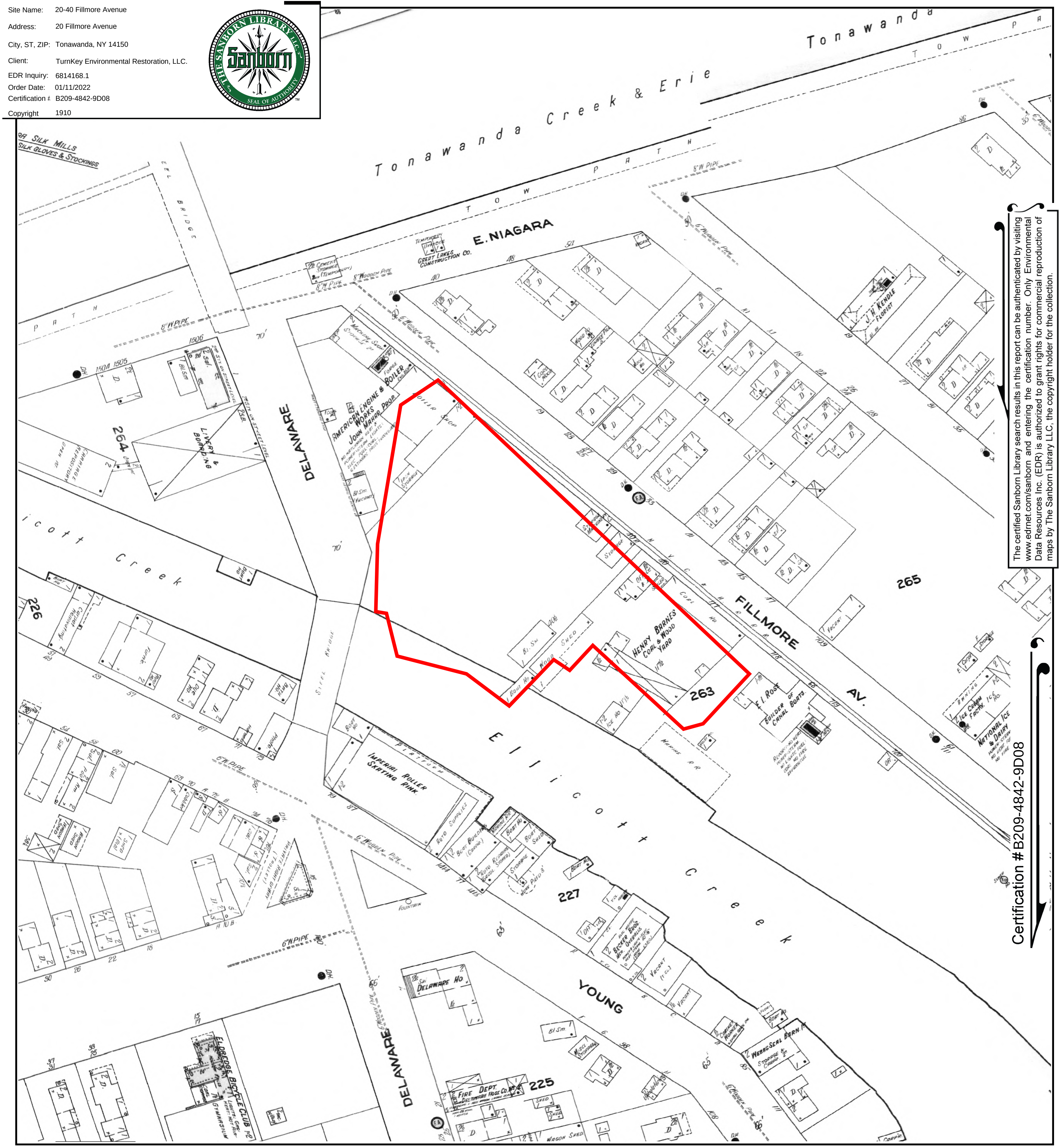
0 Feet 150 300 600

N

Certified Sanborn® Map

1910

Site Name: 20-40 Fillmore Avenue
Address: 20 Fillmore Avenue
City, ST, ZIP: Tonawanda, NY 14150
Client: TurnKey Environmental Restoration, LLC.
EDR Inquiry: 6814168.1
Order Date: 01/11/2022
Certification # B209-4842-9D08
Copyright 1910



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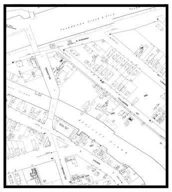
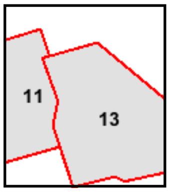




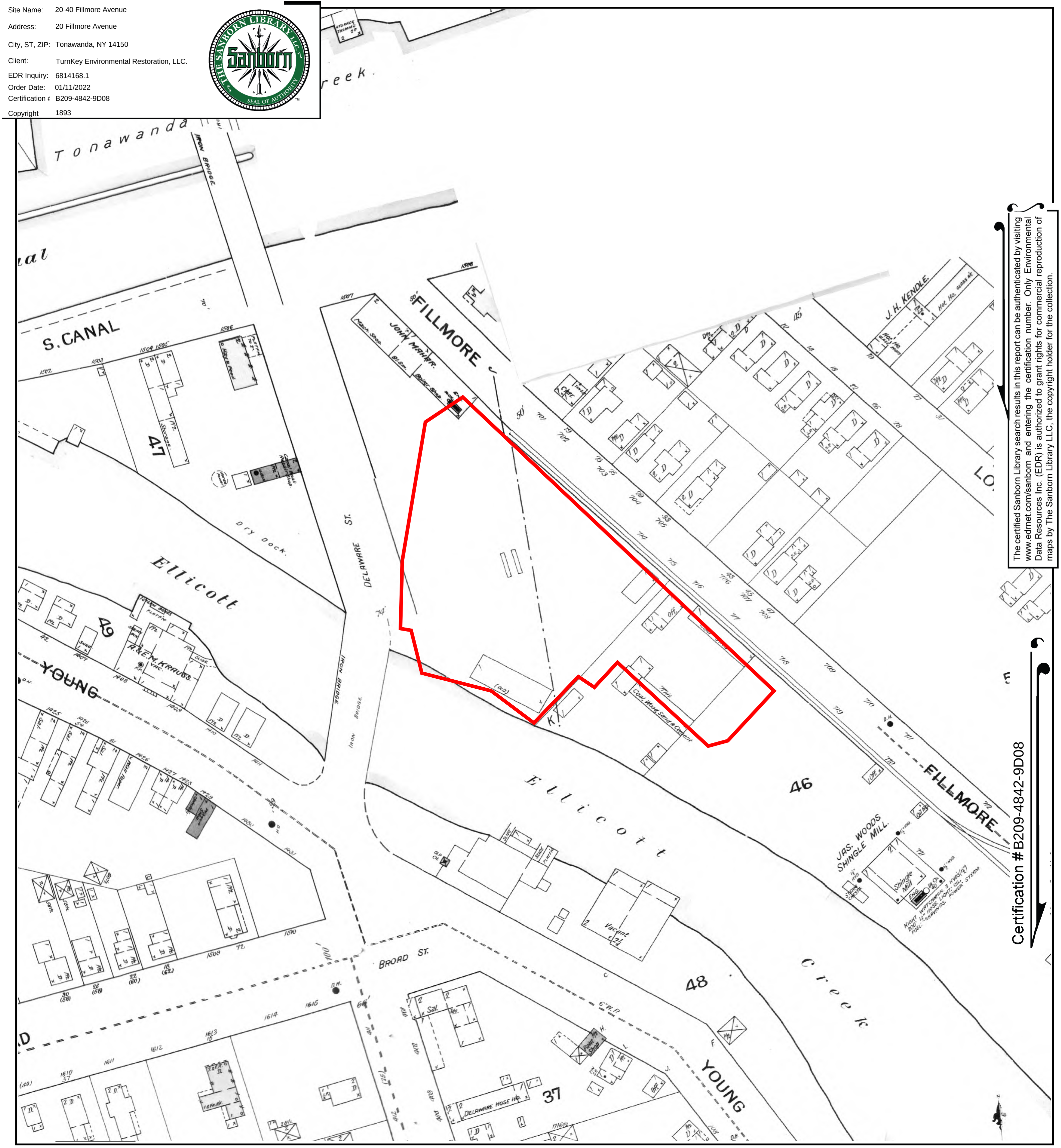
Volume 1, Sheet 13
Volume 1, Sheet 11

N

Certified Sanborn® Map

1893

Site Name: 20-40 Fillmore Avenue
Address: 20 Fillmore Avenue
City, ST, ZIP: Tonawanda, NY 14150
Client: TurnKey Environmental Restoration, LLC.
EDR Inquiry: 6814168.1
Order Date: 01/11/2022
Certification # B209-4842-9D08
Copyright 1893



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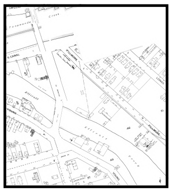
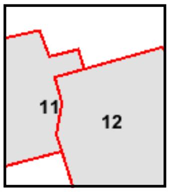




Volume 1, Sheet 12
Volume 1, Sheet 11

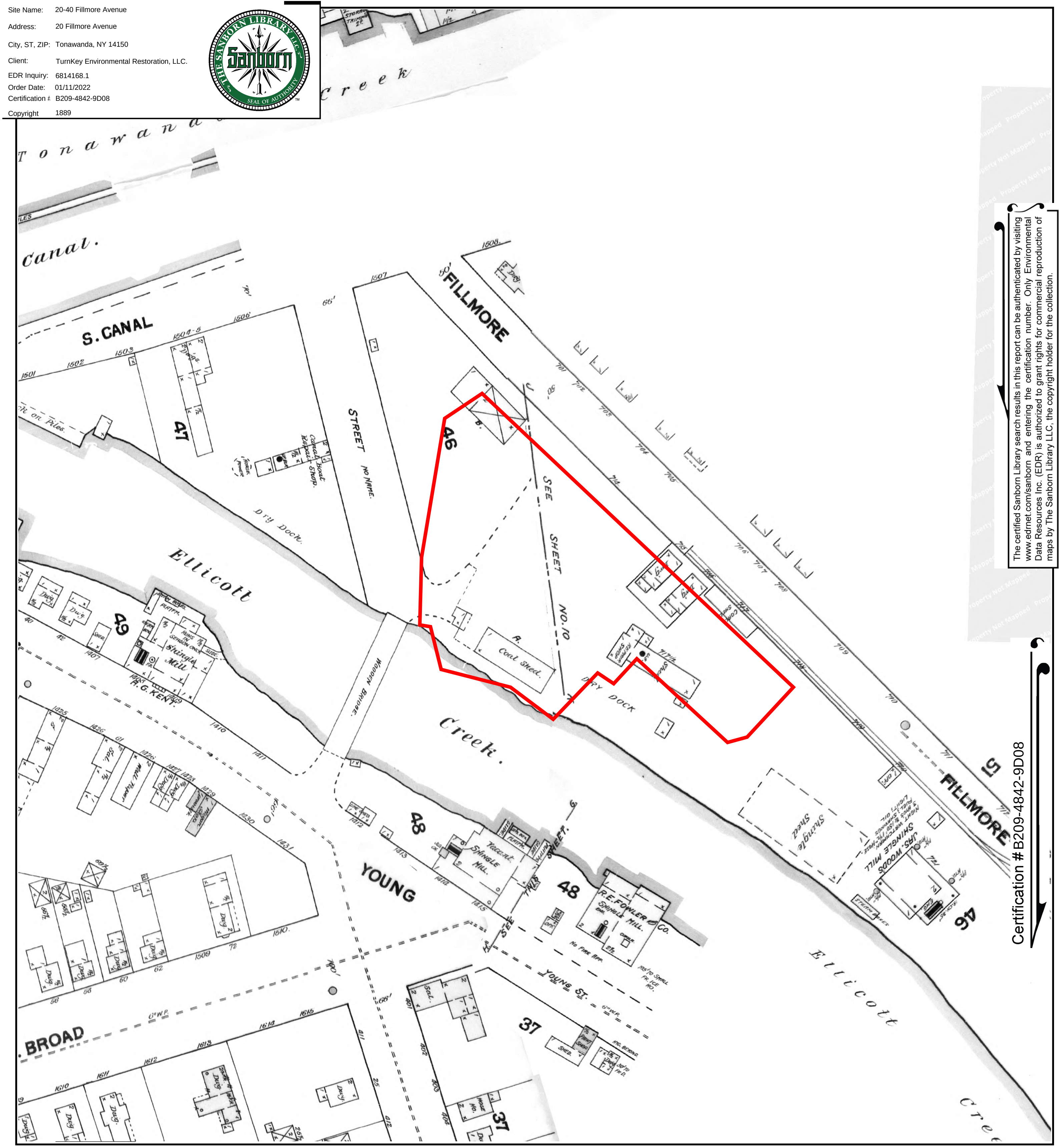
N

EDR

Certified Sanborn® Map

1889

Site Name:	20-40 Fillmore Avenue
Address:	20 Fillmore Avenue
City, ST, ZIP:	Tonawanda, NY 14150
Client:	TurnKey Environmental Restoration, LLC.
EDR Inquiry:	6814168.1
Order Date:	01/11/2022
Certification #	B209-4842-9D08
Copyright	1889



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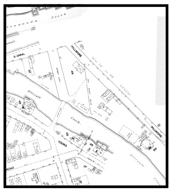

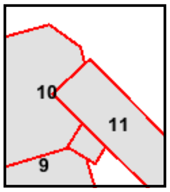

Volume 1, Sheet 11
Volume 1, Sheet 10
Volume 1, Sheet 9

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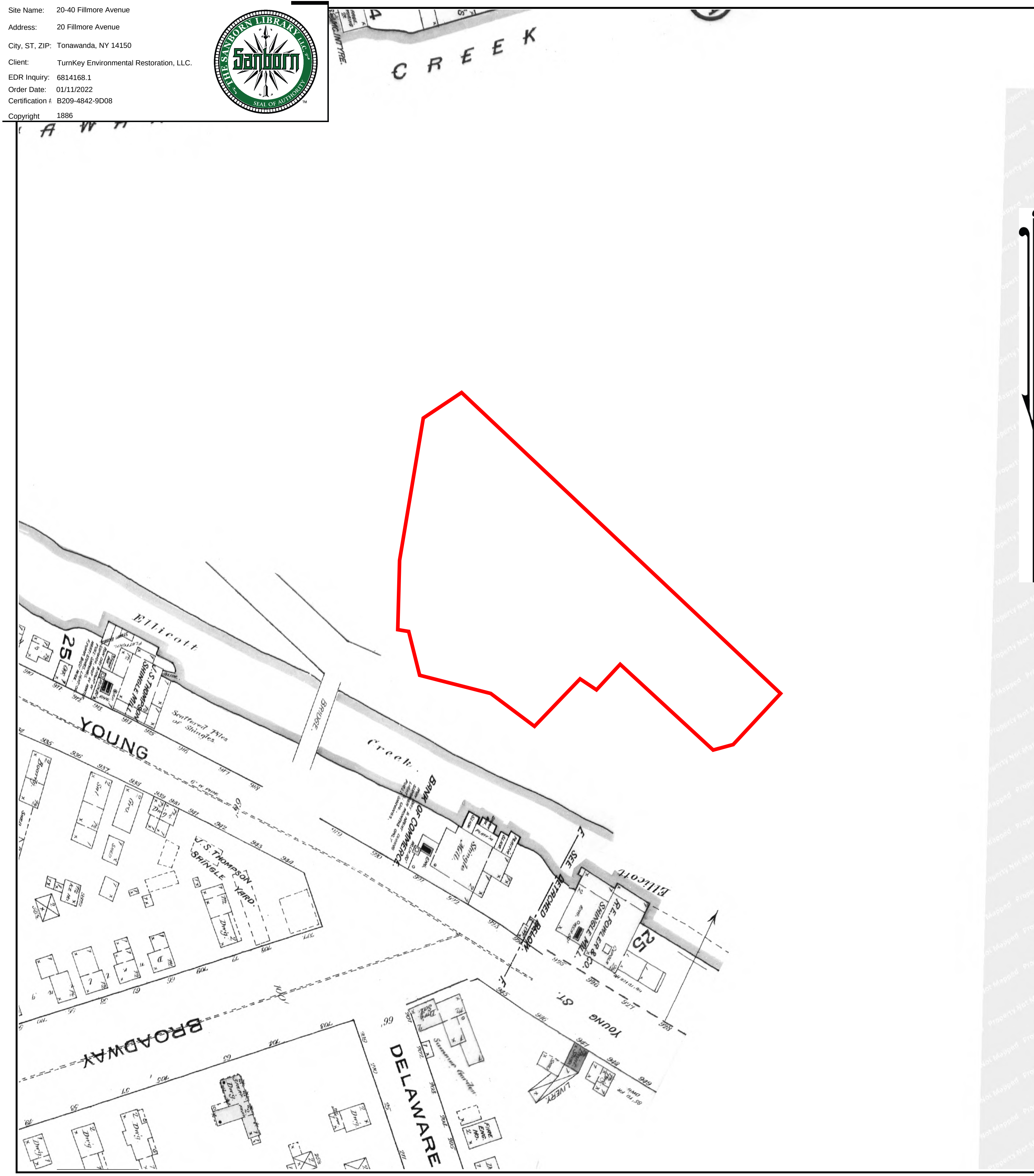
Certified Sanborn® Map

1886

Site Name: 20-40 Fillmore Avenue
Address: 20 Fillmore Avenue
City, ST, ZIP: Tonawanda, NY 14150
Client: TurnKey Environmental Restoration, LLC.
EDR Inquiry: 6814168.1
Order Date: 01/11/2022
Certification # B209-4842-9D08
Copyright 1886



Certification #B209-4842-9D08

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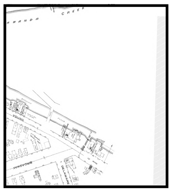

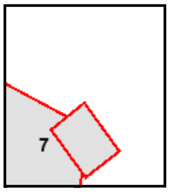

Volume 1, Sheet 7

0 Feet 150 300 600

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ATTACHMENT 2

NYSDEC Spill File

NYSDEC SPILL REPORT FORM

DEC REGION: 9
SPILL NUMBER: 9975702
SPILL NAME: NYSDOT PROJECT - SITE F
DEC LEAD: SACALAND

CALLER NAME: DAVID TACKLEY
NOTIFIER'S NAME:
CLR'S AGENCY: NYSDOT
NOTIFIER'S AGENCY:
CALLER'S PHONE: (716) 847-3036
NOTIFIER'S PHONE:

SPILL DATE: 03/01/2000
SPILL TIME: 12:00 pm
DISPATCHER:
CALL RECEIVED DATE: 03/06/2000
RECEIVED TIME: 12:00 pm

SPILL LOCATION

PLACE: NYSDOT PROJECT - SITE F
COUNTY: Erie
STREET: 22 FILLMORE AVENUE
TOWN/CITY: Tonawanda
COMMUNITY: TONAWANDA
CONTACT:
CONTACT PHONE:

CONT. FACTOR: Unknown
SPILL REPORTED BY: Responsible Party
FACILITY TYPE: Institutional, Educational, Gov., Othe
WATERBODY:

CALLER REMARKS:

NYSDOT SITE ASSESSMENT FOUND OIL CONTAMINATION AT SITE F, PEERLESS WELDING

MATERIAL	CLASS	SPILLED	RECOVERED	RESOURCES AFFECTED
unknown petroleum	Petroleum	0.00 G	0.00 G	Soil,

POTENTIAL SPILLERS

COMPANY	ADDRESS	CONTACT
NYSDOT	125 MAIN STREET BUFFALO NY	JANINE SHEPHERD (716) 847-3421

Tank No.	Tank Size	Material	Cause	Source	Test Method	Leak Rate	Gross Failure

DEC REMARKS:

Prior to Sept, 2004 data translation this spill Lead_DEC Field was "SAC"
03/06/00: RNL SENT LETTER FOR PJB SIGNATURE TO NYSDOT, DAVID TACKLEY, STATING SITE IS INACTIVE, ANY SOIL REMOVED BY NYSDOT MUST BE DISPOSED OR TREATED

HOLD FOR WORK BY NYSDOT

04/06/00: RNL SITE INSPECTION, PEERLESS WELDING IS BELOW EMBANKMENT, SITE IS LIKE A JUNKYARD, SOILS STAINED BUT AREA IS BELOW THE NYSDOT AREA AND PROBABLY NOT THE SOURCE, NYSDOT AREA IS AT INACTIVE LEVELS, ONLY PLAN WORK WITHIN NYSDOT AREA

Created On: 03/06/2000
Date Printed: 2/1/2022
Last Updated: 03/31/2004

01/02/01: RNL SENT A LETTER TO JANINE SHEPHERD OF NYSDOT ASKING FOR AN ANTICIPATED START DATE

01/22/01: RNL RECEIVED LETTER FROM DAVID TACKLEY, CONSTRUCTION HAS STARTED

02/28/01: RNL SENT MEMO TO FG AND SAC FOR ALL RNL NYSDOT SPILLS, COMPARED TO TAGM VALUES, ASSIGNED THIS SPILL TO SAC (NORTH)

2/4/04:SAC TELECON JANINE SHEPHERD, MS. SHEPHERD WILL REVIEW FILE TO FIND DOCUMENTATION FOR THE SITE, SITE INVESTIGATION REPORT WAS FILED WITH SPILL NUMBER 9975701.

3/31/04:SAC FOUND DISPOSAL RECEIPTS IN FILE FOR 9975701, NO FURTHER ACTION REQUIRED.

PIN	T & A	COST CENTER

CLASS: C3 **CLOSE DATE:** 03/31/2004 **MEETS STANDARDS:** False

RNL/Fil

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York, 14203-2999
Phone: (716) 851-7220 • **FAX:** (716) 851-7226
Website: www.dec.state.ny.us

Environmental Conservation 30 YEARS
John P. Cahill
Commissioner

January 2, 2001

Ms. Janine Shepherd
New York State Department of Transportation
125 Main Street
Buffalo, New York 14203

Dear Ms. Shepherd:

Could you please provide the following for the mentioned spills:

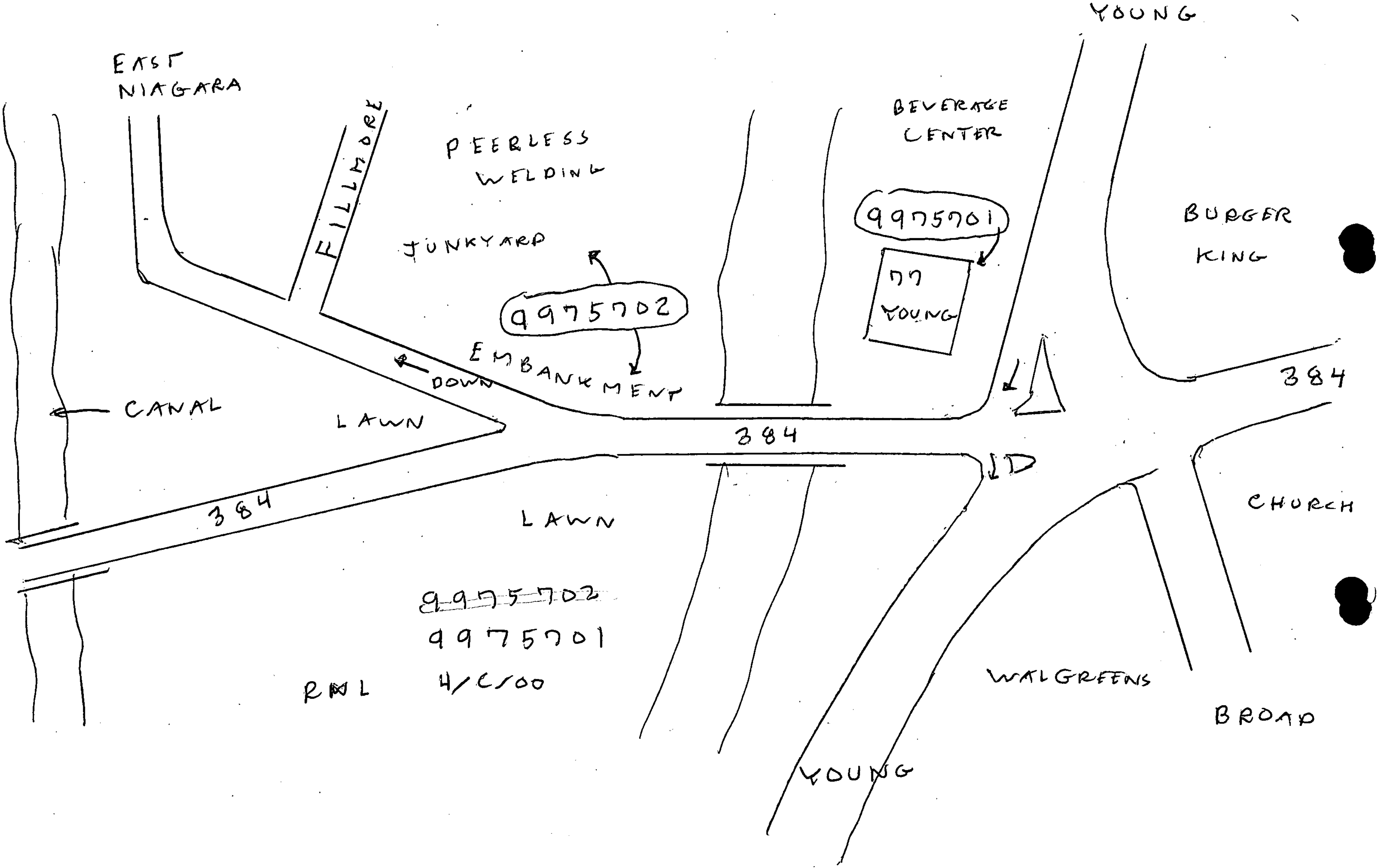
- 9875333, PIN 5131.25.121, Route 277 - Anticipated Start Date
- 9875422, PIN 5215.04.101, Route 179 - Disposal Receipt
- 9875455, Fredonia Facility - Continued Investigation
- 0075127, PIN 5045.21.101, Routes 93 & 104 - Anticipated Start Date
- 9975309, PIN 5131.25.121, Route 277 - Anticipated Start Date
- 0075479 and 0075480, PIN 5105.23.121, Route 39 - Anticipated Start Date
- 9975701 and 9975702, PIN 5460.29.121, Route 384 - Anticipated Start Date
- 9975529 to 9975532, PIN 5803.33, Williams Road - Anticipated Start Date
- 0075421, 0075423, 0075424, 0075425, 0075426, and 0075427, PIN 5019.10, Routes 265 & 384 - Anticipated Start Date
- 9975195 to 9975205, PIN 5034.86, Route 5 - Anticipated Start Date

Sincerely,

Robert N. Leary

Robert N. Leary, P.E.
Regional Spill Engineer

RNL:sz



~~9975702~~
9975701

RWL 4/6/00

KNL 1'ome

New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, New York, 14203-2999
Phone: (716) 851-7220 • **FAX:** (716) 851-7226
Website: www.dec.state.ny.us

Environmental Conservation 30 YEARS
John P. Cahill
Commissioner

March 24, 2000

Mr. David R. Tackley, Jr.
New York State Department of Transportation
125 Main Street
Buffalo, New York 14203

Dear Mr. Tackley:

NYSDOT
Delaware Street
9975701 - Site C - Automobile Repair Shop
9975702 - Site F - Peerless Welding
City of Tonawanda
Erie County

We have reviewed your Detailed Site Investigation Report dated December 1999, for Delaware Street, Erie County, PIN 5460.29.121. We have the following comments:

Our Spill Number 9975701 for your Site C will be "inactive" due to low level violations of our STARS I guidance values. Any soil removed from this site must be either disposed or treated.

Our Spill Number 9975702 for your Site F will be "inactive" due to low level violations of our STARS I guidance values. Any soil removed from this site must be either disposed or treated.

Concerning the sediments at Site H, the sample results indicate that these sediments fail the hazardous waste characteristic analysis for lead. Any sediments removed from this site must therefore be appropriately managed as a hazardous waste.

For the two spill locations, any removed soil must be either disposed at a sanitary landfill or treated on property owned by NYSDOT. Any successfully treated soil may be reused at an NYSDOT project. You must define the extent of contamination within your excavations for any soil removal via laboratory sampling at these locations.

If any tanks are found within NYSDOT ROW, you must remove, clean, and dispose them. For any tanks within your ROW, you must remove all contaminated soil and either treat or dispose the soil. Confirmatory sampling of each tank excavation will be necessary for 8021 and 8270 base neutrals. We recommend this sampling use the TCLP Method.

Should you have any questions, please call Mr. Robert Leary at (716)851-7220.

Sincerely,

Peter J. Buechi, P.E.
Regional Environmental Remediation
Engineer

/sz

cc: Mr. Robert Leary, Regional Spill Engineer ✓
Mr. Daniel King, Regional Hazardous Waste Remediation Engineer

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Meeting Minutes

Place/Date: NYSDOT - State Office Building, Buffalo, NY
March 31, 2000 - 10:00 a.m.

Subject: **CONTRACT D008683, PIN 5460.29.121**
REPLACEMENT OF DELAWARE STREET BRIDGE
(BIN 2047300) OVER ELLICOTT CREEK
CITY OF TONAWANDA, ERIE COUNTY, NEW YORK

Attendees:

Robert Leary (RL)	NYSDEC	851-7220
Mike Roche (MR)	NYSDOT	847-3667
Tom VanSplunder (TV)	NYSDOT	847-3667
Janine Shepherd (JS)	NYSDOT	847-3375
Andrew Klimek (AK)	Watts Engineers	836-1540
Phillip M. Galbo (PMG)	Watts Engineers	836-1540

CC:

Tim Woodbury	Wendel
John Flint	FAW&R
Jim Krapf	FAW&R
Gail Smith	NYSDOT Consut. Man.

Author: Andrew Klimek
(Direct Line (716) 836-2320 ext. 120)

Minutes Date: April 3, 2000

Transportation Engineering

Environmental Engineering

Civil/Site Development

Asbestos Management

Construction Inspection

NOTE: *Action items have been italicized for ease of identification.*

The purpose of this meeting was to review how the NYSDEC would classify each of the parcels adjacent to the Delaware Road Bridge (i.e., contaminated or not per regulation) and the material handling requirements for the soils/sediments identified during the detailed site investigation.

1) Petroleum Contaminated Soils (Sites C & F)

(RL) stated that the NYSDEC has prepared a letter that identifies Site C and Site F as containing petroleum contamination above NYSDEC Spill Technology

Watts Engineers
3826 Main Street
Buffalo, NY 14226
Tel 716.836.1540
Fax 716.836.2402
eowatts@eowatts.com

Distribution: File (95037.04), Attendees and CC list

And Remediation Series (STARS) Memo # 1 - Petroleum-Contaminated Soil Guidance Policy guidance values. This material is classified as a solid waste and should be disposed of properly in a Part 360 landfill approved to accept petroleum contaminated soils.

(AK) asked if the material from Site F could be reclassified during construction since the soils exhibited benzene contamination only marginally above NYSDEC STARS guidance values. (RL) stated that the excavated soils could be re-analyzed at the time of construction and reclassified to allow the soil to remain on-site if it passes NYSDEC STARS guidance values.

(RL) suggested a pay item remain in place for the collection of soil samples and laboratory analysis for NYSDEC STARS compounds. The quantity in this pay item could then be used for analysis of any of the site soils.

(JS) gave Watts Engineers a copy of Engineering Bulletin 98-048 that discusses petroleum contaminated soil specifications and how they vary depending upon whether sampling is to occur during construction or not. Since confirmation sampling is called for on this project, all petroleum-contaminated soil specifications should reference the 15203.9804 M through 15203.9807 M series.

(AK) at Watts Engineers will change the PS & E material to reflect petroleum soil contamination at Sites C & F (not Sites C & E, but see the note for Site E found below), change the pay item and associated specifications to reflect sampling during construction, and verify the quantities.

2) Petroleum Storage Tanks (Site C)

(MR) asked (RL) about excavation and disposal of the underground petroleum storage tanks that appear to be present at Site C based on Ground Penetrating Radar results. One of the four tanks is within NYSDOT's temporary easement (TE).

(RL) discussed a variety of options that are available to the NYSDOT for removing the tanks and resolving the matter. (RL) mentioned that he will attempt to speak with the property owner at 77 Young Street the week of April 3, 2000, to determine if they are willing to enter into an agreement for removal of the tanks found outside the temporary easement. The tanks on this parcel must be either brought in compliance with current petroleum bulk storage (PBS) regulations or properly closed. If the current property owner is willing to remove the tanks on his property, NYSDOT would only have to address the tanks and contaminated soils found within the temporary easement.

(MR) will check about taking the tanks out outside the limit of the temporary easement.

(RL) also stated that the NYSDEC expects the NYSDOT to "chase" contamination discovered from a leaking tank as long as it is on NYSDOT property.

(All) It was agreed that the Pay Items associated with the removal of all four tanks will remain in the estimate for now.

3) RCRA Hazardous Sediments (Site H)

(RL) stated that the NYSDEC considers the sediments sampled from Ellicott Creek to be RCRA hazardous due to lead. These sediments will have to be handled as a RCRA hazardous waste and disposed of at a permitted RCRA hazardous waste landfill.

(AK) stated that since the excavated sediment is considered a RCRA hazardous waste, Watts Engineers will delete Item 12202.0001 M SAMPLING AND ANALYSIS OF POTENTIALLY HAZARDOUS SEDIMENT.

4) Miscellaneous Site Soils (Sites A, B, E, & G)

(AK) then asked about reuse options for the soils found at Sites A, B, E, and G.

(RL) replied that the remainder of the site soils may be considered "clean" and reused on-site though discretion should be used by the contractor since some soils may contain low level semi-volatile compounds and may be unsuitable for cover material. RL also mentioned that if obvious signs of contamination are encountered during construction (including odors, elevated volatile vapor readings, or discolorization of soils) that the situation will have to be reassessed. Soils would have to pass NYSDEC STARS guidance values to be considered free of petroleum contamination.

(AK) mentioned that Site E was formerly identified as having been utilized for automobile sales and service and therefore, even though the detailed field investigations did not identify contamination, caution and good judgement should be used when excavating soil on this parcel.

The meeting adjourned at approximately 12:00 p.m.

This constitutes the writer's understanding of the major items of discussion. If you have any questions or comments, please do not hesitate to call.

Prepared by:
WATTS ENGINEERS

Andrew Klimek

Andrew Klimek

R. Gorny

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STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
125 MAIN STREET
BUFFALO, NY 14203

BRIAN O. ROWBACK
REGIONAL DIRECTOR

JOSEPH H. BOARDMAN
COMMISSIONER

February 8, 2000

Mr. Peter J. Buechi
Regional Environmental Remediation Engineer
NYS Dept. Of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999

RE: PIN 5460.29.121
DELAWARE AVENUE, NY RT. 384
BIN 2047300 OVER ELLICOTT CREEK
CITY OF TONAWANDA
ERIE COUNTY

Dear Mr. Buechi:

The attached "Detailed Site Investigation Report" for the above captioned project is being transmitted to your agency for your review and comment. The project proposes to replace the existing bridge with a new structure on the same alignment.

As the report indicates, both RCRA characteristic hazardous waste (hw) and non-hazardous solid waste were encountered during sampling. RCRA HW contamination for TCLP lead toxicity was encountered in the sediments under the bridge (Site H). Non-hazardous solid waste was encountered at sites A, C, E, F and G. Also, ground penetrating radar identified four anomalies with radar responses similar to UST's on the south side of the bridge. While two of these anomalies appear to be outside the temporary easement/excavation line , the other two potential UST's are partially and/or entirely within the temporary easement/excavation line.

Any questions may be directed to Janine Shepherd of my staff at 716-847-3421. Thank you for your prompt attention to this matter.

Sincerely,

David R. Tackley, Jr.
Regional Environmental Contact

Att.
DRT/JHS
cc: K. Farry (M. Roche), Asst. Regional Design Engineer, R-5
L. Gersh; File

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DETAILED SITE INVESTIGATION REPORT
for the

HAZARDOUS WASTE/CONTAMINATED MATERIALS ASSESSMENT

of

PIN 5460.29.121
DELAWARE STREET, NY ROUTE 384
BIN 2047300 OVER ELLICOTT CREEK
CITY OF TONAWANDA
ERIE COUNTY, NEW YORK

PREPARED FOR:
WENDEL
95 JOHN MUIR DRIVE
BUFFALO, NEW YORK 14228

FOR SUBMISSION TO:
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
REGION FIVE
125 MAIN STREET
BUFFALO, NEW YORK 14203

DECEMBER 1999

PREPARED BY:

WATTS ENGINEERS

3826 MAIN STREET • BUFFALO, NEW YORK 14226
(716) 836-1540 FAX: (716) 836-2402
EMAIL: eowatts@eowatts.com

DETAILED SITE INVESTIGATION REPORT
for the
HAZARDOUS WASTE/CONTAMINATED MATERIALS ASSESSMENT

of

PIN 5460.29.121
DELAWARE STREET, NY ROUTE 384
BIN 2047300 OVER ELLICOTT CREEK
CITY OF TONAWANDA
ERIE COUNTY, NEW YORK

PREPARED FOR:
WENDEL
95 JOHN MUIR DRIVE
BUFFALO, NEW YORK 14228

FOR SUBMISSION TO:
NEW YORK STATE DEPARTMENT OF TRANSPORTATION
REGION FIVE
125 MAIN STREET
BUFFALO, NEW YORK 14203

DECEMBER 1999

PREPARED BY:
EDWARD O. WATTS, P.E., P.C.
3826 MAIN STREET
BUFFALO, NEW YORK 14226

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1.0 INTRODUCTION

Edward O. Watts, P.E., P.C. (Watts Engineers) was retained by Wendel to conduct a Hazardous Waste/Contaminated Materials (HW/CM) Assessment in technical support of the proposed bridge replacement project at the Delaware Street Bridge (BIN 2047300) on Delaware Street, NY Route 384 in the City of Tonawanda, Erie County, New York (PIN 5460.29.121). This Detailed Site Investigation Report is part of the HW/CM Assessment prepared for the New York State Department of Transportation (NYSDOT) under contract D008683. The project location is shown on **Figure 1** in **Appendix A**.

1.1 Purpose and Scope

The purpose of the HW/CM Assessment is to identify the presence of contamination, if any, located within the proposed construction zone or right-of-way (ROW) acquisitions anticipated to take place along the project corridor. Concerns addressed by the HW/CM Assessment are the protection of the environment and protection of the health and safety of construction personnel and the public. The HW/CM Assessment will assist in the determination of additional construction costs due to special handling requirements for contaminated materials. It is the NYSDOT's policy to identify potential areas of contamination to avoid unexpected costs and significant delays late in the development of a project.

The Preliminary Screening Report of the HW/CM Assessment (also known as the Phase I report) prepared by Watts Engineers in May 1998 identified eight areas on the project corridor that were considered potential environmental concerns. The Phase I recommended geophysical surveys, soil gas surveys, soil core investigations, groundwater sampling, and the collection of soil samples at these sites. See **Table 1-1** for the Summary of Recommendations from the Preliminary Screening Report, and **Figure 2** in **Appendix A** for the locations of the sites of environmental concern. A Field Sampling Plan (FSP) was completed and approved in September 1999 specifying sampling locations and methodology to address the concerns identified in the Preliminary Screening Report.

The detailed site investigation (also known as the Phase II) was performed to implement the FSP. This detailed investigation consisted of: soil sample collection for analysis along the length of the project corridor where the potential for soil contamination had been identified; groundwater sample collection, if encountered; geophysical surveys where the potential for underground storage tanks (USTs) in the ROW had been identified; and soil gas surveys (including soil sampling if warranted) where the potential for petroleum contamination had been identified. This document presents the results of the Phase II site investigation.

1.2 NYSDOT Project Description

This proposed project consists of a bridge replacement. The preferred alternative includes replacement with a new bridge on the existing alignment, and 121 m (400ft) of related approach work. The new structure will carry four 3.3 m (11ft) travel lanes and two 0.9 m (3ft) curb offsets to accommodate motorists and bicyclists. There will also be 1.5 m (5ft) sidewalks on each side of the roadway to accommodate pedestrians. Right-of-way (ROW) acquisitions are planned at the northeast and southeast quadrants of the bridge and temporary easements will be needed in all four quadrants of the bridge.

1.3 Project Corridor Description

The project is located in an area which has been used for commercial and light industrial purposes since the late 1800's. **Table 1-1** presents the Summary of Recommendations from the Preliminary Screening Report for the sites of concern. For more detailed information regarding the project corridor and past uses of the sites of environmental concern, refer to the Preliminary Screening Report (Watts Engineers, May 1998).

Table 1-1
Summary of Recommendations from the Preliminary Screening Report

Site	Address & Current Land Use	Environmental Concerns	Recommendation
A	Vacant land 73 Young Street	Former commercial photo studio	• Soil sampling to depth of excavation for photographic developing chemicals.
B	Walgreen Drug Store 10 Young Street	Former gas station, active DEC spill site	• Soil gas survey with visual core investigation and potential soil sampling.
C	Automobile repair shop 77 Young Street	Former gas station & current automobile repair shop	• Soil gas survey with visual core investigation and potential soil sampling. • Soil sampling for auto repair shop chemicals. • GPR Survey
D	Burger King 11 Delaware Street	Former gas station/car dealer	• None beyond recommendations for Site C.
E	Vacant Land 2 Delaware Street	Former automobile repair/car dealer	• Soil gas survey with visual core investigation and potential soil sampling. • Soil sampling for auto repair shop chemicals. • GPR Survey
F	Peerless Welding 22 Fillmore Avenue	Long time scrap metal yard, former coal storage area	• Soil core investigation to depth of excavation to identify best locations for soil sampling along ROW. • Soil sampling in locations identified during soil core investigation. • GW sampling if encountered.
G	Creek Bank Soils Behind Bridge Abutments	Fill materials of unknown origin	• Soil core investigation to depth of excavation at creek banks to determine best location/depth for soil sampling. Performed in conjunction with sampling at Sites A, C, E, and F.
H	Sediments under Bridge Ellicott Creek	Past spills from upstream IHWS sites	• Sediment samples under bridge in areas of excavation.

Note: IHWS = NYSDEC Inactive Hazardous Waste Site

2.0 FIELD INVESTIGATION RESULTS

The results of the field investigation are presented below. Refer to Section 3.0 for the Laboratory Analytical Results.

2.1 Ground Penetrating Radar Survey - Field Investigation

A geophysical survey using ground penetrating radar (GPR) technology was performed at two sites adjacent to the bridge on October 13,1999. The general area of investigation for each site is delineated on **Figure 3** in **Appendix A**.

The purpose of the GPR survey is to determine the presence of, and locate, unmarked USTs. This allows NYSDOT to facilitate for the proper removal of USTs prior to, or during, construction. Additionally, the GPR survey is performed prior to the soil gas survey to avoid accidental puncture of unmarked tanks by field investigation personnel.

2.1.1 Methodology

The GPR survey was conducted by Sub-Surface Informational Surveys, Inc. (SIS), a NYSDOT-approved subcontractor, and supervised by Watts Engineers. The GPR antenna was operated parallel to the roadway for the length of each site of concern to provide continuous profiles of subsurface conditions at approximately one-meter intervals along the ROW. The survey's depth of penetration was approximately 1.21 m (4.0 ft). Five anomalies with radar responses similar to that of a UST were detected on the south side of the bridge. Details of the survey are presented below.

2.1.2 Findings Presented by Site

2.1.2.1 Site C - Automobile Repair Shop, 77 Young Street

A grid pattern with one meter spacing was set up on Site C to conduct the GPR survey. The area covered included the area shown on **Figure 3** in **Appendix A**.

The survey identified four anomalies which showed responses similar to that of a UST located west of the building between the roadway and the building. The anomalies are adjacent to each other, run parallel to the west wall of the auto repair shop, and appear to be approximately 0.8-1.0 m (2.62-3.28 ft) below ground surface. The anomalies are outlined on **Figure 3**. Two of the four anomalies are located outside the proposed temporary easement/excavation line.

However, one of the four anomalies is situated entirely within the temporary easement/excavation line and another anomaly is partially within the temporary easement/excavation line. The anomaly that is situated entirely within the proposed temporary easement/excavation line has a GPR profile consistent with an approximately 11.36 cubic meter (3000 gallon) UST, and the anomaly that is situated partially within the proposed temporary easement/excavation line has a GPR profile consistent with an approximately 15.14-18.93 cubic meter (4000-5000 gallon) UST. The remaining two anomalies appear to be outside the temporary easement/excavation line.

A fifth anomaly was detected within Delaware Street parallel to the roadway. The anomaly is located 1.0 m (3.28 ft) below ground surface at a distance of approximately 7 m (23 ft) south and outside the limits of proposed excavation for the project. This anomaly had a profile of an object up to 1.23 m (4 ft) wide and approximately 4 m (13.12 ft) long. However, consultation with a representative from Bell Atlantic, on-site with locating equipment, revealed that a large telephone duct bank approximately 0.61 m (2 ft) wide and 1.68 m (5.5 ft) tall is located in the area of the anomaly. The representative from Bell Atlantic indicated that he had difficulty locating the exact path of the duct bank, however, he believes that the duct bank likely runs directly down the centerline of the anomaly. Therefore, it is possible that the anomaly is associated with the telephone duct bank and may not be a UST.

2.1.2.2 Site E - Vacant Land, 2 Delaware Street

A grid pattern with one meter spacing was set up on Site E to conduct the GPR survey. The area covered consisted of a section approximately 70 meters (230 ft) in length by up to 20 meters (65.6 ft) in width along Delaware Street.

There was no signal penetration within the roadway pavement due to the presence of unknown materials of high conductivity within the shoulder pavement. The balance of the site showed no hyperbolic features that are characteristic of underground storage tanks.

2.2 Soil Core Investigation - Field Investigation

A soil core investigation (SCI) was performed on January 19-25, 1999 and October 19-20, 1999 for Sites A, B, C, E, F, and G. The locations of the SCI points were generally spaced at approximately 5-10 m (16-33 ft) intervals within the existing and proposed ROW at each site. Water mains, gas mains and services, telephone, and electrical cables were marked prior to field work in the project corridor. Many of the SCI points were moved slightly from their proposed locations to avoid underground utilities. Approximate SCI point locations are illustrated on **Figure 4** in **Appendix A**.

2.2.1 Methodology

A drill rig or a Geoprobe™ hydraulic direct-push probe was used to obtain subsurface soil samples for examination and to identify potentially contaminated areas to represent the best locations for soil sampling. The depth of the investigation at each point was determined by the proposed depth of construction at the site of concern. Organic vapor readings (taken with a photoionization detector (PID)), visual observations (staining, sheens, etc.), and rudimentary geologic descriptions were recorded for each soil core investigation point. Soil samples were collected from the locations believed to be most contaminated and/or representative of the contamination, if present, along the ROW.

In cases where a soil sample was warranted (as governed by the above-described criterion), a soil sample was obtained using a truck-mounted Geoprobe™ hydraulic direct-push probe or drill rig. Samples were composited over the length of the interval of concern except the volatile fraction. The fraction of the soil core selected for volatile organic analysis (VOA) was the sample fraction having obvious soil staining, having the highest organic vapor reading, or from the deepest portion of the soil boring. The remaining fraction of the core was composited for all other analyses.

2.2.2 Findings Presented by Site

Table 2-1 found on the next page lists the organic vapor readings (where applicable) and the general soil description for each soil core investigation point at sites A, B, C, E, and F. Soil sample identification numbers are also included in the first column in **Table 2-1** for all SCI point locations where a soil sample was collected for laboratory analysis. See **Appendix C** for soil boring logs from Site G. The analytical results are presented in Section 3.2.

TABLE 2-1
SOIL CORE INVESTIGATION FIELD DESCRIPTIONS
SITES A, B, C, E, AND F

SCI PT./ Sample ID	PID Reading (ppm)	*Depth*: General Soil Description
A-1 **DEL-A-SB1**	1.1	***0-3.96 m (0-13 ft)***: Fill; light brown to grey gravelly sand grading from red to dark brown to black gravelly sand, dark grey moist sandy silty clay at 2.44-3.96 m (8-13 ft). Slight unknown odor noted. *Sample collected from 2.44-3.66 m (8-12 ft).*
B-1	0.0	***0-1.52 m (0-5 ft)***: Fill; grey brown gravelly sand grading to light brown sand with silt trace asphalt.
B-2	0.0	***0-1.52 m (0-5 ft)***: Fill; brown, red, and grey sandy gravel grading to light brown fine sand.
B-3	0.0	***0-1.52 m (0-5 ft)***: Fill; dark brown silty sand with gravel grading to grey gravelly sand.
C-1	0.0	***0-1.52 m (0-5 ft)***: Fill; brown grey gravelly sand grading to light brown fine sandy silt and grey fine sandy silt.
C-2	0.0	***0-1.52 m (0-5 ft)***: Fill; dark brown silty sand grading to light brown sand with silt (brick at 0.91 m (3 ft)).
C-3	0.3	***0-1.52 m (0-5 ft)***: Fill; brown, grey, and black gravelly course sand trace brick.
C-4	0.0	***0-1.52 m (0-5 ft)***: Fill; black sand grading to brown grey coarse sand trace gravel.
C-5 **DEL-C-SB2**	10.5	***0-1.52 m (0-5 ft)***: Fill; black sand to 1.22 m (4 ft) grading to brown sand trace slag. Petroleum odors noted. *Sample collected from 0.15-1.52 m (0.5-5 ft).*
C-6	3.1	***0-1.52 m (0-5 ft)***: Fill; black sand trace slag to 1.22 (4 ft) grading to light brown sand.
C-7 **DEL-C-SB1**	375	***0-3.96 m (0-13 ft)***: Fill; brown and black sandy fill with gravel and brick. Black silty sand at 3.35-3.96 m (11-13 ft) grading to black silty clay at 3.96 m (13 ft). Strong petroleum odors at 3.05-3.96 m (10-13 ft). *Sample collected from 3.51-3.96 m (11.5-13 ft).*
E-1	0.0	***0-1.52 m (0-5 ft)***: Fill; black sand with light brown sand seams.
E-2 **DEL-E-SB1**	16.8	***0-1.52 m (0-5 ft)***: Fill; light brown sandy silt to 0.76 (2.5 ft) grading to black sand with traces of gravel slag and coal. *Sample collected from 0.15-1.52 m (0.5-5 ft).*
E-3	2.4	***0-1.52 m (0-5 ft)***: Fill; black sand with concrete at 1.52 m (5 ft).
E-4	4.5	***0-1.52 m (0-5 ft)***: Fill; black sand trace coal, brick, and slag.
E-5	0.0	***0-1.52 m (0-5 ft)***: Fill; brown to light brown silt and clay trace coal and slag grading to black slag and sand at 1.37 m (4.5 ft).
E-6	0.0	***0-1.52 m (0-5 ft)***: Fill; brown clay trace slag.
E-7	0.0	***0-1.52 m (0-5 ft)***: Fill; light brown to red silt trace coal and brick.

TABLE 2-1
SOIL CORE INVESTIGATION FIELD DESCRIPTIONS
SITES A, B, C, E, AND F

SCI PT./ Sample ID	PID Reading (ppm)	*Depth:* General Soil Description
E-8	0.1	***0-1.52 m (0-20 ft)***: Fill; black sand with concrete and brick layers grading to light brown sand at 1.52 m (5 ft), brown sandy silty at 1.83-2.44 m (6-8 ft), brown sand at 2.44-3.66 m (8-12 ft), and soft/moist brown to black silty sand trace slag from 3.66-6.1 m (12-20 ft).
F-1 **DEL-F-SB1**	1.1	***0-3.51 m (0-11.5 ft)***: Fill; light brown reddish clay with a coal/brick concrete mix at 0.76-1.37 m (2.5-4.5 ft), black sand with light brown sand seams at 1.37-2.44 m (4.5-8 ft) grading to brown to red to dark brown clay trace gravel, coal, and brick with wood at 3.51 m (11.5 ft). *Sample collected from 1.37-2.29 m (4.5-7.5 ft).*
F-2	0.0	***0-1.52 m (0-5 ft)***: Fill; light brown-red silt grading to black sandy silt trace gravel brick and cinders to dark brown silt trace coal.
F-3	1.8	***0-1.52 m (0-5 ft)***: Fill; dark brown to light brown silt with gravel trace coal, concrete at 1.52 m (5 ft).
F-4	0.0	***0-1.52 m (0-5 ft)***: Fill; light brown clay with seams of darker brown and grey clay grading to light brown red clay.
F-5	0.0	***0-1.52 m (0-5 ft)***: Fill; light brown clay grading to light brown red clay.
F-6	0.0	***0-1.52 m (0-5 ft)***: Fill; dark brown-grey silty clay with gravel grading to light brown red clay.

2.2.2.1 Site A - Vacant Land, 73 Young Street

One SCI point was drilled at this site adjacent to the southwest wing wall at Site A. No elevated volatile organic vapor readings greater than 5 ppm above background were obtained from the SCI point at this site (see **Table 2-1**). However, due to the history of photographic chemical storage at this property and the inability of the PID to detect all of the compounds of concern, one soil sample was collected from the SCI point (Sample DEL-A-SB1) at a depth of 2.44-3.66 m (8-12 ft) and analyzed for Schedule B parameters (general industrial contamination). No stained soil or sheens were noted from the sample, however, a slight unknown odor was noted emanating from the soil. See **Table 2-1** for the field description of the SCI point and the soil sample from this site. Section 3.2 of this report discusses the analytical results.

2.2.2.2 Site B - Walgreens Drug Store, 10 Young Street

Three SCI points were drilled across Young Street from Site B (a petroleum spill site) at approximately 10 m (33 ft) intervals in the area of the proposed excavation. No elevated volatile organic vapor readings, odors, stained soil, or sheens were noted in the soil from this site. Therefore, no soil samples were warranted as a result of the investigation for Site B. See **Table 2-1** for the field descriptions of the SCI points.

2.2.2.3 Site C - Automobile Repair Shop, 77 Young Street

Seven SCI points were drilled in a single row along the ROW at approximately 5 m (16 ft) intervals at Site C. Two elevated volatile organic vapor readings greater than 5 ppm above background were obtained from the SCI points at this site (see **Table 2-1**). Due to the history of petroleum storage on this property, one soil sample was collected from SCI point C-7 (Sample DEL-C-SB1) at a depth of 3.35-3.96 m (11.5-13 ft) and analyzed for Schedule A parameters (petroleum contamination). Strong petroleum odors and black stains were noted in the sample.

An unknown black sand fill was also noted at Site C which was present in five of the SCI points closest to the bridge (C-3 through C-7). A sample of this black sand was collected for analysis from SCI point C-5 (Sample DEL-C-SB2) at a depth of 0.15-1.52 m (0.5-5 ft) and analyzed for Schedule B parameters (general industrial contamination). The soil from this SCI point exhibited an elevated PID reading and black staining.

See **Table 2-1** for the field description of the SCI points and soil samples from this site. Section 3.2 of this report discusses the analytical results.

2.2.2.4 Site E - Vacant Land, 2 Delaware Street

Eight SCI points were drilled in a single row along the ROW at approximately 10 m (33 ft) intervals at Site E. One elevated volatile organic vapor reading greater than 5 ppm above background was obtained from the SCI points at this site (see **Table 2-1**). Due to the history of petroleum storage on this property, one soil sample was collected from SCI point E-2 (Sample DEL-E-SB1) at a depth of 0.15-1.52 m (0.5-5 ft) and analyzed for Schedule A parameters (petroleum contamination). No odors or sheens were noted from the sample, however, the soil was black in color. See **Table 2-1** for the field description of the SCI points and the soil sample from this site. Section 3.2 of this report discusses the analytical results.

2.2.2.5 Site F - Peerless Welding, 22 Fillmore Avenue

Six SCI points were drilled in a single row along the ROW at approximately 10 m (33 ft) intervals at Site F. No elevated volatile organic vapor readings greater than 5 ppm above background were obtained from the SCI points at this site (see **Table 2-1**). However, due to the history of coal and scrap metal storage at this property and the inability of the PID to detect all of the compounds of concern, one soil sample was collected from SCI point F-1 (Sample DEL-F-SB1) at a depth of 1.37-2.29 m (4.5-7.5 ft) and analyzed for Schedule B parameters (general industrial contamination). No odors or sheens were noted from the sample, however, the soil consisted of black sand fill. See **Table 2-1** for the field description of the SCI points and the soil sample from this site. Section 3.2.1 of this report discusses the analytical results.

2.2.2.6 Site G - Creek Bank Soils, Behind Bridge Abutments

In accordance with one of the recommendations presented in the Preliminary Site Assessment for the Hazardous Waste/Contaminated Materials (HW/CM) Assessment, a representative of Watts Engineers was present to screen soils during drilling in the fill areas for two of the geotechnical soil borings.

On January 19, 20, 22, and 25, 1999, two geotechnical soil borings (SB-1 and SB-3) were drilled into the fill behind each bridge abutment, and four additional borings (SB-2, SB-4, SB-5, and SB-6) were advanced into the structure to collect core samples, by SJB Services under the supervision of a representative of Flint, Allen, White, and Radley Consulting Engineers, P.C. Borings SB-2, SB-4, SB-5, and SB-6 were augered without sampling through the fill to the foundation for core sampling, therefore, split spoon samples were not collected and these borings were unable to be screened.

Continuous split spoon sampling of the soils was performed for borings SB-1 and SB-3. The soils from borings SB-1 and SB-3 were screened visually and with the use of a Foxboro OVA 128 flame ionization detector (FID) to determine if collection of soil samples were warranted. Investigation of the soils from the two geotechnical soil borings (SB-1 and SB-3) revealed no significant FID readings, however, a layer of black cinder-like material was noted between approximately 0.3-1.52 m (1- 5 feet) in the two borings. The layer of black cinder-like material was also reportedly noted in the auger cuttings from the same interval at the four additional borings (SB-2, SB-4, SB-5, and SB-6). A composite sample of the cinder-like material was collected from between 0.30-1.22 m (1-4 ft) at boring number SB-3 (Sample B-3) and analyzed for Schedule B parameters (general industrial contamination). See **Appendix C** for the soil boring logs for borings SB-1 and SB-3. Section 3.2 of this report discusses the analytical results.

During the investigation at SB-1 and SB-3, no significant groundwater accumulation was encountered in the borings, and therefore, no groundwater samples were collected.

2.3 Groundwater Sampling - Field Investigation

Groundwater sampling was proposed at Site F, contingent upon finding groundwater in one of the SCI boreholes drilled at the site. However, groundwater was not encountered in any of the SCI borings drilled at Site F, and therefore, a groundwater sample was not collected.

2.4 Sediment Sampling - Field Investigation

2.4.1 Site H - Sediments Under Bridge, Ellicott Creek

Two sediment samples were collected at Site H under the bridge at the locations shown on **Figure 4**. One sample was collected near each abutment using a bucket auger. See **Table 2-2** for sediment sample field descriptions. Samples were collected from a depth of 0-0.3 m (0 - 1 ft) and analyzed for potential contamination relating to upstream waste sites. The sediment samples were analyzed in accordance with Schedule D parameters (general industrial contamination in sediments) listed in **Table 3-1**.

TABLE 2-2
SEDIMENT SAMPLE FIELD DESCRIPTIONS
SITE H

SAMPLE ID/ SITE	PID Reading (ppm)	General Sediment Description
DEL-H-SED1 South Side of Bridge	0.0	Black sand with gravel.
DEL-H-SED2 North Side of Bridge	0.0	Black sand with gravel.

3.0 ANALYTICAL METHODOLOGY AND LABORATORY RESULTS

Soil samples, sediment samples, and potential groundwater samples that were to be collected from the existing or proposed highway ROW and temporary easements were subjected to chemical analysis under four different analytical schedules. These schedules are described in Section 3.1. Sample locations are shown on **Figure 4** in **Appendix A.** The analytical results are presented in Section 3.2.

3.1 Analytical Methodology

The samples were sent to Waste Stream Technology, Inc. (NYS Department of Health ELAP-certified laboratory) in Buffalo, New York for analysis according to the following analytical schedules presented below. The full laboratory report is included as **Appendix B**. **Table 3-1** presents a summary of the analytical schedules, their corresponding USEPA method numbers, and references.

3.1.1 Schedule A - Petroleum Contamination in Soils

Schedule A is a group of analytical methods designed to detect petroleum contamination. The methods are specified in accordance with the NYSDEC STARS Memo #1: Petroleum-Contaminated Soil Guidance Policy. The analysis included the following: Toxicity Characteristic Leaching Procedure (TCLP) followed by USEPA Standard Method 8021 for volatile organic compounds including methyl t-butyl ether (MTBE); TCLP followed by USEPA Standard Method 8270 (base/neutrals only) for semivolatile organic compounds; and TCLP followed by USEPA Standard Method 6010 for lead.

3.1.2 Schedule B - General Industrial Contamination in Soils

Schedule B is a group of methods designed to detect general industrial contamination. Samples were analyzed for the full Target Compound List (TCL) of volatiles (Method 8260), semivolatiles (Method 8270), pesticides/PCBs (Method 8081), eight RCRA metals (totals - Methods 6010 and 7470), RCRA Ignitability, and TCLP followed by analysis for benzene.

3.1.3 Schedule C - General Industrial Contamination in Groundwater

Schedule C is a group of methods designed to detect general industrial contamination in groundwater. In accordance with FSP criterion, a groundwater sample was not warranted as a result of the field investigation. However, if a groundwater sample was collected during this investigation, it would have been analyzed for TCL volatile organic compounds (Method 8260), semivolatile organic compounds (Method 8270), and pesticides/PCBs

(Method 8080). In addition, the groundwater sample would have been analyzed for the eight RCRA metals (Method 6010/7000).

3.1.4 Schedule D - General Industrial Contamination in Sediments

Schedule D is a group of methods designed to detect general industrial contamination in sediments. Sediments were analyzed for TCL volatile organic compounds (Method 8260), semivolatile organic compounds (Method 8270), pesticides/PCBs (Method 8080), total organic carbon (TOC) (Lloyd Khan Method) and for the eight RCRA metals (Method 6010/7000). Also, for purposes of characterizing the sediments for disposal, the samples were be subjected to TCLP (Method 1311) followed by analysis for benzene (Method 8021).

Table 3-1
Project Specific Analytical Schedules

SCHEDULE	PARAMETER	MATRIX	METHOD NO.	NUMBER OF SAMPLES COLLECTED	Sites
A	TCLP • STARS VOAs • STARS SVOAs • TCLP Lead Ignitability	Soil	1311 8021 8270 6010 1010	2 Plus 1 matrix spike	C & E
B	TCL VOAs TCL SVOAs TCL Pesticides/PCBs RCRA Metals TCLP: • Benzene Ignitability	Soil	8260 8270 8080 6010/7000 series 1311 8021 Closed Cup	2 Plus 1 matrix spike/ matrix spike duplicate	A, C, F, & G
C	TCL VOAs TCL SVOAs TCL Pesticides/PCBs RCRA Metals	Groundwater	8260 8270 8080 6010/7000 series	0	N/A (Sample not warranted per FSP/field investigation)
D[1]	TCL VOAs TCL SVOAs TCL Pesticides/PCBs RCRA Metals TCLP • Benzene TOC	Sediment	8260 8270 8080 6010/7000 series 1311 8021 Lloyd Khan	2	H

NOTE:

1. One of the sediment samples from Site H was also analyzed for TCLP lead as a result of the high total lead level determined during the initial analysis. TCLP lead analysis was added to determine whether the sediment sample could be considered a RCRA hazardous waste based on lead toxicity.

REFERENCES:

NYSDEC STARS guidance memorandum #1: Petroleum - Contaminated Soil Guidance Policy

Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, SW-846, 3rd Edition, November 1986 and Revision, November 1990.

3.2 Laboratory Results

Laboratory analytical results are presented in the sub-sections below for each of the samples collected in the field. These results are compared to the appropriate New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (USEPA) guidance values for illustrative purposes. The guidance values are not intended for use as action levels on the project corridor since the NYSDEC generally makes decisions on a site-by-site basis. However, the guidance values are useful as an indication of what determinations are likely to be made by the NYSDEC.

The laboratory report is included in **Appendix B**. See **Table 3-2** for information on the sampling sites, proposed construction activities, the type of investigations performed, sample identifications, and the analytical schedules performed per sample.

TABLE 3-2
SAMPLING SITES, INVESTIGATIONS, AND SAMPLES

Site	Land Use & Address *Reason for concern*	Proposed Construction Activities	Investigations Performed[1]	Analytical Schedule and Sample ID
A	Vacant Land 72 Young Street *Former commercial photo studio*	Bridge replacement, approach pavement reconstruction, & drainage improvements.	• Soil Core Investigation	*Analytical Schedule B:* **(DEL-A-SB1)**
B	Walgreens Drug Store 10 Young Street *Former gas station & current DEC spill site*	*No excavations are scheduled to take place directly adjacent to Site B. The closest excavations are proposed across Young Street from Site B.*	• Soil Core Investigation (Due to the proximity of the proposed excavations, the investigation was performed across Young Street from Site B on the southern edge of Site A).	*Analytical Schedule A:* **Sample not warranted per FSP criterion/field investigation**
C	Automobile Repair Shop 77 Young Street *Former gas station & current auto repair shop*	Bridge replacement, approach pavement reconstruction, & drainage improvements.	• GPR Survey • Soil Core Investigation	*Analytical Schedule A:* **(DEL-C-SB1)** *Analytical Schedule B:* **(DEL-C-SB2)**
D	Burger King 11 Delaware Street *Former gas station/car dealer*	*No excavations are scheduled to take place directly adjacent to Site D. The closest excavations are proposed across Young Street from Site D.*	• None beyond Site C due to the proximity of the proposed excavations. The Site C investigation is comprehensive enough to identify any concerns due to Site D.	N/A
E	Vacant Land 2 Delaware Street *Former auto repair/car dealer (petroleum storage)*	Bridge replacement, approach pavement reconstruction, & drainage improvements.	• GPR Survey • Soil Core Investigation	*Analytical Schedule A:* **(DEL-E-SB1)**
F	Peerless Welding 22 Fillmore Avenue *Long time scrap metal yard, former coal storage area*	Bridge replacement, approach pavement reconstruction, & drainage improvements.	• Soil Core Investigation	*Analytical Schedule B:* **(DEL-F-SB1)** *Analytical Schedule C:* **No GW sample collected per FSP criterion/field investigation**
G	Creek Bank Soils Behind Bridge Abutments *Fill material of unknown origin*	Bridge replacement	• Soil Core Investigation	*Analytical Schedule B:* **(B-3 (SITE G))**
H	Sediments under Bridge Ellicott Creek *Past spills from upstream IHWS sites*	Bridge replacement	• Sediment Sampling	*Analytical Schedule D:* **(DEL-H-SED1)[2]** **(DEL-H-SED2)**

Notes:
1. Soil core investigation includes organic vapor readings of soil gas and visual inspection of soil borings.
2. DEL-H-SED1 was also analyzed for TCLP lead due to a high total lead result.

3.2.1 Soil Samples for Petroleum Contamination

Two individual soil samples were collected as a result of petroleum concerns encountered during the soil core investigation conducted at Sites C and E. Samples were collected from the locations shown on **Figure 4** in **Appendix A** and analyzed for Schedule A parameters. Soil sampling was performed as described in Section 2.2.1. See **Table 2-1** for field observations recorded from the soil samples as a result of the soil core investigation. The analytical results for each sample are listed in **Table 3-3**.

TABLE 3-3
DELAWARE STREET BRIDGE
SCHEDULE A LABORATORY DETECTED ANALYTES - SOIL SAMPLES AT SITES C AND E

Compound	Concentration in TCLP Extract (µg/l - [ppb])		NYSDEC Guidance Values
	Sample DEL-C-SB1	Sample DEL-E-SB1	TCLP Extraction Guidance Value[1] (ppb)
Sample Date	10/19/99	10/20/99	
Sample Depth (ft)	11.5 - 13	0.5 - 5	
TCLP Volatiles			
Benzene	4.9	ND	0.7
Toluene	5.0	2.2	5
Ethylbenzene	10.7	ND	5
o-Xylene	4.4	ND	5
m/p-Xylene	10.2	ND	5
Isopropylbenzene	7.2	ND	5
n-Butylbenzene	7.4	ND	5
n-Propylbenzene	3.8	ND	5
p-Isopropyltoluene	10.9	ND	5
Naphthalene	4.8	ND	10
1,2,4-Trimethylbenzene	24.6	ND	5
1,3,5-Trimethylbenzene	9.2	ND	5
TCLP Semi-Volatiles			
Naphthalene	8	ND	10
TCLP Metals			
TCLP Lead	173	92	5,000
Ignitability			
Ignitability	<200°F	<200°F	<200°F[2]

NOTES

ND = Not Detected
J = Value is estimated.
B = Compound is found in associated blank as well as the sample (indicating laboratory contamination)

(1) Information taken from NYSDEC Division of Construction Management, Bureau of Spill Prevention and Response, STARS Memo #1 - Petroleum Contaminated Soil Guidance Policy, August 1992.

(2) RCRA ignitability guidance level - also taken from NYSDEC STARS Memo #1.

3.2.2 Soil Samples for General Industrial Contamination

Four individual soil samples were collected for general industrial contamination concerns as a result of the soil core investigation conducted at Sites A, C, F, and G. Samples were collected from the locations shown on **Figure 4** in **Appendix A** and analyzed for Schedule B parameters. Soil sampling was performed as described in Section 2.2.1. See **Table 2-1** for field observations recorded from each soil sample location. The analytical results for each sample are listed in **Table 3-4**.

TABLE 3-4
DELAWARE STREET BRIDGE
SCHEDULE B LABORATORY DETECTED ANALYTES - SOIL SAMPLES AT SITES A, C, F, & G

	Soil Concentration (µg/kg - ppb)				Guidance Values (ppb)	
Compound	Sample DEL-A-SB1	Sample DEL-C-SB2	Sample DEL-F-SB1	Sample B-3 (Site G)	NYSDEC Action Levels Based on USEPA Health Risk Data[1,2,3]	NYSDEC Recommended Soil Cleanup Objectives[2]
Sample Date	10/19/99	10/19/99	10/20/99	1/20/99		
Sample Depths (ft)	8 - 12	0.5 - 5	4.5 - 7.5	1 - 4		
TCL Volatiles						
Acetone	ND	ND	ND	26 J	8,000,000	200
Benzene	ND	ND	ND	1 J	24,000	60
Ethylbenzene	ND	1 J	1 J	ND	8,000,000	5500
Methylene Chloride	ND	5	8	ND	93,000	100
Styrene	ND	4 J	ND	ND	23,000	N/A
Toluene	2 J	3 J	4 J	3 J	20,000,000	1500
Trichloroethene	17	25	30	ND	64,000	700
Xylenes	2 J	ND	3 J	1 J	200,000,000	1200
TCL Semi-Volatiles STARS						
Naphthalene	ND	74 J	113 J	118 J	300,000	13,000
2-Methylnaphthalene	ND	92 J	96 J	121 J	N/A	36,400
Phenanthrene	ND	165 J	331	195 J	N/A	50,000
Anthracene	ND	ND	78 J	ND	20,000,000	50,000
Di-n-butyl phthalate	ND	ND	201 J	ND	8,000,000	8,100
Fluoranthene 1000	158 J	139 J	418	154J	3,000,000	50,000
Pyrene 1000	154 J	166 J	447	157 J	2,000,000	50,000
Benzo(a)Anthracene	113 J	79 J	274 J	85 J	220	224 or MDL
Chrysene	109 J	94 J	302 J	96 J	N/A	400
bis (2-Ethylhexyl) phthalate	404	423	166 J	205 J	N/A	50,000
Benzo(b) fluoranthene	ND	82 J	286 J	ND	220	1,100 or MDL
Benzo(k) fluoranthene	102 J	90 J	279 J	90 J	220	1,100 or MDL
Benzo(a) pyrene	110 J	74 J	266 J	75 J	61	61 or MDL
Indeno(1,2,3-cd) pyrene	ND	ND	94 J	ND	N/A	3,200
Benzo(g,h,i) perylene	ND	ND	93 J	ND	N/A	50,000
TCL Pesticides						

TABLE 3-4
DELAWARE STREET BRIDGE
SCHEDULE B LABORATORY DETECTED ANALYTES - SOIL SAMPLES AT SITES A, C, F, & G

	Soil Concentration (µg/kg - ppb)				Guidance Values (ppb)	
Compound	**Sample DEL-A-SB1**	**Sample DEL-C-SB2**	**Sample DEL-F-SB1**	**Sample B-3 (Site G)**	**NYSDEC Action Levels Based on USEPA Health Risk Data[1,2,3]**	**NYSDEC Recommended Soil Cleanup Objectives[2]**
None Detected	---	---	---	---	---	---
TCL PCBs						
None Detected	---	---	---	---	---	---
RCRA Metals (Totals)						
Arsenic	3030	3,890	3,630	7610	3000-12,000	7500 or SB
Barium	12,400	34,100	39,500	114,000	15,000-600,000	300,000 or SB
Cadmium	2,850	2,830	ND	1590	100-1000	1000 or SB
Chromium	7,950	5,200	5,770	16,400	1500-40,000	10,000 or SB
Lead	7,450	19,400	33,200	16,200	200,000-500,000[5]	SB
TCLP						
TCLP Benzene 0.7	ND	ND	1.6	ND	500[4]	0.7[6]
Ignitability						
Ignitability	<200°F	<200°F	<200°F	<200°F	<200°F[4]	N/A

NOTES

ND = Not Detected
N/A = Not Available
MDL = Method detection Limit
J = Estimated Value (below Laboratory Quantitation Limit)
B = Compound detected in associated blank as well as sample (indicating laboratory contamination)

[1] Taken from NYSDEC Technical and Administrative Guidance Memorandum HWR-92-3028, November 30, 1992 Based on USEPA Health Effects Assessment Summary Tables or NYSDEC Technical and Administrative Guidance Memorandum HWR-94-4046 - USEPA Health Based Values if not available in HWR-92-3028.

[2] NYSDEC Technical and Administrative Guidance Memorandum HWR-94-4046, revised January 24, 1994. As per TAGM 4046; Total volatiles <10,000 ppb, total semi-volatiles <500,000 ppb, and individual semi-volatiles <50,000 ppb.

[3] Action levels for RCRA metals are Eastern USA background levels based on NYSDEC Technical and Administrative Guidance Memorandum HWR-94-4046, Revised April, 1995.

[4] RCRA Hazardous waste level information taken from NYSDEC Division of Construction Management, Bureau of Spill Prevention and Response, STARS Memo #1 - Petroleum Contaminated Soil Guidance Policy, August 1992.

[5] Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 ppm. Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200-500 ppm. Source is NYSDEC TAGM HWR 94-4046.

[6] Information taken from NYSDEC Division of Construction Management, Bureau of Spill Prevention and Response, STARS Memo #1 - Petroleum Contaminated Soil Guidance Policy, August 1992.

▨ Exceeds guidance value.

3.2.3 Sediment Samples for General Industrial Contamination

Two sediment samples (Samples DEL-H-SED1 and DEL-H-SED2) were collected for general industrial contamination concerns from Site H under the bridge at the locations shown on **Figure 4** in **Appendix A**.

Both samples were analyzed for Schedule D parameters. Among other detected analytes, the Schedule D results identified a high total lead level in the sediments. Therefore, subsequent to the Schedule D analysis, Sample DEL-H-SED1 was also analyzed for TCLP lead to determine the proper method of disposal.

Soil sampling was performed as described in Section 2.4. See **Table 2-2** for field sediment sample descriptions. The analytical results for each sample are listed in **Table 3-5**.

TABLE 3-5
DELAWARE STREET BRIDGE
SCHEDULE D LABORATORY DETECTED ANALYTES - SEDIMENT SAMPLES AT SITE H

	Sediment Concentration (µg/kg - ppb)		Guidance Values (ppb)	
Compound	Sample DEL-H-SED1	Sample DEL-H-SED2	NYSDEC Action Levels Based on USEPA Health Risk Data[1,2,3]	NYSDEC Recommended Soil Cleanup Objectives[2]
Sample Date	10/19/99	10/19/99		
Sample Depths (ft)	0 - 1	0 - 1		
TCL Volatiles				
Toluene	2 J	ND	20,000,000	1500
Trichloroethene	7	ND	64,000	700
Xylenes	2 J	ND	200,000,000	1200
TCL Semi-Volatiles				
Acenaphthene	135 J	ND	5,000,000	50,000
Phenanthrene 1000	2600	3770	N/A	50,000
Anthracene 1000	729	ND	20,000,000	50,000
Carbazole	488	ND	32,000	N/A
Fluoranthene 1000	5060	5890	3,000,000	50,000
Pyrene 1000	5490	8420	2,000,000	50,000
Benzo(a)Anthracene .04	2200	2340 J	220	224 or MDL
Chrysene .04	2480	2740 J	N/A	400
bis (2-Ethylhexyl) phthalate	618	3010 J	N/A	50,000
Benzo(b) fluoranthene .04	2800	1820 J	220	1,100 or MDL
Benzo(k) fluoranthene .04	2370	2760 J	220	1,100 or MDL
Benzo(a) pyrene .04	2180	2380 J	61	61 or MDL
Indeno(1,2,3-cd) pyrene .04	788	ND	N/A	3,200
Dibenzo(a,h) anthracene .04	332	ND	14	14 or MDL
Benzo(g,h,i) perylene .04	651	1230 J	N/A	50,000
TCL Pesticides				
None Detected	---	---	---	---
TCL PCBs				

TABLE 3-5
DELAWARE STREET BRIDGE
SCHEDULE D LABORATORY DETECTED ANALYTES - SEDIMENT SAMPLES AT SITE H

	Sediment Concentration (µg/kg - ppb)		Guidance Values (ppb)	
Compound	Sample DEL-H-SED1	Sample DEL-H-SED2	NYSDEC Action Levels Based on USEPA Health Risk Data[1,2,3]	NYSDEC Recommended Soil Cleanup Objectives[2]
Aroclor 1260	170	140	1000	1000 (surface) 10,000 (subsurface)
RCRA Metals				
Arsenic	2,240	3,030	3000-12,000	7500 or SB
Barium	21,200	77,700	15,000-600,000	300,000 or SB
Cadmium	8,860	7,910	100-1000	1000 or SB
Chromium	26,400	55,800	1500-40,000	10,000 or SB
Lead	2,480,000	712,000	200,000-500,000[5]	SB
Mercury	30	159	1-200	100
TCLP				
TCLP Benzene	ND	1.5	500[4]	0.7[6]
TCLP Lead	7,140	N/A	5,000[4]	N/A
Total Organic Carbon				
Total Organic Carbon	0.7722 %	1.75%	1%[7]	N/A

NOTES:

ND = Not Detected
N/A = Not Available
MDL = Method detection Limit
J = Estimated Value (below Laboratory Quantitation Limit)
B = Compound detected in associated blank as well as sample (indicating laboratory contamination)

[1] Taken from NYSDEC Technical and Administrative Guidance Memorandum HWR-92-3028, November 30, 1992 Based on USEPA Health Effects Assessment Summary Tables or NYSDEC Technical and Administrative Guidance Memorandum HWR-94-4046 - USEPA Health Based Values if not available in HWR-92-3028.

[2] NYSDEC Technical and Administrative Guidance Memorandum HWR-94-4046, revised January 24, 1994. As per TAGM 4046; Total volatiles <10,000 ppb, total semi-volatiles <500,000 ppb, and individual semi-volatiles <50,000 ppb.

[3] Action levels are Eastern USA background levels based on NYSDEC Technical and Administrative Guidance Memorandum HWR-94-4046, Revised April, 1995.

[4] RCRA Hazardous waste level information taken from NYSDEC Division of Construction Management, Bureau of Spill Prevention and Response, STARS Memo #1 - Petroleum Contaminated Soil Guidance Policy, August 1992.

[5] Background levels for lead vary widely. Average levels in undeveloped, rural areas may range from 4-61 ppm. Average background levels in metropolitan or suburban areas or near highways are much higher and typically range from 200-500 ppm. Source is NYSDEC TAGM HWR 94-4046.

[6] Information taken from NYSDEC Division of Construction Management, Bureau of Spill Prevention and Response, STARS Memo #1 - Petroleum Contaminated Soil Guidance Policy, August 1992.

[7] Lowest Effect Level from NYSDEC Technical Guidance for Screening Contaminated Sediments, November 1993.

▨ Exceeds guidance value.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The Hazardous Waste/Contaminated Materials Detailed Site Investigation for this project has been completed. Several sites may require special handling of excavated materials or preparation prior to the construction phase. The NYSDEC should be made aware of the findings from the soil and sediment sampling conducted for this investigation. Prior to construction, the Engineer-In-Charge (EIC) should be made aware of the history of each site and advised to contact the NYSDOT Regional Environmental staff if any evidence of contamination or underground storage tanks is encountered.

4.1 Ground Penetrating Radar Survey (for USTs)

A geophysical survey using ground penetrating radar (GPR) technology was performed at two sites adjacent to the bridge to determine the presence of, and locate, unmarked USTs. Five anomalies with radar responses similar to that of a UST were detected on the south side of the bridge.

Four of the five anomalies are adjacent to each other and parallel to the west wall of the building at Site C (77 Young Street) between the roadway and the building. The anomalies are at a depth of at approximately 0.8-1.0 m (2.62-3.28 ft) below ground surface. One of these four anomalies (potentially an approximately 11.36 cubic meter (3000 gallon) UST) is situated entirely within the temporary easement/excavation line and one other of the four anomalies (potentially an approximately 15.14-18.93 cubic meter (4000-5000 gallon) UST) is partially within the temporary easement/excavation line. The remaining two anomalies appear to be outside the temporary easement/excavation line.

The fifth anomaly was detected within Delaware Street parallel to the roadway. The anomaly is located 1.0 m (3.28 ft) below ground surface at a distance of approximately 7 m (23 ft) south and outside the limits of proposed excavation for the project. This anomaly had a profile of an object up to 1.23 m (4 ft) wide and approximately 4 m (13.12 ft) long. However, consultation with a representative from Bell Atlantic, on-site with locating equipment, revealed that a large telephone duct bank approximately 2 ft wide and 5.5 feet tall is located in the area of the anomaly. The representative from Bell Atlantic indicated that he had difficulty locating the exact path of the duct bank, however, he believes that the duct bank likely runs directly down the centerline of the anomaly. The anomaly is located outside the proposed limits of excavation, and it is possible that the anomaly is associated with the telephone duct bank and may not be a UST. Therefore, this anomaly is not expected to be of concern to the proposed bridge project.

If additional USTs or evidence of residual petroleum contamination are encountered at any location during construction, the EIC should contact the NYSDOT Regional Environmental staff for assistance in determining what special handling provisions may be required for petroleum-contaminated media.

4.2 Sites Not Considered to be of Environmental Concern

Site B - Walgreens Drug Store, 10 Young Street

A soil core investigation was performed for contamination concerns from this site which indicated that a soil sample was not warranted for the contamination concerns from Site B. Since no stained soil, odors or elevated organic vapor readings were observed during the field investigation for this site, this site is not expected to have contaminated the proposed bridge corridor.

4.3 Sites Considered to be of Potential Environmental Concern

Both RCRA characteristic hazardous waste and non-hazardous solid waste were encountered during sampling. Specific conclusions and recommendations are presented below.

Site A - Vacant Land, 72 Young Street

A soil core investigation was performed at this site which resulted in the collection of one soil sample (Sample DEL-A-SB1) for general industrial contamination concerns. A slight unknown odor and an organic vapor reading of 1.1 were observed during the field investigation at this site. Three VOCs and seven SVOCs, were detected in the soil sample collected from this site. One of the seven SVOCs (benzo(a)pyrene) was detected at a level above the NYSDEC guidance values. One inorganic (cadmium) was also detected at a level above its NYSDEC guidance value. All other detected contaminants were at levels below the NYSDEC guidance levels. Since two of the contaminants detected were above the NYSDEC guidance values, soil from this site should not be reused as clean fill. See Section 4.4.2 for recommendations.

Site C - Automobile Repair Shop, 77 Young Street

A soil core investigation was performed at this site which resulted in the collection of two soil samples: one sample for petroleum contamination concerns (Sample DEL-C-SB1) and one for general industrial contamination concerns (Sample DEL-C-SB2).

Sample DEL-C-SB1:

This soil sample was collected for petroleum contamination concerns and had heavy stains, petroleum odors, and an elevated organic vapor readings of 375 ppm. Twelve petroleum VOCs were detected in the TCLP analysis of the soil sample collected from this site. Nine of the twelve VOCs were detected at levels above the NYSDEC guidance values. Therefore, petroleum contaminated soil from this site should not be reused as clean fill. See Section 4.4.3 for recommendations.

Sample DEL-C-SB2:

This soil sample was collected for general industrial contamination concerns and had a black sandy material with petroleum odors and elevated organic vapor readings of 10.5 ppm. Similar black sandy material was present in five of the seven soil core investigation points at this site. Four VOCs and eleven SVOCs, were detected in the soil sample of the black sand collected from this site. One of the eleven SVOCs (benzo(a)pyrene) was detected at levels above the NYSDEC guidance values. One inorganic (cadmium) was also detected at a level above its NYSDEC guidance value. All other detected contaminants were at levels below the NYSDEC guidance levels. Since two of the contaminants detected were above the NYSDEC guidance values, soil from this site should not be reused as clean fill. See Section 4.4.2 for recommendations.

Site E - Vacant Land, 2 Delaware Street

A soil core investigation was performed at this site which resulted in the collection of one soil sample (Sample DEL-E-SB1) for petroleum contamination concerns. No petroleum odors were noted from the soil, however, elevated organic vapor readings of 16.8 ppm were observed during the field investigation at this site. One VOC was detected in the TCLP analysis of the soil sample collected from this site at a level below the NYSDEC guidance values. Since elevated organic vapor readings were noted at this site, there is a potential that excavations will encounter contaminated soil. See Section 4.4.3 for recommendations.

In addition, black sandy material similar to that found at other sites was encountered in five of the boreholes at this site. The black sandy material at this site was not analyzed for Schedule B parameters, since it is likely that the analytical results would be similar to the analytical results from the black sandy material sampled at Sites A, C, F, and G. See Section 4.4.2 for recommendations.

Site F - Peerless Welding, 22 Fillmore Avenue

A soil core investigation was performed at this site which resulted in the collection of one soil sample (Sample DEL-F-SB1) for general industrial contamination concerns. No stained soil, odors, or elevated organic vapor readings were observed during the field investigation at this site. However, five VOCs and fifteen SVOCs were detected in the soil sample collected from this site. Four of the fifteen SVOCs were detected at levels above the NYSDEC guidance values and the TCLP benzene analysis detected benzene at a level above the NYSDEC STARS guidance level. All other detected contaminants were at levels below the NYSDEC guidance levels. Since five of the contaminants detected were above the NYSDEC guidance values, soil from this site should not be reused as clean fill. See Section 4.4.2 for recommendations.

Site G - Creek Bank Soils

A soil core investigation was performed at this site, in January 1999 as part of a geotechnical investigation, which resulted in the collection of one soil sample (Sample B-1 from Site G) for general industrial contamination concerns. The sample consisted of a black sandy material with no odors or elevated organic vapor readings. The black sandy material was present to a depth of approximately 0.3-1.52 m (1-5 ft). Four VOCs and ten SVOCs, were detected in the soil sample collected from this site. One of the ten SVOCs (benzo(a)pyrene) was detected at a level above the NYSDEC guidance values. Three inorganics (cadmium, arsenic, and chromium) were also detected at levels above NYSDEC guidance values. All other detected contaminants were at levels below the NYSDEC guidance levels. Since four of the contaminants detected were above the NYSDEC guidance values, soil from this site should not be reused as clean fill. See Section 4.4.2 for recommendations.

Site H - Sediments under Bridge

Two sediment samples for general industrial contamination concerns were collected from the creek. The samples were collected from both the north and south ends of the bridge adjacent to the abutments. The sediments were black in color and no elevated organic vapor readings were observed during the field investigation.

Sample DEL-H-SED1:

The analysis of the sample from the south end of the bridge (Sample DEL-H-SED1) detected three VOCs, fifteen SVOCs, and one PCB congener. Six of the fifteen SVOCs were detected at levels above the NYSDEC guidance values. Three inorganics were also detected at levels above their NYSDEC guidance values. All other detected contaminants were at levels below the NYSDEC guidance levels.

One of the inorganics detected was lead. As a result of the high total lead concentration determined during the initial analysis, Watts Engineers recommended that the lab analyze the sediment sample for TCLP lead levels. TCLP lead analysis was performed to determine whether the sediment sample could be considered a RCRA hazardous waste based on lead toxicity. TCLP lead concentration was determined to exceed the RCRA hazardous waste regulatory level for toxicity.

Sample DEL-H-SED2:

The analysis of the sample from the north end of the bridge (Sample DEL-H-SED2) detected one VOC, ten SVOCs, and one PCB congener. The VOC detected was benzene from the TCLP benzene analysis. The TCLP benzene analysis level was above the NYSDEC guidance value for petroleum contaminated soil and five of the ten SVOCs were detected at levels above their

NYSDEC guidance values. Four inorganics and TOC were also detected at a level above their NYSDEC guidance values. All other detected contaminants were at levels below the NYSDEC guidance levels.

Between these two samples, eleven of the contaminants detected were above the NYSDEC guidance values, including lead which was detected at a level above the RCRA hazardous waste level for toxicity. Sediment from this site should be considered a RCRA hazardous waste for purposes of disposal and can not be reused as clean fill. See Section 4.4.4 for recommendations.

4.4 Recommendations

4.4.1 GPR Anomalies (Potential USTs)

Construction excavations at the southeast corner of the bridge are proposed in the location of GPR anomalies that are potential USTs. Therefore, we recommend that the appropriate personnel at the NYSDEC be made aware of the presence of potential USTs at 77 Young Street (Site C). This will allow the NYSDEC to arrange for UST removal and the cleanup of associated potential contamination by responsible parties.

4.4.2 General Industrial Contamination

As a result of the findings of the Detailed Site Investigation for this project, the following actions are recommended:

Contaminated/Sediment Soil Handling:

A copy of this report should be provided to an appropriate representative of the NYSDEC in preparation for a discussion between the NYSDEC and NYSDOT regarding proper reuse and/or disposal of soil from this corridor. Topics to be discussed at this meeting should include: specifications for reuse/disposal of contaminated materials, a remediation plan, and a health and safety plan. These issues should be addressed with regard to field and laboratory results at sites A, C, E, F, G, and H.

It should be noted that the NYSDEC makes decisions on a case by case basis regarding what remedial actions should be taken during displacement of soils, sediments, or groundwaters which are contaminated as a result of petroleum or industrial spills or waste disposal practices. For excavated soils in contaminated areas of the project corridor options may include: processing under a specific NYSDEC Beneficial Use Determination (BUD), disposal at a state permitted landfill, reuse at the site of origin as subgrade material, or treatment on site.

Health and Safety:

In addition to any NYSDEC requirements, Watts Engineers recommends that the contractor's Project Safety and Health Plan (specified in the NYSDOT Standard Specifications Section 107-05) be expanded to address the environmental concerns detailed in this investigation. To this end, it is recommended that the contractor be provided with this report and the Phase I report for this project.

Also, if any unusual environmental concerns are identified during construction (e.g. strong odors, waste-like fill materials, underground tanks, fill materials inconsistent with the materials identified in this investigation, etc.), the NYSDOT Regional Environmental Staff should be consulted for further guidance.

4.4.3 Petroleum Contamination

Petroleum contamination was encountered at the former gas station at Site C, and the potential for petroleum contaminated soil was encountered at Site E. For these sites, we recommend an environmental monitor be present during excavations to separate contaminated soil from non-contaminated soil.

Petroleum contamination is not expected to be encountered at any other sites within the proposed project corridor. However, if evidence of residual petroleum contamination is encountered at any other location during construction, the EIC should contact the Regional Environmental staff for assistance in determining whether special handling provisions should be instituted for petroleum contaminated media.

4.4.4 RCRA Hazardous Waste Contamination

RCRA hazardous waste contamination for TCLP lead toxicity was encountered in the sediments collected from under the bridge (Site H). It is unclear what might be the cause for the elevated lead concentrations without additional studies and sediment samples collected from both upstream and downstream locations. If elevated lead concentrations are localized to the sediments immediately surrounding the bridge, it is possible that the lead contamination is due to lead associated with the paint on the structure. Other possible sources of the elevated lead concentrations may be fugitive emissions from years of automobile and boat traffic, release of leaded petroleum products from the adjacent service station, or cross-contamination associated with an upstream industrial source.

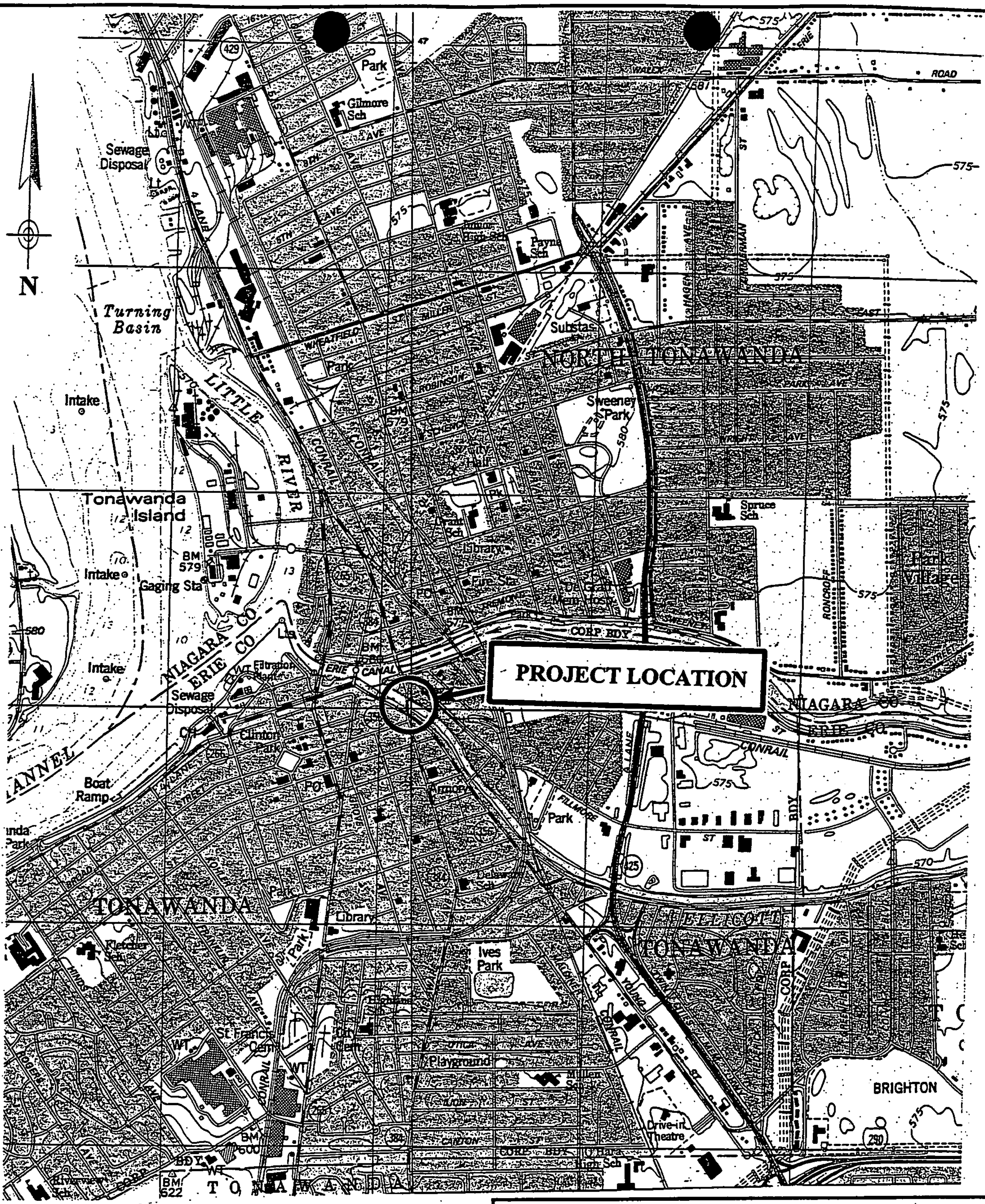
Watts Engineers recommends that an Erosion and Sediment Control Plan be prepared to address sediment excavation activities during construction to minimize the mobilization of contaminated sediments. One technique that could be employed would involve the use of sheet piling cofferdams during abutment excavation to reduce the release of sediments to the environment.

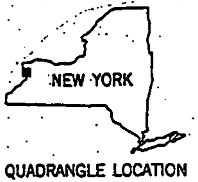
Once excavated, Watts Engineers recommends that the sediments be placed into covered rolloffs and sampled to re-confirm whether they should be considered RCRA hazardous or a non-hazardous solid waste for purposes of disposal or reuse. Resampling is suggested since it is possible that the bulk volume of excavated sediments may not be hazardous. A contingency plan should be developed beforehand in consultation with the NYSDEC in the event that the excavated sediments are determined to be non-hazardous. The sediments could then potentially be reused as fill on the site or disposed of as a solid waste in a solid waste landfill.

Alternately, if re-sampling of the containerized sediments confirms RCRA hazardous toxicity for lead, the NYSDOT will have to obtain an EPA hazardous waste generator identification number to facilitate disposal. Prior to disposal, the sediments would need to be solidified/stabilized with an additive such as portland cement so that the sediments would pass the paint filter test prior to disposal. Disposal would involve landfilling in a permitted hazardous waste landfill.

APPENDIX A

Site Maps





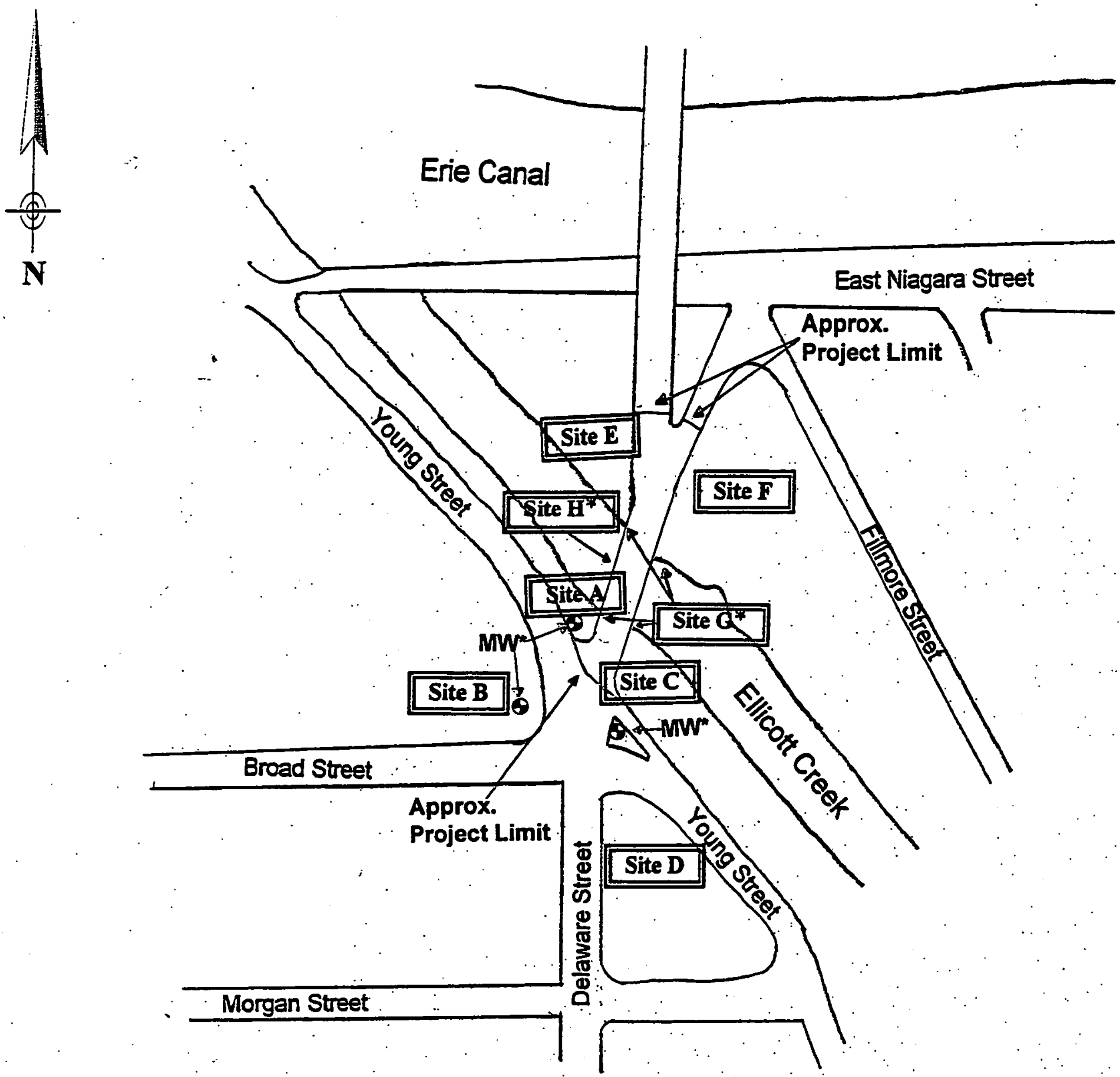
SOURCE:
USGS 15' QUADRANGLE
"TONAWANDA, EAST AND
TONAWANDA, WEST, N.Y."
1980

WATTS ENGINEERS
3826 MAIN STREET
BUFFALO, NEW YORK 14226

FIGURE 1
PROJECT LOCATION MAP

DELAWARE STREET, NY ROUTE 384
BIN 2047300 OVER ELLICOTT CREEK
CITY OF TONAWANDA, ERIE COUNTY
PIN 5460.29

SCALE: 1:25,000	NOVEMBER 1999



*** NOTES:**

Site G consists of excavation areas of creek bank soils.
Site H consists of excavation areas of sediments under bridge.
MW = Approx. location of existing monitoring wells.

FIGURE 2

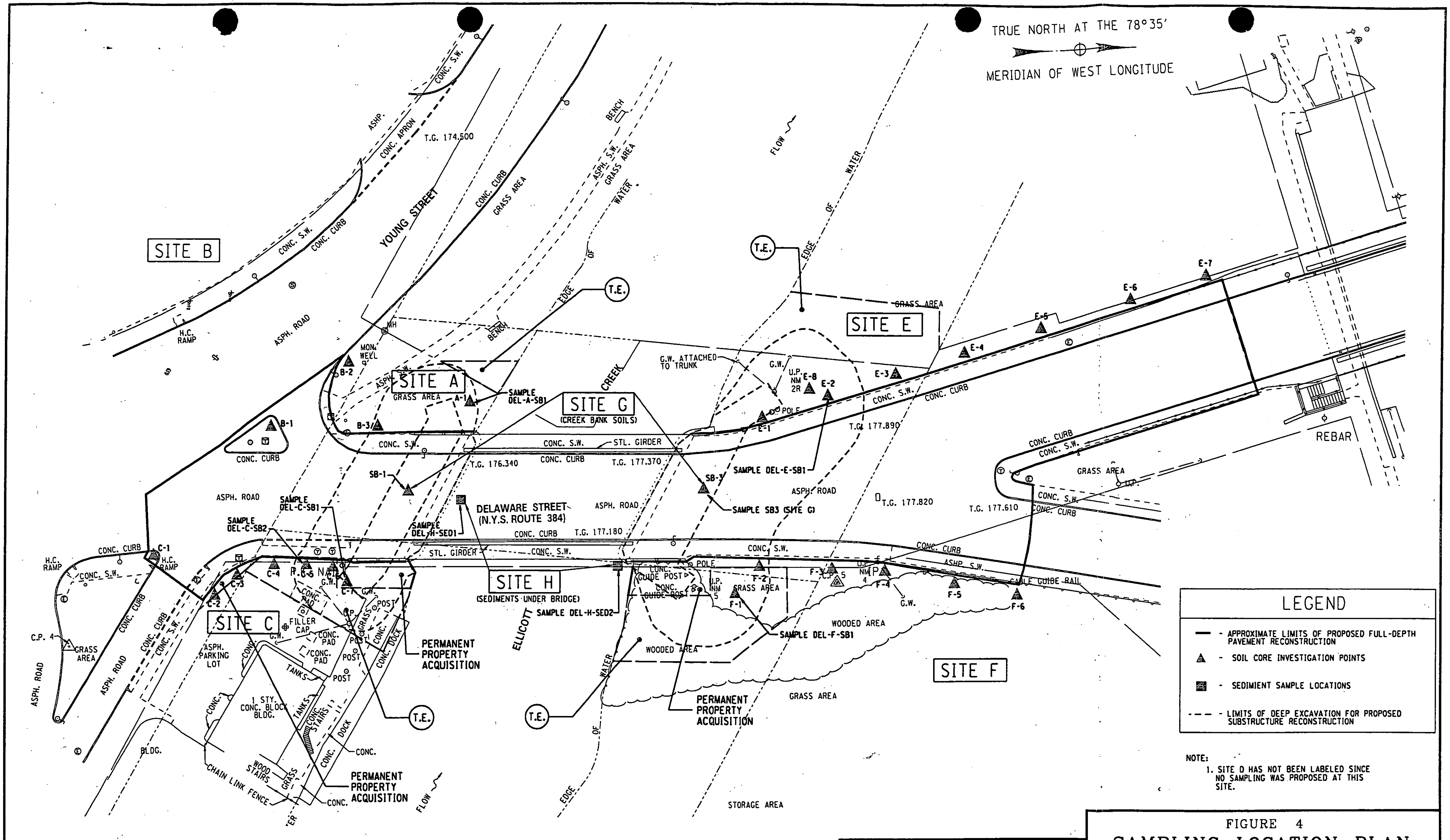
SITES OF ENVIRONMENTAL CONCERN

DELAWARE STREET, NY ROUTE 384
BIN 2047300 OVER ELLICOTT CREEK
CITY OF TONAWANDA, ERIE COUNTY
PIN 5460.29

NO SCALE

NOVEMBER 1999

WATTS ENGINEERS
3826 MAIN STREET
BUFFALO, NEW YORK 14226



NOTE:
1. SITE D HAS NOT BEEN LABELED SINCE NO SAMPLING WAS PROPOSED AT THIS SITE.

WATTS ENGINEERS

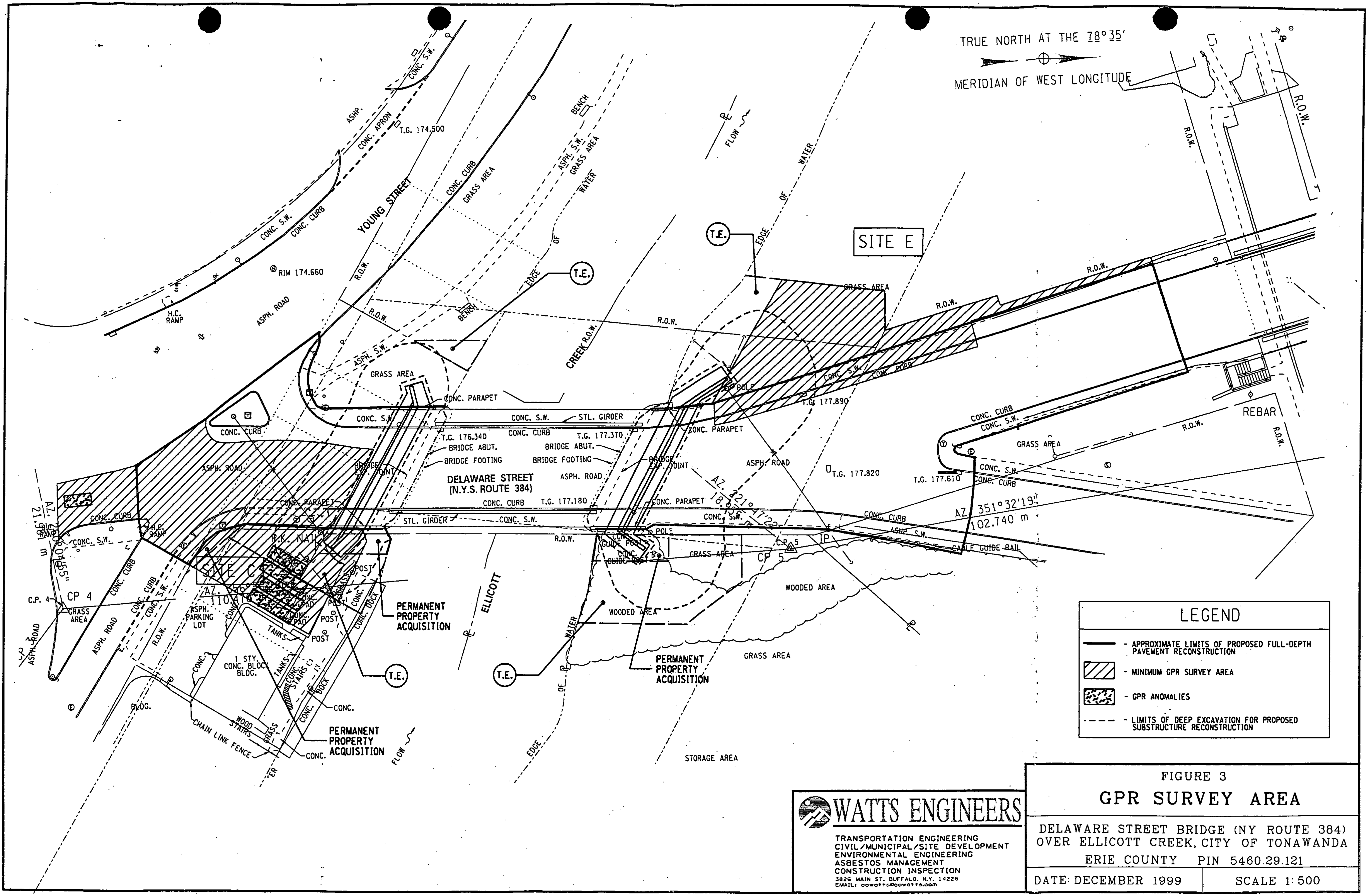
TRANSPORTATION ENGINEERING
CIVIL/MUNICIPAL/SITE DEVELOPMENT
ENVIRONMENTAL ENGINEERING
ASBESTOS MANAGEMENT
CONSTRUCTION INSPECTION
3826 MAIN ST. BUFFALO, N.Y. 14226
EMAIL: eowatts@eowatts.com

FIGURE 4
SAMPLING LOCATION PLAN

DELAWARE STREET BRIDGE (NY ROUTE 384)
OVER ELLICOTT CREEK, CITY OF TONAWANDA
ERIE COUNTY PIN 5460.29.121

DATE: DECEMBER 1999	SCALE 1:500

07 DEC 1999
04:08:14
del.04
037sa



LEGEND

- APPROXIMATE LIMITS OF PROPOSED FULL-DEPTH PAVEMENT RECONSTRUCTION
▨ - MINIMUM GPR SURVEY AREA
▩ - GPR ANOMALIES
- - - - LIMITS OF DEEP EXCAVATION FOR PROPOSED SUBSTRUCTURE RECONSTRUCTION

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FIGURE 3
GPR SURVEY AREA

DELAWARE STREET BRIDGE (NY ROUTE 384)
OVER ELLICOTT CREEK, CITY OF TONAWANDA
ERIE COUNTY PIN 5460.29.121

DATE: DECEMBER 1999 | SCALE 1:500

APPENDIX B

Laboratory Report

WASTE STREAM TECHNOLOGY, INC.

302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report

Report Date : 11/05/99
Group Number : 9901-1674

Prepared For :
Mr. Justin Kellogg
Edward O. Watts, P.E., P.C.
3826 Main Street
Buffalo, NY 14226

Site : Delaware St. Br.

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
DEL-A-SB1-8-12	WS58308	Soil	10/19/99	10/21/99	15:40
DEL-C-SB1-11.5-13	WS58309	Soil	10/19/99	10/21/99	15:40
DEL-C-SB2-0.5-5	WS58310	Soil	10/19/99	10/21/99	15:40
DEL-H-SED1	WS58311	Soil	10/19/99	10/21/99	15:40
DEL-H-SED2	WS58312	Soil	10/19/99	10/21/99	15:40
DEL-E-SB1-0.5-5	WS58313	Soil	10/20/99	10/21/99	15:40
DEL-F-SB1-4.5-7.5	WS58314	Soil	10/20/99	10/21/99	15:40
Sample Status Upon Receipt : No irregularities.					

RECEIVED
NOV 17 1999
WATTS ENGINEERS

Report Released By : Daniel W. Vo
Daniel Vollmer, Laboratory QA/QC Officer

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179   NJDEPE #73977   CDHS ELAP #2189

Analytical Data Report

Report Date : 11/05/99
Group Number : 9901-1674

Site : Delaware St. Br.

	Analytical Services	
Analytical Parameters	**Number of Samples**	**Turnaround Time**
Total Organic Carbon	2	Standard
TCLP 8021 STARS	2	Standard
TCLP 8270 STARS	2	Standard
TCLP Lead	2	Standard
Total Metals	5	Standard
Ignitability	5	Standard
Pesticides/PCBs	5	Standard
8270	5	Standard
8260B	5	Standard
TCLP Benzene	5	Standard
TCLP 8021 STARS MS	1	Standard
TCLP 8270 STARS MS	1	Standard
TCLP Lead MS	1	Standard
Total Metals Dup/MS	1	Standard
Ignitability Dup	1	Standard
Pesticides MS/MSD	1	Standard
8270 MS/MSD	1	Standard
8260B MS/MSD	1	Standard

ORGANIC DATA QUALIFIERS

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicates the presence of a compound that meets identification criteria, but the result is less than the sample quantitation limit but greater than zero.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as the sample.

E - This flag identifies all compounds whose concentrations exceed the calibration range of the GC/MS instrument of that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

G - Matrix spike recovery is greater than the expected upper limit of analytical performance.

L - Matrix spike recovery is less than the expected lower limit of analytical performance.

 # - Indicates that a surrogate recovery was found to be outside the expected limits of analytical performance.

$ - Indicates that the surrogate compound was diluted out. The sample had to be diluted to obtain analytical results and a recovery could not be calculated.

(%) - Indicates that the compound is a surrogate and that the value reported for this compound is in percent recovery. The quality control recovery limits are indicated in the detection limit or QC limits column.

Waste Stream Technology, Inc.

Ignitability (flash point)

SW-846 1010

Site: Delaware St. Br.
Date Received: 10/21/99

Group Number: 9901-1674
Matrix: Soil
Units: ° F

WST ID	Client ID	Date Sampled	Detection Limit	Result	Date Analyzed
WS58308	DEL-A-SB1-8-12	10/19/99	NA	>200	10/26/99
WS58309	DEL-C-SB1-11.5-13	10/19/99	NA	>200	10/26/99
WS58310	DEL-C-SB2-0.5-5	10/19/99	NA	>200	10/26/99
WS58313	DEL-E-SB1-0.5-5	10/20/99	NA	>200	10/26/99
WS58314	DEL-F-SB1-4.5-7.5	10/20/99	NA	>200	10/26/99

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/Kg
Matrix: Soil

WST ID: WS58308
Client ID: DEL-A-SB1-8-12
Digestion Date: 10/27/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Arsenic by ICP	1.70	3.03	10/28/99	SW-846 6010
Barium by ICP	1.00	12.4	10/28/99	SW-846 6010
Cadmium by ICP	1.00	2.85	10/28/99	SW-846 6010
Chromium by ICP	1.00	7.95	10/28/99	SW-846 6010
Lead by ICP	4.10	7.45	10/28/99	SW-846 6010
Mercury by Cold Vapor	0.014	Not detected	11/03/99	SW-846 7471
Selenium by ICP	1.40	Not detected	10/28/99	SW-846 6010
Silver by ICP	0.500	Not detected	10/28/99	SW-846 6010

Waste Stream Technology, Inc.
Pesticides and PCBs in Soil
8081A/8082

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58308
Client ID: DEL-A-SB1-8-12
Extraction Date: 10/29/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Alpha-BHC	0.5	Not detected		U
Beta-BHC	1.0	Not detected		U
Gamma-BHC (Lindane)	0.5	Not detected		U
Delta-BHC	1.6	Not detected		U
Heptachlor	3.2	Not detected		U
Aldrin	2.8	Not detected		U
Heptachlor Epoxide	1.4	Not detected		U
Endosulfan I	0.8	Not detected		U
Dieldrin	0.8	Not detected		U
4,4'-DDE	0.8	Not detected		U
Endrin	1.8	Not detected		U
Endosulfan II	1.0	Not detected		U
4,4'-DDD	0.9	Not detected		U
Endrin Aldehyde	1.3	Not detected		U
Endosulfan Sulfate	10	Not detected		U
4,4'-DDT	2.8	Not detected		U
Endrin Ketone	2.1	Not detected		U
Methoxychlor	1.0	Not detected		U
Toxaphene	51	Not detected		U
Chlordane	12	Not detected		U
Aroclor 1016	46	Not detected		U
Aroclor 1221	38	Not detected		U
Aroclor 1232	63	Not detected		U
Aroclor 1242	29	Not detected		U
Aroclor 1248	15	Not detected		U
Aroclor 1254	9.0	Not detected		U
Aroclor 1260	10	Not detected		U
Decachlorobiphenyl (%)		90	60-150	
Tetrachloro-m-xylene (%)		88	60-150	

Dilution Factor 1

W[illegible]ste Stream Technology, Inc[illegible]

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58308
Client ID: DEL-A-SB1-8-12
Extraction Date: 10/28/99
Date Analyzed: 10/29/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
4-nitroaniline	1650	Not detected		U
4-chlorophenylphenylether	330	Not detected		U
4,6-dinitro 2-methylphenol	1650	Not detected		U
n-nitrosodiphenylamine	330	Not detected		U
4-bromophenylphenylether	330	Not detected		U
hexachlorobenzene	330	Not detected		U
pentachlorophenol	1650	Not detected		U
phenanthrene	330	Not detected		U
anthracene	330	Not detected		U
carbazole	330	Not detected		U
di-n-butylphthalate	330	Not detected		U
fluoranthene	330	158		J
benzidine	3300	Not detected		U
pyrene	330	154		J
butylbenzylphthalate	330	Not detected		U
3,3'-dichlorobenzidine	660	Not detected		U
benzo(a)anthracene	330	113		J
chrysene	330	109		J
bis(2-ethylhexyl)phthalate	330	404		
di-n-octylphthalate	330	Not detected		U
benzo[b]fluoranthene	330	Not detected		U
benzo[k]fluoranthene	330	102		J
benzo[a]pyrene	330	110		J
indeno[1,2,3-cd]pyrene	330	Not detected		U
dibenzo[a,h]anthracene	330	Not detected		U
benzo[g,h,i]perylene	330	Not detected		U
2-Fluorophenol (%)		66	25-121	
Phenol-d6 (%)		75	24-113	
Nitrobenzene-d5 (%)		75	23-120	
2-Fluorobiphenyl (%)		91	30-115	
2,4,6-Tribromophenol (%)		96	19-122	
Terphenyl-d14 (%)		111	18-137	

Dilution Factor 1

WASTE STREAM
TECHNOLOGY

W[illegible]ste Stream Technology, Inc.

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58308
Client ID: DEL-A-SB1-8-12
Extraction Date: 10/28/99
Date Analyzed: 10/29/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
phenol	330	Not detected		U
bis(2-chloroethyl)ether	330	Not detected		U
2-chlorophenol	330	Not detected		U
1,3-dichlorobenzene	330	Not detected		U
1,4-dichlorobenzene	330	Not detected		U
benzyl alcohol	660	Not detected		U
1,2-dichlorobenzene	330	Not detected		U
2-methylphenol	330	Not detected		U
bis(2-chloroisopropyl)ether	330	Not detected		U
3 & 4-methylphenol	330	Not detected		U
N-nitrosodi-n-propylamine	330	Not detected		U
hexachloroethane	330	Not detected		U
nitrobenzene	330	Not detected		U
isophorone	330	Not detected		U
2-nitrophenol	330	Not detected		U
2,4-dimethylphenol	330	Not detected		U
bis(2-chloroethoxy)methane	330	Not detected		U
benzoic acid	1650	Not detected		U
2,4-dichlorophenol	330	Not detected		U
1,2,4-trichlorobenzene	330	Not detected		U
naphthalene	330	Not detected		U
4-chloroaniline	660	Not detected		U
hexachlorobutadiene	330	Not detected		U
4-chloro-3-methylphenol	660	Not detected		U
2-methylnaphthalene	330	Not detected		U
hexachlorocyclopentadiene	330	Not detected		U
2,4,6-trichlorophenol	330	Not detected		U
2,4,5-trichlorophenol	330	Not detected		U
2-chloronaphthalene	330	Not detected		U
2-nitroaniline	1650	Not detected		U
dimethylphthalate	330	Not detected		U
acenaphthylene	330	Not detected		U
3-nitroaniline	1650	Not detected		U
2,6-dinitrotoluene	330	Not detected		U
acenaphthene	330	Not detected		U
2,4-dinitrophenol	1650	Not detected		U
4-nitrophenol	1650	Not detected		U
dibenzofuran	330	Not detected		U
2,4-dinitrotoluene	330	Not detected		U
diethylphthalate	330	Not detected		U
fluorene	330	Not detected		U

W[illegible]ste Stream Technology, Inc[illegible]
Volatile Organics in Solids
SW-846 8260B

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58308
Client ID: DEL-A-SB1-8-12
Extraction Date: NA
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
chloromethane	10	Not detected		U
bromomethane	10	Not detected		U
vinyl chloride	10	Not detected		U
chloroethane	10	Not detected		U
methylene chloride	5	Not detected		U
acetone	100	Not detected		U
carbon disulfide	5	Not detected		U
1,1-dichloroethene	5	Not detected		U
1,1-dichloroethane	5	Not detected		U
trans-1,2-dichloroethene	5	Not detected		U
chloroform	5	Not detected		U
2-butanone	100	Not detected		U
1,2-dichloroethane	5	Not detected		U
1,1,1-trichloroethane	5	Not detected		U
carbon tetrachloride	5	Not detected		U
vinyl acetate	50	Not detected		U
bromodichloromethane	5	Not detected		U
1,2-dichloropropane	5	Not detected		U
cis-1,3-dichloropropene	5	Not detected		U
trichloroethene	5	17		
benzene	5	Not detected		U
dibromochloromethane	5	Not detected		U
trans-1,3-dichloropropene	5	Not detected		U
1,1,2-trichloroethane	5	Not detected		U
2-chloroethylvinyl ether	10	Not detected		U
bromoform	5	Not detected		U
4-methyl-2-pentanone	50	Not detected		U
2-hexanone	50	Not detected		U
tetrachloroethene	5	Not detected		U
1,1,2,2-tetrachloroethane	5	Not detected		U
toluene	5	2		J
chlorobenzene	5	Not detected		U
ethylbenzene	5	Not detected		U
styrene	5	Not detected		U
m,p-xylene	5	2		J
o-xylene	5	Not detected		U
1,2-Dichloroethane-d4 (%)		105	70-121	
Toluene-d8 (%)		88	81-117	
Bromofluorobenzene (%)		99	74-121	

Dilution Factor 1

Waste Stream Technology, Inc.

TCLP Benzene Analysis

SW-846 8021

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/L
Matrix: TCLP Extract

WST ID: WS58308
Client ID: DEL-A-SB1-8-12
TCLP Date: 10/27/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Benzene	0.7	Not detected		U
a,a,a-Trifluorotoluene (%)		119	91-149	

Dilution Factor 1

W[illegible]ste Stream Technology, Inc[illegible]
TCLP 8270 DEC BN List
1311/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99
TCLP Extraction Date: 10/25/99

Group Number: 9901-1674
Units: ug/L
Matrix: TCLP Extract

WST ID WS58309
Client ID: DEL-C-SB1-11.5-13
Extraction Date: 10/26/99
Date Analyzed: 10/29/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
anthracene	10	Not detected		U
fluorene	10	Not detected		U
phenanthrene	10	Not detected		U
pyrene	10	Not detected		U
acenaphthene	10	Not detected		U
benzo (a) anthracene	10	Not detected		U
fluoranthene	10	Not detected		U
benzo (b) fluoranthene	10	Not detected		U
benzo (k) fluoranthene	10	Not detected		U
benzo (a) pyrene	10	Not detected		U
dibenzo (a,h) anthracene	10	Not detected		U
benzo (g,h,i) perylene	10	Not detected		U
indeno (1,2,3-cd) pyrene	10	Not detected		U
naphthalene	10	8		J
chrysene	10	Not detected		U
Nitrobenzene-d5 (%)		69	35-114	
2-Fluorobiphenyl (%)		83	43-116	
Terphenyl-d14 (%)		98	33-141	

Dilution Factor 1

Waste Stream Technology, Inc.

TCLP 8021 Analysis - NYSDEC List

1311/8021

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/L
Matrix: TCLP Extract

WST ID: WS58309
Client ID: DEL-C-SB1-11.5-13
TCLP Date: 10/27/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Methyl-t-butylether	5.0	Not detected		U
Benzene	0.7	4.9		
Toluene	1.0	5.0		
Ethylbenzene	1.3	10.7		
m,p-Xylene	2.8	10.2		
o-xylene	1.7	4.4		
Isopropylbenzene	1.6	7.2		
n-Propylbenzene	1.7	3.8		
1,3,5-Trimethylbenzene	1.7	9.2		
tert-butylbenzene	3.6	Not detected		U
1,2,4-Trimethylbenzene	1.4	24.6		
sec-Butylbenzene	2.2	Not detected		U
p-isopropyltoluene	1.8	10.9		
n-Butylbenzene	2.8	7.4		
Naphthalene	1.6	4.8		
a,a,a-Trifluorotoluene (%)		286	91-149	#

Dilution Factor 1

Waste Stream Technology, Inc.

TCLP Metals Analysis Result Report

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/L
Matrix: TCLP Extract
TCLP Extraction Date: 10/25/99

WST ID: WS58309
Client ID: DEL-C-SB1-11.5-13
Digestion Date: 10/26/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Lead by ICP	0.075	0.173	10/27/99	SW-846 6010

W[illegible]ste Stream Technology, Inc

Metals Analysis Result Report

Site:	Delaware St. Br.
Date Sampled:	10/19/99
Date Received:	10/21/99

Group Number:	9901-1674
Units:	mg/Kg
Matrix:	Soil

WST ID:	WS58310
Client ID:	DEL-C-SB2-0.5-5
Digestion Date:	10/27/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Arsenic by ICP	1.70	3.89	10/28/99	SW-846 6010
Barium by ICP	1.00	34.1	10/28/99	SW-846 6010
Cadmium by ICP	1.00	2.83	10/28/99	SW-846 6010
Chromium by ICP	1.00	5.20	10/28/99	SW-846 6010
Lead by ICP	4.10	19.4	10/28/99	SW-846 6010
Mercury by Cold Vapor	0.014	Not detected	11/03/99	SW-846 7471
Selenium by ICP	1.40	Not detected	10/28/99	SW-846 6010
Silver by ICP	0.500	Not detected	10/28/99	SW-846 6010

Waste Stream Technology, Inc.

Pesticides and PCBs in Soil

8081A/8082

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58310
Client ID: DEL-C-SB2-0.5-5
Extraction Date: 10/29/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Alpha-BHC	0.5	Not detected		U
Beta-BHC	1.0	Not detected		U
Gamma-BHC (Lindane)	0.5	Not detected		U
Delta-BHC	1.6	Not detected		U
Heptachlor	3.2	Not detected		U
Aldrin	2.8	Not detected		U
Heptachlor Epoxide	1.4	Not detected		U
Endosulfan I	0.8	Not detected		U
Dieldrin	0.8	Not detected		U
4,4'-DDE	0.8	Not detected		U
Endrin	1.8	Not detected		U
Endosulfan II	1.0	Not detected		U
4,4'-DDD	0.9	Not detected		U
Endrin Aldehyde	1.3	Not detected		U
Endosulfan Sulfate	10	Not detected		U
4,4'-DDT	2.8	Not detected		U
Endrin Ketone	2.1	Not detected		U
Methoxychlor	1.0	Not detected		U
Toxaphene	51	Not detected		U
Chlordane	12	Not detected		U
Aroclor 1016	46	Not detected		U
Aroclor 1221	38	Not detected		U
Aroclor 1232	63	Not detected		U
Aroclor 1242	29	Not detected		U
Aroclor 1248	15	Not detected		U
Aroclor 1254	9.0	Not detected		U
Aroclor 1260	10	Not detected		U
Decachlorobiphenyl (%)		86	60-150	
Tetrachloro-m-xylene (%)		93	60-150	

Dilution Factor 1

Waste Stream Technology, Inc.

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58310
Client ID: DEL-C-SB2-0.5-5
Extraction Date: 10/28/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
phenol	330	Not detected		U
bis(2-chloroethyl)ether	330	Not detected		U
2-chlorophenol	330	Not detected		U
1,3-dichlorobenzene	330	Not detected		U
1,4-dichlorobenzene	330	Not detected		U
benzyl alcohol	660	Not detected		U
1,2-dichlorobenzene	330	Not detected		U
2-methylphenol	330	Not detected		U
bis(2-chloroisopropyl)ether	330	Not detected		U
3 & 4-methylphenol	330	Not detected		U
N-nitrosodi-n-propylamine	330	Not detected		U
hexachloroethane	330	Not detected		U
nitrobenzene	330	Not detected		U
isophorone	330	Not detected		U
2-nitrophenol	330	Not detected		U
2,4-dimethylphenol	330	Not detected		U
bis(2-chloroethoxy)methane	330	Not detected		U
benzoic acid	1650	Not detected		U
2,4-dichlorophenol	330	Not detected		U
1,2,4-trichlorobenzene	330	Not detected		U
naphthalene	330	74		J
4-chloroaniline	660	Not detected		U
hexachlorobutadiene	330	Not detected		U
4-chloro-3-methylphenol	660	Not detected		U
2-methylnaphthalene	330	92		J
hexachlorocyclopentadiene	330	Not detected		U
2,4,6-trichlorophenol	330	Not detected		U
2,4,5-trichlorophenol	330	Not detected		U
2-chloronaphthalene	330	Not detected		U
2-nitroaniline	1650	Not detected		U
dimethylphthalate	330	Not detected		U
acenaphthylene	330	Not detected		U
3-nitroaniline	1650	Not detected		U
2,6-dinitrotoluene	330	Not detected		U
acenaphthene	330	Not detected		U
2,4-dinitrophenol	1650	Not detected		U
4-nitrophenol	1650	Not detected		U
dibenzofuran	330	Not detected		U
2,4-dinitrotoluene	330	Not detected		U
diethylphthalate	330	Not detected		U
fluorene	330	Not detected		U

Waste Stream Technology, Inc.

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58310
Client ID: DEL-C-SB2-0.5-5
Extraction Date: 10/28/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
4-nitroaniline	1650	Not detected		U
4-chlorophenylphenylether	330	Not detected		U
4,6-dinitro 2-methylphenol	1650	Not detected		U
n-nitrosodiphenylamine	330	Not detected		U
4-bromophenylphenylether	330	Not detected		U
hexachlorobenzene	330	Not detected		U
pentachlorophenol	1650	Not detected		U
phenanthrene	330	165		J
anthracene	330	Not detected		U
carbazole	330	Not detected		U
di-n-butylphthalate	330	Not detected		U
fluoranthene	330	139		J
benzidine	3300	Not detected		U
pyrene	330	166		J
butylbenzylphthalate	330	Not detected		U
3,3'-dichlorobenzidine	660	Not detected		U
benzo(a)anthracene	330	79		J
chrysene	330	94		J
bis(2-ethylhexyl)phthalate	330	423		
di-n-octylphthalate	330	Not detected		U
benzo[b]fluoranthene	330	82		J
benzo[k]fluoranthene	330	90		J
benzo[a]pyrene	330	74		J
indeno[1,2,3-cd]pyrene	330	Not detected		U
dibenzo[a,h]anthracene	330	Not detected		U
benzo[g,h,i]perylene	330	Not detected		U
2-Fluorophenol (%)		69	25-121	
Phenol-d6 (%)		76	24-113	
Nitrobenzene-d5 (%)		81	23-120	
2-Fluorobiphenyl (%)		93	30-115	
2,4,6-Tribromophenol (%)		93	19-122	
Terphenyl-d14 (%)		131	18-137	

Dilution Factor 1

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.

Volatile Organics in Solids

SW-846 8260B

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58310
Client ID: DEL-C-SB2-0.5-5
Extraction Date: NA
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
chloromethane	10	Not detected		U
bromomethane	10	Not detected		U
vinyl chloride	10	Not detected		U
chloroethane	10	Not detected		U
methylene chloride	5	5		
acetone	100	Not detected		U
carbon disulfide	5	Not detected		U
1,1-dichloroethene	5	Not detected		U
1,1-dichloroethane	5	Not detected		U
trans-1,2-dichloroethene	5	Not detected		U
chloroform	5	Not detected		U
2-butanone	100	Not detected		U
1,2-dichloroethane	5	Not detected		U
1,1,1-trichloroethane	5	Not detected		U
carbon tetrachloride	5	Not detected		U
vinyl acetate	50	Not detected		U
bromodichloromethane	5	Not detected		U
1,2-dichloropropane	5	Not detected		U
cis-1,3-dichloropropene	5	Not detected		U
trichloroethene	5	25		
benzene	5	Not detected		U
dibromochloromethane	5	Not detected		U
trans-1,3-dichloropropene	5	Not detected		U
1,1,2-trichloroethane	5	Not detected		U
2-chloroethylvinyl ether	10	Not detected		U
bromoform	5	Not detected		U
4-methyl-2-pentanone	50	Not detected		U
2-hexanone	50	Not detected		U
tetrachloroethene	5	Not detected		U
1,1,2,2-tetrachloroethane	5	Not detected		U
toluene	5	3		J
chlorobenzene	5	Not detected		U
ethylbenzene	5	1		J
styrene	5	4		J
m,p-xylene	5	Not detected		U
o-xylene	5	Not detected		U
1,2-Dichloroethane-d4 (%)		113	70-121	
Toluene-d8 (%)		84	81-117	
Bromofluorobenzene (%)		111	74-121	

Dilution Factor 1

WASTE STREAM TECHNOLOGY

W[illegible]ste Stream Technology, Inc.

TCLP Benzene Analysis

SW-846 8021

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/L
Matrix: TCLP Extract

WST ID: WS58310
Client ID: DEL-C-SB2-0.5-5
TCLP Date: 10/27/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Benzene	0.7	Not detected		U
a,a,a-Trifluorotoluene (%)		125	91-149	

Dilution Factor 1

W[illegible]ste Stream Technology, Inc.

Metals Analysis Result Report

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/Kg
Matrix: Soil

WST ID: WS58311
Client ID: DEL-H-SED1
Digestion Date: 10/27/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Arsenic by ICP	1.70	2.24	10/28/99	SW-846 6010
Barium by ICP	1.00	21.2	10/28/99	SW-846 6010
Cadmium by ICP	1.00	8.86	10/28/99	SW-846 6010
Chromium by ICP	1.00	26.4	10/28/99	SW-846 6010
Lead by ICP	4.10	2480	10/28/99	SW-846 6010
Mercury by Cold Vapor	0.014	0.030	11/03/99	SW-846 7471
Selenium by ICP	1.40	Not detected	10/28/99	SW-846 6010
Silver by ICP	0.500	Not detected	10/28/99	SW-846 6010

WASTE STREAM
TECHNOLOGY

Waste Stream Technology, Inc

Pesticides in Soil

SW-846 8081

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58311
Client ID: DEL-H-SED1
Extraction Date: 10/29/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
alpha-BHC	0.5	Not detected		U
beta-BHC	1.0	Not detected		U
gamma-BHC (Lindane)	0.5	Not detected		U
delta-BHC	1.6	Not detected		U
heptachlor	3.2	Not detected		U
aldrin	2.8	Not detected		U
heptachlor epoxide	1.4	Not detected		U
endosulfan I	0.8	Not detected		U
dieldrin	0.8	Not detected		U
4,4'-DDE	0.8	Not detected		U
endrin	1.8	Not detected		U
endosulfan II	1.0	Not detected		U
4,4'-DDD	0.9	Not detected		U
endrin aldehyde	1.3	Not detected		U
endosulfan sulfate	10	Not detected		U
4,4'-DDT	2.8	Not detected		U
endrin ketone	2.1	Not detected		U
methoxychlor	1.0	Not detected		U
toxaphene	51	Not detected		U
chlordane	12	Not detected		U
Tetrachloro-m-xylene (%)		87	60-150	
Decachlorobiphenyl (%)		84	60-150	

Dilution Factor 1

Waste Stream Technology, Inc
PCBs in Soil
SW-846 8082

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/Kg
Matrix: Soil

WST ID: WS58311
Client ID: DEL-H-SED1
Extraction Date: 10/29/99
Date Analyzed: 11/01/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
aroclor 1016	0.05	Not detected		U
aroclor 1221	0.04	Not detected		U
aroclor 1232	0.06	Not detected		U
aroclor 1242	0.03	Not detected		U
aroclor 1248	0.02	Not detected		U
aroclor 1254	0.01	Not detected		U
aroclor 1260	0.01	0.17		
Decachlorobiphenyl (%)		87	60-150	
Tetrachloro-m-xylene (%)		85	60-150	

Dilution Factor 1

Waste Stream Technology, Inc
Semivolatile Organics in Solids
3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58311
Client ID: DEL-H-SED1
Extraction Date: 10/28/99
Date Analyzed: 11/02/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
phenol	330	Not detected		U
bis(2-chloroethyl)ether	330	Not detected		U
2-chlorophenol	330	Not detected		U
1,3-dichlorobenzene	330	Not detected		U
1,4-dichlorobenzene	330	Not detected		U
benzyl alcohol	660	Not detected		U
1,2-dichlorobenzene	330	Not detected		U
2-methylphenol	330	Not detected		U
bis(2-chloroisopropyl)ether	330	Not detected		U
3 & 4-methylphenol	330	Not detected		U
N-nitrosodi-n-propylamine	330	Not detected		U
hexachloroethane	330	Not detected		U
nitrobenzene	330	Not detected		U
isophorone	330	Not detected		U
2-nitrophenol	330	Not detected		U
2,4-dimethylphenol	330	Not detected		U
bis(2-chloroethoxy)methane	330	Not detected		U
benzoic acid	1650	Not detected		U
2,4-dichlorophenol	330	Not detected		U
1,2,4-trichlorobenzene	330	Not detected		U
naphthalene	330	Not detected		U
4-chloroaniline	660	Not detected		U
hexachlorobutadiene	330	Not detected		U
4-chloro-3-methylphenol	660	Not detected		U
2-methylnaphthalene	330	Not detected		U
hexachlorocyclopentadiene	330	Not detected		U
2,4,6-trichlorophenol	330	Not detected		U
2,4,5-trichlorophenol	330	Not detected		U
2-chloronaphthalene	330	Not detected		U
2-nitroaniline	1650	Not detected		U
dimethylphthalate	330	Not detected		U
acenaphthylene	330	Not detected		U
3-nitroaniline	1650	Not detected		U
2,6-dinitrotoluene	330	Not detected		U
acenaphthene	330	135		J
2,4-dinitrophenol	1650	Not detected		U
4-nitrophenol	1650	Not detected		U
dibenzofuran	330	Not detected		U
2,4-dinitrotoluene	330	Not detected		U
diethylphthalate	330	Not detected		U
fluorene	330	Not detected		U

Waste Stream Technology, Inc

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58311
Client ID: DEL-H-SED1
Extraction Date: 10/28/99
Date Analyzed: 11/02/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
4-nitroaniline	1650	Not detected		U
4-chlorophenylphenylether	330	Not detected		U
4,6-dinitro 2-methylphenol	1650	Not detected		U
n-nitrosodiphenylamine	330	Not detected		U
4-bromophenylphenylether	330	Not detected		U
hexachlorobenzene	330	Not detected		U
pentachlorophenol	1650	Not detected		U
phenanthrene	330	2600		
anthracene	330	729		
carbazole	330	488		
di-n-butylphthalate	330	Not detected		U
fluoranthene	330	5060		
benzidine	3300	Not detected		U
pyrene	330	5490		
butylbenzylphthalate	330	Not detected		U
3,3'-dichlorobenzidine	660	Not detected		U
benzo(a)anthracene	330	2200		
chrysene	330	2480		
bis(2-ethylhexyl)phthalate	330	618		
di-n-octylphthalate	330	Not detected		U
benzo[b]fluoranthene	330	2800		
benzo[k]fluoranthene	330	2370		
benzo[a]pyrene	330	2180		
indeno[1,2,3-cd]pyrene	330	788		
dibenzo[a,h]anthracene	330	332		
benzo[g,h,i]perylene	330	651		
2-Fluorophenol (%)		71	25-121	
Phenol-d6 (%)		76	24-113	
Nitrobenzene-d5 (%)		78	23-120	
2-Fluorobiphenyl (%)		86	30-115	
2,4,6-Tribromophenol (%)		104	19-122	
Terphenyl-d14 (%)		116	18-137	

Dilution Factor 1

Waste Stream Technology, Inc.

Volatile Organics in Solids

SW-846 8260B

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58311
Client ID: DEL-H-SED1
Extraction Date: NA
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
chloromethane	10	Not detected		U
bromomethane	10	Not detected		U
vinyl chloride	10	Not detected		U
chloroethane	10	Not detected		U
methylene chloride	5	Not detected		U
acetone	100	Not detected		U
carbon disulfide	5	Not detected		U
1,1-dichloroethene	5	Not detected		U
1,1-dichloroethane	5	Not detected		U
trans-1,2-dichloroethene	5	Not detected		U
chloroform	5	Not detected		U
2-butanone	100	Not detected		U
1,2-dichloroethane	5	Not detected		U
1,1,1-trichloroethane	5	Not detected		U
carbon tetrachloride	5	Not detected		U
vinyl acetate	50	Not detected		U
bromodichloromethane	5	Not detected		U
1,2-dichloropropane	5	Not detected		U
cis-1,3-dichloropropene	5	Not detected		U
trichloroethene	5	7		
benzene	5	Not detected		U
dibromochloromethane	5	Not detected		U
trans-1,3-dichloropropene	5	Not detected		U
1,1,2-trichloroethane	5	Not detected		U
2-chloroethylvinyl ether	10	Not detected		U
bromoform	5	Not detected		U
4-methyl-2-pentanone	50	Not detected		U
2-hexanone	50	Not detected		U
tetrachloroethene	5	Not detected		U
1,1,2,2-tetrachloroethane	5	Not detected		U
toluene	5	2		J
chlorobenzene	5	Not detected		U
ethylbenzene	5	Not detected		U
styrene	5	Not detected		U
m,p-xylene	5	2		J
o-xylene	5	Not detected		U
1,2-Dichloroethane-d4 (%)		98	70-121	
Toluene-d8 (%)		87	81-117	
Bromofluorobenzene (%)		106	74-121	

Dilution Factor 1

WASTE STREAM TECHNOLOGY

W[illegible]ste Stream Technology, Inc.

TCLP Benzene Analysis

SW-846 8021

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/L
Matrix: TCLP Extract

WST ID: WS58311
Client ID: DEL-H-SED1
TCLP Date: 10/27/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Benzene	0.7	Not detected		U
a,a,a-Trifluorotoluene (%)		124	91-149	

Dilution Factor 1

Waste Stream Technology, Inc.
Metals Analysis Result Report

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/Kg
Matrix: Soil

WST ID: WS58312
Client ID: DEL-H-SED2
Digestion Date: 10/27/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Arsenic by ICP	1.70	3.03	10/28/99	SW-846 6010
Barium by ICP	1.00	77.7	10/28/99	SW-846 6010
Cadmium by ICP	1.00	7.91	10/28/99	SW-846 6010
Chromium by ICP	1.00	55.8	10/28/99	SW-846 6010
Lead by ICP	4.10	712	10/28/99	SW-846 6010
Mercury by Cold Vapor	0.014	0.159	11/03/99	SW-846 7471
Selenium by ICP	1.40	Not detected	10/28/99	SW-846 6010
Silver by ICP	0.500	Not detected	10/28/99	SW-846 6010

Waste Stream Technology, Inc.

Pesticides in Soil

SW-846 8081

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58312
Client ID: DEL-H-SED2
Extraction Date: 10/29/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
alpha-BHC	0.5	Not detected		U
beta-BHC	1.0	Not detected		U
gamma-BHC (Lindane)	0.5	Not detected		U
delta-BHC	1.6	Not detected		U
heptachlor	3.2	Not detected		U
aldrin	2.8	Not detected		U
heptachlor epoxide	1.4	Not detected		U
endosulfan I	0.8	Not detected		U
dieldrin	0.8	Not detected		U
4,4'-DDE	0.8	Not detected		U
endrin	1.8	Not detected		U
endosulfan II	1.0	Not detected		U
4,4'-DDD	0.9	Not detected		U
endrin aldehyde	1.3	Not detected		U
endosulfan sulfate	10	Not detected		U
4,4'-DDT	2.8	Not detected		U
endrin ketone	2.1	Not detected		U
methoxychlor	1.0	Not detected		U
toxaphene	51	Not detected		U
chlordane	12	Not detected		U
Tetrachloro-m-xylene (%)		75	60-150	
Decachlorobiphenyl (%)		72	60-150	

Dilution Factor 1

Waste Stream Technology, Inc.

PCBs in Soil

SW-846 8082

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/Kg
Matrix: Soil

WST ID: WS58312
Client ID: DEL-H-SED2
Extraction Date: 10/29/99
Date Analyzed: 11/01/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
aroclor 1016	0.05	Not detected		U
aroclor 1221	0.04	Not detected		U
aroclor 1232	0.06	Not detected		U
aroclor 1242	0.03	Not detected		U
aroclor 1248	0.02	Not detected		U
aroclor 1254	0.01	Not detected		U
aroclor 1260	0.01	0.14		
Decachlorobiphenyl (%)		80	60-150	
Tetrachloro-m-xylene (%)		76	60-150	

Dilution Factor 1

W[illegible]te Stream Technology, Inc.

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58312
Client ID: DEL-H-SED2
Extraction Date: 10/28/99
Date Analyzed: 11/03/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
phenol	3300	Not detected		U
bis(2-chloroethyl)ether	3300	Not detected		U
2-chlorophenol	3300	Not detected		U
1,3-dichlorobenzene	3300	Not detected		U
1,4-dichlorobenzene	3300	Not detected		U
benzyl alcohol	6600	Not detected		U
1,2-dichlorobenzene	3300	Not detected		U
2-methylphenol	3300	Not detected		U
bis(2-chloroisopropyl)ether	3300	Not detected		U
3 & 4-methylphenol	3300	Not detected		U
N-nitrosodi-n-propylamine	3300	Not detected		U
hexachloroethane	3300	Not detected		U
nitrobenzene	3300	Not detected		U
isophorone	3300	Not detected		U
2-nitrophenol	3300	Not detected		U
2,4-dimethylphenol	3300	Not detected		U
bis(2-chloroethoxy)methane	3300	Not detected		U
benzoic acid	17000	Not detected		U
2,4-dichlorophenol	3300	Not detected		U
1,2,4-trichlorobenzene	3300	Not detected		U
naphthalene	3300	Not detected		U
4-chloroaniline	6600	Not detected		U
hexachlorobutadiene	3300	Not detected		U
4-chloro-3-methylphenol	6600	Not detected		U
2-methylnaphthalene	3300	Not detected		U
hexachlorocyclopentadiene	3300	Not detected		U
2,4,6-trichlorophenol	3300	Not detected		U
2,4,5-trichlorophenol	3300	Not detected		U
2-chloronaphthalene	3300	Not detected		U
2-nitroaniline	17000	Not detected		U
dimethylphthalate	3300	Not detected		U
acenaphthylene	3300	Not detected		U
3-nitroaniline	17000	Not detected		U
2,6-dinitrotoluene	3300	Not detected		U
acenaphthene	3300	Not detected		U
2,4-dinitrophenol	17000	Not detected		U
4-nitrophenol	17000	Not detected		U
dibenzofuran	3300	Not detected		U
2,4-dinitrotoluene	3300	Not detected		U
diethylphthalate	3300	Not detected		U
fluorene	3300	Not detected		U

Waste Stream Technology, Inc.
Semivolatile Organics in Solids
3550/8270

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58312
Client ID: DEL-H-SED2
Extraction Date: 10/28/99
Date Analyzed: 11/03/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
4-nitroaniline	17000	Not detected		U
4-chlorophenylphenylether	3300	Not detected		U
4,6-dinitro 2-methylphenol	17000	Not detected		U
n-nitrosodiphenylamine	3300	Not detected		U
4-bromophenylphenylether	3300	Not detected		U
hexachlorobenzene	3300	Not detected		U
pentachlorophenol	17000	Not detected		U
phenanthrene	3300	3770		
anthracene	3300	Not detected		U
carbazole	3300	Not detected		U
di-n-butylphthalate	3300	Not detected		U
fluoranthene	3300	5890		
benzidine	33000	Not detected		U
pyrene	3300	8420		
butylbenzylphthalate	3300	Not detected		U
3,3'-dichlorobenzidine	6600	Not detected		U
benzo(a)anthracene	3300	2340		J
chrysene	3300	2740		J
bis(2-ethylhexyl)phthalate	3300	3010		J
di-n-octylphthalate	3300	Not detected		U
benzo[b]fluoranthene	3300	1820		J
benzo[k]fluoranthene	3300	2760		J
benzo[a]pyrene	3300	2380		J
indeno[1,2,3-cd]pyrene	3300	Not detected		U
dibenzo[a,h]anthracene	3300	Not detected		U
benzo[g,h,i]perylene	3300	1230		J
2-Fluorophenol (%)		101	25-121	
Phenol-d6 (%)		99	24-113	
Nitrobenzene-d5 (%)		88	23-120	
2-Fluorobiphenyl (%)		113	30-115	
2,4,6-Tribromophenol (%)		100	19-122	
Terphenyl-d14 (%)		166	18-137	#

Dilution Factor 10

W ste Stream Technology, Inc

Volatile Organics in Solids

SW-846 8260B

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58312
Client ID: DEL-H-SED2
Extraction Date: NA
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
chloromethane	10	Not detected		U
bromomethane	10	Not detected		U
vinyl chloride	10	Not detected		U
chloroethane	10	Not detected		U
methylene chloride	5	Not detected		U
acetone	100	Not detected		U
carbon disulfide	5	Not detected		U
1,1-dichloroethene	5	Not detected		U
1,1-dichloroethane	5	Not detected		U
trans-1,2-dichloroethene	5	Not detected		U
chloroform	5	Not detected		U
2-butanone	100	Not detected		U
1,2-dichloroethane	5	Not detected		U
1,1,1-trichloroethane	5	Not detected		U
carbon tetrachloride	5	Not detected		U
vinyl acetate	50	Not detected		U
bromodichloromethane	5	Not detected		U
1,2-dichloropropane	5	Not detected		U
cis-1,3-dichloropropene	5	Not detected		U
trichloroethene	5	Not detected		U
benzene	5	Not detected		U
dibromochloromethane	5	Not detected		U
trans-1,3-dichloropropene	5	Not detected		U
1,1,2-trichloroethane	5	Not detected		U
2-chloroethylvinyl ether	10	Not detected		U
bromoform	5	Not detected		U
4-methyl-2-pentanone	50	Not detected		U
2-hexanone	50	Not detected		U
tetrachloroethene	5	Not detected		U
1,1,2,2-tetrachloroethane	5	Not detected		U
toluene	5	Not detected		U
chlorobenzene	5	Not detected		U
ethylbenzene	5	Not detected		U
styrene	5	Not detected		U
m,p-xylene	5	Not detected		U
o-xylene	5	Not detected		U
1,2-Dichloroethane-d4 (%)		92	70-121	
Toluene-d8 (%)		87	81-117	
Bromofluorobenzene (%)		113	74-121	

Dilution Factor 1

WASTE STREAM TECHNOLOGY

W[illegible]ste Stream Technology, Inc.

TCLP 8270 DEC BN List

1311/8270

Site:	Delaware St. Br.	Group Number:	9901-1674
Date Sampled:	10/20/99	Units:	ug/L
Date Received:	10/21/99	Matrix:	TCLP Extract
TCLP Extraction Date:	10/25/99		

WST ID WS58313
Client ID: DEL-E-SB1-0.5-5
Extraction Date: 10/26/99
Date Analyzed: 10/29/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
anthracene	10	Not detected		U
fluorene	10	Not detected		U
phenanthrene	10	Not detected		U
pyrene	10	Not detected		U
acenaphthene	10	Not detected		U
benzo (a) anthracene	10	Not detected		U
fluoranthene	10	Not detected		U
benzo (b) fluoranthene	10	Not detected		U
benzo (k) fluoranthene	10	Not detected		U
benzo (a) pyrene	10	Not detected		U
dibenzo (a,h) anthracene	10	Not detected		U
benzo (g,h,i) perylene	10	Not detected		U
indeno (1,2,3-cd) pyrene	10	Not detected		U
naphthalene	10	Not detected		U
chrysene	10	Not detected		U
Nitrobenzene-d5 (%)		74	35-114	
2-Fluorobiphenyl (%)		78	43-116	
Terphenyl-d14 (%)		90	33-141	

Dilution Factor 1

W[illegible]ste Stream Technology, Inc.

TCLP 8021 Analysis - NYSDEC List

1311/8021

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/L
Matrix: TCLP Extract

WST ID: WS58313
Client ID: DEL-E-SB1-0.5-5
TCLP Date: 10/27/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Methyl-t-butylether	5.0	Not detected		U
Benzene	0.7	Not detected		U
Toluene	1.0	2.2		
Ethylbenzene	1.3	Not detected		U
m,p-Xylene	2.8	Not detected		U
o-xylene	1.7	Not detected		U
Isopropylbenzene	1.6	Not detected		U
n-Propylbenzene	1.7	Not detected		U
1,3,5-Trimethylbenzene	1.7	Not detected		U
tert-butylbenzene	3.6	Not detected		U
1,2,4-Trimethylbenzene	1.4	Not detected		U
sec-Butylbenzene	2.2	Not detected		U
p-isopropyltoluene	1.8	Not detected		U
n-Butylbenzene	2.8	Not detected		U
Naphthalene	1.6	Not detected		U
a,a,a-Trifluorotoluene (%)		122	91-149	

Dilution Factor 1

Waste Stream Technology, Inc.

TCLP Metals Analysis Result Report

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/L
Matrix: TCLP Extract
TCLP Extraction Date: 10/25/99

WST ID: WS58313
Client ID: DEL-E-SB1-0.5-5
Digestion Date: 10/26/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Lead by ICP	0.075	0.092	10/27/99	SW-846 6010

W[illegible]ste Stream Technology, Inc.

Metals Analysis Result Report

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/Kg
Matrix: Soil

WST ID: WS58314
Client ID: DEL-F-SB1-4.5-7.5
Digestion Date: 10/27/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Arsenic by ICP	1.70	3.63	10/28/99	SW-846 6010
Barium by ICP	1.00	39.5	10/28/99	SW-846 6010
Cadmium by ICP	1.00	Not detected	11/02/99	SW-846 6010
Chromium by ICP	1.00	5.77	10/28/99	SW-846 6010
Lead by ICP	4.10	33.2	10/28/99	SW-846 6010
Mercury by Cold Vapor	0.014	Not detected	11/03/99	SW-846 7471
Selenium by ICP	1.40	Not detected	10/28/99	SW-846 6010
Silver by ICP	0.500	Not detected	10/28/99	SW-846 6010

W te Stream Technology, Inc.

Pesticides and PCBs in Soil

8081A/8082

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58314
Client ID: DEL-F-SB1-4.5-7.5
Extraction Date: 10/29/99
Date Analyzed: 10/31/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Alpha-BHC	0.5	Not detected		U
Beta-BHC	1.0	Not detected		U
Gamma-BHC (Lindane)	0.5	Not detected		U
Delta-BHC	1.6	Not detected		U
Heptachlor	3.2	Not detected		U
Aldrin	2.8	Not detected		U
Heptachlor Epoxide	1.4	Not detected		U
Endosulfan I	0.8	Not detected		U
Dieldrin	0.8	Not detected		U
4,4'-DDE	0.8	Not detected		U
Endrin	1.8	Not detected		U
Endosulfan II	1.0	Not detected		U
4,4'-DDD	0.9	Not detected		U
Endrin Aldehyde	1.3	Not detected		U
Endosulfan Sulfate	10	Not detected		U
4,4'-DDT	2.8	Not detected		U
Endrin Ketone	2.1	Not detected		U
Methoxychlor	1.0	Not detected		U
Toxaphene	51	Not detected		U
Chlordane	12	Not detected		U
Aroclor 1016	46	Not detected		U
Aroclor 1221	38	Not detected		U
Aroclor 1232	63	Not detected		U
Aroclor 1242	29	Not detected		U
Aroclor 1248	15	Not detected		U
Aroclor 1254	9.0	Not detected		U
Aroclor 1260	10	Not detected		U
Decachlorobiphenyl (%)		75	60-150	
Tetrachloro-m-xylene (%)		92	60-150	

Dilution Factor 1

W[illegible]te Stream Technology, Inc.

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58314
Client ID: DEL-F-SB1-4.5-7.5
Extraction Date: 10/28/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
phenol	330	Not detected		U
bis(2-chloroethyl)ether	330	Not detected		U
2-chlorophenol	330	Not detected		U
1,3-dichlorobenzene	330	Not detected		U
1,4-dichlorobenzene	330	Not detected		U
benzyl alcohol	660	Not detected		U
1,2-dichlorobenzene	330	Not detected		U
2-methylphenol	330	Not detected		U
bis(2-chloroisopropyl)ether	330	Not detected		U
3 & 4-methylphenol	330	Not detected		U
N-nitrosodi-n-propylamine	330	Not detected		U
hexachloroethane	330	Not detected		U
nitrobenzene	330	Not detected		U
isophorone	330	Not detected		U
2-nitrophenol	330	Not detected		U
2,4-dimethylphenol	330	Not detected		U
bis(2-chloroethoxy)methane	330	Not detected		U
benzoic acid	1650	Not detected		U
2,4-dichlorophenol	330	Not detected		U
1,2,4-trichlorobenzene	330	Not detected		U
naphthalene	330	113		J
4-chloroaniline	660	Not detected		U
hexachlorobutadiene	330	Not detected		U
4-chloro-3-methylphenol	660	Not detected		U
2-methylnaphthalene	330	96		J
hexachlorocyclopentadiene	330	Not detected		U
2,4,6-trichlorophenol	330	Not detected		U
2,4,5-trichlorophenol	330	Not detected		U
2-chloronaphthalene	330	Not detected		U
2-nitroaniline	1650	Not detected		U
dimethylphthalate	330	Not detected		U
acenaphthylene	330	Not detected		U
3-nitroaniline	1650	Not detected		U
2,6-dinitrotoluene	330	Not detected		U
acenaphthene	330	Not detected		U
2,4-dinitrophenol	1650	Not detected		U
4-nitrophenol	1650	Not detected		U
dibenzofuran	330	Not detected		U
2,4-dinitrotoluene	330	Not detected		U
diethylphthalate	330	Not detected		U
fluorene	330	Not detected		U

WASTE STREAM TECHNOLOGY

W[illegible]te Stream Technology, Inc.

Semivolatile Organics in Solids

3550/8270

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58314
Client ID: DEL-F-SB1-4.5-7.5
Extraction Date: 10/28/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
4-nitroaniline	1650	Not detected		U
4-chlorophenylphenylether	330	Not detected		U
4,6-dinitro 2-methylphenol	1650	Not detected		U
n-nitrosodiphenylamine	330	Not detected		U
4-bromophenylphenylether	330	Not detected		U
hexachlorobenzene	330	Not detected		U
pentachlorophenol	1650	Not detected		U
phenanthrene	330	331		
anthracene	330	78		J
carbazole	330	Not detected		U
di-n-butylphthalate	330	201		J
fluoranthene	330	418		
benzidine	3300	Not detected		U
pyrene	330	447		
butylbenzylphthalate	330	Not detected		U
3,3'-dichlorobenzidine	660	Not detected		U
benzo(a)anthracene	330	274		J
chrysene	330	302		J
bis(2-ethylhexyl)phthalate	330	166		J
di-n-octylphthalate	330	Not detected		U
benzo[b]fluoranthene	330	286		J
benzo[k]fluoranthene	330	279		J
benzo[a]pyrene	330	266		J
indeno[1,2,3-cd]pyrene	330	94		J
dibenzo[a,h]anthracene	330	Not detected		U
benzo[g,h,i]perylene	330	93		J
2-Fluorophenol (%)		62	25- 121	
Phenol-d6 (%)		70	24- 113	
Nitrobenzene-d5 (%)		72	23- 120	
2-Fluorobiphenyl (%)		88	30- 115	
2,4,6-Tribromophenol (%)		93	19- 122	
Terphenyl-d14 (%)		115	18- 137	

Dilution Factor 1

WASTE STREAM TECHNOLOGY

W[illegible]te Stream Technology, Inc.

Volatile Organics in Solids

SW-846 8260B

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/kg
Matrix: Soil

WST ID: WS58314
Client ID: DEL-F-SB1-4.5-7.5
Extraction Date: NA
Date Analyzed: 10/29/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
chloromethane	10	Not detected		U
bromomethane	10	Not detected		U
vinyl chloride	10	Not detected		U
chloroethane	10	Not detected		U
methylene chloride	5	8		
acetone	100	Not detected		U
carbon disulfide	5	Not detected		U
1,1-dichloroethene	5	Not detected		U
1,1-dichloroethane	5	Not detected		U
trans-1,2-dichloroethene	5	Not detected		U
chloroform	5	Not detected		U
2-butanone	100	Not detected		U
1,2-dichloroethane	5	Not detected		U
1,1,1-trichloroethane	5	Not detected		U
carbon tetrachloride	5	Not detected		U
vinyl acetate	50	Not detected		U
bromodichloromethane	5	Not detected		U
1,2-dichloropropane	5	Not detected		U
cis-1,3-dichloropropene	5	Not detected		U
trichloroethene	5	30		
benzene	5	Not detected		U
dibromochloromethane	5	Not detected		U
trans-1,3-dichloropropene	5	Not detected		U
1,1,2-trichloroethane	5	Not detected		U
2-chloroethylvinyl ether	10	Not detected		U
bromoform	5	Not detected		U
4-methyl-2-pentanone	50	Not detected		U
2-hexanone	50	Not detected		U
tetrachloroethene	5	Not detected		U
1,1,2,2-tetrachloroethane	5	Not detected		U
toluene	5	4		J
chlorobenzene	5	Not detected		U
ethylbenzene	5	1		J
styrene	5	Not detected		U
m,p-xylene	5	3		J
o-xylene	5	Not detected		U
1,2-Dichloroethane-d4 (%)		114	70-121	
Toluene-d8 (%)		79	81-117	#
Bromofluorobenzene (%)		111	74-121	

Dilution Factor 1

W[illegible]te Stream Technology, Inc.

TCLP Benzene Analysis

SW-846 8021

Site: Delaware St. Br.
Date Sampled: 10/20/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: ug/L
Matrix: TCLP Extract

WST ID: WS58314
Client ID: DEL-F-SB1-4.5-7.5
TCLP Date: 10/27/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Benzene	0.7	1.6		
a,a,a-Trifluorotoluene (%)		117	91-149	

Dilution Factor 1

Quality Control Result Reports

Waste Stream Technology, Inc.
PCB & Pesticide Method Blank
8081A/8082

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: ug/kg

WST ID MB99302
Client ID: NA
Extraction Date: 10/29/99
Date Analyzed: 10/30/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Alpha-BHC	0.5	Not detected		U
Beta-BHC	1.0	Not detected		U
Gamma-BHC (Lindane)	0.5	Not detected		U
Delta-BHC	1.6	Not detected		U
Heptachlor	3.2	Not detected		U
Aldrin	2.8	Not detected		U
Heptachlor Epoxide	1.4	Not detected		U
Endosulfan I	0.8	Not detected		U
Dieldrin	0.8	Not detected		U
4,4'-DDE	0.8	Not detected		U
Endrin	1.8	Not detected		U
Endosulfan II	1.0	Not detected		U
4,4'-DDD	0.9	Not detected		U
Endrin Aldehyde	1.3	Not detected		U
Endosulfan Sulfate	10	Not detected		U
4,4'-DDT	2.8	Not detected		U
Endrin Ketone	2.1	Not detected		U
Methoxychlor	1.0	Not detected		U
Toxaphene	51	Not detected		U
Chlordane	12	Not detected		U
Aroclor 1016	46	Not detected		U
Aroclor 1221	38	Not detected		U
Aroclor 1232	63	Not detected		U
Aroclor 1242	29	Not detected		U
Aroclor 1248	15	Not detected		U
Aroclor 1254	9.0	Not detected		U
Aroclor 1260	10	Not detected		U
Decachlorobiphenyl (%)		97	60-150	
Tetrachloro-m-xylene (%)		94	60-150	

Dilution Factor 1
MB denotes Method Blank
NA denotes Not Applicable

Waste Stream Technology, Inc.

Pesticides Reference Recovery

SW-846 8081A

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: %

WST ID: MR99302
lient ID: NA
Extraction Date: 10/29/99
Date Analyzed: 10/30/99

Compound	Result	QC Limits (%)	Qualifier
Alpha-BHC	96.8	46-144	
Beta-BHC	97.7	62-128	
Gamma-BHC (Lindane)	99.1	54-134	
Delta-BHC	110	53-140	
Heptachlor	107	59-147	
Aldrin	94.3	58-125	
Heptachlor Epoxide	99.1	60-128	
Endosulfan I	98.4	62-116	
4,4'-DDE	110	55-134	
Dieldrin	95.1	63-123	
Endrin	114	64-141	
Endosulfan II	99.0	58-132	
4,4'-DDD	109	62-133	
Endrin Aldehyde	85.7	54-138	
Endosulfan Sulfate	110	58-140	
4,4'-DDT	108	68-144	
Endrin Ketone	114	54-147	
Methoxychlor	116	74-150	
Tetrachloro-m-xylene (%)	95	60-150	
Decachlorobiphenyl (%)	100	60-150	

MR denotes Method Reference
NA denotes Not Applicable

W[illegible]ste Stream Technology, Inc.

Soil PCB Reference Recovery

SW-846 8082

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: %

WST ID: MR99302
lient ID: NA
Extraction Date: 10/29/99
Date Analyzed: 10/30/99

Compound	Result	QC Limits (%)	Qualifier
Aroclor 1016	94.6	54-148	
Aroclor 1260	98.2	64-129	
Decachlorbiphenyl (%)	99	60-150	
Tetrachloro-m-xylene (%)	96	60-150	

MR denotes Method Reference
NA denotes Not Applicable

Waste Stream Technology, Inc.

Method 8081A Pesticide Report

Soil Matrix Spike/Matrix Spike Duplicate Analysis Summary

Site : Delaware St. Br.
Date Sampled : 10/19/99
Date Received : 10/20/99
WST Sample # Spiked : WS58308
Client ID: DEL-A-SB1-8-12

Group Number : 9901-1674
Date Extracted : 10/29/99
Date Analyzed : 10/30/99
Matrix: Soil

Compound	Matrix Spike % Recovery	Matrix Spike Dup % Recovery	% RPD	QC Limits % RPD	QC Limits % Recovery
gamma-BHC (Lindane)	94	100	5.9	50	46 -127
Heptachlor	85	83	2.1	31	35 - 130
Aldrin	87	89	1.4	43	34 - 132
Dieldrin	108	120	10	38	31 - 134
Endrin	116	123	5.6	45	42 - 139
4,4'-DDT	74	56	27	50	23 - 134
Surrogate Recovery %					
Tetrachloro-m-xylene	88	90			60 - 150
Decachlorobiphenyl	88	87			60 - 150

W[illegible]ste Stream Technology, Inc.
VOC Soil Method Blank Results
SW-846 8260B

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: µg/kg

WST ID: IB102899
lient ID: NA
Extraction Date: NA
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
chloromethane	10	Not detected		U
bromomethane	10	Not detected		U
vinyl chloride	10	Not detected		U
chloroethane	10	Not detected		U
methylene chloride	5	Not detected		U
acetone	100	Not detected		U
carbon disulfide	5	Not detected		U
1,1-dichloroethene	5	Not detected		U
1,1-dichloroethane	5	Not detected		U
trans-1,2-Dichloroethene	5	Not detected		U
chloroform	5	Not detected		U
1,2-dichloroethane	5	Not detected		U
2-butanone	100	Not detected		U
1,1,1-trichloroethane	5	Not detected		U
carbon tetrachloride	5	Not detected		U
vinyl acetate	5	Not detected		U
bromodichloromethane	5	Not detected		U
1,2-dichloropropene	5	Not detected		U
cis-1,3-dichloropropene	5	Not detected		U
trichloroethene	5	Not detected		U
benzene	5	Not detected		U
dibromochloromethane	5	Not detected		U
trans-1,3-dichloropropene	5	Not detected		U
1,1,2-trichloroethane	5	Not detected		U
2-chloroethylvinyl ether	10	Not detected		U
bromoform	5	Not detected		U
4-methyl-2-pentanone	50	Not detected		U
2-hexanone	50	Not detected		U
tetrachloroethene	5	Not detected		U
1,1,2,2-tetrachloroethane	5	Not detected		U
toluene	5	Not detected		U
chlorobenzene	5	Not detected		U
ethylbenzene	5	Not detected		U
styrene	5	Not detected		U
m,p-xylene	5	Not detected		U
o-xylene	5	Not detected		U
1,2-Dichloroethane-d4 (%)		99	70-121	
Toluene-d8 (%)		89	81-117	
Bromofluorobenzene (%)		94	74-121	

Dilution Factor 1
IB denotes Instrument Blank
NA denotes Not Applicable

W[illegible]ste Stream Technology, Inc

Soil VOC Ref Sample Recoveries

SW-846 8260A

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: %

WST ID: MR102899
lient ID: NA
Extraction Date: NA
Date Analyzed: 10/28/99

Compound	Result	QC Limits (%)	Qualifier
chloromethane	120	1- 195	
bromomethane	102	25- 157	
vinyl chloride	100	54- 142	
chloroethane	107	22- 174	
methylene chloride	110	19- 196	
acetone	133	28- 209	
carbon disulfide	99.0	58- 174	
1,1-dichloroethene	113	72- 160	
1,1-dichloroethane	122	81- 148	
trans-1,2-dichloroethene	107	83- 142	
chloroform	115	71- 145	
1,2-dichloroethane	113	78- 141	
2-butanone	102	30- 215	
1,1,1-trichloroethane	114	84- 136	
carbon tetrachloride	116	73- 147	
vinyl acetate	81.2	1- 276	
bromodichloromethane	115	87- 129	
1,2-dichloropropane	114	80- 125	
cis-1,3-dichloropropene	110	89- 135	
trichloroethene	110	90- 125	
benzene	107	86- 135	
dibromochloromethane	111	88- 125	
trans-1,3-dichloropropene	113	89- 122	
1,1,2-trichloroethane	109	90- 124	
2-chloroethylvinyl ether	108	22- 185	
bromoform	108	82- 130	
4-methyl-2-pentanone	97.7	68- 145	
2-hexanone	94.0	65- 154	
tetrachloroethene	106	88- 134	
1,1,2,2-tetrachloroethane	102	79- 133	
toluene	107	91- 130	
chlorobenzene	107	95- 119	
ethylbenzene	108	95- 126	
styrene	107	87- 126	
m,p-xylene	107	98- 126	
o-xylene	105	95- 125	
1,2-dichloroethane-d4 (%)	95	70- 121	
toluene-d8 (%)	90	81- 117	
bromofluorobenzene (%)	99	74- 121	

MR denotes Method Reference
NA denotes Not Applicable

Waste Stream Technology

Method 8260B Volatile Organic Compound Analysis Report

Soil Matrix Spike/Matrix Spike Duplicate Results

Site : Delaware St. Br.
Sample Date : 10/19/99
Date Received : 10/20/99
WST Sample # Spiked : WS58308
Client ID: DEL-A-SB1-8-12

Group Number : 9901-1674
Date Analyzed : 10/26/99
Matrix : Soil

Compound	Matrix Spike % Recovery	Matrix Spike Dup % Recovery	% RPD	QC Limits	
				% RPD	% Recovery
1,1-dichloroethene	103	108	4.9	22	59 - 172
trichloroethene	112	97	12.8	24	62 - 137
benzene	109	111	2.2	21	66 - 142
toluene	102	110	7.8	21	59 - 139
chlorobenzene	103	106	2.8	21	60 - 133
Surrogate Recovery %					
1,2-dichloroethane-d4	101	103			70- 121
toluene-d8	87	88			81 - 117
bromofluorobenzene	104	95			74 - 121

W[illegible]te Stream Technology, Inc.

Method Blank for Soil SVOC

3550/8270

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: µg/Kg

WST ID: MB102899
lient ID: NA
Extraction Date: 10/28/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
n-nitrosodimethylamine	330	Not detected		U
phenol	330	Not detected		U
bis(2-chloroethyl)ether	330	Not detected		U
2-chlorophenol	330	Not detected		U
1,3-dichlorobenzene	330	Not detected		U
1,4-dichlorobenzene	330	Not detected		U
benzyl alcohol	660	Not detected		U
1,2-dichlorobenzene	330	Not detected		U
2-methylphenol	330	Not detected		U
bis(2-chloroisopropyl)ether	330	Not detected		U
3 & 4-methylphenol	330	Not detected		U
n-nitroso-di-n-propylamine	330	Not detected		U
hexachloroethane	330	Not detected		U
nitrobenzene	330	Not detected		U
isophorone	330	Not detected		U
2-nitrophenol	330	Not detected		U
2,4-dimethylphenol	330	Not detected		U
bis(2-chloroethoxy)methane	330	Not detected		U
benzoic acid	1650	Not detected		U
2,4-dichlorophenol	330	Not detected		U
1,2,4-trichlorobenzene	330	Not detected		U
naphthalene	330	Not detected		U
4-chloroaniline	660	Not detected		U
hexachlorobutadiene	330	Not detected		U
4-chloro-3-methylphenol	660	Not detected		U
2-methylnaphthalene	330	Not detected		U
hexachlorocyclopentadiene	330	Not detected		U
2,4,6-trichlorophenol	330	Not detected		U
2,4,5-trichlorophenol	330	Not detected		U
2-chloronaphthalene	330	Not detected		U
2-nitroaniline	1650	Not detected		U
dimethylphthalate	330	Not detected		U
acenaphthylene	330	Not detected		U
3-nitroaniline	1650	Not detected		U
2,6-dinitrotoluene	330	Not detected		U
acenaphthene	330	Not detected		U
2,4-dinitrophenol	1650	Not detected		U
4-nitrophenol	1650	Not detected		U
dibenzofuran	330	Not detected		U
2,4-dinitrotoluene	330	Not detected		U
diethylphthalate	330	Not detected		U

W[illegible]te Stream Technology, Inc.

Method Blank for Soil SVOC

3550/8270

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: µg/Kg

WST ID: MB102899
lient ID: NA
Extraction Date: 10/28/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
fluorene	330	Not detected		U
4-nitroaniline	1650	Not detected		U
4-chlorophenylphenylether	330	Not detected		U
4,6-dinitro-2-methylphenol	1650	Not detected		U
n-nitrosodiphenylamine	330	Not detected		U
4-bromophenylphenylether	330	Not detected		U
hexachlorobenzene	330	Not detected		U
pentachlorophenol	1650	Not detected		U
phenanthrene	330	Not detected		U
anthracene	330	Not detected		U
carbazole	330	Not detected		U
di-n-butylphthalate	330	Not detected		U
fluoranthene	330	Not detected		U
benzidine	3300	Not detected		U
pyrene	330	Not detected		U
butylbenzylphthalate	330	Not detected		U
3,3'-dichlorobenzidine	660	Not detected		U
benzo(a)anthracene	330	Not detected		U
chrysene	330	Not detected		U
bis(2-ethylhexyl)phthalate	330	Not detected		U
di-n-octylphthalate	330	Not detected		U
benzo(b)fluoranthene	330	Not detected		U
benzo(k)fluoranthene	330	Not detected		U
benzo(a)pyrene	330	Not detected		U
indeno(1,2,3-cd)pyrene	330	Not detected		U
dibenzo(a,h)anthracene	330	Not detected		U
benzo(g,h,i)perylene	330	Not detected		U
2-Fluorophenol (%)		68	25-121	
Phenol-d6 (%)		76	24-113	
Nitrobenzene-d5 (%)		79	23-120	
2-Fluorobiphenyl (%)		83	30-115	
2,4,6-Tribromophenol (%)		96	19-122	
Terphenyl-d14 (%)		109	18-137	

Dilution Factor 1
MB denotes Method Blank
NA denotes Not Applicable

W[illegible]te Stream Technology, Inc.

Reference for Soil SVOC

3550/8270

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: %

WST ID: MR102899
lient ID: NA
Extraction Date: 10/28/99
Date Analyzed: 10/28/99

Compound	Result	QC Limits (%)	Qualifier
n-nitrosodimethylamine	79.2	48-132	
phenol	83.2	40-130	
bis(2-chloroethyl)ether	85.6	34-131	
2-chlorophenol	80.1	40-125	
1,3-dichlorobenzene	80.1	35-121	
1,4-dichlorobenzene	80.9	35-121	
benzyl alcohol	84.4	47-130	
1,2-dichlorobenzene	81.7	38-120	
2-methylphenol	85.6	48-139	
bis(2-chloroisopropyl)ether	103	55-149	
3 & 4-methylphenol	84.4	48-139	
n-nitroso-di-n-propylamine	84.5	48-132	
hexachloroethane	82.3	37-125	
nitrobenzene	85.2	44-131	
isophorone	101	54-139	
2-nitrophenol	85.9	47-130	
2,4-dimethylphenol	94.0	50-141	
bis(2-chloroethoxy)methane	92.1	50-140	
benzoic acid	89.7	8-167	
2,4-dichlorophenol	90.2	50-124	
1,2,4-trichlorobenzene	86.0	43-122	
naphthalene	84.1	45-129	
4-chloroaniline	94.4	12-158	
hexachlorobutadiene	89.6	47-135	
4-chloro-3-methylphenol	97.2	56-138	
2-methylnaphthalene	92.0	49-126	
hexachlorocyclopentadiene	84.9	15-137	
2,4,6-trichlorophenol	94.1	53-133	
2,4,5-trichlorophenol	96.7	49-135	
2-chloronaphthalene	92.2	50-127	
2-nitroaniline	100	47-151	
dimethylphthalate	98.6	53-134	
acenaphthylene	97.7	56-143	
3-nitroaniline	103	50-142	
2,6-dinitrotoluene	91.9	54-138	
acenaphthene	94.6	53-138	
2,4-dinitrophenol	88.4	20-133	
4-nitrophenol	99.2	26-150	
dibenzofuran	96.0	51-130	
2,4-dinitrotoluene	104	50-140	
diethylphthalate	104	51-140	
fluorene	97.3	54-146	
4-nitroaniline	103	41-149	

W[illegible]te Stream Technology, Inc.

Reference for Soil SVOC

3550/8270

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: %

WST ID: MR102899
lient ID: NA
Extraction Date: 10/28/99
Date Analyzed: 10/28/99

Compound	Result	QC Limits (%)	Qualifier
4-chlorophenyl-phenylether	95.7	49- 136	
4,6-dinitro-2-methylphenol	93.6	21- 159	
n-nitrosodiphenylamine	120	45- 184	
4-bromophenyl-phenylether	85.1	50- 126	
hexachlorobenzene	91.8	55- 138	
pentachlorophenol	75.2	35- 150	
phenanthrene	95.1	48- 144	
anthracene	92.0	51- 139	
carbazole	93.7	51- 134	
di-n-butylphthalate	95.5	48- 141	
fluoranthene	94.5	50- 137	
pyrene	96.7	45- 151	
butylbenzylphthalate	105	42- 160	
3,3'-dichlorobenzidine	90.9	32- 142	
benzo(a)anthracene	101	51- 142	
chrysene	102	55- 140	
bis(2-ethylhexyl)phthalate	110	30- 175	
di-n-octylphthalate	106	13- 199	
benzo(b)fluoranthene	101	51- 141	
benzo(k)fluoranthene	108	57- 147	
benzo(a)pyrene	101	54- 136	
indeno(1,2,3-cd)pyrene	117	16- 173	
dibenzo(a,h)anthracene	118	29- 153	
benzo(g,h,i)perylene	119	15- 167	
2-fluorophenol (%)	72	25- 121	
phenol-d6 (%)	79	24- 113	
nitrobenzene-d5 (%)	85	23- 120	
2-fluorobiphenyl (%)	94	30- 115	
2,4,6-tribromophenol (%)	106	19- 122	
p-terphenyl-d14 (%)	106	18- 137	

MR denotes Method Reference
NA denotes Not Applicable

Waste Stream Technology

Method 8270 Semivolatile Organic Compound Analysis Report

Soil Matrix Spike/Matrix Spike Duplicate Analysis

Site : Delaware St. Br.
Date Sampled : 10/19/99
WST Sample # Spiked : WS58308
Client ID : DEL-A-SB1-8-12

Group Number : 9901-1674
Date Extracted : 10/28/99
Date Analyzed : 11/4/99

	Matrix Spike	Matrix Spike Dup		QC Limits	
Compound	**% Recovery**	**% Recovery**	**% RPD**	**% RPD**	**% Recovery**
phenol	68	70	2.5	35	26 - 90
2-chlorophenol	80	82	1.9	50	25 - 102
1,4-dichlorobenzene	81	82	1.7	27	28 - 104
n-nitroso-di-n-propylamine	65	66	1.9	38	41 - 126
1,2,4-trichlorobenzene	95	100	5.4	23	38 - 107
4-chloro-3-methylphenol	95	98	1.0	33	26 - 103
acenaphthene	103	108	4.8	19	31 - 137
4-nitrophenol	92	96	5.0	50	11 - 114
2,4-dinitrotoluene	100 #	106 #	3.7	47	28 - 89
pentachlorophenol	56	60	6.8	47	17 - 109
pyrene	106	101	3.2	36	35 - 142
Surrogate Recovery %					
2-fluorophenol	65	65			25 - 121
phenol-d6	68	68			24 - 113
nitrobenzene-d5	76	76			23 - 120
2-fluorobiphenyl	88	90			30 - 115
2,4,6-tribromophenol	104	102			19 - 122
p-terphenyl-d14	102	98			18 - 137

# denotes a recovery outside the stated QC limits.

W[illegible]te Stream Technology, Inc.

Method Blank for TCLP 8270-DEC

1311/8270

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA
TCLP Extraction Date: 10/25/99

Group Number: 9901-1674
Units: ug/L

WST ID MB102699 DT
Client ID: NA
Extraction Date: 10/26/99
Date Analyzed: 10/29/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Anthracene	10	Not detected		U
Fluorene	10	Not detected		U
Phenanthrene	10	Not detected		U
Pyrene	10	Not detected		U
Acenaphthene	10	Not detected		U
Benzo[a]Anthracene	10	Not detected		U
Fluoranthene	10	Not detected		U
Benzo[b]Fluoranthene	10	Not detected		U
Benzo[k]fluoranthene	10	Not detected		U
Benzo[a]pyrene	10	Not detected		U
Dibenzo[a,h]anthracene	10	Not detected		U
Benzo[g,h,i]perylene	10	Not detected		U
Indeno[1,2,3-cd]pyrene	10	Not detected		U
Naphthalene	10	Not detected		U
Chrysene	10	Not detected		U
Nitrobenzene-d5 (%)		81	35-114	
2-Fluorobiphenyl (%)		87	43-116	
Terphenyl-d14 (%)		100	33-141	

Dilution Factor 1
MB denotes Method Blank
NA denotes Not Applicable

Waste Stream Technology Inc.
TCLP 8270 Reference Sample Recovery Report
NYS DEC STARS Compound List

Site : Delaware St. Br.
TCLP Date : 10/25/99
Extraction Date : 10/26/99

Group Number : 9901-1674
Date Analyzed : 10/29/99

Compound	Spike Amount (ug/L)	Reference Sample Result (ug/L)	% Recovery	QC Limits % Recovery
anthracene	50	46.8	94	57 - 122
fluorene	50	47.2	94	62 - 120
phenanthrene	50	43.7	87	61 - 124
pyrene	50	46.4	93	57 - 127
acenaphthene	50	45.6	91	64 - 119
benzo[a]anthracene	50	44.7	89	60 - 123
fluoranthene	50	46.2	92	51 - 129
benzo[b]fluoranthene	50	45.3	91	50 - 131
benzo[k]fluoranthene	50	49.8	100	50 - 132
benzo[a]pyrene	50	45.9	92	56 - 128
dibenzo[a,h]anthracene	50	47.1	94	20 - 143
benzo[g,h,i]perylene	50	46.1	92	12 - 154
indeno[1,2,3-cd]pyrene	50	46.6	93	22 - 143
naphthalene	50	43.0	86	60 - 110
chrysene	50	46.5	93	62 - 125
Surrogate Recovery %				
Nitrobenzene-d5		87		35 - 114
2-Fluorobiphenyl		93		43 - 116
p-Terphenyl-d14		98		33 - 141

Waste Stream Technology Inc.
8270 TCLP Matrix Spike Recovery Report
NYS DEC STARS Compound List

Site : Delaware St. Br.
TCLP Extraction Date : 10/25/99
Solvent Extraction Date : 10/26/99
Date Analyzed : 11/4/99

Group Number : 9901-1674
WST Sample ID # : WS58313
Client ID : DEL-SB1-0.5-5

Compound	Matrix Spike Amount (ug/L)	WS Sample Result (ug/L)	Matrix Spike Sample Result (ug/L)	Percent Recovery	QC Limits % Recovery
anthracene	50	< 10	51.7	103	49 - 112
fluorene	50	< 10	51.7	103	37 - 126
phenanthrene	50	< 10	52.1	104	49 - 119
pyrene	50	< 10	51.3	103	33 - 123
acenaphthene	50	< 10	54.4	109	53 - 119
benzo[a]anthracene	50	< 10	49.7	99	34 - 123
fluoranthene	50	< 10	50.2	100	37 - 126
benzo[b]fluoranthene	50	< 10	62.0	124 #	33 - 118
benzo[k]fluoranthene	50	< 10	64.0	128 #	30 - 122
benzo[a]pyrene	50	< 10	50.5	101	32 - 121
dibenzo[a,h]anthracene	50	< 10	31.3	63	25 - 110
benzo[g,h,i]perylene	50	< 10	31.9	64	31 - 94
indeno[1,2,3-cd]pyrene	50	< 10	39.7	79	34 - 103
naphthalene	50	< 10	49.0	98	43 - 120
chrysene	50	< 10	50.5	101	34 - 128
Surrogate Recovery %					
Nitrobenzene-d5	100	74	65		35 - 114
2-Fluorobiphenyl	100	78	71		43 - 116
p-Terphenyl-d14	100	90	71		33 - 141

# denotes a recovery or RPD outside the stated QC limits. Refer to case narrative.

W[illegible]te Stream Technology, Inc.
TCLP 8021 Method Blank Result
1311/8021

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: ug/L

WST ID: MB102799 DT
Client ID: NA
TCLP Date: 10/27/99
Date Analyzed: 10/28/99

Compound	Detection Limit	Result	QC Limits (%)	Qualifier
Methyl-t-butylether	5.0	Not detected		U
Benzene	0.7	Not detected		U
Toluene	1.0	Not detected		U
Ethylbenzene	1.3	Not detected		U
m,p-Xylene	2.8	Not detected		U
o-Xylene	1.7	Not detected		U
Isopropylbenzene	1.6	Not detected		U
n-Propylbenzene	1.7	Not detected		U
1,3,5-Trimetylbenzene	1.7	Not detected		U
tert-Butylbenzene	3.6	Not detected		U
1,2,4-Trimethylbenzene	1.4	Not detected		U
sec-Butylbenzene	2.2	Not detected		U
p-Isopropyltoluene	1.8	Not detected		U
n-Butylbenzene	2.8	Not detected		U
Naphthalene	1.6	Not detected		U
a,a,a-Trifluorotoluene (%)		126	91-149	

Dilution Factor 1
MB denotes Method Blank
NA denotes Not Applicable

Waste Stream Technology Inc.

TCLP 8021 Reference Sample Recovery Report

NYS DEC STARS Compound List

Site : Delaware St. Br.
TCLP Date : 10/27/99

Group Number : 9901-1674
Date Analyzed : 10/28/99

Compound	Spike Added (ug/L)	Reference Sample Result (ug/L)	% Recovery	QC Limits % Recovery
MTBE	20	22.0	110	66 - 130
Benzene	20	21.6	108	73 - 124
Toluene	20	22.7	114	73 - 127
Ethylbenzene	20	23.0	115	60 - 122
m,p- Xylene	40	46.4	116	66 - 130
o-xylene	20	21.8	109	69 - 133
Isopropylbenzene	20	22.6	113	73 - 116
n-Propylbenzene	20	23.0	115	75 - 126
1,3,5-Trimethylbenzene	20	22.7	113	72 - 126
tert-Butylbenzene	20	20.7	104	84 - 122
1,2,4-Trimethylbenzene	20	23.8	119 #	75 - 118
sec-Butylbenzene	20	22.3	111	80 - 120
p-Isopropyltoluene	20	20.1	101	82 - 127
n-Butylbenzene	20	22.5	113	80 - 128
Naphthalene	20	21.8	109	75 - 123
Surrogate Recovery %	▨	▨	▨	▨
a,a,a-Trifluorotoluene	▨	113	▨	91 - 149

# denotes a recovery outside the stated QC limits.

Waste Stream Technology Inc.
8021 TCLP Matrix Spike Recovery Report
NYS DEC STARS Compound List

Site : Delaware St. Br.
TCLP Extraction Date : 10/27/99
Date Analyzed : 10/28/99

Group Number : 9901-1674
WST Sample ID # : WS58313
Client ID : DEL-SB1-0.5-5

Compound	Matrix Spike Amount (ug/L)	WS Sample Result (ug/L)	Matrix Spike Sample Result (ug/L)	Percent Recovery	QC Limits % Recovery
MTBE	20	< 5.0	21.8	109	30 - 182
benzene	20	< 0.7	20.9	104	79 - 126
toluene	20	2.2	22.6	102	50 - 147
ethylbenzene	20	< 1.3	22.0	110	69 - 126
m,p- xylene	40	< 2.8	44.7	112	71 - 134
o-xylene	20	< 1.7	22.4	112	80 - 133
isopropylbenzene	20	< 1.6	21.3	107	65 - 131
n-propylbenzene	20	< 1.7	21.8	109	73 - 136
1,3,5-trimethylbenzene	20	< 1.7	21.8	109	60 - 143
tert-butylbenzene	20	< 3.6	22.6	113	75 - 126
1,2,4-trimethylbenzene	20	< 1.4	21.6	108	76 - 142
sec-butylbenzene	20	< 2.2	21.1	106	77 - 136
p-isopropyltoluene	20	< 1.8	20.3	101	73 - 143
n-butylbenzene	20	< 2.8	21.6	108	70 - 143
naphthalene	20	< 1.6	22.3	111	65 - 141
Surrogate Recovery %	▨	▨	▨	▨	▨
a,a,a-trifluorotoluene	30	122	110	▨	91 - 149

W[illegible]te Stream Technology, Inc.

Metals Method Blank Analysis

Site: Delaware St. Br.
Date Sampled: NA
Date Received: NA

Group Number: 9901-1674
Units: mg/Kg

WST ID MB102799
Client ID: NA
Digestion Date: 10/27/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Ag soil Method Blank	0.500	Not detected	10/28/99	SW-846 6010
As soil Method Blank	1.70	Not detected	10/28/99	SW-846 6010
Ba soil Method Blank	1.00	Not detected	10/28/99	SW-846 6010
Cd soil Method Blank	1.00	Not detected	10/28/99	SW-846 6010
Cr soil Method Blank	1.00	Not detected	10/28/99	SW-846 6010
Hg soil Method Blank	0.014	Not detected	11/03/99	SW-846 7471
Pb soil Method Blank	4.10	Not detected	10/28/99	SW-846 6010
Se soil Method Blank	1.40	Not detected	10/28/99	SW-846 6010

MB denotes Method Blank
NA denotes Not Applicable

Waste Stream Technology Inc

Total Metals Analysis Result Report

Reference Sample Analysis Summary

Site : Delaware St. Br.
Group Number: 9901-1674

Report Units : % Recovery
Matrix : Soil

	Lab ID	RF102799-S1		
	Date Digested	10/27/99		
Analyte	**Reference % Recovery QC Limits**	**% Recovery**	**Date Analyzed**	**Analysis Method**
Silver	85 - 115	102	05/28/99	SW-846 6010
Arsenic	85 - 115	98	05/28/99	SW-846 6010
Barium	85 - 115	105	05/28/99	SW-846 6010
Cadmium	85 - 115	107	05/28/99	SW-846 6010
Chromium	85 - 115	107	05/28/99	SW-846 6010
Lead	85 - 115	100	05/28/99	SW-846 6010
Selenium	85 - 115	95	05/28/99	SW-846 6010

RF denotes Reference Sample.

Waste Stream Technology Inc

Total Metals Analysis Result Report

Reference Sample Analysis Summary

Site : Delaware St. Br.
Group Number: 9901-1674

Report Units : % Recovery
Matrix : Soil

	Lab ID	RF110299-S1		
	Date Digested	11/2/99		
Analyte	**Reference % Recovery QC Limits**	**% Recovery**	**Date Analyzed**	**Analysis Method**
Mercury	80 - 120	108	11/03/99	SW-846 7470

RF denotes Reference Sample.

Waste Stream Technology, Inc.

Total Metals Analysis Result Report
Duplicate Sample Analysis Summary

Site : Delaware St. Br.
Matrix : Soil

Group Number : 9901-1674
Report Units : mg/kg

Lab ID Number	WS58308	WS58308 Dup		
Client ID	DEL-A-SB1-8-12	DEL-A-SB1-8-12		
Date Digested	10/27/99	10/27/99		
Date Analyzed	10/28/99	10/28/99	**RPD (%)**	**RPD QC Limits (%)**
Analyte	**Initial Result**	**Duplicate Result**		
Silver	< 0.50	< 0.50	< 0.1	25
Arsenic	3.03	2.67	13.0	25
Barium	12.4	11.6	6.2	25
Cadmium	2.85	2.98	4.6	25
Chromium	7.95	8.49	6.6	25
Lead	7.45	7.57	1.5	25
Selenium	< 1.40	< 1.40	< 0.1	25

Waste Stream Technology, Inc.

Total Metals Analysis Result Report
Duplicate Sample Analysis Summary

Site : Delaware St. Br.
Matrix : Soil

Group Number : 9901-1674
Report Units : mg/kg

Lab ID Number	WS58308	WS58308 Dup		
Client ID	DEL-A-SB1-8-12	DEL-A-SB1-8-12		
Date Digested	11/2/99	11/2/99		
Date Analyzed	11/3/99	11/3/99	**RPD (%)**	**RPD QC Limits (%)**
Analyte	**Initial Result**	**Duplicate Result**		
Mercury	< 0.014	< 0.014	< 0.1	25

Waste Stream Technology Inc
Total Metals Analysis Result Report
Matrix Spike Sample Analysis Summary

Site : Delaware St. Br.
WST Sample No. Spiked : WS58308
Client ID : DEL-A-SB1-8-12

Group Number: 9901-1674
Report Units : % Recovery
Matrix : Soil

	Lab ID	WS58308 MS		
	Date Digested	10/27/99		
Analyte	**Matrix Spike % Recovery QC Limits**	**% Recovery**	**Date Analyzed**	**Analysis Method**
Silver	75 - 125	6 #	10/28/99	SW-846 6010
Arsenic	75 - 125	93	10/28/99	SW-846 6010
Barium	75 - 125	94	10/28/99	SW-846 6010
Cadmium	75 - 125	95	10/28/99	SW-846 6010
Chromium	75 - 125	97	10/28/99	SW-846 6010
Lead	75 - 125	90	10/28/99	SW-846 6010
Selenium	75 - 125	92	10/28/99	SW-846 6010

MS denotes Matrix Spike
# denotes a recovery outside QC limits.

Waste Stream Technology Inc
Total Metals Analysis Result Report
Matrix Spike Sample Analysis Summary

Site : Delaware St. Br.
WST Sample No. Spiked : WS58308
Client ID : DEL-A-SB1-8-12

Group Number: 9901-1674
Report Units : % Recovery
Matrix : Soil

	Lab ID	WS58308 MS		
	Date Digested	11/2/99		
Analyte	**Reference % Recovery QC Limits**	**% Recovery**	**Date Analyzed**	**Analysis Method**
Mercury	75 - 125	80	11/03/99	SW-846 7470

MS denotes Matrix Spike

Waste Stream Technology Inc

TCLP Metals Analysis Result Report

Method Blank Analysis Summary

Site : Delaware St. Br.
Group Number: 9901-1674

Report Units : % Recovery
Matrix : TCLP Extract

	Lab ID	MBTC582-T1		
	Date Digested	10/26/99		
Analyte	**Detection Limit**	**Result**	**Date Analyzed**	**Analysis Method**
Lead	0.075	< 0.075	10/27/99	SW-846 6010

MB denotes Method Blank

Waste Stream Technology Inc

TCLP Metals Analysis Result Report

Reference Sample Analysis Summary

Site : Delaware St. Br.
Group Number: 9901-1674

Report Units : % Recovery
Matrix : TCLP Extract

	Lab ID	RFTC582-T1		
	Date Digested	10/26/99		
Analyte	**Reference % Recovery QC Limits**	**% Recovery**	**Date Analyzed**	**Analysis Method**
Lead	85 - 115	97	10/27/99	SW-846 6010

RF denotes Reference Sample.

Waste Stream Technology, Inc.

TCLP Metals Analysis Result Report
Duplicate Sample Analysis Summary

Site : Delaware St. Br.
Matrix : TCLP extract

Group Number : 9901-1674
Report Units : mg/kg

Lab ID Number	WS58313	WS58313 Dup		
Client ID	DEL-E-SB1-0.5-5	DEL-E-SB1-0.5-5		
TCLP Date	10/25/99	10/25/99		
Date Digested	10/26/99	10/26/99		
Date Analyzed	10/27/99	10/27/99	**RPD**	**RPD**
Analyte	**Initial Result**	**Duplicate Result**	**(%)**	**QC Limits (%)**
Lead	0.092	0.092	0.6	25

Waste Stream Technology Inc

TCLP Metals Analysis Result Report

Matrix Spike Sample Analysis Summary

Site : Delaware St. Br.	Group Number: 9901-1674
WST Sample No. Spiked : WS58313	Report Units : % Recovery
Client ID : DEL-E-SB1-0.5-5	Matrix : TCLP Extract

	Lab ID	WS58313 MS		
	TCLP Date	10/25/99		
	Date Digested	10/26/99		
Analyte	**Matrix Spike % Recovery QC Limits**	**% Recovery**	**Date Analyzed**	**Analysis Method**
Lead	75 - 125	97	10/27/99	SW-846 6010

MS denotes Matrix Spike

HES
HUDSON ENVIRONMENTAL SERVICES, INC.
Mail: 22 Hudson Falls Rd., So. Glens Falls, NY 12803
Delivery: 211 Ferry Blvd., So. Glens Falls, NY 12803
Phone: 518/747-1060 Fax: 518/747-1062

RECEIVED
NOV 15 1999

CLIENT:	Waste Stream Technology	DATE SAMPLED:	10/19/99
SAMPLE DESCRIPTION:	See Below	DATE SAMPLE RECD:	10/25/99
		MATRIX:	Solid
LOCATION:	Buffalo, NY	TYPE SAMPLE:	Not Specified
H.E.S. #:	See Below	SAMPLER:	Client

PARAMETER: TOC

METHOD: LLOYD KAHN
(MODIFIED)

HES #	SAMPLE DESCRIPTION	RESULT	UNITS	TEST DATE
991025F01	WS58311	7,722 ± 301	mg/kg	11/04/99
991025F02	WS58312	17,500 ± 901	mg/kg	11/04/99

Approval By:
Date: 11-12-99
N.Y.S.D.O.H. Lab ID# 11140

CHAIN OF CUSTODY

WASTE STREAM TECHNOLOGY

Waste Stream Technology Inc.
302 Grote Street, Buffalo, NY 14207
(716) 876-5290 • FAX (716) 876-2412

OFFICE USE ONLY
GROUP #
DUE DATE

PAGE 1 OF 1

REPORT TO: WST
302 Grote St.
Buffalo, NY 14207

CONTACT P.K. Morrow
PH. # 716-876-5290
FAX # 716-876-2412

BILL TO:
130866

PO# 9901

PROJECT DESCRIPTION

SAMPLER SIGNATURE

DW DRINKING WATER
GW GROUND WATER
SW SURFACE WATER
WW WASTE WATER
O OIL
SL SLUDGE
SO SOIL
S SOLID
W WIPE
OTHER

TURN AROUND TIME: 8 BD

QUOTATION NUMBER:

ARE SPECIAL DETECTION LIMITS REQUIRED:
YES NO
If yes please attach requirements.

Is a QC Package required:
YES NO
If yes please attach requirements

ANALYSES TO BE PERFORMED

	SAMPLE I.D.	DATE SAMPLED	TIME OF SAMPLING	SAMPLE TYPE	TOTAL NO. OF CONTAINERS	TOC										TYPE OF CONTAINER/ COMMENTS: ~~[illegible]~~	OFFICE USE ONLY WST. I.D.
1	WS58311	10/19/99		So	1	X										9910D25F01	
2	WS58312	10/19/99		So	1	X										F02	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

REMARKS:

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
Sondra Crofts	10/22/99	15:00	UPS TRACKING# 12 118 947 22	1002104810	
	/ /		Sam Brown/HES	10/25/99	10:20 A.M

CHAIN OF COUSTODY

WASTE STREAM TECHNOLOGY

Waste Stream Technology Inc.
302 Grote Street, Buffalo, NY 14207
(716) 876-5290 • FAX (716) 876-2412

OFFICE USE ONLY
GROUP # 9901-1674
DUE DATE

PAGE 1 OF 1

ARE SPECIAL DETECTION LIMITS REQUIRED:
YES NO
If yes please attach requirements.

TURN AROUND TIME: 10BD

QUOTATION NUMBER:

Is a QC Package required:
YES NO
If yes please attach requirements

REPORT TO: Watts Engineers
3826 Main St
Buffalo NY 14226

CONTACT Justin Kellogg
PH. # ( ) (716) 836-1540
FAX # ( ) (716) 836-2902

BILL TO:

PO# 2772

PROJECT DESCRIPTION Delaware St. Br.

SAMPLER SIGNATURE J.K. Kellogg

DW DRINKING WATER
GW GROUND WATER
SW SURFACE WATER
WW WASTE WATER
O OIL
SL SLUDGE
SO SOIL
S SOLID
W WIPE
OTHER

ANALYSES TO BE PERFORMED

	SAMPLE I.D.	DATE SAMPLED	TIME OF SAMPLING	SAMPLE TYPE	TOTAL NO. OF CONTAINERS	TCLP STARS VOA TCLP STARS SVOA TCLP Lead	Ignitability	TCL VOA TCL SVOA TCL Pest/PCB	RCRA Metals	TCLP Benzene	TOC						TYPE OF CONTAINER/ COMMENTS:	OFFICE USE ONLY WST. I.D.
1	DEL-A-SB1-8-12	10/19	16:00	Soil	5		X	X	X	X							MS/MSD - Limited Volume	WS58308
2	DEL-C-SB1-11.5-13	10/19	12:30	Soil	5	X	X										Moderate Contam.	Hits 57ppm 09
3	DEL-C-SB2-0.5-5	10/19	13:00	Soil	5		X	X	X	X								10
4	DEL-H-SED1	10/19	17:00	Sed	6			X	X	X	X							11
5	DEL-H-SED2	10/19	17:30	Sed	6			X	X	X	X							12
6	DEL-E-SB1-0.5-5	10/20	15:30	Soil	6	X	X										MS	13
7	DEL-F-SB1-4.5-7.5	10/20	11:16	Soil	5		X	X	X	X								14
8																		
9																		
10																		

REMARKS: Include all batch QC for all analyses,

RELINQUISHED BY: J.K. Kellogg	DATE: 10/21/99	TIME: 15:40	RECEIVED BY:	DATE: 10/21/99	TIME: 15:40
RELINQUISHED BY:	DATE: / /	TIME:	RECEIVED BY:	DATE: / /	TIME:

FAX LEAD SHEET

WASTE STREAM TECHNOLOGY
302 GROTE STREET
BUFFALO, NEW YORK 14207
Phone (716) 876-5290
Fax (716) 876-2412

DATE: 11/30

NUMBER OF PAGES (including cover): 4

TO: Justin Kellogg

FROM: Dan

FAX NUMBER: 836-2402

MESSAGE

TCLP Pb result for Delaware St. Br. Sample

Please call the number listed above if all pages are not received.

WASTE STREAM TECHNOLOGY, INC.

302 Grote Street
Buffalo, NY 14207
(716) 876-5290

Analytical Data Report

Report Date : 11/30/99
Group Number : 9901-1674

Prepared For :
Mr. Justin Kellogg
Edward O. Watts, P.E., P.C.
3826 Main Street
Buffalo, NY 14226

Site : Delaware St. Br.

Field and Laboratory Information

Client Id	WST Lab #	Matrix	Date Sampled	Date Received	Time
DEL-H-SED1	WS58311	Soil	10/19/99	10/21/99	15:40
Sample Status Upon Receipt : No irregularities.					

Analytical Services

Analytical Parameters	Number of Samples	Turnaround Time
TCLP Lead	1	Standard

Report Released By : Daniel W. Voll
Daniel Vollmer, Laboratory QA/QC Officer

ENVIRONMENTAL LABORATORY ACCREDITATION CERTIFICATION NUMBERS
NYSDOH ELAP #11179 NJDEPE #73977 CDHS ELAP #2189

WASTE STREAM TECHNOLOGY

Waste Stream Technology, Inc.
TCLP Metals Analysis Result Report

Site: Delaware St. Br.
Date Sampled: 10/19/99
Date Received: 10/21/99

Group Number: 9901-1674
Units: mg/L
Matrix: TCLP Extract
TCLP Extraction Date: 11/17/99

WST ID: WS58311
Client ID: DEL-H-SED1
Digestion Date: 11/18/99

Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Lead by ICP	0.075	7.14	11/18/99	SW-846 6010

CHAIN OF CUSTODY

WASTE STREAM TECHNOLOGY

Waste Stream Technology Inc.
302 Grote Street, Buffalo, NY 14207
(716) 876-5290 • FAX (716) 876-2412

OFFICE USE ONLY
GROUP # 9901-1674
DUE DATE

PAGE ____ OF ____

REPORT TO: Watts Engineers
3826 Main St
Buffalo NY 14226

CONTACT Justin Kellogg
PH. #( ) (716) 836-1540
FAX #( ) (716) 836-2402
BILL TO:

PO# 2772

PROJECT DESCRIPTION Delaware St. Br.

SAMPLER SIGNATURE J.K. Kellogg

DW DRINKING WATER
GW GROUND WATER
SW SURFACE WATER
WW WASTE WATER
O OIL
SL SLUDGE
SO SOIL
S SOLID
W WIPE
OTHER

TURN AROUND TIME: 10BD
QUOTATION NUMBER:

ARE SPECIAL DETECTION LIMITS REQUIRED: YES NO
If yes please attach requirements.

Is a QC Package required: YES NO
If yes please attach requirements

ANALYSES TO BE PERFORMED

	SAMPLE I.D.	DATE SAMPLED	TIME OF SAMPLING	SAMPLE TYPE	TOTAL NO. OF CONTAINERS	TCLP STARS VOA TCLP STARS SVOA TCLP Lead	Ignitability	TCL VOA TCL SVOA TCL Pest/PCB	RCRA Metals	TCLP Benzene	TOC					TYPE OF CONTAINER/ COMMENTS:	OFFICE USE ONLY WST. I.D.
1	DEL-A-SB1-8-12	10/19	16:00	Soil	5		X	X	X	X						MS/MSD - Limited Volume	WS58308
2	DEL-C-SB1-11.5-13	10/19	12:30	Soil	5	X	X									Moderate Contam.	HNu [illegible] 09
3	DEL-C-SB2-0.5-5	10/19	13:00	Soil	5		X	X	X	X							10
4	DEL-H-SED1	10/19	17:00	Sed	6			X	X	X	X						11
5	DEL-H-SED2	10/19	17:30	Sed	6			X	X	X	X						12
6	DEL-E-SB1-0.5-5	10/20	15:30	Soil	6	X	X									MS	13
7	DEL-F-SB1-4.5-7.5	10/20	11:16	Soil	5		X	X	X	X							14
8																	
9																	
10																	

REMARKS: Include all batch QC for all analyses.

RELINQUISHED BY: J.K. Kellogg	DATE: 10/21/99	TIME: 15:40	RECEIVED BY:	DATE: 10/21/99	TIME: 15:40
RELINQUISHED BY:	DATE: / /	TIME:	RECEIVED BY:	DATE: / /	TIME:

FAX LEAD SHEET

WASTE STREAM TECHNOLOGY
302 GROTE STREET
BUFFALO, NY 14207
Phone (716)876-5290
Fax (716)876-2412

DATE: 12/1/99 NUMBER OF PAGES (including cover): 6

TO: Justin Kellogg

FROM: Dan Vollmer FAX NUMBER: 836-2402

MESSAGE:

Attached is the results of the re-digestion and re-analysis of sample WS58308 (DEL-A-SB1-8-12) from the Delaware St. Br. Site for total metals analysis (except mercury). I included the results from the initial sample analysis for your comparison. I have also included the result reports for the re-digested and re-analyzed duplicate and matrix spike sample analyses as well as the associated method blank and reference sample result reports.

Please review and let me know if you have any questions or comments regarding the total metals re-analysis results.

Please call the number listed above if all pages are not received.

Waste Stream Technology, Inc.

Total Metals Analysis Result Report
Sample Re-digestion and Re-analysis Analysis Summary

Site : Delaware St. Br.
Matrix : Soil

Group Number : 9901-1674
Report Units : mg/kg

Lab ID Number	WS58308 Initial	WS58308 RE	
Client ID	DEL-A-SB1-8-12	DEL-A-SB1-8-12	
Date Digested	10/27/99	11/22/99	
Date Analyzed	10/28/99	11/30/99	**Detection Limit**
Analyte	**Initial Result**	**Duplicate Result**	
Silver	< 0.50	< 0.50	0.50
Arsenic	3.03	3.82	1.70
Barium	12.4	18.5	1.00
Cadmium	2.85	< 1.00	1.00
Chromium	7.95	11.10	1.00
Lead	7.45	7.03	4.10
Selenium	< 1.40	< 1.40	1.40

RE denotes Re-digested and Re-analyzed sample.

Waste Stream Technology, Inc.

Total Metals Analysis Result Report
Duplicate Sample Analysis Summary

Site : Delaware St. Br.
Matrix : Soil

Group Number : 9901-1674
Report Units : mg/kg

Lab ID Number	WS58308 RE	WS58308 RE Dup		
Client ID	DEL-A-SB1-8-12	DEL-A-SB1-8-12		
Date Digested	11/22/99	11/22/99		
Date Analyzed	11/30/99	11/30/99	**RPD (%)**	**RPD QC Limits (%)**
Analyte	**Initial Result**	**Duplicate Result**		
Silver	< 0.50	< 0.50	< 0.1	25
Arsenic	3.82	3.67	4.2	25
Barium	18.5	12.8	36 #	25
Cadmium	< 1.00	< 1.00	< 0.1	25
Chromium	11.10	9.08	20.4	25
Lead	7.03	6.19	12.7	25
Selenium	< 1.40	< 1.40	< 0.1	25

RE denotes Re-digested and Re-analyzed sample.
Dup denotes Duplicate sample.
# denotes an RPD outside the stated QC limits.

Waste Stream Technology Inc

Total Metals Analysis Result Report

Matrix Spike Sample Analysis Summary

Site : Delaware St. Br.
WST Sample No. Spiked : WS58308
Client ID : DEL-A-SB1-8-12

Group Number: 9901-1674
Report Units : % Recovery
Matrix : Soil

	Lab ID	WS58308 RE MS		
	Date Digested	11/22/99		
Analyte	Matrix Spike % Recovery QC Limits	% Recovery	Date Analyzed	Analysis Method
Silver	75 - 125	100	11/30/99	SW-846 6010
Arsenic	75 - 125	96	11/30/99	SW-846 6010
Barium	75 - 125	93	11/30/99	SW-846 6010
Cadmium	75 - 125	93	11/30/99	SW-846 6010
Chromium	75 - 125	98	11/30/99	SW-846 6010
Lead	75 - 125	91	11/30/99	SW-846 6010
Selenium	75 - 125	95	11/30/99	SW-846 6010

RE denotes Re-digested and Re-analyzed.
MS denotes Matrix Spike

Waste Stream Technology Inc

Total Metals Analysis Result Report

Method Blank Sample Analysis Summary

Site : Delaware St. Br.
Group Number: 9901-1674

Report Units : mg/kg
Matrix : Soil

	Lab ID	MB112299-S1		
	Date Digested	11/22/99		
Analyte	Detection Limit	Result	Date Analyzed	Analysis Method
Silver	0.50	< 0.50	11/30/99	SW-846 6010
Arsenic	1.70	< 1.70	11/30/99	SW-846 6010
Barium	1.00	< 1.00	11/30/99	SW-846 6010
Cadmium	1.00	< 1.00	11/30/99	SW-846 6010
Chromium	1.00	< 1.00	11/30/99	SW-846 6010
Lead	4.10	< 4.10	11/30/99	SW-846 6010
Selenium	1.40	< 1.40	11/30/99	SW-846 6010

MB denotes Method Blank

Waste Stream Technology Inc

Total Metals Analysis Result Report

Reference Sample Analysis Summary

Site : Delaware St. Br.
Group Number: 9901-1674

Report Units : % Recovery
Matrix : Soil

	Lab ID	RF112299-S1		
	Date Digested	11/22/99		
Analyte	**Reference % Recovery QC Limits**	**% Recovery**	**Date Analyzed**	**Analysis Method**
Silver	85 - 115	101	11/30/99	SW-846 6010
Arsenic	85 - 115	99	11/30/99	SW-846 6010
Barium	85 - 115	105	11/30/99	SW-846 6010
Cadmium	85 - 115	103	11/30/99	SW-846 6010
Chromium	85 - 115	107	11/30/99	SW-846 6010
Lead	85 - 115	102	11/30/99	SW-846 6010
Selenium	85 - 115	96	11/30/99	SW-846 6010

RF denotes Reference Sample.

APPENDIX C

Soil Boring Logs for Site G

GENERAL INFORMATION & KEY TO SUBSURFACE LOGS

The Subsurface Logs attached to this report present the observations and mechanical data collected by the driller at the site, supplemented by classification of the material removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a fraction of the total volume of the deposits at the site and may not necessarily be representative of the subsurface conditions between adjacent borings or between the sampled intervals. The data presented on the Subsurface Logs together with the recovered samples will provide a basis for evaluating the character of the subsurface conditions relative to the project. The evaluation must consider all the recorded details and their significance relative to each other. Often analyses of standard boring data indicate the need for additional testing or sampling procedures to more accurately evaluate the subsurface conditions. Any evaluation of the contents of this report and recovered samples must be performed by Professionals. The information presented in the following defines some of the procedures and terms used on the Subsurface Logs to describe the conditions encountered.

1. The figures in the Depth column defines the scale of the Subsurface Log.

2. The sample column shows, graphically, the depth range from which a sample was recovered See Table 1 for a description of the symbols used to signify the various types of samples.

3. The Sample No. is used for identification on sample containers and/or Laboratory Test Reports.

4. Blows on Sampler—shows the results of the "Penetration Test", recording the number of blows required to drive a split spoon sampler into the soil. The number of blows required for each six inches of penetration is recorded. The first 6 inches of penetration is considered to be a seating drive. The number of blows required for the second and third 6 inches of penetration is termed the penetration resistance, N. The outside diameter of the sampler, the hammer weight and the length of drop are noted at the bottom of the Subsurface Log.

5. Blows on Casing — shows the number of blows required to advance the casing a distance of 12 inches. The casing size, the hammer weight and the length of drop are noted at the bottom of the Subsurface Log. If the casing is advanced by means other than driving, the method of advancement will be indicated in the Notes column or under the Method of Investigation at the bottom of the Subsurface Log.

6. All recovered soil samples are reviewed in the laboratory by an engineering technician, geologist or geotechnical engineer, unless noted otherwise. The visual descriptions are made on the basis of a combination of the driller's field descriptions and observations and the sample as received in the laboratory. The method of visual classification is based primarily on the Unified Soil Classification (ASTM D 2487-83) with regard to the particle size and plasticity (See Table No. 2) Additionally, the relative portion, by weight, of two or more soil types is described for granular soils in accordance with "Suggested Methods of Test for Identification of Soils" by D M. Burmister, ASTM Special Technical Publication 479, June 1970. (See Table No. 3) The description of the relative soil density or consistency is based upon the penetration records as defined on Table No. 4. The description of the soil moisture is based upon the relative wetness of the soil as recovered and is described as dry, moist, wet and saturated. Water introduced in the boring either naturally or during drilling may have affected the moisture condition of the recovered sample. Special terms are used as required to describe materials in greater detail several such terms are listed in Table 5. When sampling gravelly soils with a standard two inch diameter split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter. The presence of boulders and large gravel is sometimes, but not necessarily, detected by an evaluation of the casing and samplers blows or through the "action" of the drill rig as reported by the driller.

7. The description of the rock shown is based on the recovered rock core and the driller's observations. The terms frequently used in the description are included in Table 6.

8. The stratification lines represent the approximate boundary between soil types end the transition may be gradual. Solid stratification lines are based on the driller's field observations.

9. Miscellaneous observations and procedures noted by the driller are shown in this column, including water level observations. It is important to realize the reliability of the water level observations depends upon the soil type (water does not readily stabilize in a hole through fine grained soils), and that drill water used to advance the boring may have influenced the observations. The ground water level typically will fluctuate seasonally. One or more perched or trapped water levels may exist in the ground seasonally. All the available readings should be evaluated. If definite conclusions cannot be made, it is often prudent to examine the conditions more thoroughly through test pit excavations or water observation wells.

10. The length of core run is defined as the length of penetration of the core barrel. Core recovery is the length of core recovered divided by the core run. The RQD (Rock Quality Designation) is the total pieces of NX core exceeding 4 inches in length divided by the core run. The size core barrel used is also noted.

SUBSURFAC[illegible]LOG KEY

Project____________________ Date Started____________________

Project#____________________ Date Finished____________________

Location____________________ Surf. Elv.____________________

Driller:____________________ G.W. Depth____________________

SERVICES, INC.

Hole #__________

Sheet_____of_____

Contract Drilling and Testing

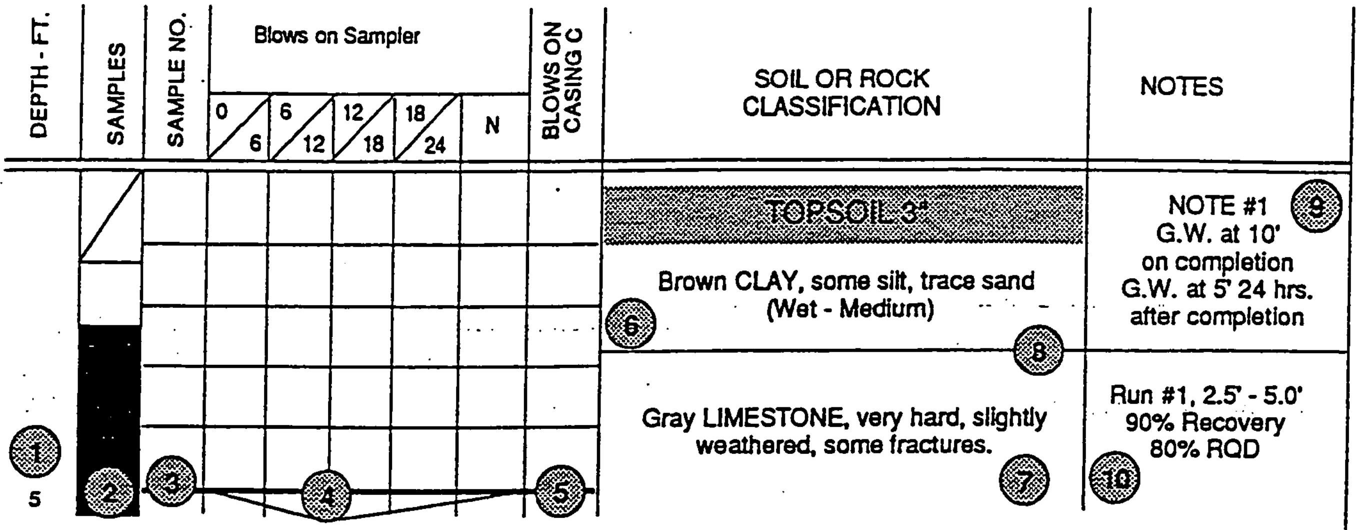

TABLE 1

⧄	Split Spoon Sample
◧	Shelby Tube Sample
↕	Auger or Test Pit Sample
■	Rock Core

TABLE 2

Identification of soil type is made on basis of an estimate of particle sizes, and in the case of fine grained soils also on the basis of plasticity.

Soil Type	Soil Particle Size	
Boulder	>12"	
Cobble	3" - 12"	
Gravel - Course	3" - 3/4"	Coarse Grained (Granular)
- Fine	3/4" - #4	
Sand - Coarse	#4 - #10	
- Medium	#10 - #40	
- Fine	#40 - #200	
Silt - Non Plastic (Granular)		
Clay-Plastic (Cohesive)	<#200	Fine Grained

TABLE 3

The following terms are used in classifying soils consisting of mixtures of 2 or more soil types. The estimate is based on weight of total sample.

Term	% of Total Sample
"and"	35-50
"some"	20-35
"little"	10-20
"trace"	less than 10

(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter.)

TABLE 4

The relative compactness or consistency is described in accord with the following terms:

Granular Soils		**Cohesive Soils**	
Term	**Blows per Foot, N**	**Term**	**Blows per Foot, N**
Loose	<11	Very Soft	<3
Firm	11-30	Soft	3-15
Compact	31-50	Stiff	16-25
Very Compact	>51	Hard	>26

(Large particles in the soils will often significantly influence the blows per foot recorded during the Penetration Test)

TABLE 5

Varved - Horizontal uniform layers or seams of soil(s).

Layer - Soil deposit more than 6" thick.

Seam - Soil deposit more than 6" thick.

Parting - Soil deposit less than 1/8" thick.

Laminated- Irregular, horizontal and angled seams and partings of soil(s).

TABLE 6

Rock Classification Terms		**Meaning**
Hardness	Soft	Scratched by fingernail
	Medium Hard	Scratched easily by penknife
	Hard	Scratched very difficultly with penknife
	Very Hard	Cannot be scratched by penknife
Weathering	Very Weathered	Judged from relative amounts
	Weathered, Sound	of disintegration, iron staining, core recovery, clay seams, etc.

Rock Classification Terms		**Meaning**	
Bedding	Laminated	(<1")	Natural
	Thin Bedded	(1"-4")	breaks in
	Bedded	(4"-12")	Rock Layers
	Thick Bedded	(12" - 36")	
	Massive	(>36")	

Fracturing- natural breaks in the rock oriented at an angle to the rock layers

SM 282e (2/76)

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU

SUBSURFACE EXPLORATION LOG

GION 5
UNTY Erie
PIN 5460.29.121
OJECT Delaware Street, NY Route 384, Bridge Over Ellicott Creek
L SERIES
COORD. LOC. N 335457.954 E 326245.292
TE START 1/19/99 DATE FINISH 1/19/99

HOLE B-1
LINE STA. LINE
STA 0+052.80
OFFSET 0.25 m Left
SURF. ELEV. 176.12 m
DEPTH TO WATER See Note

CASING O.D. ______ I.D. ______ WEIGHT OF HAMMER - CASING ______ LBS. HAMMER FALL - CASING ______
SAMPLER O.D. 2" I.D. 1 5/8" WEIGHT OF HAMMER - SAMPLER 140 LBS. HAMMER FALL - SAMPLER 30"

ELOV SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER 0/.5	.5/1.0	1.0/1.5	1.5/2.0	DESCRIPTION OF SOIL AND ROCK	MOIST. CONT. %
			AUGER				ASPHALTIC CONCRETE	
		1	38	40			Fill - Black CINDERS with Gravel (M-NPL)	
		2	42	18				
			14	13				
		3	4	4				
			4	5				
		4	11	12			Fill - Brn. Clayey fine SAND, with Wood Fragments (M-LPL)	
			5	4				
		5	4	3				
			4	3				
		6	4	3			Fill - Red-Grey Silty Sandy CLAY, with Gravel and Wood Fragments (M-LPL)	
			4	4				
		7	3	3				
			2	1				
		8	2	5			Fill - Brn.-Black Clayey fine SAND, Gravelly	
			1	1				
		9	1	1				
			3	3				
		10	woh/2.0					
		11	1	1				
			woh/1.0					
		12	woh/2.0					
		13	woh/2.0				Fill - Brn. Silty CLAY (M-PL)	
		14	woh/2.0					
		15	woh/1.5					
.30				3				
		16	25	23			Fill - Brn.-Black Clayey fine SAND, Gravelly with Brick Fragments (M-LPL)	
			3	3				
		17	3	3			Fill - Brn. Silty CLAY (M-PL)	
			3	3				
		18	woh/1.5					
				5				
		19	19	25			Brn. Silty fine SAND, Gravelly (M-NPL)	
			31	26				
		20	17	33				
			39	43				
		21	37	51				
			50/.04					
							Boring Complete with Sample Spoon Refusal at 41.4' No Free Standing Water Encountered at Boring Completion.	
							Free Standing Water Recorded at 39.0' 24 Hours After Boring Completion.	

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO AUTHORIZED USERS ONLY THAT THEY MAY HAVE ACCESS TO THE SAME INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF SUCH AUTHORIZED USERS.

CONTRACTOR ______ SM ______

DRILL RIG OPERATOR C. Ackley
SOIL & ROCK DESCRIP. C. Guzzetta / F. Minnolera
REGIONAL SOILS ENGR. ______
SHEET 1 OF 1
STRUCTURE NAME/NO. Delaware Street - Over Ellicott Creek - BIN 2047300
HOLE B-1

SM 282e (2/76)

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
SOIL MECHANICS BUREAU

SUBSURFACE EXPLORATION LOG

[illegible]GION 5
COUNTY Erie
PIN 5460.29.121
[illegible]OJECT Delaware Street, NY Route 384, Bridge Over Ellicott Creek
[illegible]L SERIES
COORD. LOC. N 335499.337 E 326246.233
D[illegible]TE START 1/20/99 DATE FINISH 1/20/99

HOLE B-3
LINE STA. LINE
STA 0+094.25
OFFSET 0.50m Left
SURF. ELEV. 177.51 m
DEPTH TO WATER See Note

CASING O.D. ______ I.D. ______ WEIGHT OF HAMMER - CASING ______ LBS. HAMMER FALL - CASING ______
SAMPLER O.D. 2" I.D. 1 5/8" WEIGHT OF HAMMER - SAMPLER 140 LBS. HAMMER FALL - SAMPLER 30"

[illegible]LOW SURFACE	BLOWS ON CASING	SAMPLE NO.	BLOWS ON SAMPLER 0/.5	.5/1.0	1.0/1.5	1.5/2.0	DESCRIPTION OF SOIL AND ROCK	MOIST. CONT. %
			AUGER				ASPHALTIC CONCRETE	
		1	27	34			Fill - Black CINDERS with Slag (M-NPL)	
		2	21	24				
			15	16				
		3	8	5				
			3	2				
		4	2	2			Fill - Brn. fine SAND (moist, NPL)	
			3	2				
		5	woh/2.0				Fill - Brn. Silty fine SAND (M-NPL)	
		6	woh/1.5					
				1				
		7	woh/2.0					
		8	woh/2.0					
		9	1	1				
			2	1				
		10	woh/2.0				Fill - Black Silty CLAY (M-PL)	
		11	woh/1.5					
				1				
		12	woh/2.0					
		13	woh/1.0					
			2	2				
		14	2	2				
			2	2				
		15	1	1			Brn. Silty CLAY (W-PL)	
			1	1				
		16	1	1				
			1	1				
		17	woh/1.5					
		18	5	9			Brn, Clayey fine SAND, Gravelly (M-LPL)	
			17	20				
		19	25	50				
			50/.03					
							Boring Complete with Sample Spoon Refusal at 43.3'	
							No Free Standing Water Encountered at Boring Completion	

THE SUBSURFACE INFORMATION SHOWN HEREON WAS OBTAINED FOR STATE DESIGN AND ESTIMATE PURPOSES. IT IS MADE AVAILABLE TO AUTHORIZED USERS ONLY THAT THEY MAY HAVE ACCESS TO THE SAME INFORMATION AVAILABLE TO THE STATE. IT IS PRESENTED IN GOOD FAITH, BUT IS NOT INTENDED AS A SUBSTITUTE FOR INVESTIGATIONS, INTERPRETATION OR JUDGMENT OF SUCH AUTHORIZED USERS.

CONTRACTOR ______ SM ______

DRILL RIG OPERATOR C. Ackley
SOIL & ROCK DESCRIP. C. Guzzetta / F. Minnolera
REGIONAL SOILS ENGR.
SHEET 1 OF 1
STRUCTURE NAME/NO. Delaware Street - Over Ellicott Creek - BIN 2047300

HOLE B-3

ATTACHMENT 3

Laboratory Analytical Report

ANALYTICAL REPORT

Lab Number:	L2222083
Client:	Turnkey Environmental Restoration, LLC 2558 Hamburg Turnpike Suite 300 Buffalo, NY 14218
ATTN:	Chris Boron
Phone:	(716) 856-0599
Project Name:	20 TO 40 FILLMORE AVE
Project Number:	T0621-022-001-002
Report Date:	05/12/22

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

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

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2222083-01	TP-1 0-1.5 FT	SOIL	TONAWANDA, NY	04/26/22 07:44	04/27/22
L2222083-02	TP-1 3-6 FT	SOIL	TONAWANDA, NY	04/26/22 07:49	04/27/22
L2222083-03	TP-3 1-3.5 FT	SOIL	TONAWANDA, NY	04/26/22 08:25	04/27/22
L2222083-04	TP-4 0-2 FT	SOIL	TONAWANDA, NY	04/26/22 08:37	04/27/22
L2222083-05	TP-6 0.5-2 FT	SOIL	TONAWANDA, NY	04/26/22 09:17	04/27/22
L2222083-06	TP-10 0-2 FT	SOIL	TONAWANDA, NY	04/26/22 11:25	04/27/22
L2222083-07	TP-11 0-2 FT	SOIL	TONAWANDA, NY	04/26/22 11:49	04/27/22
L2222083-08	TP-12 0.5-4 FT	SOIL	TONAWANDA, NY	04/26/22 12:15	04/27/22

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 NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. 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. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. 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. 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 Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data 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.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) 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 Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

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

L2222083-01 and -02: 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.

L2222083-01: The surrogate recovery is outside the acceptance criteria for 4-bromofluorobenzene (140%); however, the sample was not re-analyzed due to coelution with an obvious interference. A copy of the chromatogram is included as an attachment to this report.

L2222083-02: The surrogate recoveries are outside the acceptance criteria for toluene-d8 (152%) and 4-bromofluorobenzene (427%); however, the sample was not re-analyzed due to coelution with an obvious interference. A copy of the chromatogram is included as an attachment to this report.

Semivolatile Organics

L2222083-04D: The sample has elevated detection limits due to the dilution required by the sample matrix.

Total Metals

L2222083-01, -03 and -07: The sample has elevated detection limits for all elements, with the exception of mercury, due to the dilution required by matrix interferences encountered during analysis.

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: Caitlin Walukevich Caitlin Walukevich

Title: Technical Director/Representative Date: 05/12/22

ORGANICS

VOLATILES

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-01	Date Collected:	04/26/22 07:44
Client ID:	TP-1 0-1.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8260C
Analytical Date: 05/06/22 15:11
Analyst: LAC
Percent Solids: 80%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	5.3	2.4	1
1,1-Dichloroethane	ND		ug/kg	1.1	0.15	1
Chloroform	ND		ug/kg	1.6	0.15	1
Carbon tetrachloride	ND		ug/kg	1.1	0.24	1
1,2-Dichloropropane	ND		ug/kg	1.1	0.13	1
Dibromochloromethane	ND		ug/kg	1.1	0.15	1
1,1,2-Trichloroethane	ND		ug/kg	1.1	0.28	1
Tetrachloroethene	ND		ug/kg	0.53	0.21	1
Chlorobenzene	ND		ug/kg	0.53	0.14	1
Trichlorofluoromethane	ND		ug/kg	4.3	0.74	1
1,2-Dichloroethane	ND		ug/kg	1.1	0.27	1
1,1,1-Trichloroethane	ND		ug/kg	0.53	0.18	1
Bromodichloromethane	ND		ug/kg	0.53	0.12	1
trans-1,3-Dichloropropene	ND		ug/kg	1.1	0.29	1
cis-1,3-Dichloropropene	ND		ug/kg	0.53	0.17	1
Bromoform	ND		ug/kg	4.3	0.26	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	0.53	0.18	1
Benzene	8.6		ug/kg	0.53	0.18	1
Toluene	4.8		ug/kg	1.1	0.58	1
Ethylbenzene	7.6		ug/kg	1.1	0.15	1
Chloromethane	ND		ug/kg	4.3	0.99	1
Bromomethane	ND		ug/kg	2.1	0.62	1
Vinyl chloride	ND		ug/kg	1.1	0.36	1
Chloroethane	ND		ug/kg	2.1	0.48	1
1,1-Dichloroethene	ND		ug/kg	1.1	0.25	1
trans-1,2-Dichloroethene	ND		ug/kg	1.6	0.14	1
Trichloroethene	ND		ug/kg	0.53	0.14	1
1,2-Dichlorobenzene	ND		ug/kg	2.1	0.15	1

SAMPLE RESULTS

Lab ID:	L2222083-01	Date Collected:	04/26/22 07:44
Client ID:	TP-1 0-1.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichlorobenzene	ND		ug/kg	2.1	0.16	1
1,4-Dichlorobenzene	ND		ug/kg	2.1	0.18	1
Methyl tert butyl ether	ND		ug/kg	2.1	0.21	1
p/m-Xylene	14		ug/kg	2.1	0.60	1
o-Xylene	2.5		ug/kg	1.1	0.31	1
cis-1,2-Dichloroethene	ND		ug/kg	1.1	0.19	1
Styrene	ND		ug/kg	1.1	0.21	1
Dichlorodifluoromethane	ND		ug/kg	11	0.98	1
Acetone	ND		ug/kg	11	5.1	1
Carbon disulfide	ND		ug/kg	11	4.8	1
2-Butanone	ND		ug/kg	11	2.4	1
4-Methyl-2-pentanone	ND		ug/kg	11	1.4	1
2-Hexanone	ND		ug/kg	11	1.2	1
Bromochloromethane	ND		ug/kg	2.1	0.22	1
1,2-Dibromoethane	ND		ug/kg	1.1	0.30	1
n-Butylbenzene	0.76	J	ug/kg	1.1	0.18	1
sec-Butylbenzene	1.8		ug/kg	1.1	0.16	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	3.2	1.1	1
Isopropylbenzene	4.6		ug/kg	1.1	0.12	1
p-Isopropyltoluene	2.1		ug/kg	1.1	0.12	1
n-Propylbenzene	3.1		ug/kg	1.1	0.18	1
1,2,3-Trichlorobenzene	ND		ug/kg	2.1	0.34	1
1,2,4-Trichlorobenzene	ND		ug/kg	2.1	0.29	1
1,3,5-Trimethylbenzene	20		ug/kg	2.1	0.20	1
1,2,4-Trimethylbenzene	18		ug/kg	2.1	0.36	1
Methyl Acetate	ND		ug/kg	4.3	1.0	1
Cyclohexane	3.3	J	ug/kg	11	0.58	1
1,4-Dioxane	ND		ug/kg	85	37.	1
Freon-113	ND		ug/kg	4.3	0.74	1
Methyl cyclohexane	17		ug/kg	4.3	0.64	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,2-Dichloroethane-d4	103		70-130
Toluene-d8	120		70-130
4-Bromofluorobenzene	**140**	Q	70-130
Dibromofluoromethane	90		70-130

SAMPLE RESULTS

Lab ID:	L2222083-02	Date Collected:	04/26/22 07:49
Client ID:	TP-1 3-6 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8260C
Analytical Date: 05/07/22 13:43
Analyst: AJK
Percent Solids: 84%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	270	120	1
1,1-Dichloroethane	ND		ug/kg	54	7.9	1
Chloroform	ND		ug/kg	81	7.6	1
Carbon tetrachloride	ND		ug/kg	54	12.	1
1,2-Dichloropropane	ND		ug/kg	54	6.8	1
Dibromochloromethane	ND		ug/kg	54	7.6	1
1,1,2-Trichloroethane	ND		ug/kg	54	14.	1
Tetrachloroethene	ND		ug/kg	27	11.	1
Chlorobenzene	ND		ug/kg	27	6.9	1
Trichlorofluoromethane	ND		ug/kg	220	38.	1
1,2-Dichloroethane	ND		ug/kg	54	14.	1
1,1,1-Trichloroethane	ND		ug/kg	27	9.1	1
Bromodichloromethane	ND		ug/kg	27	5.9	1
trans-1,3-Dichloropropene	ND		ug/kg	54	15.	1
cis-1,3-Dichloropropene	ND		ug/kg	27	8.6	1
Bromoform	ND		ug/kg	220	13.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	27	9.0	1
Benzene	54		ug/kg	27	9.0	1
Toluene	320		ug/kg	54	29.	1
Ethylbenzene	7300		ug/kg	54	7.6	1
Chloromethane	ND		ug/kg	220	50.	1
Bromomethane	ND		ug/kg	110	32.	1
Vinyl chloride	ND		ug/kg	54	18.	1
Chloroethane	ND		ug/kg	110	24.	1
1,1-Dichloroethene	ND		ug/kg	54	13.	1
trans-1,2-Dichloroethene	ND		ug/kg	81	7.4	1
Trichloroethene	ND		ug/kg	27	7.4	1
1,2-Dichlorobenzene	ND		ug/kg	110	7.8	1

SAMPLE RESULTS

Lab ID:	L2222083-02	Date Collected:	04/26/22 07:49
Client ID:	TP-1 3-6 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Volatile Organics by GC/MS - Westborough Lab						
1,3-Dichlorobenzene	ND		ug/kg	110	8.0	1
1,4-Dichlorobenzene	ND		ug/kg	110	9.3	1
Methyl tert butyl ether	ND		ug/kg	110	11.	1
p/m-Xylene	18000		ug/kg	110	30.	1
o-Xylene	2100		ug/kg	54	16.	1
cis-1,2-Dichloroethene	ND		ug/kg	54	9.5	1
Styrene	ND		ug/kg	54	11.	1
Dichlorodifluoromethane	ND		ug/kg	540	50.	1
Acetone	ND		ug/kg	540	260	1
Carbon disulfide	ND		ug/kg	540	250	1
2-Butanone	ND		ug/kg	540	120	1
4-Methyl-2-pentanone	ND		ug/kg	540	69.	1
2-Hexanone	ND		ug/kg	540	64.	1
Bromochloromethane	ND		ug/kg	110	11.	1
1,2-Dibromoethane	ND		ug/kg	54	15.	1
n-Butylbenzene	2000		ug/kg	54	9.1	1
sec-Butylbenzene	2300		ug/kg	54	7.9	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	160	54.	1
Isopropylbenzene	3000		ug/kg	54	5.9	1
p-Isopropyltoluene	11000		ug/kg	54	5.9	1
n-Propylbenzene	4900		ug/kg	54	9.3	1
1,2,3-Trichlorobenzene	ND		ug/kg	110	17.	1
1,2,4-Trichlorobenzene	ND		ug/kg	110	15.	1
1,3,5-Trimethylbenzene	14000		ug/kg	110	10.	1
1,2,4-Trimethylbenzene	33000	E	ug/kg	110	18.	1
Methyl Acetate	ND		ug/kg	220	52.	1
Cyclohexane	2900		ug/kg	540	30.	1
1,4-Dioxane	ND		ug/kg	4300	1900	1
Freon-113	ND		ug/kg	220	38.	1
Methyl cyclohexane	40000	E	ug/kg	220	33.	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,2-Dichloroethane-d4	94		70-130
Toluene-d8	**152**	Q	70-130
4-Bromofluorobenzene	**427**	Q	70-130
Dibromofluoromethane	76		70-130

SAMPLE RESULTS

Lab ID:	L2222083-02	D	Date Collected:	04/26/22 07:49
Client ID:	TP-1 3-6 FT		Date Received:	04/27/22
Sample Location:	TONAWANDA, NY		Field Prep:	Not Specified

Sample Depth:

Matrix: Soil

Analytical Method: 1,8260C

Analytical Date: 05/06/22 15:31

Analyst: LAC

Percent Solids: 84%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
1,2,4-Trimethylbenzene	33000		ug/kg	1100	180	10
Methyl cyclohexane	32000		ug/kg	2200	330	10

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	99		70-130
Toluene-d8	108		70-130
4-Bromofluorobenzene	122		70-130
Dibromofluoromethane	83		70-130

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/06/22 08:20
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 02 Batch: WG1635424-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/06/22 08:20
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 02 Batch: WG1635424-5					
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
Styrene	ND		ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	230
2-Butanone	ND		ug/kg	500	110
4-Methyl-2-pentanone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Methyl Acetate	ND		ug/kg	200	48.
Cyclohexane	ND		ug/kg	500	27.
1,4-Dioxane	ND		ug/kg	4000	1800
Freon-113	ND		ug/kg	200	35.
Methyl cyclohexane	ND		ug/kg	200	30.

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/06/22 08:20
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by EPA 5035 High - Westborough Lab for sample(s): 02 Batch: WG1635424-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	109		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	91		70-130

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/06/22 08:20
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1635989-5					
Methylene chloride	ND		ug/kg	5.0	2.3
1,1-Dichloroethane	ND		ug/kg	1.0	0.14
Chloroform	ND		ug/kg	1.5	0.14
Carbon tetrachloride	ND		ug/kg	1.0	0.23
1,2-Dichloropropane	ND		ug/kg	1.0	0.12
Dibromochloromethane	ND		ug/kg	1.0	0.14
1,1,2-Trichloroethane	ND		ug/kg	1.0	0.27
Tetrachloroethene	ND		ug/kg	0.50	0.20
Chlorobenzene	ND		ug/kg	0.50	0.13
Trichlorofluoromethane	ND		ug/kg	4.0	0.70
1,2-Dichloroethane	ND		ug/kg	1.0	0.26
1,1,1-Trichloroethane	ND		ug/kg	0.50	0.17
Bromodichloromethane	ND		ug/kg	0.50	0.11
trans-1,3-Dichloropropene	ND		ug/kg	1.0	0.27
cis-1,3-Dichloropropene	ND		ug/kg	0.50	0.16
Bromoform	ND		ug/kg	4.0	0.25
1,1,2,2-Tetrachloroethane	ND		ug/kg	0.50	0.17
Benzene	ND		ug/kg	0.50	0.17
Toluene	ND		ug/kg	1.0	0.54
Ethylbenzene	ND		ug/kg	1.0	0.14
Chloromethane	ND		ug/kg	4.0	0.93
Bromomethane	ND		ug/kg	2.0	0.58
Vinyl chloride	ND		ug/kg	1.0	0.34
Chloroethane	ND		ug/kg	2.0	0.45
1,1-Dichloroethene	ND		ug/kg	1.0	0.24
trans-1,2-Dichloroethene	ND		ug/kg	1.5	0.14
Trichloroethene	ND		ug/kg	0.50	0.14
1,2-Dichlorobenzene	ND		ug/kg	2.0	0.14
1,3-Dichlorobenzene	ND		ug/kg	2.0	0.15

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/06/22 08:20
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1635989-5					
1,4-Dichlorobenzene	ND		ug/kg	2.0	0.17
Methyl tert butyl ether	ND		ug/kg	2.0	0.20
p/m-Xylene	ND		ug/kg	2.0	0.56
o-Xylene	ND		ug/kg	1.0	0.29
cis-1,2-Dichloroethene	ND		ug/kg	1.0	0.18
Styrene	ND		ug/kg	1.0	0.20
Dichlorodifluoromethane	ND		ug/kg	10	0.92
Acetone	ND		ug/kg	10	4.8
Carbon disulfide	ND		ug/kg	10	4.6
2-Butanone	ND		ug/kg	10	2.2
4-Methyl-2-pentanone	ND		ug/kg	10	1.3
2-Hexanone	ND		ug/kg	10	1.2
Bromochloromethane	ND		ug/kg	2.0	0.20
1,2-Dibromoethane	ND		ug/kg	1.0	0.28
n-Butylbenzene	ND		ug/kg	1.0	0.17
sec-Butylbenzene	ND		ug/kg	1.0	0.15
1,2-Dibromo-3-chloropropane	ND		ug/kg	3.0	1.0
Isopropylbenzene	ND		ug/kg	1.0	0.11
p-Isopropyltoluene	ND		ug/kg	1.0	0.11
n-Propylbenzene	ND		ug/kg	1.0	0.17
1,2,3-Trichlorobenzene	ND		ug/kg	2.0	0.32
1,2,4-Trichlorobenzene	ND		ug/kg	2.0	0.27
1,3,5-Trimethylbenzene	ND		ug/kg	2.0	0.19
1,2,4-Trimethylbenzene	ND		ug/kg	2.0	0.33
Methyl Acetate	ND		ug/kg	4.0	0.95
Cyclohexane	ND		ug/kg	10	0.54
1,4-Dioxane	ND		ug/kg	80	35.
Freon-113	ND		ug/kg	4.0	0.69
Methyl cyclohexane	ND		ug/kg	4.0	0.60

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/06/22 08:20
Analyst: NLK

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 01 Batch: WG1635989-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	109		70-130
Toluene-d8	102		70-130
4-Bromofluorobenzene	106		70-130
Dibromofluoromethane	91		70-130

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/07/22 10:45
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 02 Batch: WG1636201-5					
Methylene chloride	ND		ug/kg	250	110
1,1-Dichloroethane	ND		ug/kg	50	7.2
Chloroform	ND		ug/kg	75	7.0
Carbon tetrachloride	ND		ug/kg	50	12.
1,2-Dichloropropane	ND		ug/kg	50	6.2
Dibromochloromethane	ND		ug/kg	50	7.0
1,1,2-Trichloroethane	ND		ug/kg	50	13.
Tetrachloroethene	ND		ug/kg	25	9.8
Chlorobenzene	ND		ug/kg	25	6.4
Trichlorofluoromethane	ND		ug/kg	200	35.
1,2-Dichloroethane	ND		ug/kg	50	13.
1,1,1-Trichloroethane	ND		ug/kg	25	8.4
Bromodichloromethane	ND		ug/kg	25	5.4
trans-1,3-Dichloropropene	ND		ug/kg	50	14.
cis-1,3-Dichloropropene	ND		ug/kg	25	7.9
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	25	8.3
Benzene	ND		ug/kg	25	8.3
Toluene	ND		ug/kg	50	27.
Ethylbenzene	ND		ug/kg	50	7.0
Chloromethane	ND		ug/kg	200	47.
Bromomethane	ND		ug/kg	100	29.
Vinyl chloride	ND		ug/kg	50	17.
Chloroethane	ND		ug/kg	100	23.
1,1-Dichloroethene	ND		ug/kg	50	12.
trans-1,2-Dichloroethene	ND		ug/kg	75	6.8
Trichloroethene	ND		ug/kg	25	6.8
1,2-Dichlorobenzene	ND		ug/kg	100	7.2
1,3-Dichlorobenzene	ND		ug/kg	100	7.4

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/07/22 10:45
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 02 Batch: WG1636201-5					
1,4-Dichlorobenzene	ND		ug/kg	100	8.6
Methyl tert butyl ether	ND		ug/kg	100	10.
p/m-Xylene	ND		ug/kg	100	28.
o-Xylene	ND		ug/kg	50	14.
cis-1,2-Dichloroethene	ND		ug/kg	50	8.8
Styrene	14	J	ug/kg	50	9.8
Dichlorodifluoromethane	ND		ug/kg	500	46.
Acetone	ND		ug/kg	500	240
Carbon disulfide	ND		ug/kg	500	230
2-Butanone	ND		ug/kg	500	110
4-Methyl-2-pentanone	ND		ug/kg	500	64.
2-Hexanone	ND		ug/kg	500	59.
Bromochloromethane	ND		ug/kg	100	10.
1,2-Dibromoethane	ND		ug/kg	50	14.
n-Butylbenzene	ND		ug/kg	50	8.4
sec-Butylbenzene	ND		ug/kg	50	7.3
1,2-Dibromo-3-chloropropane	ND		ug/kg	150	50.
Isopropylbenzene	ND		ug/kg	50	5.4
p-Isopropyltoluene	ND		ug/kg	50	5.4
n-Propylbenzene	ND		ug/kg	50	8.6
1,2,3-Trichlorobenzene	ND		ug/kg	100	16.
1,2,4-Trichlorobenzene	ND		ug/kg	100	14.
1,3,5-Trimethylbenzene	ND		ug/kg	100	9.6
1,2,4-Trimethylbenzene	ND		ug/kg	100	17.
Methyl Acetate	ND		ug/kg	200	48.
Cyclohexane	ND		ug/kg	500	27.
1,4-Dioxane	ND		ug/kg	4000	1800
Freon-113	ND		ug/kg	200	35.
Methyl cyclohexane	ND		ug/kg	200	30.

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 05/07/22 10:45
Analyst: LAC

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 02 Batch: WG1636201-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	111		70-130
Toluene-d8	103		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	93		70-130

Lab Control Sample Analysis

Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Parameter	*LCS %Recovery*	*Qual*	*LCSD %Recovery*	*Qual*	*%Recovery Limits*	*RPD*	*Qual*	*RPD Limits*
Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 02 Batch: WG1635424-3 WG1635424-4								
Methylene chloride	82		84		70-130	2		30
1,1-Dichloroethane	87		88		70-130	1		30
Chloroform	85		86		70-130	1		30
Carbon tetrachloride	84		84		70-130	0		30
1,2-Dichloropropane	93		95		70-130	2		30
Dibromochloromethane	87		93		70-130	7		30
1,1,2-Trichloroethane	92		102		70-130	10		30
Tetrachloroethene	88		88		70-130	0		30
Chlorobenzene	88		90		70-130	2		30
Trichlorofluoromethane	84		83		70-139	1		30
1,2-Dichloroethane	89		95		70-130	7		30
1,1,1-Trichloroethane	87		86		70-130	1		30
Bromodichloromethane	85		88		70-130	3		30
trans-1,3-Dichloropropene	94		100		70-130	6		30
cis-1,3-Dichloropropene	92		97		70-130	5		30
Bromoform	80		86		70-130	7		30
1,1,2,2-Tetrachloroethane	100		110		70-130	10		30
Benzene	90		91		70-130	1		30
Toluene	88		89		70-130	1		30
Ethylbenzene	92		92		70-130	0		30
Chloromethane	91		88		52-130	3		30
Bromomethane	99		94		57-147	5		30
Vinyl chloride	88		85		67-130	3		30

Lab Control Sample Analysis

Batch Quality Control

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 02 Batch: WG1635424-3 WG1635424-4								
Chloroethane	94		92		50-151	2		30
1,1-Dichloroethene	81		80		65-135	1		30
trans-1,2-Dichloroethene	82		83		70-130	1		30
Trichloroethene	89		90		70-130	1		30
1,2-Dichlorobenzene	92		93		70-130	1		30
1,3-Dichlorobenzene	93		92		70-130	1		30
1,4-Dichlorobenzene	92		92		70-130	0		30
Methyl tert butyl ether	87		99		66-130	13		30
p/m-Xylene	90		91		70-130	1		30
o-Xylene	89		90		70-130	1		30
cis-1,2-Dichloroethene	82		84		70-130	2		30
Styrene	88		89		70-130	1		30
Dichlorodifluoromethane	73		72		30-146	1		30
Acetone	91		103		54-140	12		30
Carbon disulfide	86		83		59-130	4		30
2-Butanone	76		88		70-130	15		30
4-Methyl-2-pentanone	83		100		70-130	19		30
2-Hexanone	73		88		70-130	19		30
Bromochloromethane	81		85		70-130	5		30
1,2-Dibromoethane	90		100		70-130	11		30
n-Butylbenzene	108		105		70-130	3		30
sec-Butylbenzene	100		96		70-130	4		30
1,2-Dibromo-3-chloropropane	80		91		68-130	13		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by EPA 5035 High - Westborough Lab Associated sample(s): 02 Batch: WG1635424-3 WG1635424-4								
Isopropylbenzene	96		95		70-130	1		30
p-Isopropyltoluene	100		97		70-130	3		30
n-Propylbenzene	100		97		70-130	3		30
1,2,3-Trichlorobenzene	94		96		70-130	2		30
1,2,4-Trichlorobenzene	99		99		70-130	0		30
1,3,5-Trimethylbenzene	100		98		70-130	2		30
1,2,4-Trimethylbenzene	100		98		70-130	2		30
Methyl Acetate	77		90		51-146	16		30
Cyclohexane	89		89		59-142	0		30
1,4-Dioxane	69		85		65-136	21		30
Freon-113	85		83		50-139	2		30
Methyl cyclohexane	89		89		70-130	0		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	96		99		70-130
Toluene-d8	104		103		70-130
4-Bromofluorobenzene	105		103		70-130
Dibromofluoromethane	92		93		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1635989-3 WG1635989-4								
Methylene chloride	82		84		70-130	2		30
1,1-Dichloroethane	87		88		70-130	1		30
Chloroform	85		86		70-130	1		30
Carbon tetrachloride	84		84		70-130	0		30
1,2-Dichloropropane	93		95		70-130	2		30
Dibromochloromethane	87		93		70-130	7		30
1,1,2-Trichloroethane	92		102		70-130	10		30
Tetrachloroethene	88		88		70-130	0		30
Chlorobenzene	88		90		70-130	2		30
Trichlorofluoromethane	84		83		70-139	1		30
1,2-Dichloroethane	89		95		70-130	7		30
1,1,1-Trichloroethane	87		86		70-130	1		30
Bromodichloromethane	85		88		70-130	3		30
trans-1,3-Dichloropropene	94		100		70-130	6		30
cis-1,3-Dichloropropene	92		97		70-130	5		30
Bromoform	80		86		70-130	7		30
1,1,2,2-Tetrachloroethane	100		110		70-130	10		30
Benzene	90		91		70-130	1		30
Toluene	88		89		70-130	1		30
Ethylbenzene	92		92		70-130	0		30
Chloromethane	91		88		52-130	3		30
Bromomethane	99		94		57-147	5		30
Vinyl chloride	88		85		67-130	3		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1635989-3 WG1635989-4

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Chloroethane	94		92		50-151	2		30
1,1-Dichloroethene	81		80		65-135	1		30
trans-1,2-Dichloroethene	82		83		70-130	1		30
Trichloroethene	89		90		70-130	1		30
1,2-Dichlorobenzene	92		93		70-130	1		30
1,3-Dichlorobenzene	93		92		70-130	1		30
1,4-Dichlorobenzene	92		92		70-130	0		30
Methyl tert butyl ether	87		99		66-130	13		30
p/m-Xylene	90		91		70-130	1		30
o-Xylene	89		90		70-130	1		30
cis-1,2-Dichloroethene	82		84		70-130	2		30
Styrene	88		89		70-130	1		30
Dichlorodifluoromethane	73		72		30-146	1		30
Acetone	91		103		54-140	12		30
Carbon disulfide	86		83		59-130	4		30
2-Butanone	76		88		70-130	15		30
4-Methyl-2-pentanone	83		100		70-130	19		30
2-Hexanone	73		88		70-130	19		30
Bromochloromethane	81		85		70-130	5		30
1,2-Dibromoethane	90		100		70-130	11		30
n-Butylbenzene	108		105		70-130	3		30
sec-Butylbenzene	100		96		70-130	4		30
1,2-Dibromo-3-chloropropane	80		91		68-130	13		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 01 Batch: WG1635989-3 WG1635989-4								
Isopropylbenzene	96		95		70-130	1		30
p-Isopropyltoluene	100		97		70-130	3		30
n-Propylbenzene	100		97		70-130	3		30
1,2,3-Trichlorobenzene	94		96		70-130	2		30
1,2,4-Trichlorobenzene	99		99		70-130	0		30
1,3,5-Trimethylbenzene	100		98		70-130	2		30
1,2,4-Trimethylbenzene	100		98		70-130	2		30
Methyl Acetate	77		90		51-146	16		30
Cyclohexane	89		89		59-142	0		30
1,4-Dioxane	69		85		65-136	21		30
Freon-113	85		83		50-139	2		30
Methyl cyclohexane	89		89		70-130	0		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	96		99		70-130
Toluene-d8	104		103		70-130
4-Bromofluorobenzene	105		103		70-130
Dibromofluoromethane	92		93		70-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02 Batch: WG1636201-3 WG1636201-4								
Methylene chloride	88		80		70-130	10		30
1,1-Dichloroethane	96		87		70-130	10		30
Chloroform	92		83		70-130	10		30
Carbon tetrachloride	93		85		70-130	9		30
1,2-Dichloropropane	99		90		70-130	10		30
Dibromochloromethane	91		85		70-130	7		30
1,1,2-Trichloroethane	96		90		70-130	6		30
Tetrachloroethene	97		89		70-130	9		30
Chlorobenzene	94		86		70-130	9		30
Trichlorofluoromethane	94		84		70-139	11		30
1,2-Dichloroethane	95		88		70-130	8		30
1,1,1-Trichloroethane	97		88		70-130	10		30
Bromodichloromethane	91		83		70-130	9		30
trans-1,3-Dichloropropene	99		93		70-130	6		30
cis-1,3-Dichloropropene	100		91		70-130	9		30
Bromoform	82		79		70-130	4		30
1,1,2,2-Tetrachloroethane	101		97		70-130	4		30
Benzene	97		88		70-130	10		30
Toluene	95		88		70-130	8		30
Ethylbenzene	99		92		70-130	7		30
Chloromethane	103		90		52-130	13		30
Bromomethane	109		92		57-147	17		30
Vinyl chloride	100		88		67-130	13		30

Lab Control Sample Analysis

Batch Quality Control

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02 Batch: WG1636201-3 WG1636201-4								
Chloroethane	106		93		50-151	13		30
1,1-Dichloroethene	90		80		65-135	12		30
trans-1,2-Dichloroethene	92		82		70-130	11		30
Trichloroethene	97		88		70-130	10		30
1,2-Dichlorobenzene	96		90		70-130	6		30
1,3-Dichlorobenzene	99		92		70-130	7		30
1,4-Dichlorobenzene	98		90		70-130	9		30
Methyl tert butyl ether	93		87		66-130	7		30
p/m-Xylene	97		89		70-130	9		30
o-Xylene	95		87		70-130	9		30
cis-1,2-Dichloroethene	88		81		70-130	8		30
Styrene	93		86		70-130	8		30
Dichlorodifluoromethane	85		76		30-146	11		30
Acetone	111		91		54-140	20		30
Carbon disulfide	95		84		59-130	12		30
2-Butanone	85		78		70-130	9		30
4-Methyl-2-pentanone	84		83		70-130	1		30
2-Hexanone	79		75		70-130	5		30
Bromochloromethane	89		81		70-130	9		30
1,2-Dibromoethane	93		88		70-130	6		30
n-Butylbenzene	119		109		70-130	9		30
sec-Butylbenzene	110		101		70-130	9		30
1,2-Dibromo-3-chloropropane	81		78		68-130	4		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 02 Batch: WG1636201-3 WG1636201-4								
Isopropylbenzene	105		97		70-130	8		30
p-Isopropyltoluene	110		100		70-130	10		30
n-Propylbenzene	109		100		70-130	9		30
1,2,3-Trichlorobenzene	99		92		70-130	7		30
1,2,4-Trichlorobenzene	105		97		70-130	8		30
1,3,5-Trimethylbenzene	108		98		70-130	10		30
1,2,4-Trimethylbenzene	108		99		70-130	9		30
Methyl Acetate	78		76		51-146	3		30
Cyclohexane	102		91		59-142	11		30
1,4-Dioxane	80		80		65-136	0		30
Freon-113	94		86		50-139	9		30
Methyl cyclohexane	104		93		70-130	11		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	98		96		70-130
Toluene-d8	103		103		70-130
4-Bromofluorobenzene	106		106		70-130
Dibromofluoromethane	93		91		70-130

SEMIVOLATILES

SAMPLE RESULTS

Lab ID:	L2222083-01	Date Collected:	04/26/22 07:44
Client ID:	TP-1 0-1.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	05/02/22 19:33
Analytical Date:	05/03/22 18:00		
Analyst:	SZ		
Percent Solids:	80%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	29	J	ug/kg	160	21.	1
Fluoranthene	1500		ug/kg	120	24.	1
Naphthalene	250		ug/kg	200	25.	1
Benzo(a)anthracene	740		ug/kg	120	23.	1
Benzo(a)pyrene	750		ug/kg	160	50.	1
Benzo(b)fluoranthene	900		ug/kg	120	34.	1
Benzo(k)fluoranthene	330		ug/kg	120	33.	1
Chrysene	730		ug/kg	120	21.	1
Acenaphthylene	ND		ug/kg	160	32.	1
Anthracene	140		ug/kg	120	40.	1
Benzo(ghi)perylene	600		ug/kg	160	24.	1
Fluorene	32	J	ug/kg	200	20.	1
Phenanthrene	570		ug/kg	120	25.	1
Dibenzo(a,h)anthracene	110	J	ug/kg	120	24.	1
Indeno(1,2,3-cd)pyrene	640		ug/kg	160	28.	1
Pyrene	1200		ug/kg	120	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	62		25-120
Phenol-d6	66		10-120
Nitrobenzene-d5	76		23-120
2-Fluorobiphenyl	58		30-120
2,4,6-Tribromophenol	53		10-136
4-Terphenyl-d14	48		18-120

SAMPLE RESULTS

Lab ID:	L2222083-02	Date Collected:	04/26/22 07:49
Client ID:	TP-1 3-6 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	05/02/22 19:33
Analytical Date:	05/03/22 18:24		
Analyst:	SZ		
Percent Solids:	84%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	160	20.	1
Fluoranthene	ND		ug/kg	120	22.	1
Naphthalene	2100		ug/kg	190	24.	1
Benzo(a)anthracene	ND		ug/kg	120	22.	1
Benzo(a)pyrene	ND		ug/kg	160	47.	1
Benzo(b)fluoranthene	ND		ug/kg	120	33.	1
Benzo(k)fluoranthene	ND		ug/kg	120	31.	1
Chrysene	ND		ug/kg	120	20.	1
Acenaphthylene	ND		ug/kg	160	30.	1
Anthracene	ND		ug/kg	120	38.	1
Benzo(ghi)perylene	ND		ug/kg	160	23.	1
Fluorene	ND		ug/kg	190	19.	1
Phenanthrene	ND		ug/kg	120	24.	1
Dibenzo(a,h)anthracene	ND		ug/kg	120	22.	1
Indeno(1,2,3-cd)pyrene	ND		ug/kg	160	27.	1
Pyrene	ND		ug/kg	120	19.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	82		25-120
Phenol-d6	89		10-120
Nitrobenzene-d5	**149**	Q	23-120
2-Fluorobiphenyl	61		30-120
2,4,6-Tribromophenol	58		10-136
4-Terphenyl-d14	60		18-120

SAMPLE RESULTS

Lab ID:	L2222083-03	Date Collected:	04/26/22 08:25
Client ID:	TP-3 1-3.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	05/02/22 19:33
Analytical Date:	05/03/22 18:48		
Analyst:	SZ		
Percent Solids:	79%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	130	J	ug/kg	160	21.	1
Fluoranthene	2300		ug/kg	120	24.	1
Naphthalene	290		ug/kg	200	25.	1
Benzo(a)anthracene	1500		ug/kg	120	23.	1
Benzo(a)pyrene	2200		ug/kg	160	50.	1
Benzo(b)fluoranthene	2200		ug/kg	120	35.	1
Benzo(k)fluoranthene	590		ug/kg	120	33.	1
Chrysene	1300		ug/kg	120	21.	1
Acenaphthylene	54	J	ug/kg	160	32.	1
Anthracene	320		ug/kg	120	40.	1
Benzo(ghi)perylene	1500		ug/kg	160	24.	1
Fluorene	100	J	ug/kg	200	20.	1
Phenanthrene	1200		ug/kg	120	25.	1
Dibenzo(a,h)anthracene	340		ug/kg	120	24.	1
Indeno(1,2,3-cd)pyrene	1800		ug/kg	160	29.	1
Pyrene	1900		ug/kg	120	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	76		25-120
Phenol-d6	80		10-120
Nitrobenzene-d5	86		23-120
2-Fluorobiphenyl	63		30-120
2,4,6-Tribromophenol	57		10-136
4-Terphenyl-d14	52		18-120

SAMPLE RESULTS

Lab ID: L2222083-04 D
Client ID: TP-4 0-2 FT
Sample Location: TONAWANDA, NY

Date Collected: 04/26/22 08:37
Date Received: 04/27/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 05/11/22 03:47
Analyst: IM
Percent Solids: 83%

Extraction Method: EPA 3546
Extraction Date: 05/02/22 19:33

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	1100		ug/kg	790	100	5
Fluoranthene	11000		ug/kg	600	110	5
Naphthalene	630	J	ug/kg	990	120	5
Benzo(a)anthracene	4800		ug/kg	600	110	5
Benzo(a)pyrene	3200		ug/kg	790	240	5
Benzo(b)fluoranthene	4000		ug/kg	600	170	5
Benzo(k)fluoranthene	1200		ug/kg	600	160	5
Chrysene	4100		ug/kg	600	100	5
Acenaphthylene	ND		ug/kg	790	150	5
Anthracene	4100		ug/kg	600	190	5
Benzo(ghi)perylene	1700		ug/kg	790	120	5
Fluorene	2100		ug/kg	990	96.	5
Phenanthrene	14000		ug/kg	600	120	5
Dibenzo(a,h)anthracene	450	J	ug/kg	600	110	5
Indeno(1,2,3-cd)pyrene	2000		ug/kg	790	140	5
Pyrene	7900		ug/kg	600	99.	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	52		25-120
Phenol-d6	56		10-120
Nitrobenzene-d5	60		23-120
2-Fluorobiphenyl	52		30-120
2,4,6-Tribromophenol	49		10-136
4-Terphenyl-d14	42		18-120

SAMPLE RESULTS

Lab ID: L2222083-05
Client ID: TP-6 0.5-2 FT
Sample Location: TONAWANDA, NY

Date Collected: 04/26/22 09:17
Date Received: 04/27/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 05/03/22 19:36
Analyst: SZ
Percent Solids: 77%

Extraction Method: EPA 3546
Extraction Date: 05/02/22 19:33

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	170	22.	1
Fluoranthene	270		ug/kg	130	24.	1
Naphthalene	ND		ug/kg	210	26.	1
Benzo(a)anthracene	230		ug/kg	130	24.	1
Benzo(a)pyrene	330		ug/kg	170	52.	1
Benzo(b)fluoranthene	320		ug/kg	130	36.	1
Benzo(k)fluoranthene	100	J	ug/kg	130	34.	1
Chrysene	180		ug/kg	130	22.	1
Acenaphthylene	ND		ug/kg	170	33.	1
Anthracene	44	J	ug/kg	130	42.	1
Benzo(ghi)perylene	260		ug/kg	170	25.	1
Fluorene	ND		ug/kg	210	21.	1
Phenanthrene	140		ug/kg	130	26.	1
Dibenzo(a,h)anthracene	52	J	ug/kg	130	25.	1
Indeno(1,2,3-cd)pyrene	300		ug/kg	170	30.	1
Pyrene	240		ug/kg	130	21.	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
2-Fluorophenol	73		25-120
Phenol-d6	77		10-120
Nitrobenzene-d5	81		23-120
2-Fluorobiphenyl	59		30-120
2,4,6-Tribromophenol	60		10-136
4-Terphenyl-d14	49		18-120

SAMPLE RESULTS

Lab ID:	L2222083-06	Date Collected:	04/26/22 11:25
Client ID:	TP-10 0-2 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	05/02/22 19:33
Analytical Date:	05/03/22 20:00		
Analyst:	SZ		
Percent Solids:	75%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	180	23.	1
Fluoranthene	720		ug/kg	130	25.	1
Naphthalene	130	J	ug/kg	220	27.	1
Benzo(a)anthracene	340		ug/kg	130	25.	1
Benzo(a)pyrene	350		ug/kg	180	54.	1
Benzo(b)fluoranthene	480		ug/kg	130	37.	1
Benzo(k)fluoranthene	160		ug/kg	130	35.	1
Chrysene	370		ug/kg	130	23.	1
Acenaphthylene	72	J	ug/kg	180	34.	1
Anthracene	58	J	ug/kg	130	43.	1
Benzo(ghi)perylene	290		ug/kg	180	26.	1
Fluorene	23	J	ug/kg	220	21.	1
Phenanthrene	370		ug/kg	130	27.	1
Dibenzo(a,h)anthracene	53	J	ug/kg	130	26.	1
Indeno(1,2,3-cd)pyrene	310		ug/kg	180	31.	1
Pyrene	600		ug/kg	130	22.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	82		25-120
Phenol-d6	89		10-120
Nitrobenzene-d5	98		23-120
2-Fluorobiphenyl	67		30-120
2,4,6-Tribromophenol	65		10-136
4-Terphenyl-d14	50		18-120

SAMPLE RESULTS

Lab ID:	L2222083-07	Date Collected:	04/26/22 11:49
Client ID:	TP-11 0-2 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	05/02/22 19:33
Analytical Date:	05/03/22 20:24		
Analyst:	SZ		
Percent Solids:	80%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	46	J	ug/kg	160	21.	1
Fluoranthene	2600		ug/kg	120	23.	1
Naphthalene	210		ug/kg	200	25.	1
Benzo(a)anthracene	1200		ug/kg	120	23.	1
Benzo(a)pyrene	1100		ug/kg	160	50.	1
Benzo(b)fluoranthene	1500		ug/kg	120	34.	1
Benzo(k)fluoranthene	430		ug/kg	120	33.	1
Chrysene	1200		ug/kg	120	21.	1
Acenaphthylene	170		ug/kg	160	32.	1
Anthracene	260		ug/kg	120	40.	1
Benzo(ghi)perylene	700		ug/kg	160	24.	1
Fluorene	62	J	ug/kg	200	20.	1
Phenanthrene	1200		ug/kg	120	25.	1
Dibenzo(a,h)anthracene	160		ug/kg	120	24.	1
Indeno(1,2,3-cd)pyrene	820		ug/kg	160	28.	1
Pyrene	2100		ug/kg	120	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	74		25-120
Phenol-d6	81		10-120
Nitrobenzene-d5	89		23-120
2-Fluorobiphenyl	65		30-120
2,4,6-Tribromophenol	58		10-136
4-Terphenyl-d14	49		18-120

SAMPLE RESULTS

Lab ID:	L2222083-08	Date Collected:	04/26/22 12:15
Client ID:	TP-12 0.5-4 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	05/02/22 19:33
Analytical Date:	05/03/22 20:48		
Analyst:	JG		
Percent Solids:	71%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	140	J	ug/kg	180	24.	1
Fluoranthene	10000	E	ug/kg	140	27.	1
Naphthalene	330		ug/kg	230	28.	1
Benzo(a)anthracene	3900		ug/kg	140	26.	1
Benzo(a)pyrene	4000		ug/kg	180	57.	1
Benzo(b)fluoranthene	5100		ug/kg	140	39.	1
Benzo(k)fluoranthene	1100		ug/kg	140	37.	1
Chrysene	4000		ug/kg	140	24.	1
Acenaphthylene	820		ug/kg	180	36.	1
Anthracene	1400		ug/kg	140	45.	1
Benzo(ghi)perylene	2700		ug/kg	180	27.	1
Fluorene	240		ug/kg	230	22.	1
Phenanthrene	7400		ug/kg	140	28.	1
Dibenzo(a,h)anthracene	520		ug/kg	140	27.	1
Indeno(1,2,3-cd)pyrene	3000		ug/kg	180	32.	1
Pyrene	8600		ug/kg	140	23.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	76		25-120
Phenol-d6	82		10-120
Nitrobenzene-d5	85		23-120
2-Fluorobiphenyl	63		30-120
2,4,6-Tribromophenol	59		10-136
4-Terphenyl-d14	48		18-120

SAMPLE RESULTS

Lab ID:	L2222083-08 D	Date Collected:	04/26/22 12:15
Client ID:	TP-12 0.5-4 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	05/02/22 19:33
Analytical Date:	05/11/22 04:12		
Analyst:	IM		
Percent Solids:	71%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Fluoranthene	8600		ug/kg	700	130	5

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

Method Blank Analysis
Batch Quality Control

Analytical Method:	1,8270D	Extraction Method:	EPA 3546
Analytical Date:	05/03/22 13:13	Extraction Date:	05/02/22 19:33
Analyst:	IM		

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01-08 Batch: WG1633577-1					
Acenaphthene	ND		ug/kg	130	17.
Fluoranthene	ND		ug/kg	99	19.
Naphthalene	ND		ug/kg	160	20.
Benzo(a)anthracene	ND		ug/kg	99	18.
Benzo(a)pyrene	ND		ug/kg	130	40.
Benzo(b)fluoranthene	ND		ug/kg	99	28.
Benzo(k)fluoranthene	ND		ug/kg	99	26.
Chrysene	ND		ug/kg	99	17.
Acenaphthylene	ND		ug/kg	130	25.
Anthracene	ND		ug/kg	99	32.
Benzo(ghi)perylene	ND		ug/kg	130	19.
Fluorene	ND		ug/kg	160	16.
Phenanthrene	ND		ug/kg	99	20.
Dibenzo(a,h)anthracene	ND		ug/kg	99	19.
Indeno(1,2,3-cd)pyrene	ND		ug/kg	130	23.
Pyrene	ND		ug/kg	99	16.

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	87		25-120
Phenol-d6	91		10-120
Nitrobenzene-d5	90		23-120
2-Fluorobiphenyl	73		30-120
2,4,6-Tribromophenol	67		10-136
4-Terphenyl-d14	72		18-120

Lab Control Sample Analysis

Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE

Project Number: T0621-022-001-002

Lab Number: L2222083

Report Date: 05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-08 Batch: WG1633577-2 WG1633577-3								
Acenaphthene	83		78		31-137	6		50
Fluoranthene	81		77		40-140	5		50
Naphthalene	83		80		40-140	4		50
Benzo(a)anthracene	85		80		40-140	6		50
Benzo(a)pyrene	74		68		40-140	8		50
Benzo(b)fluoranthene	73		68		40-140	7		50
Benzo(k)fluoranthene	75		70		40-140	7		50
Chrysene	77		71		40-140	8		50
Acenaphthylene	82		78		40-140	5		50
Anthracene	80		75		40-140	6		50
Benzo(ghi)perylene	87		80		40-140	8		50
Fluorene	85		80		40-140	6		50
Phenanthrene	80		75		40-140	6		50
Dibenzo(a,h)anthracene	87		80		40-140	8		50
Indeno(1,2,3-cd)pyrene	94		86		40-140	9		50
Pyrene	80		75		35-142	6		50

Lab Control Sample Analysis
Batch Quality Control

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01-08 Batch: WG1633577-2 WG1633577-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Fluorophenol	95		88		25-120
Phenol-d6	102		94		10-120
Nitrobenzene-d5	98		91		23-120
2-Fluorobiphenyl	79		74		30-120
2,4,6-Tribromophenol	72		68		10-136
4-Terphenyl-d14	71		66		18-120

METALS

SAMPLE RESULTS

Lab ID:	L2222083-01	Date Collected:	04/26/22 07:44
Client ID:	TP-1 0-1.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 80%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	6.51		mg/kg	0.983	0.204	2	05/11/22 10:05	05/11/22 17:57	EPA 3050B	1,6010D	MC
Barium, Total	84.9		mg/kg	0.983	0.171	2	05/11/22 10:05	05/11/22 17:57	EPA 3050B	1,6010D	MC
Cadmium, Total	0.482	J	mg/kg	0.983	0.096	2	05/11/22 10:05	05/11/22 17:57	EPA 3050B	1,6010D	MC
Chromium, Total	5.40		mg/kg	0.983	0.094	2	05/11/22 10:05	05/11/22 17:57	EPA 3050B	1,6010D	MC
Lead, Total	158		mg/kg	4.91	0.263	2	05/11/22 10:05	05/11/22 17:57	EPA 3050B	1,6010D	MC
Mercury, Total	0.218		mg/kg	0.079	0.051	1	05/11/22 11:05	05/11/22 13:17	EPA 7471B	1,7471B	ZK
Selenium, Total	ND		mg/kg	1.96	0.254	2	05/11/22 10:05	05/11/22 17:57	EPA 3050B	1,6010D	MC
Silver, Total	ND		mg/kg	0.983	0.278	2	05/11/22 10:05	05/11/22 17:57	EPA 3050B	1,6010D	MC

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-02	Date Collected:	04/26/22 07:49
Client ID:	TP-1 3-6 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 84%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	4.24		mg/kg	0.471	0.098	1	05/11/22 10:05	05/11/22 17:11	EPA 3050B	1,6010D	MC
Barium, Total	29.5		mg/kg	0.471	0.082	1	05/11/22 10:05	05/11/22 17:11	EPA 3050B	1,6010D	MC
Cadmium, Total	0.273	J	mg/kg	0.471	0.046	1	05/11/22 10:05	05/11/22 17:11	EPA 3050B	1,6010D	MC
Chromium, Total	8.72		mg/kg	0.471	0.045	1	05/11/22 10:05	05/11/22 17:11	EPA 3050B	1,6010D	MC
Lead, Total	405		mg/kg	2.36	0.126	1	05/11/22 10:05	05/11/22 17:11	EPA 3050B	1,6010D	MC
Mercury, Total	ND		mg/kg	0.075	0.049	1	05/11/22 11:05	05/11/22 13:20	EPA 7471B	1,7471B	ZK
Selenium, Total	0.141	J	mg/kg	0.943	0.122	1	05/11/22 10:05	05/11/22 17:11	EPA 3050B	1,6010D	MC
Silver, Total	ND		mg/kg	0.471	0.133	1	05/11/22 10:05	05/11/22 17:11	EPA 3050B	1,6010D	MC

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-03	Date Collected:	04/26/22 08:25
Client ID:	TP-3 1-3.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 79%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	3.59		mg/kg	0.978	0.204	2	05/11/22 10:05	05/11/22 18:12	EPA 3050B	1,6010D	MC
Barium, Total	90.1		mg/kg	0.978	0.170	2	05/11/22 10:05	05/11/22 18:12	EPA 3050B	1,6010D	MC
Cadmium, Total	0.254	J	mg/kg	0.978	0.096	2	05/11/22 10:05	05/11/22 18:12	EPA 3050B	1,6010D	MC
Chromium, Total	3.14		mg/kg	0.978	0.094	2	05/11/22 10:05	05/11/22 18:12	EPA 3050B	1,6010D	MC
Lead, Total	320		mg/kg	4.89	0.262	2	05/11/22 10:05	05/11/22 18:12	EPA 3050B	1,6010D	MC
Mercury, Total	0.184		mg/kg	0.081	0.053	1	05/11/22 11:05	05/11/22 13:30	EPA 7471B	1,7471B	ZK
Selenium, Total	1.26	J	mg/kg	1.96	0.252	2	05/11/22 10:05	05/11/22 18:12	EPA 3050B	1,6010D	MC
Silver, Total	ND		mg/kg	0.978	0.277	2	05/11/22 10:05	05/11/22 18:12	EPA 3050B	1,6010D	MC

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-04	Date Collected:	04/26/22 08:37
Client ID:	TP-4 0-2 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 83%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	4.82		mg/kg	0.465	0.097	1	05/11/22 10:05	05/11/22 17:21	EPA 3050B	1,6010D	MC
Barium, Total	40.3		mg/kg	0.465	0.081	1	05/11/22 10:05	05/11/22 17:21	EPA 3050B	1,6010D	MC
Cadmium, Total	0.610		mg/kg	0.465	0.046	1	05/11/22 10:05	05/11/22 17:21	EPA 3050B	1,6010D	MC
Chromium, Total	16.9		mg/kg	0.465	0.045	1	05/11/22 10:05	05/11/22 17:21	EPA 3050B	1,6010D	MC
Lead, Total	40.4		mg/kg	2.33	0.125	1	05/11/22 10:05	05/11/22 17:21	EPA 3050B	1,6010D	MC
Mercury, Total	0.091		mg/kg	0.076	0.050	1	05/11/22 11:05	05/11/22 13:33	EPA 7471B	1,7471B	ZK
Selenium, Total	0.405	J	mg/kg	0.931	0.120	1	05/11/22 10:05	05/11/22 17:21	EPA 3050B	1,6010D	MC
Silver, Total	ND		mg/kg	0.465	0.132	1	05/11/22 10:05	05/11/22 17:21	EPA 3050B	1,6010D	MC

SAMPLE RESULTS

Lab ID: L2222083-05
Client ID: TP-6 0.5-2 FT
Sample Location: TONAWANDA, NY
Date Collected: 04/26/22 09:17
Date Received: 04/27/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 77%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	5.06		mg/kg	0.502	0.104	1	05/11/22 10:05	05/11/22 17:26	EPA 3050B	1,6010D	MC
Barium, Total	60.2		mg/kg	0.502	0.087	1	05/11/22 10:05	05/11/22 17:26	EPA 3050B	1,6010D	MC
Cadmium, Total	0.322	J	mg/kg	0.502	0.049	1	05/11/22 10:05	05/11/22 17:26	EPA 3050B	1,6010D	MC
Chromium, Total	8.48		mg/kg	0.502	0.048	1	05/11/22 10:05	05/11/22 17:26	EPA 3050B	1,6010D	MC
Lead, Total	537		mg/kg	2.51	0.135	1	05/11/22 10:05	05/11/22 17:26	EPA 3050B	1,6010D	MC
Mercury, Total	0.145		mg/kg	0.083	0.054	1	05/11/22 11:05	05/11/22 13:36	EPA 7471B	1,7471B	ZK
Selenium, Total	0.377	J	mg/kg	1.00	0.130	1	05/11/22 10:05	05/11/22 17:26	EPA 3050B	1,6010D	MC
Silver, Total	ND		mg/kg	0.502	0.142	1	05/11/22 10:05	05/11/22 17:26	EPA 3050B	1,6010D	MC

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

SAMPLE RESULTS

Lab ID: L2222083-06
Date Collected: 04/26/22 11:25
Client ID: TP-10 0-2 FT
Date Received: 04/27/22
Sample Location: TONAWANDA, NY
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 75%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	5.27		mg/kg	0.530	0.110	1	05/11/22 10:05	05/11/22 17:32	EPA 3050B	1,6010D	MC
Barium, Total	157		mg/kg	0.530	0.092	1	05/11/22 10:05	05/11/22 17:32	EPA 3050B	1,6010D	MC
Cadmium, Total	1.06		mg/kg	0.530	0.052	1	05/11/22 10:05	05/11/22 17:32	EPA 3050B	1,6010D	MC
Chromium, Total	12.3		mg/kg	0.530	0.051	1	05/11/22 10:05	05/11/22 17:32	EPA 3050B	1,6010D	MC
Lead, Total	699		mg/kg	2.65	0.142	1	05/11/22 10:05	05/11/22 17:32	EPA 3050B	1,6010D	MC
Mercury, Total	1.37		mg/kg	0.085	0.055	1	05/11/22 11:05	05/11/22 13:40	EPA 7471B	1,7471B	ZK
Selenium, Total	0.233	J	mg/kg	1.06	0.137	1	05/11/22 10:05	05/11/22 17:32	EPA 3050B	1,6010D	MC
Silver, Total	ND		mg/kg	0.530	0.150	1	05/11/22 10:05	05/11/22 17:32	EPA 3050B	1,6010D	MC

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

SAMPLE RESULTS

Lab ID: L2222083-07
Date Collected: 04/26/22 11:49
Client ID: TP-11 0-2 FT
Date Received: 04/27/22
Sample Location: TONAWANDA, NY
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 80%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	7.80		mg/kg	0.984	0.204	2	05/11/22 10:05	05/11/22 18:17	EPA 3050B	1,6010D	MC
Barium, Total	127		mg/kg	0.984	0.171	2	05/11/22 10:05	05/11/22 18:17	EPA 3050B	1,6010D	MC
Cadmium, Total	1.82		mg/kg	0.984	0.096	2	05/11/22 10:05	05/11/22 18:17	EPA 3050B	1,6010D	MC
Chromium, Total	24.4		mg/kg	0.984	0.094	2	05/11/22 10:05	05/11/22 18:17	EPA 3050B	1,6010D	MC
Lead, Total	228		mg/kg	4.92	0.264	2	05/11/22 10:05	05/11/22 18:17	EPA 3050B	1,6010D	MC
Mercury, Total	0.452		mg/kg	0.079	0.051	1	05/11/22 11:05	05/11/22 13:43	EPA 7471B	1,7471B	ZK
Selenium, Total	0.295	J	mg/kg	1.97	0.254	2	05/11/22 10:05	05/11/22 18:17	EPA 3050B	1,6010D	MC
Silver, Total	0.423	J	mg/kg	0.984	0.278	2	05/11/22 10:05	05/11/22 18:17	EPA 3050B	1,6010D	MC

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-08	Date Collected:	04/26/22 12:15
Client ID:	TP-12 0.5-4 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 71%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	2.80		mg/kg	0.559	0.116	1	05/11/22 10:05	05/11/22 17:42	EPA 3050B	1,6010D	MC
Barium, Total	56.6		mg/kg	0.559	0.097	1	05/11/22 10:05	05/11/22 17:42	EPA 3050B	1,6010D	MC
Cadmium, Total	0.252	J	mg/kg	0.559	0.055	1	05/11/22 10:05	05/11/22 17:42	EPA 3050B	1,6010D	MC
Chromium, Total	54.8		mg/kg	0.559	0.054	1	05/11/22 10:05	05/11/22 17:42	EPA 3050B	1,6010D	MC
Lead, Total	40.8		mg/kg	2.80	0.150	1	05/11/22 10:05	05/11/22 17:42	EPA 3050B	1,6010D	MC
Mercury, Total	0.118		mg/kg	0.089	0.058	1	05/11/22 11:05	05/11/22 13:46	EPA 7471B	1,7471B	ZK
Selenium, Total	ND		mg/kg	1.12	0.144	1	05/11/22 10:05	05/11/22 17:42	EPA 3050B	1,6010D	MC
Silver, Total	ND		mg/kg	0.559	0.158	1	05/11/22 10:05	05/11/22 17:42	EPA 3050B	1,6010D	MC

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-08 Batch: WG1637063-1										
Arsenic, Total	ND		mg/kg	0.400	0.083	1	05/11/22 10:05	05/11/22 14:49	1,6010D	SB
Barium, Total	ND		mg/kg	0.400	0.070	1	05/11/22 10:05	05/11/22 14:49	1,6010D	SB
Cadmium, Total	ND		mg/kg	0.400	0.039	1	05/11/22 10:05	05/11/22 14:49	1,6010D	SB
Chromium, Total	0.168	J	mg/kg	0.400	0.038	1	05/11/22 10:05	05/11/22 14:49	1,6010D	SB
Lead, Total	ND		mg/kg	2.00	0.107	1	05/11/22 10:05	05/11/22 14:49	1,6010D	SB
Selenium, Total	ND		mg/kg	0.800	0.103	1	05/11/22 10:05	05/11/22 14:49	1,6010D	SB
Silver, Total	ND		mg/kg	0.400	0.113	1	05/11/22 10:05	05/11/22 14:49	1,6010D	SB

Prep Information

Digestion Method: EPA 3050B

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 01-08 Batch: WG1637067-1										
Mercury, Total	ND		mg/kg	0.083	0.054	1	05/11/22 11:05	05/11/22 12:45	1,7471B	ZK

Prep Information

Digestion Method: EPA 7471B

Lab Control Sample Analysis
Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE

Lab Number: L2222083

Project Number: T0621-022-001-002

Report Date: 05/12/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-08 Batch: WG1637063-2 SRM Lot Number: D113-540								
Arsenic, Total	94		-		70-130	-		
Barium, Total	87		-		75-125	-		
Cadmium, Total	90		-		75-125	-		
Chromium, Total	87		-		70-130	-		
Lead, Total	91		-		72-128	-		
Selenium, Total	94		-		66-134	-		
Silver, Total	92		-		70-131	-		
Total Metals - Mansfield Lab Associated sample(s): 01-08 Batch: WG1637067-2 SRM Lot Number: D113-540								
Mercury, Total	107		-		60-140	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Lab Number: L2222083
Project Number: T0621-022-001-002
Report Date: 05/12/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1637063-3 QC Sample: L2224611-01 Client ID: MS Sample												
Arsenic, Total	4.61	11	13.7	82		-	-		75-125	-		20
Barium, Total	70.4	184	222	82		-	-		75-125	-		20
Cadmium, Total	0.482J	4.88	4.09	84		-	-		75-125	-		20
Chromium, Total	17.7	18.4	28.2	**57**	Q	-	-		75-125	-		20
Lead, Total	119	48.8	164	92		-	-		75-125	-		20
Selenium, Total	ND	11	9.02	82		-	-		75-125	-		20
Silver, Total	ND	27.6	22.3	81		-	-		75-125	-		20
Total Metals - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1637067-3 QC Sample: L2224702-01 Client ID: MS Sample												
Mercury, Total	33.4	1.64	59.1	**1560**	Q	-	-		80-120	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE
Project Number: T0621-022-001-002

Lab Number: L2222083
Report Date: 05/12/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1637063-4 QC Sample: L2224611-01 Client ID: DUP Sample						
Arsenic, Total	4.61	4.04	mg/kg	13		20
Barium, Total	70.4	69.0	mg/kg	2		20
Cadmium, Total	0.482J	0.378J	mg/kg	NC		20
Chromium, Total	17.7	15.4	mg/kg	14		20
Lead, Total	119	121	mg/kg	2		20
Selenium, Total	ND	ND	mg/kg	NC		20
Silver, Total	ND	ND	mg/kg	NC		20
Total Metals - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1637067-4 QC Sample: L2224702-01 Client ID: DUP Sample						
Mercury, Total	33.4	39.4	mg/kg	16		20

Project Name: 20 TO 40 FILLMORE AVE

Project Number: T0621-022-001-00

Lab Serial Dilution Analysis

Batch Quality Control

Lab Number: L2222083

Report Date: 05/12/22

Parameter	Native Sample	Serial Dilution	Units	% D	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1637063-6 QC Sample: L2224611-01 Client ID: DUP Sample						
Barium, Total	70.4	84.2	mg/kg	20		20
Lead, Total	119	149	mg/kg	**25**	Q	20

INORGANICS
&
MISCELLANEOUS

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-01	Date Collected:	04/26/22 07:44
Client ID:	TP-1 0-1.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	79.8		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-02	Date Collected:	04/26/22 07:49
Client ID:	TP-1 3-6 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	84.1		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-03	Date Collected:	04/26/22 08:25
Client ID:	TP-3 1-3.5 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	78.8		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

SAMPLE RESULTS

Lab ID:	L2222083-04	Date Collected:	04/26/22 08:37
Client ID:	TP-4 0-2 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	83.3		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

SAMPLE RESULTS

Lab ID: L2222083-05
Client ID: TP-6 0.5-2 FT
Sample Location: TONAWANDA, NY
Date Collected: 04/26/22 09:17
Date Received: 04/27/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	76.9		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-06	Date Collected:	04/26/22 11:25
Client ID:	TP-10 0-2 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	74.8		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-07	Date Collected:	04/26/22 11:49
Client ID:	TP-11 0-2 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	79.8		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

Project Name:	20 TO 40 FILLMORE AVE	**Lab Number:**	L2222083
Project Number:	T0621-022-001-002	**Report Date:**	05/12/22

SAMPLE RESULTS

Lab ID:	L2222083-08	Date Collected:	04/26/22 12:15
Client ID:	TP-12 0.5-4 FT	Date Received:	04/27/22
Sample Location:	TONAWANDA, NY	Field Prep:	Not Specified
Sample Depth:			
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	70.7		%	0.100	NA	1	-	04/28/22 12:20	121,2540G	RI

Lab Duplicate Analysis

Batch Quality Control

Project Name: 20 TO 40 FILLMORE AVE

Project Number: T0621-022-001-002

Lab Number: L2222083

Report Date: 05/12/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01-08 QC Batch ID: WG1632076-1 QC Sample: L2222083-01 Client ID: TP-1 0-1.5 FT						
Solids, Total	79.8	82.2	%	3		20

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2222083-01A	Metals Only-Glass 60mL/2oz unpreserved	A	NA		3.5	Y	Absent		AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L2222083-01B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8260-R2(14)
L2222083-01C	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)
L2222083-01X	Vial MeOH preserved split	A	NA		3.5	Y	Absent		NYTCL-8260-R2(14)
L2222083-01Y	Vial Water preserved split	A	NA		3.5	Y	Absent	**06-MAY-22 05:38**	NYTCL-8260-R2(14)
L2222083-01Z	Vial Water preserved split	A	NA		3.5	Y	Absent	**06-MAY-22 05:38**	NYTCL-8260-R2(14)
L2222083-02A	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		BA-TI(180),AS-TI(180),AG-TI(180),CR-TI(180),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L2222083-02B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8260-R2(14)
L2222083-02C	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)
L2222083-02X	Vial MeOH preserved split	A	NA		3.5	Y	Absent		NYTCL-8260-R2(14)
L2222083-02Y	Vial Water preserved split	A	NA		3.5	Y	Absent	**06-MAY-22 05:38**	NYTCL-8260-R2(14)
L2222083-02Z	Vial Water preserved split	A	NA		3.5	Y	Absent	**06-MAY-22 05:38**	NYTCL-8260-R2(14)
L2222083-03A	Metals Only-Glass 60mL/2oz unpreserved	A	NA		3.5	Y	Absent		AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),SE-TI(180),PB-TI(180),HG-T(28),CD-TI(180)
L2222083-03B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)
L2222083-04A	Metals Only-Glass 60mL/2oz unpreserved	A	NA		3.5	Y	Absent		AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L2222083-04B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)
L2222083-05A	Metals Only-Glass 60mL/2oz unpreserved	A	NA		3.5	Y	Absent		BA-TI(180),AS-TI(180),AG-TI(180),CR-TI(180),SE-TI(180),PB-TI(180),HG-T(28),CD-TI(180)
L2222083-05B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)

*Values in parentheses indicate holding time in days

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2222083-06A	Metals Only-Glass 60mL/2oz unpreserved	A	NA		3.5	Y	Absent		AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),SE-TI(180),PB-TI(180),HG-T(28),CD-TI(180)
L2222083-06B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)
L2222083-07A	Metals Only-Glass 60mL/2oz unpreserved	A	NA		3.5	Y	Absent		BA-TI(180),AS-TI(180),AG-TI(180),CR-TI(180),SE-TI(180),PB-TI(180),HG-T(28),CD-TI(180)
L2222083-07B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)
L2222083-08A	Metals Only-Glass 60mL/2oz unpreserved	A	NA		3.5	Y	Absent		BA-TI(180),AS-TI(180),AG-TI(180),CR-TI(180),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L2222083-08B	Vial Large Septa unpreserved (4oz)	A	NA		3.5	Y	Absent		NYTCL-8270(14),TS(7)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

DL - 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 limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

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).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

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.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

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. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

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.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

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.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

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.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A	- Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
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. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
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.
F	- The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.
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.
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).
M	- Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
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

Data Qualifiers

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.
V	- The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)
Z	- The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.

LIMITATION OF LIABILITIES

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

Westborough Facility
EPA 624/624.1: m/p-xylene, o-xylene, Naphthalene
EPA 625/625.1: alpha-Terpineol
EPA 8260C/8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D/8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

Mansfield Facility
SM 2540D: TSS
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
Biological Tissue Matrix: EPA 3050B

The following analytes are included in our Massachusetts DEP Scope of Accreditation

Westborough Facility:

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 332: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
EPA 624.1: Volatile Halocarbons & Aromatics,
EPA 608.3: 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
EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

Mansfield Facility:

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1 Hg.
SM2340B

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

ALPHA

NEW YORK CHAIN OF CUSTODY

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page 1 of 1

Date Rec'd in Lab 4/28/22

ALPHA Job # L2222083

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Project Information

Project Name: 20 to 40 Fillmore Ave
Project Location: Tonawanda NY
Project # T0621-022-001-002
(Use Project name as Project #) ☐
Project Manager: Chris Boron
ALPHAQuote #:

Turn-Around Time

Standard ☒ Due Date:
Rush (only if pre approved) ☐ # of Days:

Deliverables

☐ ASP-A ☒ ASP-B
☐ EQuIS (1 File) ☒ EQuIS (4 File)
☐ Other

Billing Information

☐ Same as Client Info
PO #

Client Information

Client: Turnkey Environmental
Address: 2558 Hamburg
Turnpike Lackawanna NY
Phone: (716) 818-8358
Fax: (716) 856-0583
Email: TBehrendt@turnkeyllc.com

Regulatory Requirement

☐ NY TOGS ☐ NY Part 375
☐ AWQ Standards ☐ NY CP-51
☐ NY Restricted Use ☐ Other
☐ NY Unrestricted Use
☐ NYC Sewer Discharge

Disposal Site Information

Please identify below location of applicable disposal facilities.

Disposal Facility:
☐ NJ ☐ NY
☐ Other:

These samples have been previously analyzed by Alpha ☐

Other project specific requirements/comments:

Please specify Metals or TAL.

ANALYSIS

Sample Filtration
☐ **Done**
☐ **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	Full list Voc	PAH list SVOC	RCRA METALS						Sample Specific Comments	Total Bottle
22083-01	TP-1 0-1.5ft	4/26/22	744	Soil	TAB	X	X	X							
-02	TP-1 3-6 ft		749			X	X	X							
-03	TP-3 1-3.5ft		825				X	X							
-04	TP-4 0-2 ft		837				X	X							
-05	TP-6 0.5-2 ft		917				X	X							
-06	TP-10 0-2 ft		1125				X	X							
-07	TP-11 0-2 ft		1149				X	X							
-08	TP-12 0.5-4 ft		1215				X	X							

Container Type	A	A	A					
Preservative	A	A	A					

Preservative Code:
A = None
B = HCl
C = HNO_3
D = H_2SO_4
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Relinquished By:	Date/Time	Received By:	Date/Time
	4/27/22 0805	Jm AL AAC	4/27/22 15:00
Jm AL AAC	4/27/22 15:45		4/28/22 0030

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

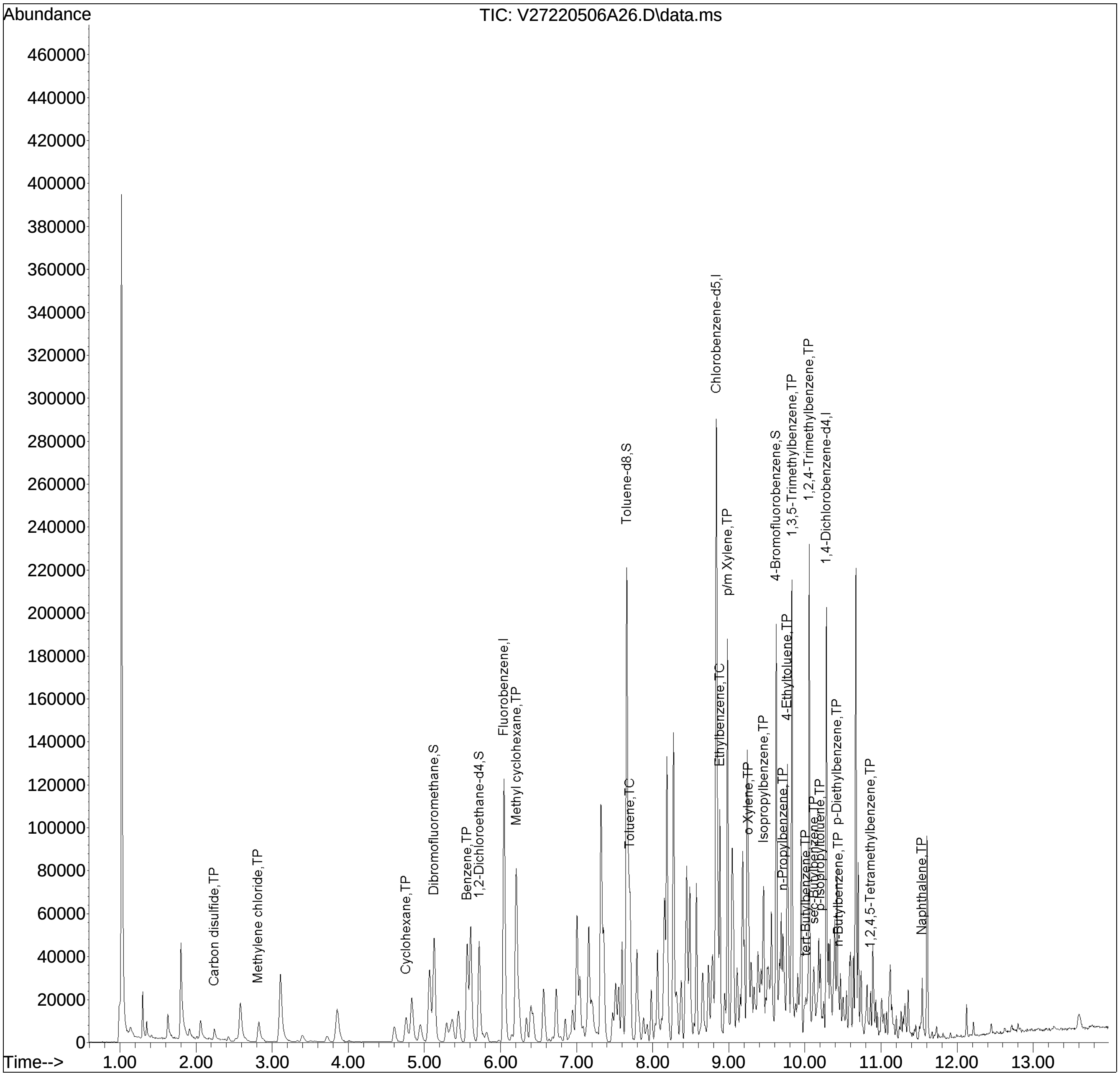
Form No: 01-25 HC (rev. 30-Sept-2013)

Quantitation Report   (QT Reviewed)

```
Data Path : I:\VOLATILES\VOA127\2022\220506A\
Data File : V27220506A26.D
Acq On    : 06 May 2022  03:11 pm
Operator  : VOA127:LAC
Sample    : L2222083-01,31,5.88,5,,Z,PRI
Misc      : WG1635989,ICAL18933
ALS Vial  : 26   Sample Multiplier: 1

Quant Time: May 06 21:17:08 2022
Quant Method : I:\VOLATILES\VOA127\2022\220506A\V127_220413B_8260.m
Quant Title  : VOLATILES BY GC/MS
QLast Update : Thu Apr 14 07:05:09 2022
Response via : Initial Calibration

Sub List     : 8260-CurveSoil - Megamix plus Diox6A\V27220506A01.D•
```

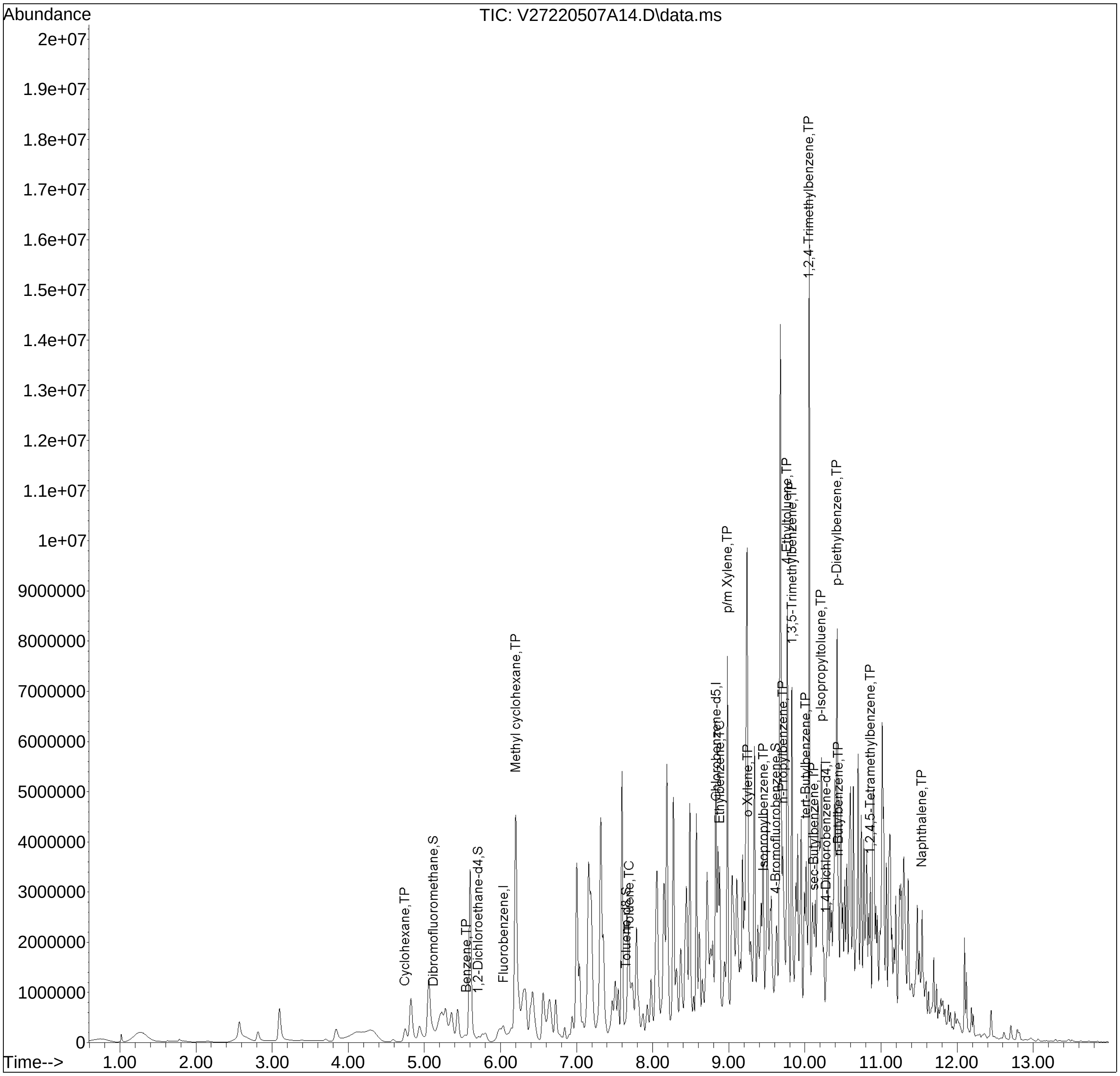


Quantitation Report (QT Reviewed)

```
Data Path : I:\VOLATILES\VOA127\2022\220507A\
Data File : V27220507A14.D
Acq On    : 07 May 2022  01:43 pm
Operator  : VOA127:AJK
Sample    : L2222083-02,31H,6.63,5,0.100,,X,PRI
Misc      : WG1636201,ICAL18933
ALS Vial  : 14   Sample Multiplier: 1

Quant Time: May 09 13:39:03 2022
Quant Method : I:\VOLATILES\VOA127\2022\220507A\V127_220413B_8260.m
Quant Title  : VOLATILES BY GC/MS
QLast Update : Thu Apr 14 07:05:09 2022
Response via : Initial Calibration

Sub List     : 8260-CurveSoil - Megamix plus Diox7A\V27220507A01.D•
```



APPENDIX C

Field Operating Procedures

ROUX

FIELD OPERATING PROCEDURES

Abandonment of Borehole Procedures

FOP 001.1

ABANDONMENT OF BOREHOLE PROCEDURE

PURPOSE

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

PROCEDURE

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

   Grout Slurry Composition (% Weight)

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

2. Calculate the volume of the borehole base on the bit or auger head diameter plus 10% and determine the volume of grout to be emplaced. Generally, the total mixed volume is the borehole volume plus 20%.

3. Identify the equipment to be used for the preparation and mixing of the grout. Ensure the volume of the tanks to be used for mixing has been measured adequately. Document these volumes on the Well Abandonment/Decommissioning Log (sample attached).

4. Identify the source of the water to be used for the grout and determine its suitability for use. In particular, water with high sulfate, or chloride levels or heated water should not be used. These types of waters can cause operational difficulties or modify the set-up for the grout.

5. Identify the equipment to be used for emplacing the grout. Ensure that the pump to be used has adequate pressure to enable complete return to surface.

6. Identify the volumes to be pumped at each stage or in total if only one stage is to be used.

7. Prepare the borehole abandonment plan and discuss the plan and activities with the drilling contractor prior to beginning any mixing activities.

8. Begin mixing the grout to be emplaced.

9. Record the type and amount of materials used during the mixing operation. Ensure the ratios are within specifications tolerance.

10. Begin pumping the grout through the return line bypass system to confirm all pump and surface fittings are secure.

11. Initiate downhole pumping from the bottom of the borehole. Record the times and volumes emplaced on the Well Abandonment/Decommissioning Log (sample attached).

12. Document the return circulation of grout. This may be facilitated by using a colored dye or other tagging method if a mudded borehole condition exists prior to grout injection.

13. Identify what procedures will be used for grouting in the upper 3 feet. When casing exists in the borehole, decisions are required as to the timing for removal and final disposition of the casing. Generally, it will not be removed prior to grouting because of the potential for difficult access and loss of circulation in the upper soil or rock layers. Accordingly, when cement return is achieved at surface, the casing is commonly removed and the borehole is topped off with grout or soils. If casing removal is not possible or not desired, the casing left in place should be cut off at a depth of 5 feet or greater below ground surface. If casing is not present during grouting, the grout level in the borehole is topped off after the rods or tremie pipe is removed.

14. Clear and clean the surface near the borehole.

15. The uppermost five feet of the borehole at the land surface should be filled with material physically similar to the natural soils. The surface of the borehole should be restored to the condition of the area surrounding the borehole. For example, concrete or asphalt will be patched with concrete or asphalt of the same type and thickness, grassed areas will be seeded, and topsoil will be used in other areas. All solid waste materials generated during the decommissioning process must be disposed of properly.

16. A follow-up check at each site should be made within one week to 10 days of completion. It should be noted that on occasion, the grout and/or surface material may settle over several days. If settling occurs, additional material physically similar to surrounding materials (i.e., asphalt, concrete, or soil) must be used to match the existing grade.

17. Document borehole and/or well/piezometer decommissioning activities on a Well Abandonment/Decommissioning Log (sample attached).

ATTACHMENTS

Well Abandonment/Decommissioning Log (sample)

REFERENCES

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

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

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

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

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

WELL ABANDONMENT/ DECOMMISSIONING LOG

PROJECT INFORMATION	WELL INFORMATION
Project Name:	WELL I.D.:
Client:	Stick-up (fags):
Project Job Number:	Total Depth (fbgs):
Date:	Screen Interval (fbgs):
Weather:	Well Material:
	Diameter (inches):
BM/TK Personnel:	
Drilling Company:	Drilling Company Personnel:
Drill Rig Type:	

DECOMMISSIONING PROCEDURES

Time	Description of Field Activities

PREPARED BY: DATE:

ROUX

FIELD OPERATING PROCEDURES

Air Rotary Drilling Procedure

FOP 003.0

AIR ROTARY DRILLING PROCEDURE

PURPOSE

This guideline presents a standard method of subsurface drilling in bedrock or extremely resistant unconsolidated soils using air rotary drilling techniques.

PROCEDURE

1. Advance boring to top of competent bedrock as per Roux's Hollow Stem Auger (HSA) Drilling Procedures FOP and/or the Overburden Casing Installation Procedures FOP, or approved other as per the project work plan.

2. Rock drilling is performed using air as the primary drilling fluid. Water present in the formation assists the drilling process. A large compressor supplies air that is piped through a dual filter system to a swivel hose connected to the top of the Kelly or drill pipe. The dual filters remove oil that may enter the air stream at the compressor. The secondary filter should be inspected periodically to determine if oil is passing the primary filter. If this occurs, the primary and secondary filters should be replaced.

3. The cuttings and formation water are blown from the bottom of the borehole and are channeled by the dissipator (an enclosed hood located at the borehole surface) through flexible hosing to a covered 55-gallon D.O.T.-approved drum.

4. Advance the boring into consolidated materials by standard rock coring procedures using a triple was core barrel of NX or HQ size. Log bedrock core in accordance with Roux's FOP 043: Rock Core Classification Procedure. Temporary casing may be used if circulation of drill water is desired.

5. Perform packer permeability testing at this stage if the project requires such testing as per Roux's FOP 042: Pressure Packer Test Procedure.

6. Continue advancing boring alternating between air rotary drilling (3 7/8-inch roller bit or other size as required) and core sample collection (typically in 5-foot increments or as the formation allows).

7. Verify borehole depth using a weighted measuring tape.

8. Air monitoring is performed in accordance with the site Health and Safety Plan (HASP).

9. Record all information in the Project Field Book and on the appropriate project field forms.

ATTACHMENTS

none

REFERENCES

Roux FOPs:

026	*Hollow Stem Auger (HSA) Drilling Procedures*
041	*Overburden Casing Installation Procedures*
042	*Pressure Packer Test Procedure*
043	*Rock Core Classification Procedure*

FIELD OPERATING PROCEDURES

Soil Vapor Sample Collection Procedures

FOP 004.7

SOIL VAPOR SAMPLE
COLLECTION PROCEDURE

BACKGROUND

In October 2006, the New York State Department of Health (NYSDOH) finalized their vapor intrusion guidance document entitled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York." (www.health.state.ny.us/nysdoh/gas/svi_guidance/), which has been guiding NYSDOH and New York State Department of Environmental Conservation (NYSDEC) decisions concerning the need for subslab vapor mitigation at sites undergoing investigation, cleanup and monitoring under formal NY Sate remedial programs (e.g., Brownfield Cleanup Program sites, Inactive Hazardous Waste Site Remediation Program sites, etc.). Per the most recent update, February 2024, guidance presents six (6) soil vapor/indoor air matrices to assist in interpreting the comparison of subslab and ambient air data. As of February 2024, 20 compounds have been assigned to these six (6) current matrices (i.e., "Matrix A", "Matrix B", "Matrix C", "Matrix D", "Matrix E", and "Matrix F") as follows:

Soil Vapor / Indoor Air Matrix	Volatile Chemical
Matrix A	Carbon tetrachloride
	1,1-Dichloroethene
	cis-1,2-Dichloroethene
	Trichloroethene
Matrix B	Methylene Chloride
	Tetrachlorethene
	1,1,1-Trichloroethane
Matrix C	Vinyl chloride
Matrix D	Benzene
	Ethylbenzene
	Naphthalene

	Cyclohexane
	Isooctane (2,2,4-Trimethylpentane)
	1,2,4-Trimethylbenzene
	1,3,5-Trimethylbenzene
	o-Xylene
Matrix E	m,p-Xylene
	Heptane
	Hexane
Matrix F	Toluene

The matrices are attached as Figures 1 through 6.

PURPOSE

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

SURVEYS AND PRE-SAMPLING BUILDING PREPARATION (IF REQUIRED)

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

- Construction characteristics, including foundation cracks and utility penetrations or other openings that may serve as preferential pathways for vapor intrusion;
- Presence of an attached garage;
- Recent renovations or maintenance to the building (e.g., fresh paint, new carpet or furniture);
- Mechanical equipment that can affect pressure gradients (e.g., heating systems, clothes dryers or exhaust fans);
- Use or storage of petroleum products (e.g., fuel containers, gasoline operated equipment and unvented kerosene heaters); and
- Recent use of petroleum-based finishes or products containing volatile chemicals.

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

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

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

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

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

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

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

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

- Opening any windows, fireplace dampers, openings or vents;
- Operating ventilation fans unless special arrangements are made;
- Smoking in the building;
- Painting;
- Using a wood stove, fireplace or other auxiliary heating equipment (e.g., kerosene heater);
- Operating or storing automobile in an attached garage;
- Allowing containers of gasoline or oil to remain within the house or garage area, except for fuel oil tanks;
- Cleaning, waxing or polishing furniture, floors or other woodwork with petroleum- or oil-based products;
- Using air fresheners, scented candles or odor eliminators;
- Engaging in any hobbies that use materials containing volatile chemicals;
- Using cosmetics including hairspray, nail polish, nail polish removers, perfume/cologne, etc.;
- Lawn mowing, paving with asphalt, or snow blowing;
- Applying pesticides; and
- Using building repair or maintenance products, such as caulk or roofing tar.

PRODUCT INVENTORY (IF REQUIRED)

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

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

The presence and description of odors (e.g., solvent, moldy) and portable vapor monitoring equipment readings (e.g., PIDs, ppb RAE, Jerome Mercury Vapor Analyzer, etc.) should be noted and used to help evaluate potential sources. This includes taking readings near products stored or used in the building. Products in buildings should be inventoried every time air is tested to provide an accurate assessment of the potential contribution of volatile chemicals. If available, chemical ingredients of interest (e.g., analyte list) should be recorded for each product. If the ingredients are not listed on the label, record the product's exact and full name, and the manufacturer's name, address and telephone number, if available. In some cases, Material Safety Data Sheets (MSDS) may be useful for identifying confounding sources of volatile chemicals in air. Adequately documented photographs of the products and their labeled ingredients can supplement the inventory and facilitate recording the information.

SAMPLE LOCATIONS

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

- Subsurface vapor samples:

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

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

- Soil vapor

  Soil vapor samples are collected to determine whether this environmental medium is contaminated, characterize the nature and extent of contamination, and identify possible sources of the contamination. Soil vapor sampling results are used when evaluating the following:
  - The potential for *current* human exposures;
  - The potential for *future* human exposures (e.g., should a building be constructed); and
  - The effectiveness of measures implemented to remediate contaminated subsurface vapors.

- Sub-slab vapor

  Sub-slab vapor samples are collected to characterize the nature and extent of soil vapor contamination immediately beneath a building with a basement foundation and/or a slab-on-grade. Sub-slab vapor sampling results are used when evaluating the following:
  - *Current* human exposures;
  - The potential for *future* human exposures (e.g., if the structural integrity of the building changes or the use of the building changes); and
  - Site-specific attenuation factors (i.e., the ratio of indoor air to sub-slab vapor concentrations).

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

- Indoor air

  Indoor air samples are collected to characterize exposures to air within a building, including those with earthen floors and crawlspaces. Indoor air sampling results are used when evaluating the following:
  - *Current* human exposures;
  - The potential for *future* exposures (e.g., if a currently vacant building should become occupied); and
  - Site-specific attenuation factors (e.g., the ratio of indoor air to sub-slab vapor concentrations).

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

  In addition, site-specific situations may warrant collecting indoor air samples prior to characterizing subsurface vapors and/or without concurrent sub-slab sampling due to a need to examine immediate inhalation hazards. Examples of such situations may include, but are not limited to, the following:
  - In response to a spill event when there is a need to qualitatively and/or quantitatively characterize the contamination;
  - If high readings are obtained in a building when screening with field equipment (e.g., a photoionization detector (PID), an organic vapor analyzer, or an explosimeter) and the source is unknown;
  - If significant odors are present and the source needs to be characterized; or
  - If groundwater beneath the building is contaminated, the building is prone to groundwater intrusion or flooding (e.g., sump pit overflows), and subsurface vapor sampling is not feasible.

- Outdoor air

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

SOIL VAPOR SAMPLE COLLECTION PROCEDURES

Soil vapor probe installations (see Figure 4 attached) may be permanent, semi-permanent, or temporary. In general, permanent installations are preferred for data consistency reasons. Soil implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any construction protocol:

- Soil vapor probes should be installed using direct push technology or, if necessary to attain the desired depth, using an auger;

- Porous backfill material (e.g., glass beads or coarse sand) should be used to create a sampling zone 1 to 2 feet in length;

- Soil vapor probes should be fitted with inert tubing (e.g., polyethylene, stainless steel, or Teflon®) of the appropriate size (typically 1/8 inch to 1/4 inch diameter) and of laboratory or food grade quality to the surface;

- Soil vapor probes should be sealed above the sampling zone with a bentonite slurry for a minimum distance of 3 feet to prevent outdoor air infiltration and the remainder of the borehole backfilled with clean material;

- For multiple probe depths, the borehole should be grouted with bentonite between probes to create discrete sampling zones; and

- For permanent installations, a protective casing should be set around the top of the probe tubing and grouted in place to the top of bentonite to minimize infiltration of water or outdoor air, as well as to prevent accidental damage.

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

- At least 24 hours after the installation of permanent probes and shortly after the installation of temporary probes, one to three implant volumes (i.e., the volume of the sample probe and tube) must be purged prior to collecting the samples to ensure samples collected are representative;

- Flow rates for both purging and collecting must not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling;

- The target final field vacuum after 24 hours will be approximately -5 inches of mercury. Samples with a final field vacuum of greater than -10 inches of mercury, or equal to zero, will be flagged (usability of data will depend on sample volume and reporting limits that can be achieved).

- Samples must be collected, using conventional sampling methods, in an appropriate container — one which meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory;

- Sample size depends upon the volume of sample required to achieve minimum reporting limit requirements; and

- A tracer gas (e.g., helium, butane, or sulfur hexafluoride) must be used when collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring) (discussed later in this procedure). Once verified, continued use of the tracer gas may be reconsidered.

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

- If sampling near a commercial or industrial building, uses of volatile chemicals during normal operations of the facility should be identified;

- Outdoor plot sketches should be drawn that include the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor ambient air sample locations (if applicable), and compass orientation (north);

- Weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed and direction) should be noted for the past 24 to 48 hours; and

- Any pertinent observations should be recorded, such as odors and readings from field instrumentation.

The field sampling team must maintain a sample log sheet summarizing the following:

- Sample identification,
- Date and time of sample collection,
- Sampling depth,
- Identity of samplers,
- Sampling methods and devices,
- Purge volumes,
- Volume of soil vapor extracted,
- If canisters used, the vacuum before and after samples collected,
- Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
- Chain of custody protocols and records used to track samples from sampling point to analysis.

SUB-SLAB VAPOR SAMPLE COLLECTION PROCEDURES

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. Prior to installation of the sub-slab vapor probe, the building floor should be inspected and any penetrations (cracks, floor drains, utility perforations, sumps, etc.) should be noted and recorded. Probes should be installed at locations where the potential for ambient air infiltration via floor penetrations is minimal.

Sub-slab vapor probe installations (see Figure 5 attached) may be permanent, semi-permanent, or temporary. Sub-slab implants or probes should be constructed in the same manner at all sampling locations to minimize possible discrepancies. The following procedures should be included in any construction protocol:

- Permanent recessed probes must be constructed with brass or stainless steel tubing and fittings;
- Temporary probes must be constructed with polyethylene or Teflon® tubing of laboratory or food grade quality;
- Tubing should not extend further than 2 inches into the sub-slab material;
- Coarse sand or glass beads should be added to cover about 1 inch of the probe tip for permanent installations; and
- The soil vapor probe should be sealed to the surface with permagum grout, melted beeswax, putty or other non-VOC-containing and non-shrinking products for temporary installations or cement for permanent installations.

Sub-slab vapor samples should be collected in the following manner:

- After installation of the probes, one to three volumes (i.e., the volume of the sample probe and tube) must be purged prior to collecting the samples to ensure samples collected are representative;
- Flow rates for both purging and collecting must not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling;
- The target final field vacuum after 24 hours will be approximately -5 inches of mercury. Samples with a final field vacuum of greater than -10 inches of mercury,

or equal to zero, will be flagged (usability of data will depend on sample volume and reporting limits that can be achieved).

- Samples must be collected, using conventional sampling methods, in an appropriate container — one which meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory;
- Sample size depends upon the volume of sample required to achieve minimum reporting limit requirements [Section 2.9 of the Guidance], the flow rate, and the sampling duration; and
- Ideally, samples should be collected over the same period of time as concurrent indoor and outdoor air samples.

When sub-slab vapor samples are collected, the following actions should be taken to document conditions during sampling and ultimately to aid in the interpretation of the sampling results:

- If sampling within a commercial or industrial building, uses of volatile chemicals in commercial or industrial processes and/or during building maintenance, should be identified;
- The use of heating or air conditioning systems during sampling should be noted;
- Floor plan sketches should be drawn that include the floor layout with sample locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system air supply and return registers, compass orientation (north), and any other pertinent information should be completed;
- If possible, photographs should accompany floor plan sketches;
- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sample locations (if applicable), compass orientation (north), footings that create separate foundation sections, and paved areas;
- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., heating system active and windows closed) should be reported;

- Smoke tubes or other devices should be used to confirm pressure relationships and air flow patterns, especially between floor levels and between suspected contaminant sources and other areas; and
- Any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppb RAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

The field sampling team must maintain a sample log sheet summarizing the following:

- Sample identification,
- Date and time of sample collection,
- Sampling depth,
- Identity of samplers,
- Sampling methods and devices,
- Soil vapor purge volumes,
- Volume of soil vapor extracted,
- If canisters used, the vacuum before and after samples collected,
- Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and
- Chain of custody protocols and records used to track samples from sampling point to analysis.

The following describes the subslab air sampling procedure:

1. Canisters will be supplied by the laboratory that will be conducting the analysis.

2. Sampling will take place in accordance with the project work plan sufficiently spaced to allow locations to be modified, if necessary.

3. The number of Summa canisters required as well as the flow rate of the constant differential low volume flow controllers will be supplied by the laboratory in accordance with the project work plan.

4. The sampling program will consist of concurrently collecting and analyzing one sub-slab vapor sample and one indoor ambient air sample (discussed in

the next section). Sample locations should be selected based on the likelihood for potential continuous human occupancy during the workday (i.e., due to the size of the areas and available infrastructure), and to account for the possibility of varying foundation depths in different areas of the building. In addition, sample locations typically are based upon the results of a subsurface investigation (i.e., soil gas survey or boring advancement) conducted prior to air sample collection activities. Canisters are typically placed in areas where the highest concentrations of soil gas were observed. Indoor air sample locations preferably should be selected near the middle of the sampled room, well away from the edges where dilution is more likely to occur.

5. Collect at least one outdoor ambient air sample from a location on the building roof or designated background area of the site positioned away from building ventilation system equipment on the highest portion of the building roof or site. See the Outdoor Ambient Air Sampling Procedure section in this procedure.

6. Field personnel should assure conservative sampling conditions prior to and throughout the sampling event. The building should be closed (windows and doors shut) and existing building ventilation systems should be turned off 12 to 24 hours before the air sampling is scheduled to begin as well as during sample collection. Any air-handling units that may induce large pressure gradients (i.e., exhaust fans, HVAC units etc.) should also be turned off.

7. Any activity being conducted by current building tenants involving volatile organic compounds, such as the use of lacquer thinner and cleaning solvents, prior to and/or during air sampling activities should be noted in the Project Field Book. These activities have the potential to bias the analytical results.

8. At each location, drill an approximately ¾-inch diameter hole through the concrete slab (typically 6-8 inches thick) using a hand-held hammer drill.

9. Measure and record the concrete thickness in the Project Field Book.

10. Insert polyethylene or Teflon® tubing of laboratory or food grade quality into the drilled hole and <u>no further than 2 inches</u> into the subslab material.

11. Seal the tubing with an appropriately sized volatile organic compound-free stopper (i.e., permagum grout, melted beeswax, putty, or other non-VOC-containing and non-shrinking product) into the concrete core hole and secure in-place making sure the fit is very snug. Supplement any visible gaps between the stopper and concrete slab with a VOC-free sealant, such as beeswax or bentonite slurry.

12. Run the tubing assembly through a shroud (plastic pail, cardboard box, or garbage bag) creating a tight seal with the surface making sure not to disturb the seal around the tubing penetration.

13. Enrich the atmosphere of the shroud with helium. Measure and record the helium concentration within the shroud.

14. Purge approximately 1 to 3 tubing volumes (i.e., the volume of the sample probe and tube) using a hand pump (or similar approved device) to ensure the collection of a representative sample.

15. Flow rates for both purging and sample collection must not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling.

16. Use a portable monitoring device to analyze a sample of soil vapor for the tracer **prior to and after** sampling for the compounds of concern. Note that the tracer gas samples can be collected via syringe, Tedlar bag etc. They need not be collected in Summa® canisters or minicans.

17. If concentrations greater than 10% of tracer gas are observed either prior to and/or after sampling, the probe seal should be enhanced to reduce the infiltration of outdoor air. Following enhancement of the seal, repeat steps 14 through 17 above until purged concentrations are less than 10% of the tracer gas within the shroud.

18. Following tubing purge and adequate seal integrity testing via helium tracer gas, immediately attach a 6-liter Summa Canister fitted with a 24-hour regulator (or approved other duration) to the opposite end of the tubing.

Concurrent with each subslab sample location, prepare an indoor ambient air sample by staging a second Summa Canister on a ladder (approximately 2 to 5-feet above the floor) adjacent to the sub-slab sample location.

19. All Summa Canister valves should remain closed until all subslab borings are complete and all of the canisters in their respective positions.

20. Open the valves to all of the canisters for the required collection period (i.e., 24-hours). Record initial canister pressure on the Air Canister Field Record form.

21. Following sample collection and prior to closing canister valve, record final canister pressure on the Air Canister Field Record form. Close canister valve.

22. Collect all Summa Canisters and ship, under chain-of-custody command to an approved analytical laboratory for VOC analysis in accordance with USEPA Method TO-14 or TO-15.

23. Repair all concrete openings with a cement patch.

24. Analytical results submitted by the laboratory should be reported as concentrations of each VOC at each location, typically in parts per billion by volume (ppbv).

INDOOR AIR SAMPLE COLLECTION PROCEDURES

During colder months, heating systems should be operating to maintain normal indoor air temperatures (i.e., 65 – 75 °F) for at least 24 hours prior to and during the scheduled sampling time. If possible, prior to collecting indoor samples, a pre-sampling inspection, discussed earlier in this procedure, should be performed to evaluate the physical layout and conditions of the building being investigated, to identify conditions that may affect or interfere with the proposed sampling, and to prepare the building for sampling.

In general, indoor air samples should be collected in the following manner:

- Sampling duration should reflect the exposure scenario being evaluated without compromising the detection limit or sample collection flow rate (e.g., an 8 hour sample from a workplace with a single shift versus a 24 hour sample from a workplace with multiple shifts). To ensure that air is representative of the locations sampled and to avoid undue influence from sampling personnel, samples should be collected for at least 1 hour. If the goal of the sampling is to represent average concentrations over longer periods, then longer duration sampling periods may be appropriate. Typically, 24 hour samples are collected from residential settings;

- Personnel should avoid lingering in the immediate area of the sampling device while samples are being collected;

- Sample flow rates must conform to the specifications in the sample collection method and, if possible, should be consistent with the flow rates for concurrent outdoor air and sub-slab samples;

- The target final field vacuum after 24 hours will be approximately -5 inches of mercury. Samples with a final field vacuum of greater than -10 inches of mercury, or equal to zero, will be flagged (usability of data will depend on sample volume and reporting limits that can be achieved); and

- Samples must be collected, using conventional sampling methods, in an appropriate container — one which meets the objectives of the sampling (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photodegradation), meets the requirements of the sampling and analytical methods (e.g., low flow rate; Summa® canisters if analyzing by using EPA Method TO-15), and is certified clean by the laboratory.

At sites with tetrachloroethene contamination, passive air monitors that are specifically analyzed for tetrachloroethene (i.e., "perc badges") are commonly used to collect indoor and outdoor air samples. If site characterization activities indicate that degradation products of tetrachloroethene also represent a vapor intrusion concern, perc badges may be used to indicate the likelihood of vapor intrusion (i.e., by using tetrachloroethene as a surrogate) followed, as needed, by more comprehensive sampling and laboratory analyses to quantify both tetrachloroethene and its degradation products. Perc badge samples ideally should be collected over a twenty-four hour period, but for no less than eight hours.

The following actions should be taken to document conditions during indoor air sampling and ultimately to aid in the interpretation of the sampling results:

- A product inventory survey must be completed (discussed earlier);
- The use of heating or air conditioning systems during sampling should be noted;
- Floor plan sketches should be drawn that include the floor layout with sample locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system supply and return registers, compass orientation (north), and any other pertinent information should be completed;
- If possible, photographs should accompany floor plan sketches;
- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sample locations (if applicable), compass orientation (north), footings that create separate foundation sections, and paved areas;
- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., heating system active and windows closed) should be reported;
- Smoke tubes or other devices should be used to confirm pressure relationships and air flow patterns, especially between floor levels and between suspected contaminant sources and other areas; and

- Any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppb RAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

The field sampling team must maintain a sample log sheet summarizing the following:

- Sample identification,
- Date and time of sample collection,
- Sampling height,
- Identity of samplers,
- Sampling methods and devices,
- Depending upon the method, volume of air sampled,
- If canisters used, the vacuum before and after samples collected,
- Chain of custody protocols and records used to track samples from sampling point to analysis.

The following describes the indoor air sampling procedure:

1. Canisters will be supplied by the laboratory that will be conducting the analysis.

2. Sampling will take place in accordance with the project work plan sufficiently spaced to allow locations to be modified, if necessary.

3. The number of Summa canisters required as well as the flow rate of the constant differential low volume flow controllers will be supplied by the laboratory in accordance with the project work plan. Indoor air sampling typically requires the continuous collection of samples over a 24-hour period.

4. The sampling program will consist of concurrently collecting and analyzing one sub-slab vapor sample and one indoor ambient air sample. Sample locations should be selected based on the likelihood for potential continuous human occupancy during the workday (i.e., due to the size of the areas and available infrastructure), and to account for the possibility of varying foundation depths in different areas of the building. In addition, sample locations typically are based upon the results of a subsurface investigation (i.e.,

soil gas survey or boring advancement) conducted prior to air sample collection activities. Canisters are typically placed in areas where the highest concentrations of soil gas were observed. Indoor air sample locations preferably should be selected near the middle of the sampled room, well away from the edges where dilution is more likely to occur.

5. Collect at least one outdoor ambient air sample from a location on the building roof or designated background area of the site positioned away from building ventilation system equipment on the highest portion of the building roof or site. See the Outdoor Ambient Air Sampling Procedure presented in this procedure.

6. Field personnel should assure conservative sampling conditions prior to and throughout the sampling event. The building should be closed (windows and doors shut) and existing building ventilation systems should be turned off 12 to 24 hours before the air sampling is scheduled to begin as well as during sample collection. Any air-handling units that may induce large pressure gradients (i.e., exhaust fans, HVAC units etc.) should also be turned off.

7. Any activity being conducted by current building tenants involving volatile organic compounds, such as the use of lacquer thinner and cleaning solvents, prior to and/or during air sampling activities should be noted in the Project Field Book. These activities have the potential to bias the analytical results.

8. Concurrent with each subslab sample location, prepare an indoor ambient air sample by staging a second Summa Canister on a ladder (approximately 2 to 5-feet above the floor) adjacent to the sub-slab sample location.

9. All Summa Canister valves should remain closed until all subslab borings are complete and all of the canisters in their respective positions.

10. Open the valves to all of the canisters for the required collection period (i.e., 24-hours). Record initial canister pressure on the Air Canister Field Record form.

11. Following sample collection and prior to closing canister valve, record final canister pressure on the Air Canister Field Record form. Close canister valve.

12. Collect all Summa Canisters and ship, under chain-of-custody command to an approved analytical laboratory for VOC analysis in accordance with USEPA Method TO-14 or TO-15.

13. Analytical results submitted by the laboratory should be reported as concentrations of each VOC at each location, typically in parts per billion by volume (ppbv).

OUTDOOR AIR SAMPLE COLLECTION PROCEDURES

Outdoor air samples must be collected simultaneously with indoor air samples and may be collected concurrently with subsurface vapor samples. Outdoor air samples must be collected in the same manner as indoor samples.

The following actions should be taken to document conditions during outdoor air sampling and ultimately to aid in the interpretation of the sampling results:

- Outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sample locations (if applicable), the location of potential interferences (e.g., gasoline stations, factories, lawn movers, etc.), compass orientation (north), footings that create separate foundation sections, and paved areas;

- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and

- Any pertinent observations, such as odors, readings from field instrumentation, and significant activities in the vicinity (e.g., operation of heavy equipment or dry cleaners) should be recorded.

The following describes the outdoor air sampling procedure:

FOP 004.7

SOIL VAPOR SAMPLE COLLECTION PROCEDURE

1. Canisters will be supplied by the laboratory that will be conducting the analysis.

2. Sampling will take place in accordance with the project work plan sufficiently spaced to allow locations to be modified, if necessary.

3. The number of Summa canisters required as well as the flow rate of the constant differential low volume flow controllers will be supplied by the laboratory in accordance with the project work plan.

4. Sample locations typically are collected upwind of the facility.

5. Collect at least one outdoor ambient air sample from a location on the building roof or designated background area of the site positioned away from building ventilation system equipment on the highest portion of the building roof or site. Place canisters on the ground or step ladder, with a clear plastic sheet beneath to prevent contamination. Locate the sampling inlet approximately 18-inches above the ground surface.

6. Sample collection should take place on warm, dry days. If rain or high humidity conditions develop during sampling, the sampling event should be suspended. Temperature, barometric pressure, and wind speed should be monitored during the sampling event, for use in analysis of the results.

7. The combination of sampling location, height, and meteorological conditions will assure that sampling will measure VOCs at their highest concentrations.

8. All Summa Canister valves should remain closed until all subslab borings are complete and all of the indoor and outdoor canisters in their respective positions.

9. Open the valves to all of the canisters for the required collection period (i.e., 24-hours). Record initial canister pressure on the Air Canister Field Record form.

10. Following sample collection and prior to closing canister valve, record final canister pressure on the Air Canister Field Record form. Close canister valve.

11. Collect all Summa Canisters and ship, under chain-of-custody command to an approved analytical laboratory for VOC analysis in accordance with USEPA Method TO-14 or TO-15.

12. Air samples will be analyzed by Gas Chromatography/Mass Spectroscopy (GC/MS) in accordance with EPA Method TO-14 or TO-15.

13. Analytical results will be reported as concentrations of each VOC at each location during each sampling event, typically in parts per billion by volume (ppbv).

TRACER GAS

When collecting soil vapor samples as part of a vapor intrusion evaluation, a tracer gas serves as a quality assurance/quality control device to verify the integrity of the soil vapor probe seal. Without the use of a tracer, there is no way to verify that a soil vapor sample has not been diluted by surface air.

Depending on the nature of the contaminants of concern, a number of different compounds can be used as a tracer. Typically, sulfur hexafluoride (SF6) or helium are used as tracers because they are readily available, have low toxicity, and can be monitored with portable measurement devices. Butane and propane (or other gases) could also be used as a tracer in some situations. The protocol for using a tracer gas is straightforward: simply enrich the atmosphere in the immediate vicinity of the area where the probe intersects the ground surface with the tracer gas, and measure a vapor sample from the probe for the presence of high concentrations (> 10%) of the tracer. A cardboard box, a plastic pail, or even a garbage bag can serve to keep the tracer gas in contact with the probe during the testing.

There are two basic approaches to testing for the tracer gas:

- Include the tracer gas in the list of target analytes reported by the laboratory; or
- Use a portable monitoring device to analyze a sample of soil vapor for the tracer prior to and after sampling for the compounds of concern. (Note that the tracer gas samples can be collected via syringe, Tedlar bag etc. They need not be collected in Summa® canisters or minicans.)

The advantage of the second approach is that the real time tracer sampling results can be used to confirm the integrity of the probe seals prior to formal sample collection. Figure 6 (attached) depicts common methods for using tracer gas. In each of the examples, a, b and c, the tracer gas is released in the enclosure prior to initially purging the sample point. Care should be taken to avoid excessive purging prior to sample collection. Care should also be taken to prevent pressure build-up in the enclosure during introduction of the tracer gas. Inspection of the installed sample probe, specifically noting the integrity of the surface seal and the porosity of the soil in which the probe is installed, will help to determine the tracer gas setup. Figure 6(a) may be most effective at preventing tracer gas infiltration; however, it may not be required in some situations depending on site-specific conditions. Figures 6(b) and 6(c) may be sufficient for probes installed in tight soils with well-constructed surface seals. In all cases, the same tracer gas application should be used for all probes at any given site.

Because minor leakage around the probe seal should not materially affect the usability of the soil vapor sampling results, the mere presence of the tracer gas in the sample should not be a cause for alarm. Consequently, portable field monitoring devices with detection limits in the low ppm range are more than adequate for screening samples for the tracer. If high concentrations (> 10%) of tracer gas are observed in a sample, the probe seal should be enhanced to reduce the infiltration of ambient air.

During the initial stages of a soil vapor sampling program, tracer gas samples should be collected at each of the sampling probes. If the results of the initial samples indicate that the probe seals are adequate, the project manager can consider reducing the number of locations at which tracer gas samples are employed. At a minimum, at least 10% of the subsequent samples should be supported with tracer gas analyses. When using permanent soil vapor probes as part of a long-term monitoring program, annual testing of the probe integrity is recommended.

QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

Extreme care should be taken during all aspects of sample collection to ensure that sampling error is minimized and high quality data are obtained. The sampling team members should avoid actions (e.g., fueling vehicles, using permanent marking pens, and wearing freshly dry-cleaned clothing or personal fragrances), which can cause sample interference in the field. Appropriate QA/QC protocols must be followed for sample collection and laboratory analysis, such as use of certified clean sample devices, meeting sample holding times and temperatures, sample accession, chain of custody, etc. Samples should be delivered to the analytical laboratory as soon as possible after collection. In addition, laboratory accession procedures must be followed including field documentation (sample collection information and locations), chain of custody, field blanks, field sample duplicates, and laboratory duplicates, as appropriate.

Some methods require collecting samples in duplicate (e.g., indoor air sampling using passive sampling devices for tetrachloroethene) to assess errors. Duplicate and/or split samples should be collected in accordance with the requirements of the sampling and analytical methods being implemented.

For certain regulatory programs, a Data Usability Summary Report (DUSR) may be required to determine whether or not the data, as presented, meets the site or project specific criteria for data quality and data use. This requirement may dictate the level of QC and the category of data deliverable to request from the laboratory. Guidance on preparing a DUSR is available by contacting the NYSDEC's Division of Environmental Remediation.

New York State Public Health Law requires laboratories analyzing environmental samples collected from within New York State to have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. If ELAP certification is not currently required for an analyte (e.g., trichloroethene), the analysis should be performed by a laboratory that has ELAP certification for similar compounds in air and uses analytical methods with detection limits similar to background (e.g., tetrachloroethene via EPA Method TO-15).

The work plan must state that all samples that will be used to make decisions on appropriate actions to address exposures and environmental contamination will be analyzed by an ELAP-certified laboratory. If known, the name of the laboratory should also be provided. Similarly, the name of the laboratory that was used must be included in the report of the sampling results. For samples collected and tested in the field for screening purposes by using field testing technology, the qualifications of the field technician must be documented in the work plan.

The target final field vacuum of any sample canister after 24 hours will be approximately -5 inches of mercury. Samples with a final field vacuum of greater than -10 inches of mercury, or equal to zero, will be flagged (usability of data will depend on sample volume and reporting limits that can be achieved).

DECISION MATRICES (FIGURES 1 THROUGH 6)

The considerations in assigning a chemical to a matrix include the following:

- Human health risks, including such factors as a chemical's ability to cause cancer, reproductive, developmental, liver, kidney, nervous system, immune system or other effects, in animals and humans and the doses that may cause those effects;
- The data gaps in its toxicological database;
- Background concentrations of volatile chemicals in indoor air [Section 3.2.4]; and
- Analytical capabilities currently available.

To use the matrices accurately as a tool in the decision-making process, the following must be noted:

- The matrices are generic. As such, it may be necessary to modify recommended actions to accommodate building-specific conditions (e.g., dirt floor in basement, crawl spaces, etc.) and/or site-specific conditions (e.g., proximity of building to identified subsurface contamination) for the protection of public health. Additionally, actions more conservative than those specified within the matrix may be implemented at any time. For example, the decision to implement more conservative actions may be based on a comparison of the costs associated with resampling or monitoring to the costs associated with installation and monitoring of a mitigation system.
- Indoor air concentrations detected in samples collected from the building's basement or, if the building has a slab-on-grade foundation, from the building's lowest occupied living space should be used.
- Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude the need to investigate possible sources of vapor contamination, nor does it preclude the need to remediate contaminated soil vapors or the source of soil vapor contamination.

- When current exposures are attributed to sources other than vapor intrusion, the agencies must be provided documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix and to support assessment and follow-up by the agencies.

RECOMMENDED ACTIONS

Actions recommended in the matrix are based on the relationship between sub-slab vapor concentrations and corresponding indoor air concentrations. They are intended to address both potential and current human exposures and include the following:

- *No further action*
  When the volatile chemical is not detected in the indoor air sample and the concentration detected in the corresponding sub-slab vapor sample is not expected to substantially affect indoor air quality.

- *Identify source(s) and resample or mitigate*
  Reasonable and practical actions are recommended to identify the source(s) affecting indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. The concentration detected in the indoor air sample is likely due to indoor and/or outdoor sources rather than soil vapor intrusion given the concentration detected in the sub-slab vapor sample. Resampling may be required in the event indoor and/or outdoor sources are not readily identified or confirmed to demonstrate SVI mitigation actions are not needed. Steps should be taken to identify potential source(s) and to reduce exposures accordingly (e.g., by keeping containers tightly capped or by storing volatile chemical-containing products in places where people do not spend much time, such as a garage or shed). Mitigation may be required if soil vapor intrusion cannot be ruled out.

- *Monitor*
  Monitoring, including sub-slab vapor, basement air, lowest occupied living space air, and outdoor air sampling, is needed to determine whether concentrations in

the indoor air or sub-slab vapor have changed. Monitoring may also be needed to determine whether existing building conditions (e.g., positive pressure HVAC systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined on a site-specific and building specific basis, taking into account applicable environmental data and building operating conditions.

- *Mitigate*
  Mitigation is needed to minimize current or potential exposures associated with soil vapor intrusion. Methods to mitigate exposures related to soil vapor intrusion are described in Section 4 of the Guidance.

TIME OF YEAR

Sub-slab vapor samples and, unless there is an immediate need for sampling, indoor air samples are typically collected during the heating season because soil vapor intrusion is more likely to occur when a building's heating system is in operation and air is being drawn into the building. In general, heating systems are expected to be operating routinely from November 15th to March 31st throughout the state. However, this timeframe may vary depending on factors, such as the location of the site (e.g., upstate versus downstate) and the weather conditions for a particular year.

A vapor intrusion investigation may also be conducted outside of the heating season. However, the results may not be used to rule out exposures. For example, results indicating "no further action" or "monitoring required" must be verified during the heating season to ensure these actions are protective during the heating season as well.

SAMPLING ROUNDS

Investigating a soil vapor intrusion pathway usually requires more than one round of subsurface vapor, indoor air, and/or outdoor air sampling, for reasons such as the following:

- To characterize the nature and extent of subsurface vapor contamination (similar to the delineation of groundwater contamination) and to address corresponding exposure concerns;

- To evaluate fluctuations in concentrations due to
    - Different weather conditions (e.g., seasonal effects),
    - Changes in building conditions (e.g., various operating conditions of a building's HVAC system),
    - Changes in source strength, or
    - Vapor migration or contaminant biodegradation processes (particularly when degradation products may be more toxic than the parent compounds); or
- To confirm sampling results or the effectiveness of mitigation or remedial systems.

Overall, successive rounds of sampling are conducted until the following questions can be answered:

- Are subsurface vapors contaminated? If so, what are the nature and extent of contamination? What is/are the source(s) of the contamination?
- What are the current and potential exposures to contaminated subsurface vapors?
- What actions, if any, are needed to prevent or mitigate exposures and to remediate subsurface vapor contamination?

Toward this end, multiple rounds of sampling may be required to characterize the nature and extent of subsurface vapor contamination such that

- Both potential and current exposures are adequately addressed;
- Measures can be designed to remediate subsurface vapor contamination, either directly (e.g., SVE system) or indirectly (e.g., soil excavation or groundwater remediation), given that monitoring and mitigation are considered temporary measures implemented to address exposures related to vapor intrusion until contaminated environmental media are remediated; and
- The effectiveness of remedial measures can be monitored and confirmed (e.g., endpoint sampling).

ATTACHMENTS

Figure 1	*Soil Vapor/Indoor Air Matrix A*
Figure 2	*Soil Vapor/Indoor Air Matrix B*
Figure 3	*Soil Vapor/Indoor Air Matrix C*
Figure 4	*Soil Vapor/Indoor Air Matrix D*
Figure 5	*Soil Vapor/Indoor Air Matrix E*
Figure 6	*Soil Vapor/Indoor Air Matrix F*
Figure 7	*Schematics of a permanent soil vapor probe and permanent nested soil vapor probes*
Figure 8	*Schematic of a sub-slab vapor probe*
Figure 9	*Schematics of tracer gas applications*

Air Canister Field Record

Indoor Air Quality Questionnaire and Building Inventory

REFERENCES

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

New York State Department of Health, *Indoor Air Sampling & Analysis Guidance.* (February 1, 2005).

Office of Solid Waste and Emergency Response (OSWER). *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance).* November 2002.

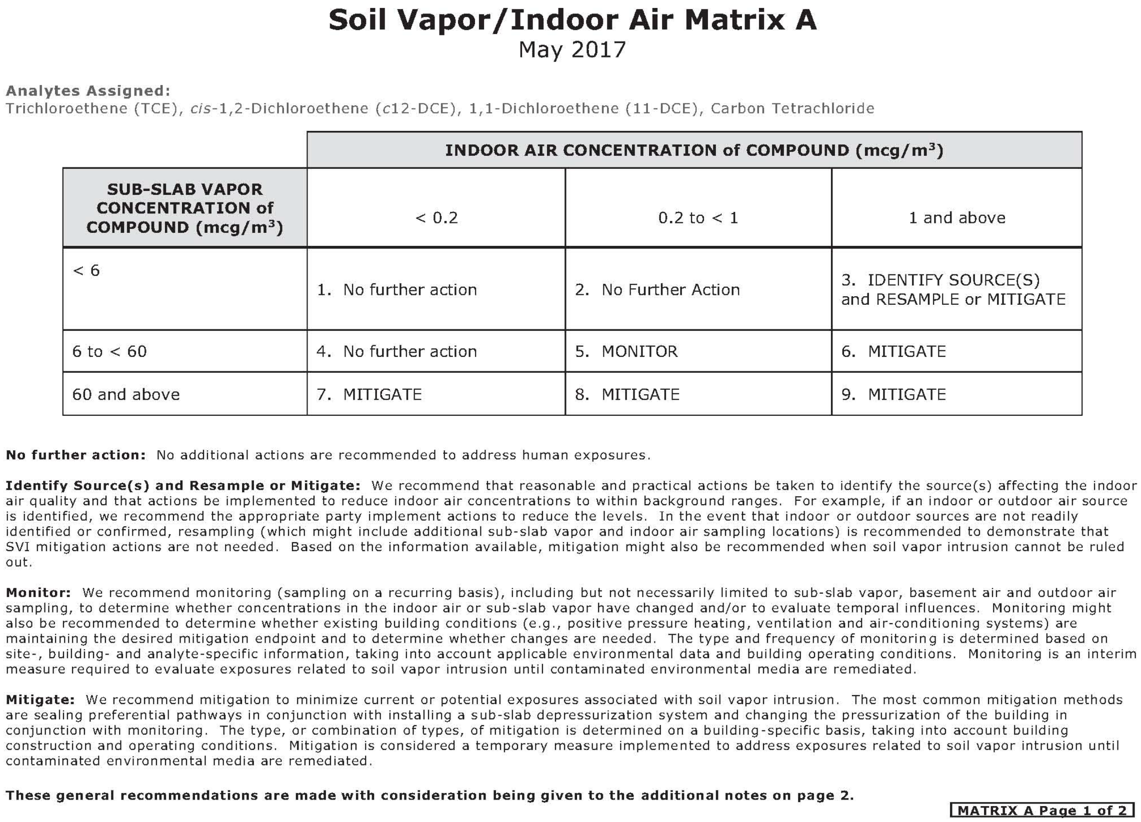
United States Environmental Protection Agency. *EPA Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air.* 1988

- Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). Pp. 15-1 through 15-62.

- Method TO-17, Determination of Volatile Organic Compounds in Ambient Air using Active Sampling on Sorbent Tubes. Pp. 17-1 through 17-49.

- Compendium of Methods for the Determination of Air Pollutants in Indoor Air, EPA/600/4-90-010.

FIGURE 1



Soil Vapor/Indoor Air Matrix A

May 2017

Analytes Assigned:
Trichloroethene (TCE), *cis*-1,2-Dichloroethene (*c*12-DCE), 1,1-Dichloroethene (11-DCE), Carbon Tetrachloride

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m^3)		
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m^3)	< 0.2	0.2 to < 1	1 and above
< 6	1. No further action	2. No Further Action	3. IDENTIFY SOURCE(S) and RESAMPLE or MITIGATE
6 to < 60	4. No further action	5. MONITOR	6. MITIGATE
60 and above	7. MITIGATE	8. MITIGATE	9. MITIGATE

No further action: No additional actions are recommended to address human exposures.

Identify Source(s) and Resample or Mitigate: We recommend that reasonable and practical actions be taken to identify the source(s) affecting the indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. For example, if an indoor or outdoor air source is identified, we recommend the appropriate party implement actions to reduce the levels. In the event that indoor or outdoor sources are not readily identified or confirmed, resampling (which might include additional sub-slab vapor and indoor air sampling locations) is recommended to demonstrate that SVI mitigation actions are not needed. Based on the information available, mitigation might also be recommended when soil vapor intrusion cannot be ruled out.

Monitor: We recommend monitoring (sampling on a recurring basis), including but not necessarily limited to sub-slab vapor, basement air and outdoor air sampling, to determine whether concentrations in the indoor air or sub-slab vapor have changed and/or to evaluate temporal influences. Monitoring might also be recommended to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined based on site-, building- and analyte-specific information, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

Mitigate: We recommend mitigation to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

These general recommendations are made with consideration being given to the additional notes on page 2.

MATRIX A Page 1 of 2

ADDITIONAL NOTES FOR MATRIX A

This matrix summarizes actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate analyte-specific, building-specific conditions (e.g., dirt floor in basement, crawl spaces, thick slabs, current occupancy, etc.), and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, collection of additional samples may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Mitigation might be recommended when the results of multiple contaminants indicate monitoring is recommended. Proactive actions may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action might be undertaken for reasons other than public health (e.g., seeking community acceptance, reducing costs, etc.). However, actions implemented *in lieu* of sampling will typically be expected to be captured in the final engineering report and site management plan, and might not rule out the need for post-implementation sampling (e.g., to document effectiveness or to support terminating the action).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of soil vapor contamination, nor does it preclude remediating contaminated soil vapor or the source of soil vapor contamination.

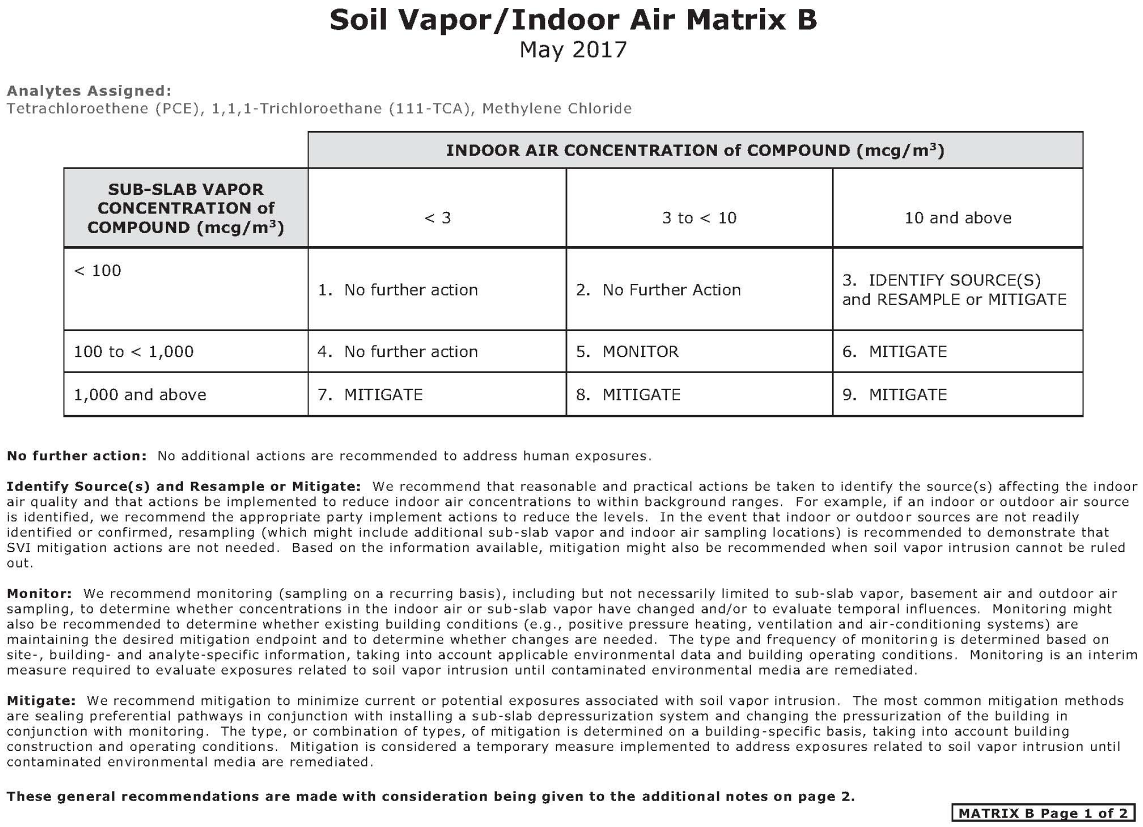
[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 0.20 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples and dirt floor soil vapor samples, a minimum reporting limit of 1 microgram per cubic meter is recommended.

[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions might be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including but not limited to the following: the identified source of the volatile chemicals, the environmental remediation program, and analyte-specific, site-specific and building-specific factors.

FIGURE 2



Soil Vapor/Indoor Air Matrix B

May 2017

Analytes Assigned:
Tetrachloroethene (PCE), 1,1,1-Trichloroethane (111-TCA), Methylene Chloride

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m³)		
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m³)	< 3	3 to < 10	10 and above
< 100	1. No further action	2. No Further Action	3. IDENTIFY SOURCE(S) and RESAMPLE or MITIGATE
100 to < 1,000	4. No further action	5. MONITOR	6. MITIGATE
1,000 and above	7. MITIGATE	8. MITIGATE	9. MITIGATE

No further action: No additional actions are recommended to address human exposures.

Identify Source(s) and Resample or Mitigate: We recommend that reasonable and practical actions be taken to identify the source(s) affecting the indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. For example, if an indoor or outdoor air source is identified, we recommend the appropriate party implement actions to reduce the levels. In the event that indoor or outdoor sources are not readily identified or confirmed, resampling (which might include additional sub-slab vapor and indoor air sampling locations) is recommended to demonstrate that SVI mitigation actions are not needed. Based on the information available, mitigation might also be recommended when soil vapor intrusion cannot be ruled out.

Monitor: We recommend monitoring (sampling on a recurring basis), including but not necessarily limited to sub-slab vapor, basement air and outdoor air sampling, to determine whether concentrations in the indoor air or sub-slab vapor have changed and/or to evaluate temporal influences. Monitoring might also be recommended to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined based on site-, building- and analyte-specific information, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

Mitigate: We recommend mitigation to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

These general recommendations are made with consideration being given to the additional notes on page 2.

MATRIX B Page 1 of 2

ADDITIONAL NOTES FOR MATRIX B

This matrix summarizes actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate analyte-specific, building-specific conditions (e.g., dirt floor in basement, crawl spaces, thick slabs, current occupancy, etc.), and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, collection of additional samples may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Mitigation might be recommended when the results of multiple contaminants indicate monitoring is recommended. Proactive actions may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action might be undertaken for reasons other than public health (e.g., seeking community acceptance, reducing costs, etc.). However, actions implemented *in lieu* of sampling will typically be expected to be captured in the final engineering report and site management plan, and might not rule out the need for post-implementation sampling (e.g., to document effectiveness or to support terminating the action).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of soil vapor contamination, nor does it preclude remediating contaminated soil vapor or the source of soil vapor contamination.

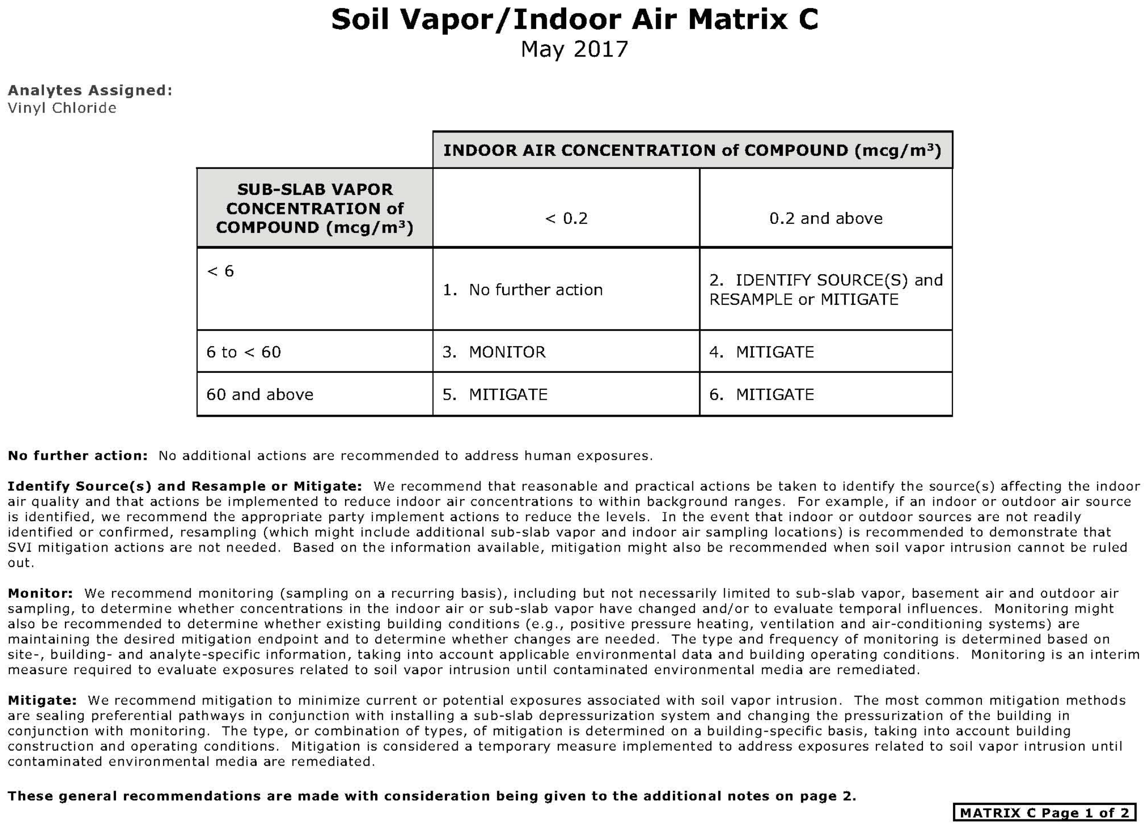
[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 1 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples and dirt floor soil vapor samples, a minimum reporting limit of 1 microgram per cubic meter is recommended.

[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions might be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including but not limited to the following: the identified source of the volatile chemicals, the environmental remediation program, and analyte-specific, site-specific and building-specific factors.

FIGURE 3



Soil Vapor/Indoor Air Matrix C

May 2017

Analytes Assigned:
Vinyl Chloride

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m^3)	
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m^3)	< 0.2	0.2 and above
< 6	1. No further action	2. IDENTIFY SOURCE(S) and RESAMPLE or MITIGATE
6 to < 60	3. MONITOR	4. MITIGATE
60 and above	5. MITIGATE	6. MITIGATE

No further action: No additional actions are recommended to address human exposures.

Identify Source(s) and Resample or Mitigate: We recommend that reasonable and practical actions be taken to identify the source(s) affecting the indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. For example, if an indoor or outdoor air source is identified, we recommend the appropriate party implement actions to reduce the levels. In the event that indoor or outdoor sources are not readily identified or confirmed, resampling (which might include additional sub-slab vapor and indoor air sampling locations) is recommended to demonstrate that SVI mitigation actions are not needed. Based on the information available, mitigation might also be recommended when soil vapor intrusion cannot be ruled out.

Monitor: We recommend monitoring (sampling on a recurring basis), including but not necessarily limited to sub-slab vapor, basement air and outdoor air sampling, to determine whether concentrations in the indoor air or sub-slab vapor have changed and/or to evaluate temporal influences. Monitoring might also be recommended to determine whether existing building conditions (e.g., positive pressure heating, ventilation and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined based on site-, building- and analyte-specific information, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

Mitigate: We recommend mitigation to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building-specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

These general recommendations are made with consideration being given to the additional notes on page 2.

MATRIX C Page 1 of 2

ADDITIONAL NOTES FOR MATRIX C

This matrix summarizes actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate analyte-specific, building-specific conditions (e.g., dirt floor in basement, crawl spaces, thick slabs, current occupancy, etc.), and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, collection of additional samples may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Mitigation might be recommended when the results of multiple contaminants indicate monitoring is recommended. Proactive actions may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action might be undertaken for reasons other than public health (e.g., seeking community acceptance, reducing costs, etc.). However, actions implemented *in lieu* of sampling will typically be expected to be captured in the final engineering report and site management plan, and might not rule out the need for post-implementation sampling (e.g., to document effectiveness or to support terminating the action).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of soil vapor contamination, nor does it preclude remediating contaminated soil vapor or the source of soil vapor contamination.

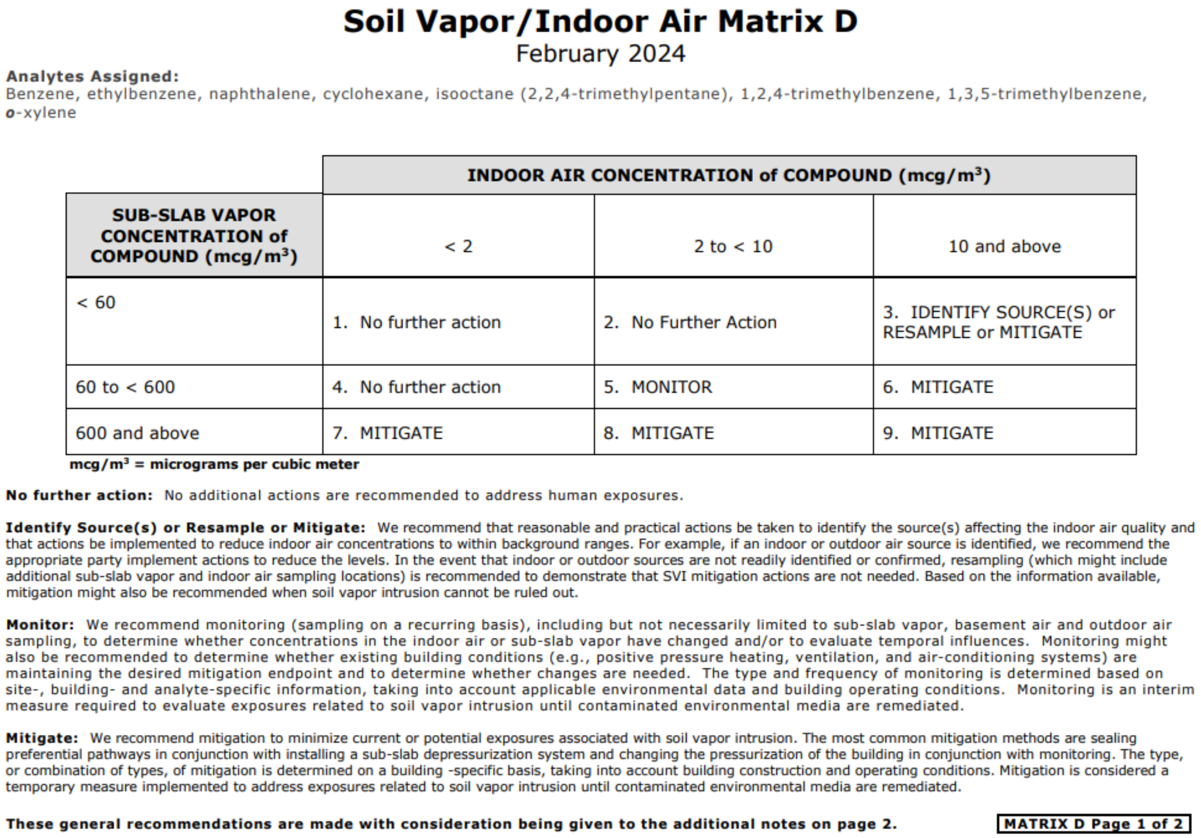
[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 0.20 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples and dirt floor soil vapor samples, a minimum reporting limit of 1 microgram per cubic meter is recommended.

[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions might be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including but not limited to the following: the identified source of the volatile chemicals, the environmental remediation program, and analyte-specific, site-specific and building-specific factors.

FIGURE 4



Soil Vapor/Indoor Air Matrix D

February 2024

Analytes Assigned:
Benzene, ethylbenzene, naphthalene, cyclohexane, isooctane (2,2,4-trimethylpentane), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ***o***-xylene

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m^3)		
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m^3)	< 2	2 to < 10	10 and above
< 60	1. No further action	2. No Further Action	3. IDENTIFY SOURCE(S) or RESAMPLE or MITIGATE
60 to < 600	4. No further action	5. MONITOR	6. MITIGATE
600 and above	7. MITIGATE	8. MITIGATE	9. MITIGATE

mcg/m^3 = micrograms per cubic meter

No further action: No additional actions are recommended to address human exposures.

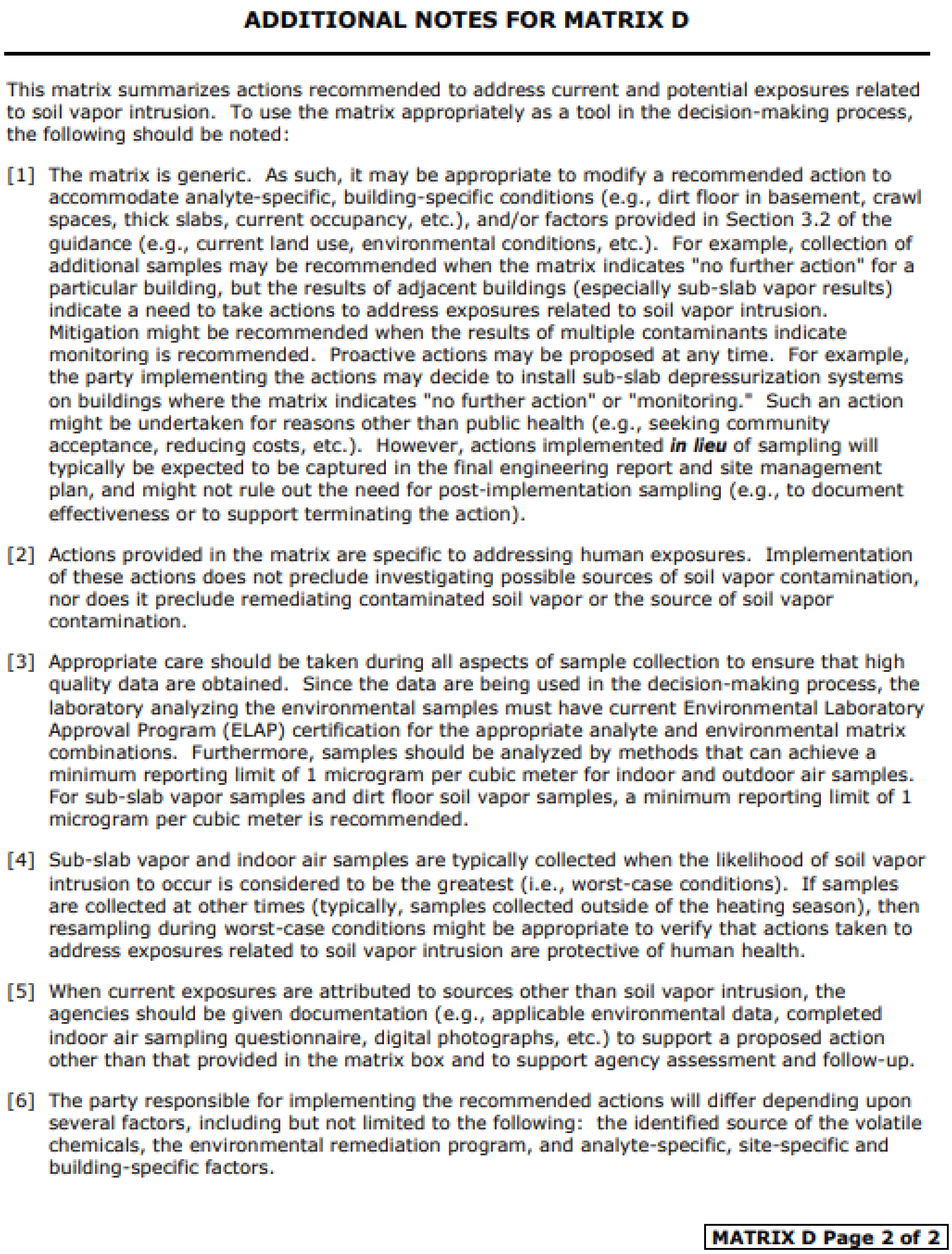
Identify Source(s) or Resample or Mitigate: We recommend that reasonable and practical actions be taken to identify the source(s) affecting the indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. For example, if an indoor or outdoor air source is identified, we recommend the appropriate party implement actions to reduce the levels. In the event that indoor or outdoor sources are not readily identified or confirmed, resampling (which might include additional sub-slab vapor and indoor air sampling locations) is recommended to demonstrate that SVI mitigation actions are not needed. Based on the information available, mitigation might also be recommended when soil vapor intrusion cannot be ruled out.

Monitor: We recommend monitoring (sampling on a recurring basis), including but not necessarily limited to sub-slab vapor, basement air and outdoor air sampling, to determine whether concentrations in the indoor air or sub-slab vapor have changed and/or to evaluate temporal influences. Monitoring might also be recommended to determine whether existing building conditions (e.g., positive pressure heating, ventilation, and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined based on site-, building- and analyte-specific information, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

Mitigate: We recommend mitigation to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building -specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

These general recommendations are made with consideration being given to the additional notes on page 2.

MATRIX D Page 1 of 2



ADDITIONAL NOTES FOR MATRIX D

This matrix summarizes actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate analyte-specific, building-specific conditions (e.g., dirt floor in basement, crawl spaces, thick slabs, current occupancy, etc.), and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, collection of additional samples may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Mitigation might be recommended when the results of multiple contaminants indicate monitoring is recommended. Proactive actions may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action might be undertaken for reasons other than public health (e.g., seeking community acceptance, reducing costs, etc.). However, actions implemented ***in lieu*** of sampling will typically be expected to be captured in the final engineering report and site management plan, and might not rule out the need for post-implementation sampling (e.g., to document effectiveness or to support terminating the action).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of soil vapor contamination, nor does it preclude remediating contaminated soil vapor or the source of soil vapor contamination.

[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 1 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples and dirt floor soil vapor samples, a minimum reporting limit of 1 microgram per cubic meter is recommended.

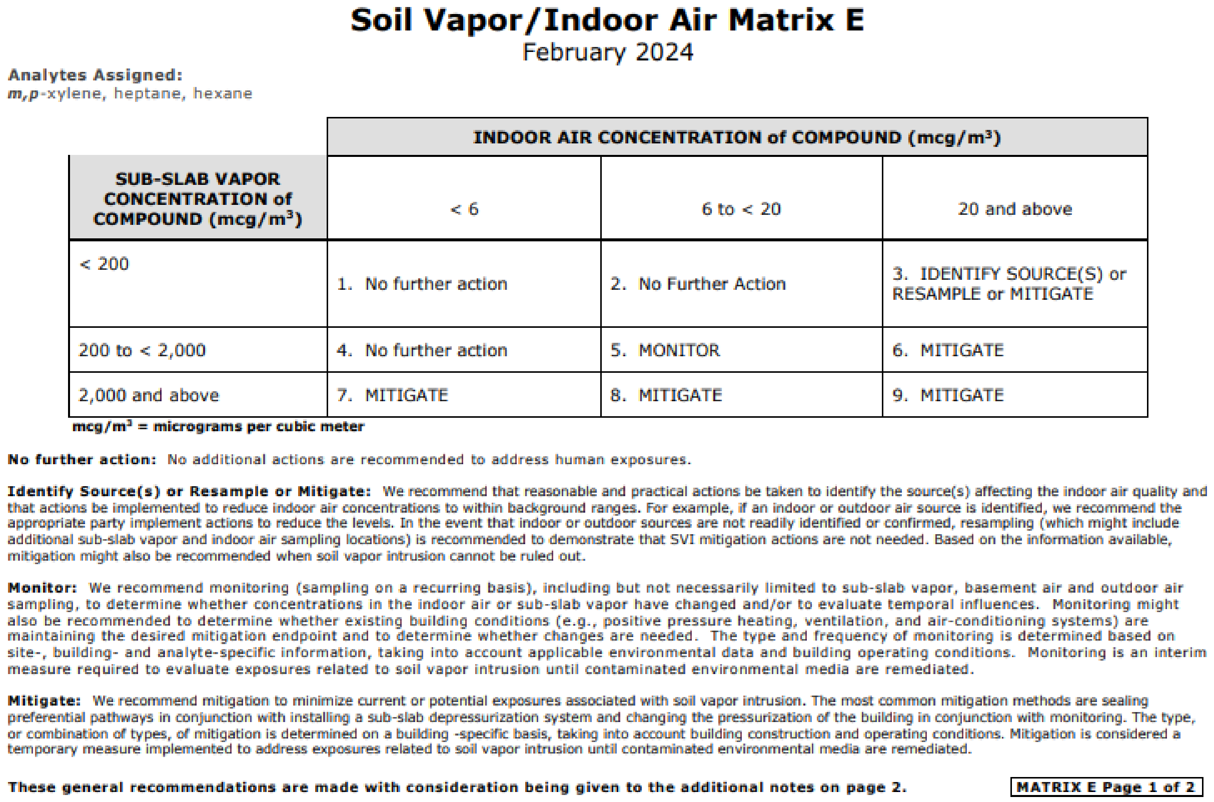
[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion to occur is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions might be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including but not limited to the following: the identified source of the volatile chemicals, the environmental remediation program, and analyte-specific, site-specific and building-specific factors.

MATRIX D Page 2 of 2

FIGURE 5



Soil Vapor/Indoor Air Matrix E

February 2024

Analytes Assigned:
m,p-xylene, heptane, hexane

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m^3)		
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m^3)	< 6	6 to < 20	20 and above
< 200	1. No further action	2. No Further Action	3. IDENTIFY SOURCE(S) or RESAMPLE or MITIGATE
200 to < 2,000	4. No further action	5. MONITOR	6. MITIGATE
2,000 and above	7. MITIGATE	8. MITIGATE	9. MITIGATE

mcg/m^3 = micrograms per cubic meter

No further action: No additional actions are recommended to address human exposures.

Identify Source(s) or Resample or Mitigate: We recommend that reasonable and practical actions be taken to identify the source(s) affecting the indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. For example, if an indoor or outdoor air source is identified, we recommend the appropriate party implement actions to reduce the levels. In the event that indoor or outdoor sources are not readily identified or confirmed, resampling (which might include additional sub-slab vapor and indoor air sampling locations) is recommended to demonstrate that SVI mitigation actions are not needed. Based on the information available, mitigation might also be recommended when soil vapor intrusion cannot be ruled out.

Monitor: We recommend monitoring (sampling on a recurring basis), including but not necessarily limited to sub-slab vapor, basement air and outdoor air sampling, to determine whether concentrations in the indoor air or sub-slab vapor have changed and/or to evaluate temporal influences. Monitoring might also be recommended to determine whether existing building conditions (e.g., positive pressure heating, ventilation, and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined based on site-, building- and analyte-specific information, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

Mitigate: We recommend mitigation to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building -specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

These general recommendations are made with consideration being given to the additional notes on page 2.

MATRIX E Page 1 of 2

ADDITIONAL NOTES FOR MATRIX E

This matrix summarizes actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate analyte-specific, building-specific conditions (e.g., dirt floor in basement, crawl spaces, thick slabs, current occupancy, etc.), and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, collection of additional samples may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Mitigation might be recommended when the results of multiple contaminants indicate monitoring is recommended. Proactive actions may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action might be undertaken for reasons other than public health (e.g., seeking community acceptance, reducing costs, etc.). However, actions implemented ***in lieu*** of sampling will typically be expected to be captured in the final engineering report and site management plan, and might not rule out the need for post-implementation sampling (e.g., to document effectiveness or to support terminating the action).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of soil vapor contamination, nor does it preclude remediating contaminated soil vapor or the source of soil vapor contamination.

[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 1 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples and dirt floor soil vapor samples, a minimum reporting limit of 1 microgram per cubic meter is recommended.

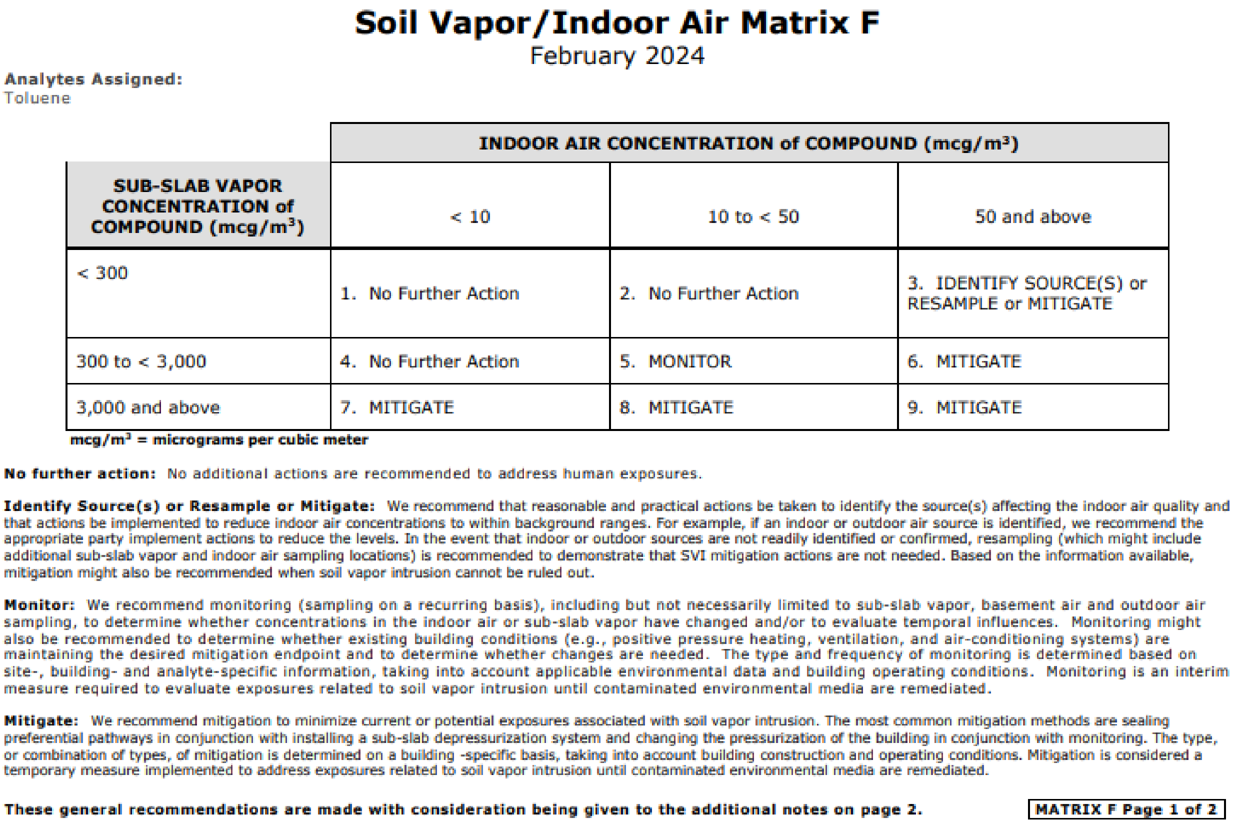
[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion to occur is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions might be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including but not limited to the following: the identified source of the volatile chemicals, the environmental remediation program, and analyte-specific, site-specific and building-specific factors.

MATRIX E Page 2 of 2

FIGURE 6



Soil Vapor/Indoor Air Matrix F

February 2024

Analytes Assigned:
Toluene

	INDOOR AIR CONCENTRATION of COMPOUND (mcg/m^3)		
SUB-SLAB VAPOR CONCENTRATION of COMPOUND (mcg/m^3)	< 10	10 to < 50	50 and above
< 300	1. No Further Action	2. No Further Action	3. IDENTIFY SOURCE(S) or RESAMPLE or MITIGATE
300 to < 3,000	4. No Further Action	5. MONITOR	6. MITIGATE
3,000 and above	7. MITIGATE	8. MITIGATE	9. MITIGATE

mcg/m^3 = micrograms per cubic meter

No further action: No additional actions are recommended to address human exposures.

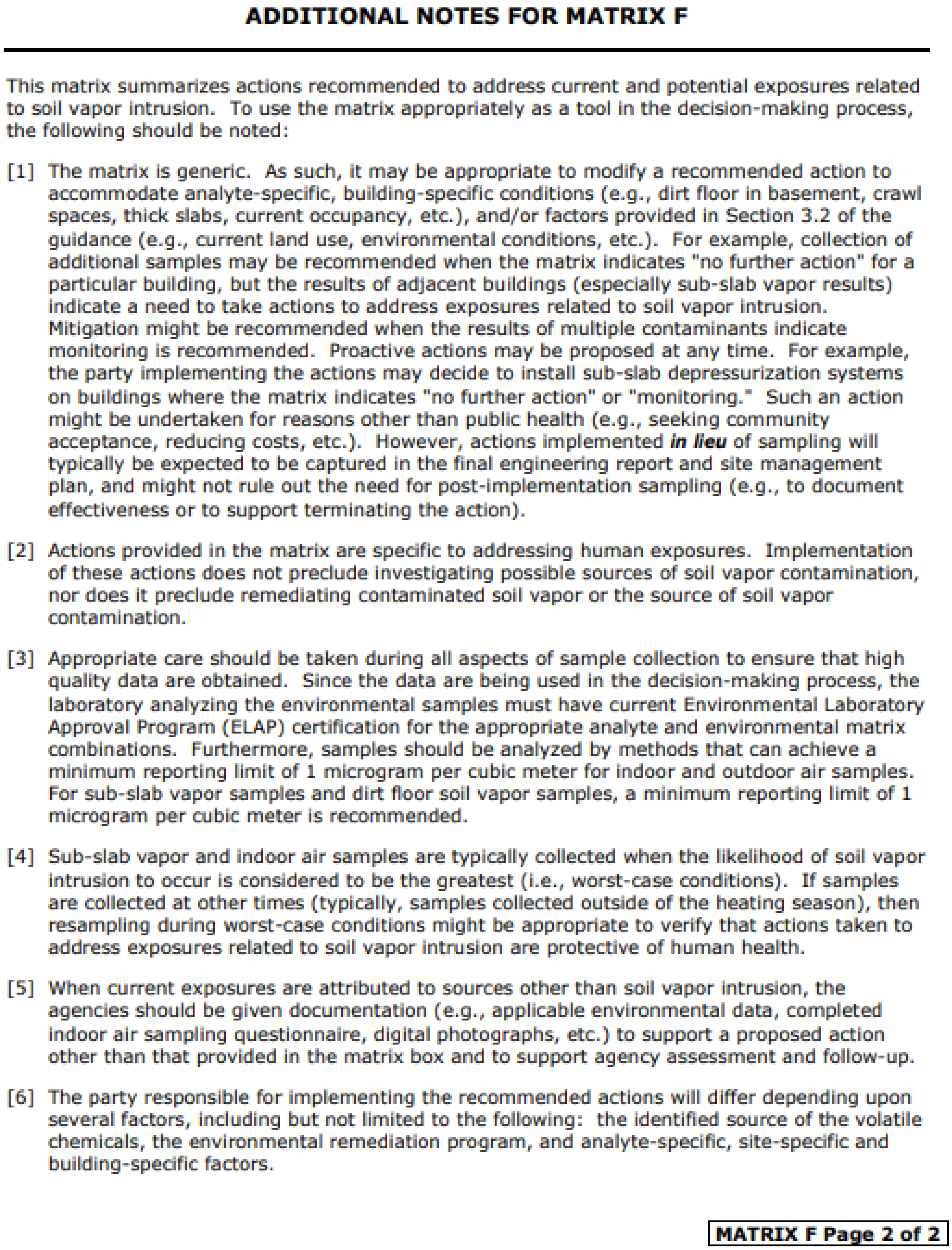
Identify Source(s) or Resample or Mitigate: We recommend that reasonable and practical actions be taken to identify the source(s) affecting the indoor air quality and that actions be implemented to reduce indoor air concentrations to within background ranges. For example, if an indoor or outdoor air source is identified, we recommend the appropriate party implement actions to reduce the levels. In the event that indoor or outdoor sources are not readily identified or confirmed, resampling (which might include additional sub-slab vapor and indoor air sampling locations) is recommended to demonstrate that SVI mitigation actions are not needed. Based on the information available, mitigation might also be recommended when soil vapor intrusion cannot be ruled out.

Monitor: We recommend monitoring (sampling on a recurring basis), including but not necessarily limited to sub-slab vapor, basement air and outdoor air sampling, to determine whether concentrations in the indoor air or sub-slab vapor have changed and/or to evaluate temporal influences. Monitoring might also be recommended to determine whether existing building conditions (e.g., positive pressure heating, ventilation, and air-conditioning systems) are maintaining the desired mitigation endpoint and to determine whether changes are needed. The type and frequency of monitoring is determined based on site-, building- and analyte-specific information, taking into account applicable environmental data and building operating conditions. Monitoring is an interim measure required to evaluate exposures related to soil vapor intrusion until contaminated environmental media are remediated.

Mitigate: We recommend mitigation to minimize current or potential exposures associated with soil vapor intrusion. The most common mitigation methods are sealing preferential pathways in conjunction with installing a sub-slab depressurization system and changing the pressurization of the building in conjunction with monitoring. The type, or combination of types, of mitigation is determined on a building -specific basis, taking into account building construction and operating conditions. Mitigation is considered a temporary measure implemented to address exposures related to soil vapor intrusion until contaminated environmental media are remediated.

These general recommendations are made with consideration being given to the additional notes on page 2.

MATRIX F Page 1 of 2



ADDITIONAL NOTES FOR MATRIX F

This matrix summarizes actions recommended to address current and potential exposures related to soil vapor intrusion. To use the matrix appropriately as a tool in the decision-making process, the following should be noted:

[1] The matrix is generic. As such, it may be appropriate to modify a recommended action to accommodate analyte-specific, building-specific conditions (e.g., dirt floor in basement, crawl spaces, thick slabs, current occupancy, etc.), and/or factors provided in Section 3.2 of the guidance (e.g., current land use, environmental conditions, etc.). For example, collection of additional samples may be recommended when the matrix indicates "no further action" for a particular building, but the results of adjacent buildings (especially sub-slab vapor results) indicate a need to take actions to address exposures related to soil vapor intrusion. Mitigation might be recommended when the results of multiple contaminants indicate monitoring is recommended. Proactive actions may be proposed at any time. For example, the party implementing the actions may decide to install sub-slab depressurization systems on buildings where the matrix indicates "no further action" or "monitoring." Such an action might be undertaken for reasons other than public health (e.g., seeking community acceptance, reducing costs, etc.). However, actions implemented ***in lieu*** of sampling will typically be expected to be captured in the final engineering report and site management plan, and might not rule out the need for post-implementation sampling (e.g., to document effectiveness or to support terminating the action).

[2] Actions provided in the matrix are specific to addressing human exposures. Implementation of these actions does not preclude investigating possible sources of soil vapor contamination, nor does it preclude remediating contaminated soil vapor or the source of soil vapor contamination.

[3] Appropriate care should be taken during all aspects of sample collection to ensure that high quality data are obtained. Since the data are being used in the decision-making process, the laboratory analyzing the environmental samples must have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. Furthermore, samples should be analyzed by methods that can achieve a minimum reporting limit of 1 microgram per cubic meter for indoor and outdoor air samples. For sub-slab vapor samples and dirt floor soil vapor samples, a minimum reporting limit of 1 microgram per cubic meter is recommended.

[4] Sub-slab vapor and indoor air samples are typically collected when the likelihood of soil vapor intrusion to occur is considered to be the greatest (i.e., worst-case conditions). If samples are collected at other times (typically, samples collected outside of the heating season), then resampling during worst-case conditions might be appropriate to verify that actions taken to address exposures related to soil vapor intrusion are protective of human health.

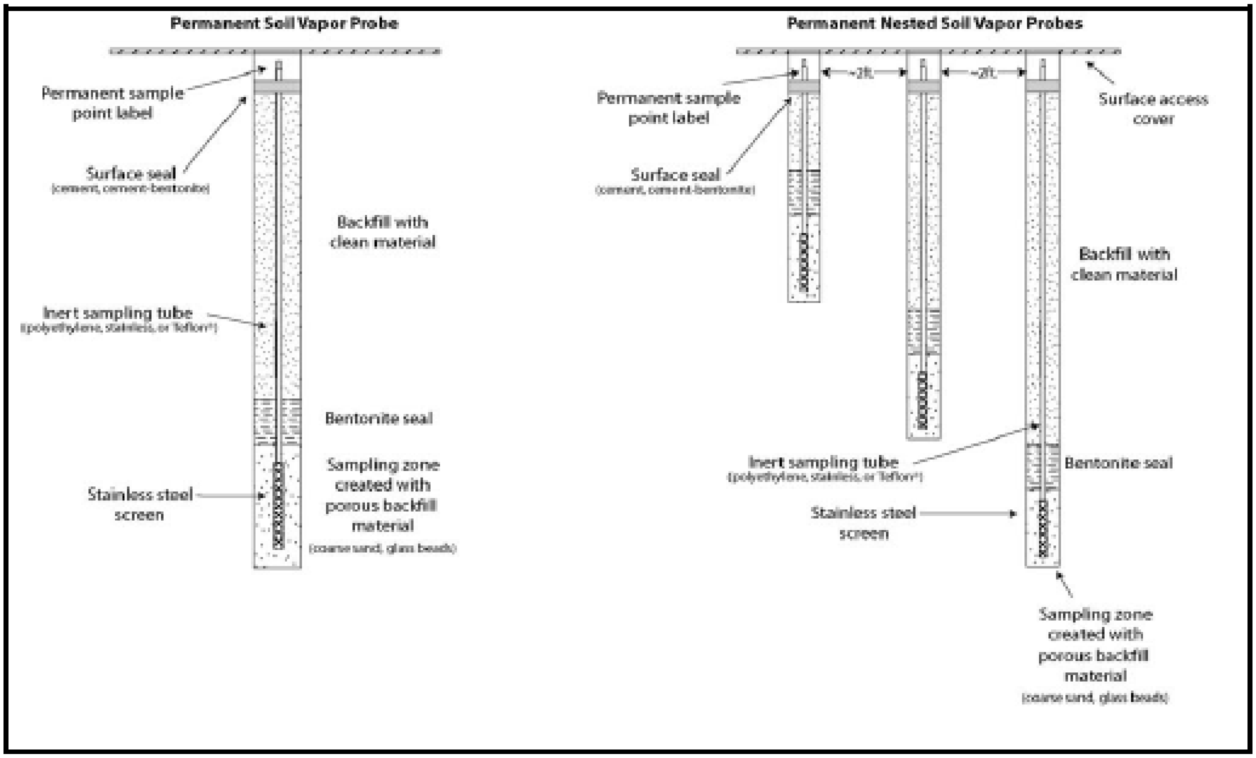
[5] When current exposures are attributed to sources other than soil vapor intrusion, the agencies should be given documentation (e.g., applicable environmental data, completed indoor air sampling questionnaire, digital photographs, etc.) to support a proposed action other than that provided in the matrix box and to support agency assessment and follow-up.

[6] The party responsible for implementing the recommended actions will differ depending upon several factors, including but not limited to the following: the identified source of the volatile chemicals, the environmental remediation program, and analyte-specific, site-specific and building-specific factors.

MATRIX F Page 2 of 2

FIGURE 7

Schematics of a permanent soil vapor probe and permanent nested soil vapor probes



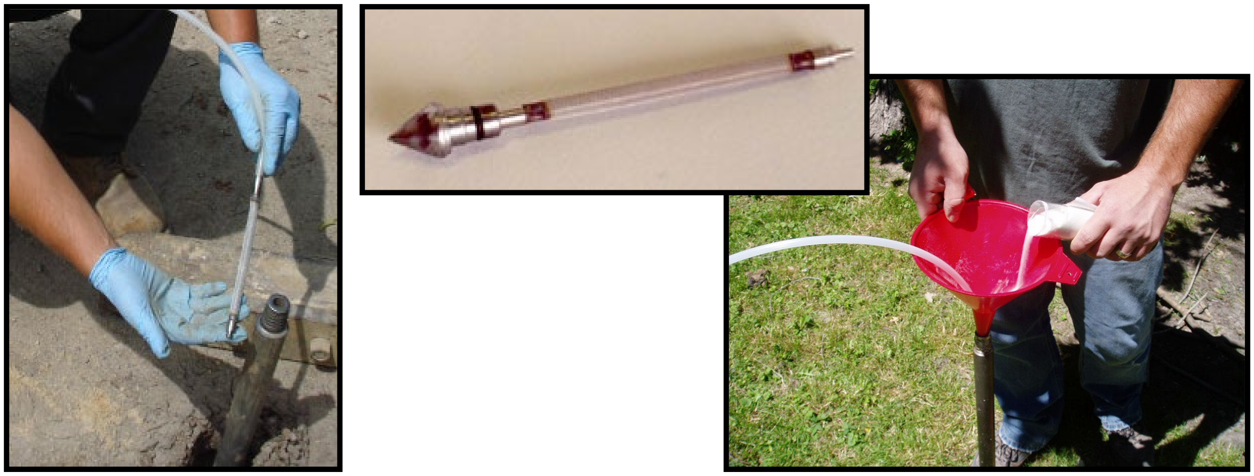
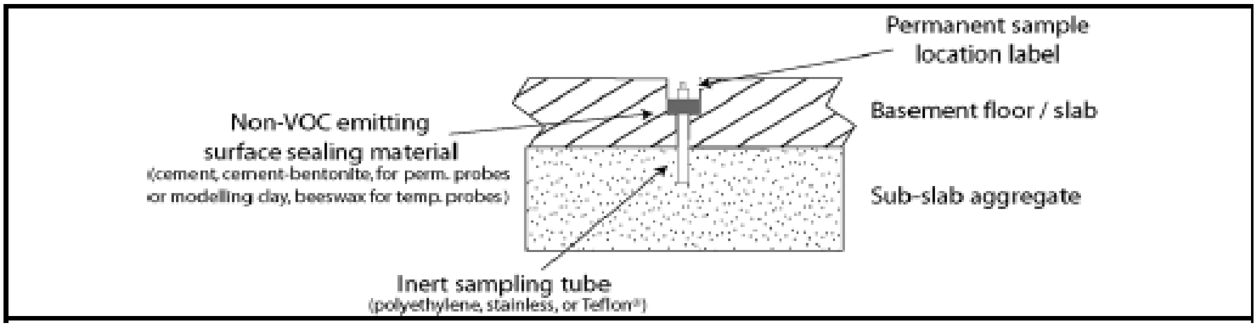


FIGURE 8

Schematic of a sub-slab vapor probe



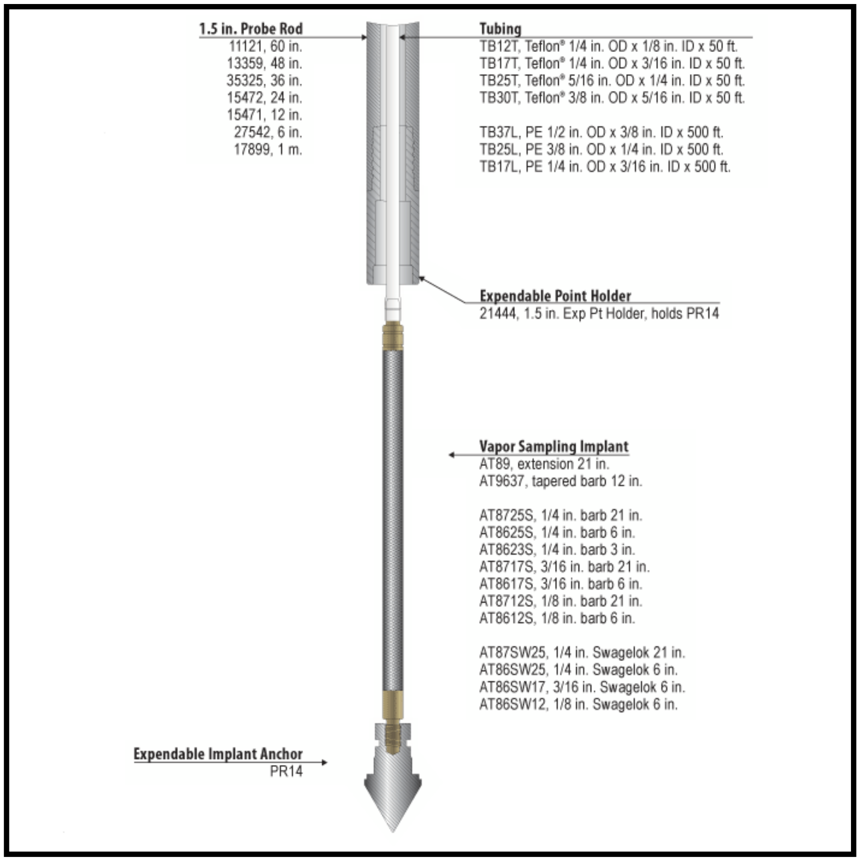
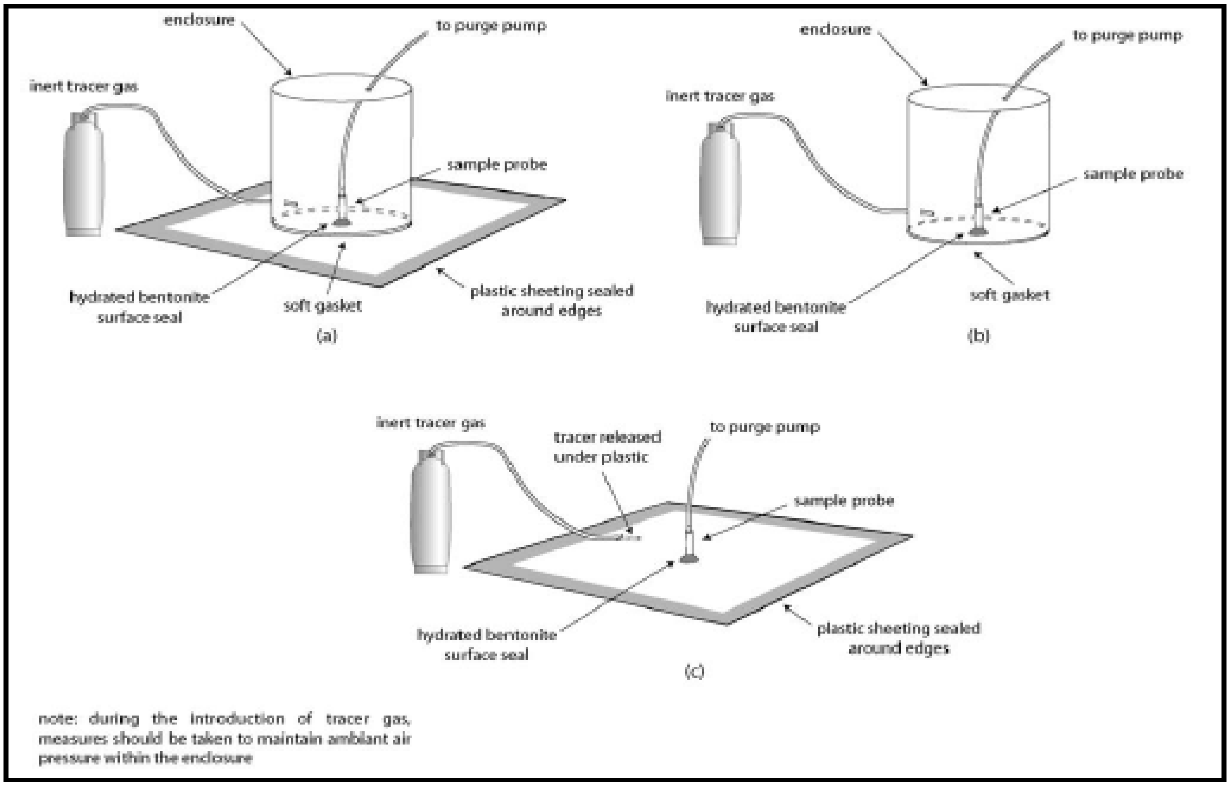


FIGURE 9

Schematics of tracer gas applications



note: during the introduction of tracer gas, measures should be taken to maintain ambiant air pressure within the enclosure

AIR CANISTER FIELD RECORD

PROJECT INFORMATION:

Project:
Job No:
Location:
Field Staff:
Client:

SAMPLE I.D.:

Size of Canister:
Canister Serial No.:
Flow Controller No.:
Sample Date(s):
Shipping Date:
Sample Type: ☐ ☐
☐ ☐
Soil Gas Probe Depth:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:
Ambient Air Temp. - P.M.:
Wind Direction:
Wind Speed:
Precipitation:

FIELD SAMPLING INFORMATION:

READING	TIME	VACUUM (inches Hg) or PRESSURE (psig)	DATE	INITIALS
Lab Vacuum (on tag)				
Field Vacuum Check [1]				
Initial Field Vacuum [2]				
Final Field Vacuum [3]				
Duration of Sample Collection				

LABORATORY CANISTER PRESSURIZATION:

Initial Vacuum (inches Hg and psia)		
Final Pressure (psia)		
Pressurization Gas		

SUBSLAB SHROUD:

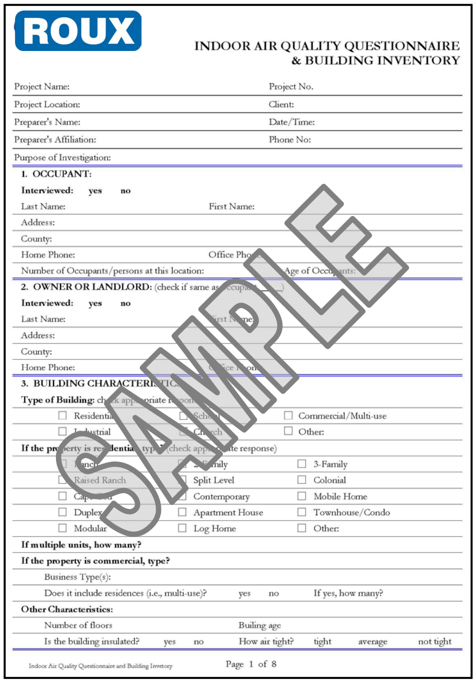
Shroud Helium Concentration:
Calculated tubing volume: x 3 =
Purged Tubing Volume Concentration:
Is the purged volume concentration less than or equal to 10% in shroud?
☐
☐

COMPOSITE TIME (hours)	FLOW RATE RANGE (ml/min)
15 Min.	316 - 333
0.5 Hours	158 - 166.7
1	79.2 - 83.3
2	39.6 - 41.7
4	19.8 - 20.8
6	13.2 - 13.9
8	9.9 - 10.4
10	7.92 - 8.3
12	6.6 - 6.9
24	3.5 - 4.0

NOTES:

1 Vacuum measured using portable vacuum gauge (provided by Lab)
2 Vacuum measured by canister gauge upon opening valve
3 Vacuum measured by canister gauge prior to closing valve

Signed:



ROUX INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

Project Name: Project No.
Project Location: Client:
Preparer's Name: Date/Time:
Preparer's Affiliation: Phone No:
Purpose of Investigation:

1. OCCUPANT:
Interviewed: **yes** **no**
Last Name: First Name:
Address:
County:
Home Phone: Office Phone:
Number of Occupants/persons at this location: Age of Occupants:

2. **OWNER OR LANDLORD:** (check if same as occupant ____)
Interviewed: **yes** **no**
Last Name: First Name:
Address:
County:
Home Phone: Office Phone:

3. **BUILDING CHARACTERISTICS**
Type of Building: check appropriate response

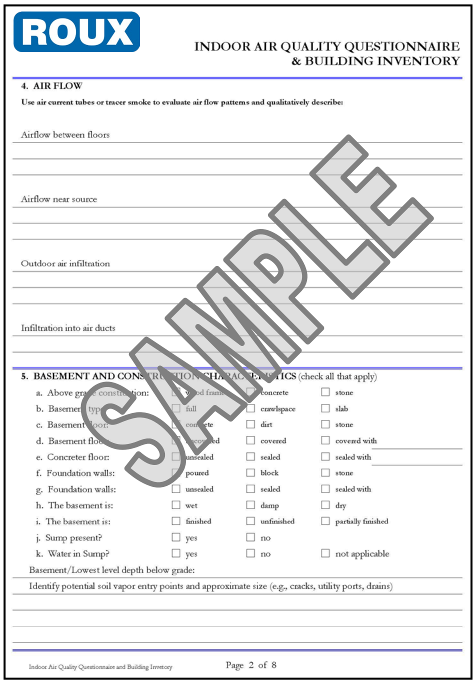
☐ Residential	☐ School	☐ Commercial/Multi-use
☐ Industrial	☐ Church	☐ Other:

If the property is residential, type? (check appropriate response)

☐ Ranch	☐ 2-Family	☐ 3-Family
☐ Raised Ranch	☐ Split Level	☐ Colonial
☐ Cape Cod	☐ Contemporary	☐ Mobile Home
☐ Duplex	☐ Apartment House	☐ Townhouse/Condo
☐ Modular	☐ Log Home	☐ Other:

If multiple units, how many?
If the property is commercial, type?
Business Type(s):
Does it include residences (i.e., multi-use)? yes no If yes, how many?
Other Characteristics:
Number of floors Builing age
Is the building insulated? yes no How air tight? tight average not tight

Indoor Air Quality Questionnaire and Building Invetory Page 1 of 8



ROUX INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

4. AIR FLOW
Use air current tubes or tracer smoke to evaluate air flow patterns and qualitatively describe:

Airflow between floors

Airflow near source

Outdoor air infiltration

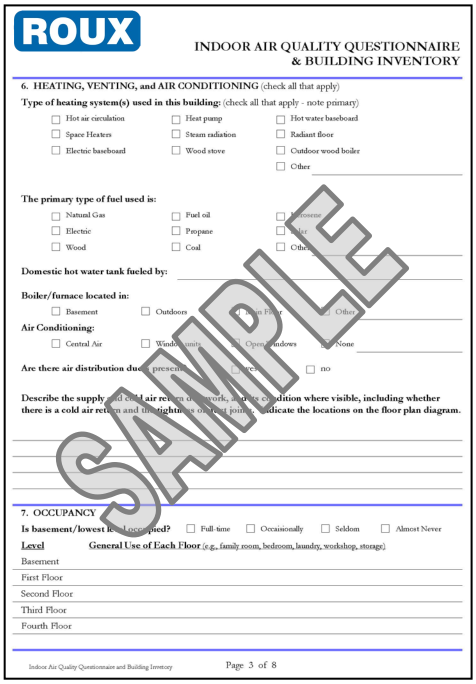
Infiltration into air ducts

5. **BASEMENT AND CONSTRUCTION CHARACTERISTICS** (check all that apply)

a. Above grade construction:	☐ wood frame	☐ concrete	☐ stone
b. Basement type:	☐ full	☐ crawlspace	☐ slab
c. Basement floor:	☐ concrete	☐ dirt	☐ stone
d. Basement floor:	☐ uncovered	☐ covered	☐ covered with ____
e. Concreter floor:	☐ unsealed	☐ sealed	☐ sealed with ____
f. Foundation walls:	☐ poured	☐ block	☐ stone
g. Foundation walls:	☐ unsealed	☐ sealed	☐ sealed with
h. The basement is:	☐ wet	☐ damp	☐ dry
i. The basement is:	☐ finished	☐ unfinished	☐ partially finished
j. Sump present?	☐ yes	☐ no	
k. Water in Sump?	☐ yes	☐ no	☐ not applicable

Basement/Lowest level depth below grade:
Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

Indoor Air Quality Questionnaire and Building Invetory Page 2 of 8



ROUX INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

6. **HEATING, VENTING, and AIR CONDITIONING** (check all that apply)
Type of heating system(s) used in this building: (check all that apply - note primary)

☐ Hot air circulation	☐ Heat pump	☐ Hot water baseboard
☐ Space Heaters	☐ Steam radiation	☐ Radiant floor
☐ Electric baseboard	☐ Wood stove	☐ Outdoor wood boiler
		☐ Other ____

The primary type of fuel used is:

☐ Natural Gas	☐ Fuel oil	☐ Kerosene
☐ Electric	☐ Propane	☐ Solar
☐ Wood	☐ Coal	☐ Other ____

Domestic hot water tank fueled by: ____

Boiler/furnace located in:
☐ Basement ☐ Outdoors ☐ Main Floor ☐ Other ____

Air Conditioning:
☐ Central Air ☐ Window units ☐ Open Windows ☐ None ____

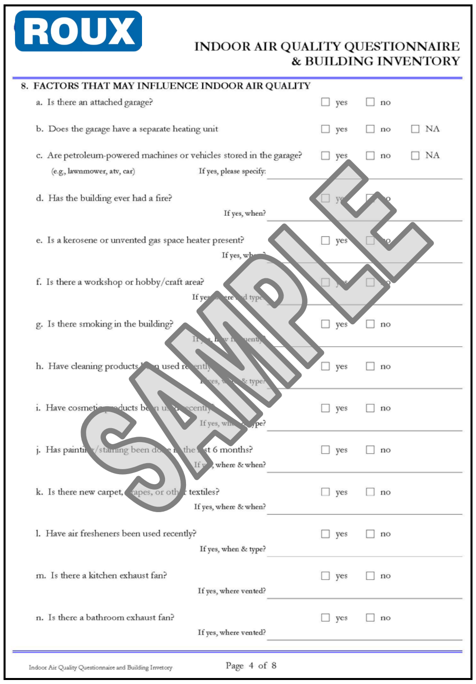
Are there air distribution ducts present? ☐ yes ☐ no

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

7. OCCUPANCY
Is basement/lowest level occupied? ☐ Full-time ☐ Occaisionally ☐ Seldom ☐ Almost Never

Level	**General Use of Each Floor** (e.g., family room, bedroom, laundry, workshop, storage)
Basement	
First Floor	
Second Floor	
Third Floor	
Fourth Floor	

Indoor Air Quality Questionnaire and Building Invetory Page 3 of 8

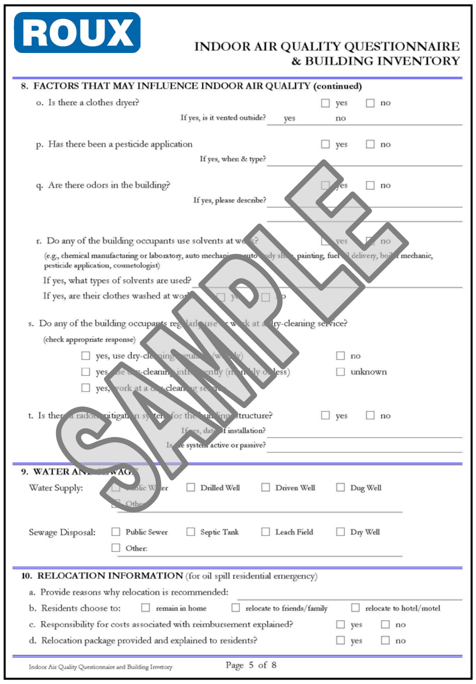


ROUX INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage?	☐ yes	☐ no	
b. Does the garage have a separate heating unit	☐ yes	☐ no	☐ NA
c. Are petroleum-powered machines or vehicles stored in the garage? (e.g., lawnmower, atv, car) If yes, please specify:	☐ yes	☐ no	☐ NA
d. Has the building ever had a fire? If yes, when?	☐ yes	☐ no	
e. Is a kerosene or unvented gas space heater present? If yes, where?	☐ yes	☐ no	
f. Is there a workshop or hobby/craft area? If yes, where and type?	☐ yes	☐ no	
g. Is there smoking in the building? If yes, how frequently?	☐ yes	☐ no	
h. Have cleaning products been used recently? If yes, when & type?	☐ yes	☐ no	
i. Have cosmetic products been used recently? If yes, when & type?	☐ yes	☐ no	
j. Has painting/staining been done in the last 6 months? If yes, where & when?	☐ yes	☐ no	
k. Is there new carpet, drapes, or other textiles? If yes, where & when?	☐ yes	☐ no	
l. Have air fresheners been used recently? If yes, when & type?	☐ yes	☐ no	
m. Is there a kitchen exhaust fan? If yes, where vented?	☐ yes	☐ no	
n. Is there a bathroom exhaust fan? If yes, where vented?	☐ yes	☐ no	

Indoor Air Quality Questionnaire and Building Invetory Page 4 of 8



ROUX

INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY (continued)

o. Is there a clothes dryer? ☐ yes ☐ no
If yes, is it vented outside? yes no

p. Has there been a pesticide application ☐ yes ☐ no
If yes, when & type? ________

q. Are there odors in the building? ☐ yes ☐ no
If yes, please describe? ________

r. Do any of the building occupants use solvents at work? ☐ yes ☐ no
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist)
If yes, what types of solvents are used? ________
If yes, are their clothes washed at work? ☐ yes ☐ no

s. Do any of the building occupants regularly use or work at a dry-cleaning service?
(check appropriate response)
☐ yes, use dry-cleaning regularly (weekly) ☐ no
☐ yes, use dry-cleaning infrequently (monthly or less) ☐ unknown
☐ yes, work at a dry-cleaning service

t. Is there a radon mitigation system for the building/structure? ☐ yes ☐ no
If yes, date of installation? ________
Is the system active or passive? ________

9. WATER AND SEWAGE

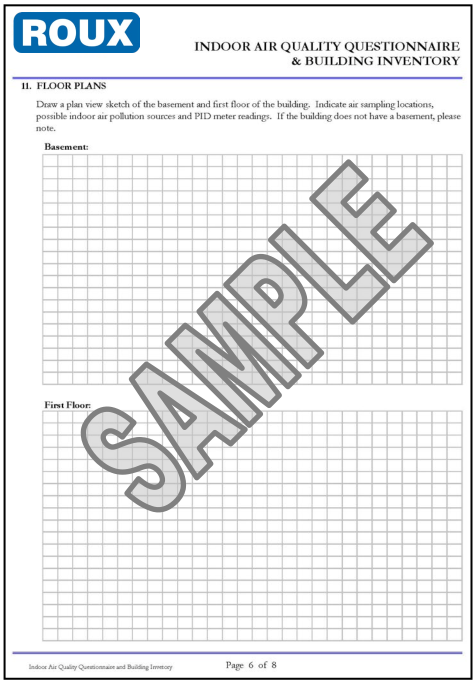
Water Supply: ☐ Public Water ☐ Drilled Well ☐ Driven Well ☐ Dug Well
☐ Other: ________

Sewage Disposal: ☐ Public Sewer ☐ Septic Tank ☐ Leach Field ☐ Dry Well
☐ Other: ________

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: ________
b. Residents choose to: ☐ remain in home ☐ relocate to friends/family ☐ relocate to hotel/motel
c. Responsibility for costs associated with reimbursement explained? ☐ yes ☐ no
d. Relocation package provided and explained to residents? ☐ yes ☐ no

Indoor Air Quality Questionnaire and Building Invetory Page 5 of 8



ROUX

INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

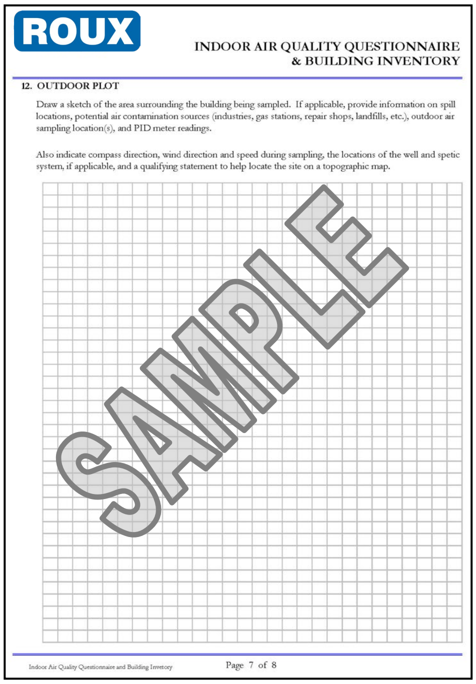
11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

Basement:

First Floor:

Indoor Air Quality Questionnaire and Building Invetory Page 6 of 8



ROUX

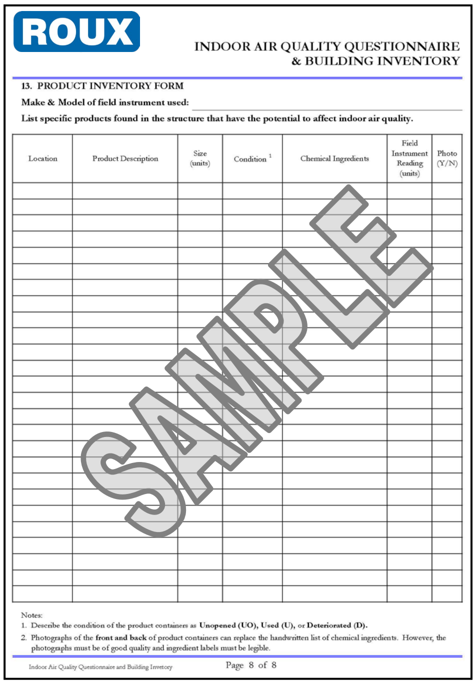
INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s), and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and spetic system, if applicable, and a qualifying statement to help locate the site on a topographic map.

Indoor Air Quality Questionnaire and Building Invetory Page 7 of 8



ROUX

INDOOR AIR QUALITY QUESTIONNAIRE
& BUILDING INVENTORY

13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: ________

List specific products found in the structure that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition [1]	Chemical Ingredients	Field Instrument Reading (units)	Photo (Y/N)

Notes:
1. Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D).**
2. Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Indoor Air Quality Questionnaire and Building Invetory Page 8 of 8

FIELD OPERATING PROCEDURES

Calibration and Maintenance of Combustible Gas/Oxygen Meter

FOP 006.0

CALIBRATION AND MAINTENANCE OF COMBUSTIBLE GAS/OXYGEN METER

PURPOSE

This procedure presents a method for calibration of the GasTech GT402 four-gas meter. The GasTech GT402 is a portable instrument designed primarily for detection of combustible gases and of oxygen deficiency in ambient air and confined workspaces, such as natural gas or depleted oxygen in utility manholes. The GasTech GT402 monitors an environment for hydrocarbons (LEL/ppm), oxygen (O_2), carbon monoxide (CO) and hydrogen sulfide (H_2S). The meter detects gas by a sample-drawing method utilizing up to four internal sensors plugged into assigned molded flow block receptacles. During operation, the GasTech GT402 alerts the user with visual and audible alarms whenever a monitored gas reaches the preset alarm level. The GasTech GT402 has an internal pump that continually draws the atmosphere sample into the external probe and hose, then into the monitor to the sensor(s).

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 GasTech GT402. The actual equipment to be used in the field will be equivalent or similar. The unit selected for use in the field will be used to measure methane gas, hydrogen sulfide gas, Lower Explosive Limit (LEL), and percent oxygen. As always, consult the manufacturers operations manual prior to conducting this procedure to confirm accuracy.

START-UP PROCEDURE

Perform the following steps to start up the GasTech GT402 gas monitor and adjust internal circuits to "fresh air" readings (demand zero). Read this entire section before turning on the meter.

WARNING

Perform the following start-up procedure in a "fresh air" environment only (environment known to be free of toxic gases, combustible gases, and of normal oxygen content).

1. If you are using Ni-Cd batteries, make sure the batteries are fully charged before you continue this procedure.
2. Press the **ON/OFF** button once, then release the button. The display momentarily shows the software version of your monitor and the number of data logging hours that remain in memory. During the warm-up period, the gas readings stabilize for the installed sensors. You can hear the pump operating, and the words **WARMING UP** are displayed. The red LED flashes slowly during warm-up. Allow one minute for the display to stabilize and the LED to stop flashing. The GT sounds a periodic beep, and the display shows the words **WARMUP COMPLETE** when the meter completes initial warm-up.

WARNING

Do not perform the next step in the monitoring area. This can place you in potential danger if hazardous conditions exist.

3. Press and hold the **ADJUST/ENTER** button to adjust the monitor to "fresh air" readings. When the display reads "**DONE. THANK YOU"**, release the button.

4. Verify that the meter displays the correct fresh air reading for each of the meter's channels. The table below lists the correct fresh air reading for **all** channels available for the meter.

Channel	Fresh Air Reading
% LEL	000
% Oxygen	20.9
Carbon Monoxide (ppm)	000
Hydrogen Sulfide (ppm)	000

5. Exhale over the inlet of the probe. The O_2 reading decreases.

6. Continue exhaling over the probe until the O_2 reading decreases to **19.5%** or below.

7. Verify that the alarm activates when the O_2 reading decreases to **19.5%**. The buzzer sounds, the O_2 reading flashes, and the display flashes "**ALRM"** when the alarm activates.

8. Verify that the O_2 reading returns to **20.9%**. The gas reading flashes until it increases above 19.5%.

9. To turn the GT Series gas monitor off, press the **ON/OFF** button and hold it down while the GT sounds five audible beeps. The monitor automatically shuts off. Release the button.

10. If your GT uses rechargeable Ni-Cd batteries, the batteries must be fully charged before each use. When using alkaline batteries with your GT, for best possible operation you may choose to install fresh batteries before each use.

CALIBRATION PROCEDURE

Perform the following steps to calibrate the GasTech GT402 gas monitor and adjust internal circuits to "fresh air" readings (demand zero). Read this entire section before calibrating the meter.

CAUTION

Calibrate the GasTech GT402 gas monitor in a "fresh air" environment (known to be of normal oxygen content and free of toxic or combustible gases). Do not begin calibration unless you can verify that you are in a "fresh air" environment.

1. Verify that the calibrating area contains a level surface to set the meter and calibration kit accessories.

2. Turn on the meter in accordance with the Start-Up Procedure previously discussed. Enter the Function program and verify that the Battery Capacity screen displays at least three bars. Attach the probe to the inlet fitting on the meter.

3. Carefully screw the threaded end of the regulator into the gas cylinder.
4. Attach the sample tubing over the fitting on the regulator.
5. Press the **ADJUST/ENTER** button. The display shows the main screen.

6. Press the **RESET** and **BACK LITE/-** buttons simultaneously three times. The meter displays:

Version N.NN

Calibrate

Setting the Zero Readings

NOTE: During a zeroing operation, an exclamation point (!) may appear at the beginning of the second line of the display reading when the reading is centered in the zero range. The "!" symbol represents the optimum reading.

1. Press the ADJUST/ENTER button. The GT displays:

Zero Gas

NNN PPM H2S

2. Use the FUNC./+ or BACK LITE/- buttons to adjust the display reading to 000 PPM H2S.

3. Press the ADJUST/ENTER button to save this zero setting. The GT displays:

Zero Gas

NNNN PPM COMB

4. Use the **FUNC./+** or **BACK LITE/-** buttons to adjust the display reading to **0000 PPM COMB**.

5. Press the **ADJUST/ENTER** button to save this zero setting. The GT displays:

Zero Gas

NNN PPM CO

6. Use the **FUNC./+** or **BACK LITE/-** buttons to adjust the display reading to **000 PPM CO**.

7. Press the **ADJUST/ENTER** button to save this zero setting. The GT displays:

Zero Gas

NN.N %VOL OXY

8. Attach the tubing from the regulator to the probe tube. The GT will draw gas from the gas cylinder.

9. Allow at least one minute, then use the **FUNC./+** or **BACK LITE/-** buttons to adjust the display reading to match the O2 value marked on the gas cylinder.

10. Press the **ADJUST/ENTER** button to save this setting. The GT displays:

Span Gas

NNN PPM H2S

Setting the Span Readings

1. Use the **FUNC./+** or **BACK LITE/-** buttons to adjust the display reading to match the H2S value marked on the gas cylinder.

2. Press the ADJUST/ENTER button to save this span setting. The GT displays:

Span Gas

NNN %LEL COMB

3. Use the **FUNC./+** or **BACK LITE/-** buttons to adjust the display reading to match the combustible gas value marked on the gas cylinder.

4. Press the ADJUST/ENTER button to save this span setting. The GT displays:

Span Gas

NNN PPM CO

5. Use the **FUNC./+** or **BACK LITE/-** buttons to adjust the display reading to match the CO value marked on the gas cylinder.

6. Press the ADJUST/ENTER button to save this span setting. The GT displays:

   Span Gas

   NN.N %VOL OXY

7. Disconnect the probe from the tubing leading to the regulator. The flow of gas will stop automatically.

8. Use the FUNC./+ or BACK LITE/- buttons to adjust the display reading to 20.9 %VOL OXY.

9. Press the ADJUST/ENTER button to save this span setting.

Calibration is now complete. The GT displays:

Exit

Press any Key…

Exiting Calibration Mode

1. Press any button, except the **ON/OFF** to exit calibration mode.

2. Unscrew the regulator from the gas cylinder.

3. Store the components of the calibration kit in the storage case.

4. The GT is now ready for normal operation.

5. Record all calibration information in the Project Field Book as well as on an **Equipment Calibration Log** sheet (see attached sample).

MAINTENANCE

The following are daily, monthly, quarterly, and "as required" preventive maintenance suggestions to ensure the reliability of the GT monitor.

Daily

BATTERIES

The GT should always contain fully charged Ni-Cd batteries or sufficiently powered alkaline batteries before each day's use. You can verify the capacity of the batteries using the Function program. To verify battery capacity:

1. Verify that the battery slide switch is at the proper **ALK** or **NI-CAD** setting for the type of batteries in the GT.

2. Press and hold the **FUNC./+** button, for four beeps, then release the button. If the display shows less than three bars, recharge the Ni-Cd batteries or replace the alkaline batteries as described later in this chapter.

3. Press the **FUNC./+** button to return to the main display.

CALIBRATION

For **optimum** efficiency of the monitor, calibrate the GT **before** and **after** each use. If multiple calibrations over a period of days indicate that only a minimum of adjustments are required, the frequency of calibration can be changed to weekly or monthly, depending on how often the monitor is used, and how demanding the monitoring environment is.

NOTE

At the very least, “challenge” the normal operation of the oxygen (O2) sensor (if applicable) before every use. Exhale over the inlet of the probe as you watch the display. The O2 reading should **decrease**. When the O2 reading decreases to **19.5%**, the alarm should activate confirming the normal operation of the O2

SAMPLE-DRAW SUBCOMPONENTS

Verify the proper operation of the flow alarm circuit by holding your finger over the inlet of the probe for a few seconds. The pump shuts off, the **PUMP OFF PRESS RESET** message appears on the display, and the audible alarm sounds if the flow alarm circuit is operating properly.

Monthly/Quarterly

CALIBRATION

Calibrate the sensors at least every one to three months. Calibration frequency depends on the frequency of use and also the environmental conditions in which you use the GT.

As Required

ALARM CIRCUITS

Periodically verify that all visual and audible alarms function properly.

WARNING

Verify alarm circuits in a “fresh air” environment only (environment known to be free of combustible and toxic gases and of normal oxygen content).

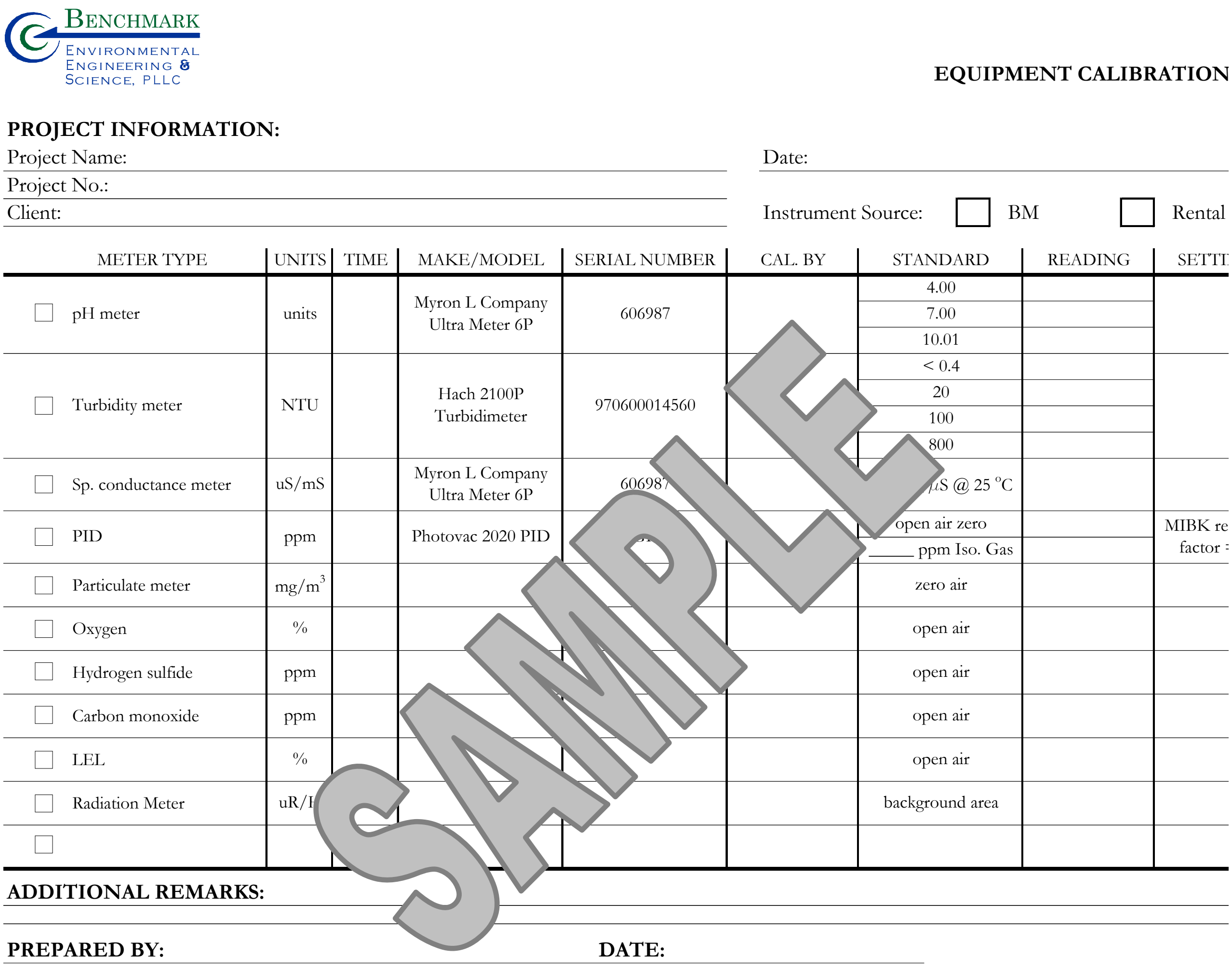
To verify the alarm circuits, use a concentration of the proper gas sample that is greater than the preset warn or alarm levels. Verify that **WARN** or **ALRM** displays and the buzzer sounds. Also, verify that the display reading in alarm flashes during the alarm sequence.

SAMPLE-DRAW SUBCOMPONENTS

Periodically check the probe, hoses, internal filter, and tubing for obstructions that can accumulate over time. *This is especially important if you use the GT in a dusty or dirty environment.* Replace the cotton and hydrophobic filter elements if they become contaminated or discolored.

ATTACHMENTS

Equipment Calibration Log (sample)



Benchmark Environmental Engineering & Science, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name:

Date:

Project No.:

Client:

Instrument Source: ☐ BM ☐ 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/					background area		
☐								

ADDITIONAL REMARKS:

PREPARED BY: **DATE:**

FIELD OPERATING PROCEDURES

Calibration and 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)

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name:

Date:

Project No.:

Client:

Instrument Source: ☐ BM ☐ 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:**

FIELD OPERATING PROCEDURES

Calibration and Maintenance of Portable Field pH/Eh Meter

FOP 008.0

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	± 0.2 pH unit, over the temperature range of ± 0.2 C.
Eh	± 0.2 millivolts (mV) over the range of ± 399.9 mV, otherwise ± 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)

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name: Date:

Project No.:

Client: Instrument Source: ☐ BM ☐ 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 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)

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name: Date:

Project No.:

Client: Instrument Source: ☐ BM ☐ 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:**

FIELD OPERATING PROCEDURES

Calibration and Maintenance of Portable Flame Ionization Detector (FID)

FOP 010.0

CALIBRATION AND MAINTENANCE OF PORTABLE FLAME IONIZATION DECTECTOR

PURPOSE

This guideline presents a general description of the method for calibration and maintenance of a portable flame ionization detector (FID). The FID detects and initially quantifies a reading of the volatile organic compound (VOC) concentration in air. The FID is used as a field-screening tool for initial evaluation of soil samples and for ambient air monitoring. In order to ensure an accurate reading, the FID must be calibrated prior to use in the field.

Although 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 Sensidyne Portable Flame Ionization Detector. The actual equipment to be used in the field will be equivalent or similar.

The FID indicates total VOC concentration readings, which are normalized to a methane standard, so actual quantification of individual compounds is not provided. In addition, the FID response to compounds is highly variable, dependent on the structure of the compound and the presence or absence of other compounds. In the calibration mode, a methane standard of 200 parts per million by volume (ppmv) is used, and the desired accuracy at this concentration is ± 50 ppmv.

PROCEDURE

1. Zero the machine.
2. Calibrate all field test equipment at the beginning of each sampling day and check and recalibrate according to the manufacture's specifications.
3. Calibrate the FID meter using a compressed gas cylinder containing 200 ppmv methane in air, a 2 liter per minute flow regulator, and a tubing assembly.

4. Assemble the calibration equipment and actuate the FID. Insert the probe into the calibration assembly and wait for a stable indication. Remove the cover over the calibration adjustment screw. Using a slotted screwdriver, turn the adjustment screw until the meter reads exactly 200 ppmv.

5. Replace the adjustment screw cover and deactivate the FID.

6. 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 instrument adjustments. 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 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

- The probe and handle of the FID should be checked before and after every use for cleanliness and worn or damaged parts. Drain the water trap in the handle as needed. Remove any other condensation with a clean cloth or tissue. The dust filter and hydrophobic filters should be inspected and cleaned between use.

- The FID battery must be recharged when the battery level indicator is in the red sector. It is also recommended that the battery be recharged every month the instrument is not used frequently. Replace the instrument's hydrogen carrier gas as necessary.

- Store the FID in its carrying case when not in use. Additional maintenance details related to individual components of the FID 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

Equipment Calibration Log (sample)

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name:

Project No.:

Client:

Date:

Instrument Source: ☐ BM ☐ 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

Calibration and Maintenance of Portable Photoionization Detector (PID)

FOP 011.1

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 9.8, 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., 9.8, 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. Compound-specific calibration methods should be selected on a project-by-project basis to increase the accuracy of the instrument. The best way to calibrate a PID to different compounds is to use a standard of the gas of interest. However, correction factors have been determined that enable the user to quantify a large number of chemicals using only a single calibration gas, typically isobutylene. 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 MiniRAE 2000 Portable VOC Monitor equipped with a 10.6 eV lamp. The actual equipment to be used in the field will be equivalent or similar. The following information is provided for general reference; the equipment-specific manufacturer's manual should be followed with precedence over this FOP.

Note: The PID indicates <u>total</u> VOC concentration readings that are normalized to a calibration 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 MiniRAE 2000 is accurate to ± 2 ppm or 10% of the reading for concentrations ranging from 0-2,000 ppm and ± 20% of the reading at concentrations greater than 2,000 ppm. Response time is less than two seconds to 90 percent of full-scale. The operating temperature range is 0 to 45° C and the operating humidity range is 0 to 95 % relative humidity (non-condensing).

CALIBRATION PROCEDURE

The calibration method and correction factor, if applicable, will be selected on a project-by-project basis and confirmed with the Project Manager prior to the start of field work.

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 using a compressed gas cylinder or equivalent containing the calibration 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 the calibration standard gas.

4. Assemble the calibration equipment and actuate the PID in its calibration mode.

5. Select the appropriate calibration method. Calibration may be completed with two methods: 1) where the calibration standard gas is the same as the measurement gas (no correction factor is applied) or 2) where the calibration standard gas is not the same as the measurement gas and a correction factor will be applied. An isobutylene standard gas must be used as the calibration standard gas for the use of correction factors with the MiniRAE 2000. See below for additional instructions for calibration specific to use with or without correction factors.

Calibrating Without a Correction Factor

Navigate within the menu to select the "cal memory" for the specific calibration standard gas prior to calibration. The default gas selections for the MiniRAE 2000 are as follows:

Cal Memory #0	Isobutylene
Cal Memory #1	Hexane
Cal Memory #2	Xylene
Cal Memory #3	Benzene
Cal Memory #4	Styrene
Cal Memory #5	Toluene
Cal Memory #6	Vinyl Chloride
Cal Memory #7	Custom

The calibration standard gas for Cal Memory #1-7 may be toggled for selection of any of the approximately 100 preprogrammed calibration standard gases for use without an applied correction factor (i.e., the calibration gas must be the same as the measurement gas).

Calibrating With a Correction Factor

Navigate within the menu to select the "Cal Memory".

Select "Cal Memory #0" and toggle for selection of any of the approximately 100 preprogrammed chemicals. During calibration, the unit requests isobutylene gas and displays the isobutylene concentration immediately following calibration, but when the unit is returned to the normal reading mode, it displays the selected chemical and applies the correction factor.

If the pre-programmed list does not include the desired chemical or a user-defined measurement gas and correction factor is desired, toggle Cal Memory #0 to "user defined custom gas". A list of approximately 300 correction factors is attached in Technical Note 106 generated by MiniRAE.

6. Once the PID settings have been verified, connect the PID probe to the zero air calibration bag (or calibrate to ambient air if conditions permit) and wait for a stable indication.

7. Connect the PID probe to the calibration standard bag. Measure an initial reading of the standard and wait for a stable indication.

8. Keep the PID probe connected to the calibration standard bag, calibrate to applicable concentration (typically 100 ppm with isobutylene) with the standard and wait for a stable indication.

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 calibration standard and concentration
- Correction factors used, if any
- The brand and expiration date of the calibration standard 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)
Technical Note TN-106

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	

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

EQUIPMENT CALIBRATION LOG

PROJECT INFORMATION:

Project Name:

Project No.:

Client:

Date:

Instrument Source: ☐ BM ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	POST CAL. READING	SETTINGS
☐ pH meter	units		Myron L Company Ultra Meter 6P	606987		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P Turbidimeter	9706000145[illegible]		≤ 0.4		
						[illegible]		
						[illegible]		
						800		
☐ Sp. Cond. meter	uS mS		Myron L Company Ultra Meter 6P	[illegible]		_______ mS @ 25 °C		
☐ PID	ppm		MinRAE 20[illegible]			open air zero		MIBK response factor = 1.0
						_____ ppm Iso. Gas		
☐ Dissolved Oxygen	ppm		YSI Model 5[illegible]	[illegible]				
☐ 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:**

ROUX

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)

Benchmark Environmental Engineering & Science, PLLC

EQUIPMENT CALIBRATION

PROJECT INFORMATION:

Project Name: Date:

Project No.:

Client: Instrument Source: ☐ BM ☐ 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:**

ROUX

FIELD OPERATING PROCEDURES

Composite Sample Collection Procedure for Non-VOC Analysis

FOP 013.0

COMPOSITE SAMPLE COLLECTION PROCEDURE FOR NON-VOLATILE ORGANIC ANALYSIS

PURPOSE

This guideline addresses the procedure to be used when soil samples are to be composited in the field.

PROCEDURE

1. Transfer equal weighted aliquots of soil from individual split-spoon samples, excavator bucket, hand auger or surface soil sample location to a large precleaned stainless steel (or Pyrex glass) mixing bowl.

2. Thoroughly mix (homogenize) and break up the soil using a stainless steel scoop or trowel.

3. Spread the composite sample evenly on a stainless steel tray and quarter the sample.

4. Discard alternate (i.e., diagonal) quarters and, using a small stainless steel scoop or spatula, collect equal portions of subsample from the remaining two quarters until the amount required for the composite sample is acquired. Transfer these subsamples to a precleaned stainless steel (or Pyrex glass) mixing bowl and re-mix.

5. Transfer the composite sample to the laboratory provided, precleaned sample jars. Store any excess sample from the stainless steel tray in a separate, precleaned, wide-mouth sample jar and refrigerate for future use, if applicable.

6. Decontaminate all stainless steel (or Pyrex glass) equipment in accordance with Roux's Non-disposable and Non-dedicated Sampling Equipment Decontamination procedures.

7. Prepare samples in accordance with Roux's Sample Labeling, Storage and Shipment FOP.

8. Record all sampling details in the Project Field Book and on the Soil/Sediment Sample Collection Summary Log (sample attached).

ATTACHMENTS

Soil/Sediment Sample Collection Summary Log (sample)

REFERENCES

<u>Roux FOPs:</u>

040 *Non-disposable and Non-dedicated Sampling Equipment Decontamination*
046 *Sample Labeling, Storage and Shipment*

FIELD OPERATING PROCEDURES

Constant Rate Pump Test Procedure

FOP 014.0

CONSTANT RATE PUMP TEST PROCEDURE

PURPOSE

This guideline presents a procedure for conducting a constant rate pump test in order to calculate the hydraulic properties of an aquifer from time drawdown of the water level in a pumping well and/or observation well(s). A pump or pump intake installed in the proposed production well and the discharge from the well is measured periodically, and regulated as necessary to maintain a constant pumping rate. Although variations from the outlined procedure may be warranted based on program scope and site conditions, the basic elements of the guideline (i.e., pre and post monitoring) should be maintained.

Aquifer pumping/recovery tests via this FOP will include an initial step-drawdown test to evaluate pumping well performance characteristics, a 72-hour (or other duration as required by the project Work Plan) constant rate discharge test, and a recovery test. These tests will require the use of a single well for pumping, and one or more additional wells for observation of water table drawdown and recovery. Pumping will be performed using an appropriately sized downhole pump (i.e., electric-powered submersible, pneumatic or specified other). The wells to be utilized during the testing will be selected based on the specific site assessment requirements. As the work progresses, and if warranted, appropriate revisions may be made by the Project Hydrogeologist or Project Manager.

DOCUMENTATION

Aquifer test data and all field notes will be recorded in the Project Field Book and on the following forms:

- **Field Activity Daily Log (FADL)** forms (sample attached) are completed for each day of fieldwork (see Field Operating Procedures for Documentation Requirements of Drilling and Well Installation). Weather conditions, proximity of surface water bodies, irrigation, discharge location, volume of pumped/treated water, personnel onsite, or other observations that may affect results of the aquifer testing will be noted.

- **Aquifer Test Data Sheets** (sample attached) are completed for each well observed during the test, during both drawdown and recovery phases. Alternatively, a data logger may be used in each well, and the set-up parameters determined by the Project Hydrogeologist should be recorded on a form developed for this purpose. If a data logger is used, data should be transferred to a computer as soon as possible after collection. As data is collected, it will be checked periodically in the field for accuracy and completeness. All data entries will include the date and time that the measurement was made.

- **Step-Drawdown Test Data Sheets** are completed for each well observed during the step-drawdown test, during both drawdown and recovery phases. Alternatively, a data logger may be used in each well, and the set-up parameters determined by the Project Hydrogeologist should be recorded on a form developed for this purpose. If a data logger is used, data should be transferred to a computer as soon as possible after collection. As data is collected, it will be checked periodically in the field for accuracy and completeness. All data entries will include the date and time that the measurement was made.

- **Step-Drawdown Test Evaluation** forms are completed following completion of the Step-Drawdown Test to estimate a maximum sustainable discharge rate for the pumping well.

SITE PREPARATION

1. Observe and record site conditions in the field log. Note weather conditions, site activities, and personnel on site. Prepare aquifer test forms for each well to be monitored during the test.

2. Inventory available equipment and mobilize to a central staging area adjacent to the test location(s).

3. Assembly of pump/discharge manifold:

   - Pump (pump selection based on well construction, aquifer formation and step-drawdown test (if applicable);
   - Discharge pipe or tubing from pump assembly;
   - Swivel;
   - Flow valve;
   - Water-flow meter (measures to the nearest tenth in gallons per minute) or calibrated 5-gallon bucket (measures to the nearest 0.25-gallon), if applicable;
   - Sample port and valve for collecting physical and/or chemical samples for analysis;
   - Tandem flow valves;
   - Flexible hose to storage tanks or basin; and
   - Licensed waste hauler(s) or properly lined storage tanks or basin, as necessary.

PRELIMINARY PROCEDURES

1. Open all wells (pumping and observation) and allow a minimum of 15 minutes for the water level in the wells to stabilize.

2. Measure and record static water levels of the pumping well and all observation wells involved with the aquifer pump test with a water level indicator to the

nearest 0.01-foot to establish pre-test static water level conditions. Note the time of the measurement and record on the aquifer test form for each well. Use the same electric sounder for every measurement in a given well for the duration of the test, in order to avoid cross-contamination between wells.

3. At the designated background observation well, monitor barometric pressure readings using a calibrated barometer. As an adequate substitute, barometric measurements obtained from the nearest National Weather Service station may be obtained. Water level and pressure monitoring should be conducted simultaneously and continue prior to and throughout the pump and recovery test to establish pre- and post-test conditions, as necessary.

4. Decontaminate all downhole equipment in accordance with Roux's Non-Disposable and Non-Dedicated Sampling Equipment Decontamination FOP.

5. Synchronize the field watch, computer and data logger clock times and note in the Project Field Book. To verify the sensitivity of each transducer use the following procedure:

   a. Submerge the transducer in the well approximately one foot and check the pressure reading against the measurement from the electric sounder;

   b. Measure a one- to two-foot increment on the transducer cable and lower the transducer further into the well by this amount;

   c. Check the pressure reading to verify that it changed by the amount the transducer was lowered;

   d. Record this information in the Project Field Book.

6. Lower pre-cleaned pressure transducers into the pumping and observation wells (if not previously installed during site preparation) and make connections to the data logger, as necessary. The transducer within the pumping well should be positioned as far below the expected depth of the pump intake to minimize disturbance of the transducer. Install transducers/data loggers at

the observation wells (if applicable) to a depth such that during the aquifer pump test, the water level within the observation wells does not fall below the level of the transducer. Typically, 10 to 15-feet below the static water level is sufficient. Document depths, installation times, sensitivity check etc. in the Project Field Book.

7. Set each transducer via a computer to measure and record water pressure at ten-minute intervals. Transducers in all wells should be activated at the same time (e.g. on the quarter hour) for ease in data reduction. Note the time that each transducer is activated on the appropriate field form (samples attached) and the Project Field Book.

8. Insert the pump assembly into the pump well and lower to its desired intake depth. Confirm that the pump inlet is set at a depth appropriate for optimum drawdown.

9. Allow all pumping and observation well water levels to stabilize (i.e., ± 0.05 feet of static).

STEP-DRAWDOWN TEST

The purpose of the Step-Drawdown Test is to conduct a series of short duration pump tests over a consistent time interval and at increasing pumping rates. Step-drawdown test evaluation will determine the discharge potential (i.e., optimum yield) of the pumping well and the pumping well performance as well as test the discharge manifold for leaks and the water-flow meter for accuracy prior to initiating the pumping test.

The step-drawdown test also evaluates the ability of the discharge line to convey purged groundwater outside the cone of influence thereby eliminating unnatural recharge response during the pump test. Water level measurements will be collected in the pumped well and the observation wells using water level indicators or pressure transducers, and will be recorded for the appropriate well.

Step-Drawdown Test – Pumping Phase

The pumping phase of the step-drawdown test consists of:

- Pumping the well at least three successively higher pumping rates (steps) specified by the Project Hydrogeologist, with a recommended duration of two to four hours per step;

- Periodically measuring the water levels in the pumped well and observation wells during each step; and

- Measuring the instantaneous and cumulative discharge from the pumped well using a flow meter or other appropriate means.

The maximum water-level drawdown will be approximately 50% of the available drawdown. A relatively constant pumping rate will be maintained during each step. The rate will be checked periodically (at least hourly) and adjusted, if necessary. The accuracy of the flow meter also may be verified periodically by comparing the flow rate obtained by timing a revolution of the sweep needle on the flow meter with the flow rate obtained by timing the filling of a container of known volume.

Step-Drawdown Test – Recovery Phase

The recovery phase of the step-drawdown test will begin immediately after the pump is shut off, at the completion of the final step of the pumping phase. Recovery water-level measurements will be made periodically in the pumped well and observation wells. Water level measurements will conclude when one of the following is satisfied:

- 95 percent of the induced drawdown has recovered; or
- The water level in the pumped well has changed less than 0.05 foot for at least 2 hours.

Step-Drawdown Test Procedure

1. The Step-Drawdown Test pumping rate should initially be lower than the anticipated maximum pump rate of the formation/pumping well. Pump the well at this lower rate for 1 hour (typically 30 minutes to 2 hours). The key is to run each step for the exact same amount of time and to run at least three steps. If time permits, allow the pumping well to recover to ± 0.05 feet of static prior to commencing each successive step.

2. Start the pressure transducer and pump as simultaneously as possible. Measure and record water levels within the pumping well (either manually with a water level indicator or with the previously installed pressure transducer) as well as the time of measurement.

3. Record the time upon stabilization of drawdown within the pumping well (i.e., negligible drawdown while continuing pumping).

4. Upon drawdown stabilization, record total pumping duration of STEP 1 and allow pumping well to recover to ± 0.05 feet of static prior to commencing the next step (time permitting).

5. Increase the pumping rate by either opening the discharge valve or increasing the pumping rate of pump via controller. Record new pumping rate of the second step. Remember to pump STEP 2 for the same duration as STEP 1.

6. Repeat steps 2 through 5 until adequate data has been collected, typically three steps. Generally, a minimum of three steps are all that are required, however four or five may be necessary.

7. Following the Step-Drawdown Test pumping phase, stop the pressure transducer (if installed) within the pumping well, extract data and allow the pumping and observation wells to stabilize to ± 0.05 feet of static.

8. Evaluate the Step-Drawdown Test utilizing the **Step-Drawdown Test Evaluation Form** (see attached sample).

CONSTANT RATE PUMPING TEST

The constant rate pumping test will be conducted long enough (estimated minimum of 72 hours) to allow the influence of local hydraulic boundaries, if present, to be observed. The duration of the recovery period will be determined when one of the following have been met:

- The recovery period is equivalent to the planned pumping period;
- 95 percent of the induced drawdown has been recovered in all wells;
- The water level in all wells has not changed more than 0.05 foot for at least two hours; or
- The Project Hydrogeologist determines that extension of the recovery period would not result in collection of additional useful data.

Pretest Phase

During the pretest phase, water level measurements will be taken in the pumped well and each observation well that is to be monitored throughout the duration of the test. Water level measurements will be taken with a water level indicator. All pretest water level measurements for the pumping well and observation wells will be recorded on the Aquifer Test Data Sheet (sample attached) for each appropriate well. Water levels during the test will be measured using a data logger and pressure transducers, with periodic verification checks using water level indicators. Transducer pressure ranges should be as small as practical, but large enough to allow for the maximum expected drawdown.

1. Measure and record static water levels of the pumping well and all observation wells involved with the aquifer pump test.

2. Lower pressure transducers into the pumping and observation wells (if not previously installed during site preparation) and make connections to the data logger, as necessary. The transducer within the pumping well should be positioned as far below the expected depth of the pump intake to minimize disturbance of the transducer. Install transducers/data loggers at the observation wells (if applicable) to a depth such that during the aquifer pump test, the water level within the observation wells does not fall below the level of the transducer. Typically, 10 to 15-feet below the static water level is sufficient.

3. Insert the pump assembly into the pump well and lower to its desired intake depth.

9. Allow all pumping and observation well water levels to stabilize (i.e., ± 0.05 feet of static).

10. Upon well stabilization, start the pressure transducers in all observations wells beginning with the farthest working toward the closest observation well to the pumping well.

Pumping Phase

During the pumping phase of the aquifer test, the following measurements will be collected:

- Water levels in the pumped well and the observation wells;
- Instantaneous and cumulative discharge from the pumped well; and
- Time at which measurements are taken.

During the pumping phase, time-drawdown curves for the observation wells should be field-plotted on semi-logarithmic graph paper to evaluate the progress of the test. If the plots indicate steady-state conditions in the aquifer, pumping may be terminated before the planned conclusion upon approval of the Project Hydrogeologist. Likewise, the pumping phase of the test may be extended at the discretion of the Project Hydrogeologist.

The water levels in the pumped well and the observation wells will be measured on an approximate, pre-determined time schedule. An example time schedule is presented in the procedure below. The pumping rate for the pumping test will be based on the ideal rate estimated during the Step-Drawdown Test discussed earlier in this FOP. The selected pumping rate is expected to result in a sufficient water level drawdown for representative aquifer data to be collected.

Discharge from the pumped well will be measured using a calibrated flow meter (to the nearest tenth) or 5-gallon bucket (to the nearest 0.25-gallon). The accuracy of the flow meter will be checked periodically, using the method described in the section on step-drawdown testing. Discharge will be maintained at a relatively constant rate. The discharge rate will be checked and adjusted, if necessary, at 10-minute intervals during the first hour of pumping, and at appropriate intervals thereafter. Rate of discharge, cumulative gallons discharged, and time of measurement will be recorded during each check of the flow rate.

The pumping phase shall adhere to the following procedure:

1. Commence pumping and initiate discharge and drawdown monitoring simultaneously. The pumping well discharge should be controlled to keep it as constant as possible by adjusting the flow valve located before the water flow meter. The tone or rhythm of the generator powering the pump (if applicable) provides an audible check of the pump's performance. If a sudden change in tone is noted, check the discharge immediately and make proper adjustments to the flow valve, if necessary.

   NOTE: When using pressure transducers, manual water level measurements should also be obtained during the test at the prescribed time intervals as a backup. Pressure transducer data can be lost due to a variety of reasons: damage, battery drainage etc.

2. Record discharge and drawdown data as follows:
   - Discharge:

Elapsed Time	Log Sample Interval
0 – 1 hr.	15 min.
1 – 6 hr.	1 hr.
6 hr. – completion	4 hr.

- Drawdown:

Elapsed Time	Log Sample Interval
0 – 2 sec.	0.2 sec.
2 – 20 sec.	1 sec.
2 sec. – 2 min.	5 sec.
2 – 10 min.	30 sec.
10 – 100 min. (1 hr. 40 min.)	2 min.
100 – 1000 min. (16 hr. 40 min.)	10 min.
1000 – 10,000 min. (166 hr. 40 min.)	100 min.
10,000 – completion	500 min.

Water level vs. time measurements should be recorded in the field on semi-log graph paper to monitor the progress of the test.

3. Monitor the discharge water, prior to pre-treatment (if present) for visual, olfactory and other physical parameters (pH, specific conductance, turbidity and temperature) through the sample port at the same frequency as described above for discharge.

4. Frequently inspect discharge pipe train and storage capacity to minimize potential for spillage of discharge water at the same frequency as described above for discharge.

5. Prior to turning pump off following completion of the pump test, collect environmental samples for laboratory analysis in accordance with Roux's Groundwater Sample Collection FOP.

Recovery Phase

At completion of the pumping phase of the test, the pump will be shut off. Care will be taken to ensure that produced water does not flow back into the well. In the recovery phase, water level measurements will be taken in the pumped well and the observation wells immediately following pump shut-off at the approximate times established during the pumping phase. During the recovery phase of the aquifer test, the following measurements will be collected:

- Record the drawdown and time at which pump is shut down.
- Record depth-to-water and time in the pumping and observation wells, following the schedule used during the pump test.
- The wells may not recover to the original static water level within a reasonable length of time. Once the slope of the recovery curve stability is at a rate of 0.1 feet/hour recovery, test measurements can be discontinued.
- Recovery phase monitoring should continue at a frequency to be determined in the field, to establish post-test conditions.

Collection of water level measurements during the recovery phase will be complete when one of the following conditions applies:

- 95% of the induced drawdown in all wells has been recovered;
- The water level in the pumped well has changed less than 0.05 foot for at least 2 hours; or
- A period of time equal to the duration of the pumping phase has elapsed since the pump was shut off.

DISCHARGED WATER MANAGEMENT

It is very important to ensure discharged water is released well away from the pumping test in order to not affect the cone of depression established during the pumping phase by creating an un-natural recharge boundary to the results. Either run the discharge line outside the anticipated cone of depression or containerize the discharge water. Containerization can be costly due to the large quantities of discharge water generated during pumping tests, therefore every effort to direct the discharge away from the pump test location is recommended.

In addition, water produced during the aquifer test will be managed as appropriate based on laboratory results obtained from analysis of discharged water. Appropriate management may include temporary storage of water or pretreatment through a granular activated carbon unit; see project Work Plan for discharged water management.

ABORTED TEST

Failure of pumping operations (mechanical breakdown of generator, pump, etc.) for a period greater than 10 percent of the elapsed pumping time may require postponement of the test. The pumping phase of the test may be resumed at the same rate after brief interruptions. Restarting a postponed test can occur when one of the following conditions has been reached:

- 95% of the induced drawdown in the pumped well has been recovered; or
- The well has not been pumped for a period at least equal to the elapsed pumping time of the test before postponement.

CLEANUP PERIOD

Following the recovery period, deactivate the data logger, and remove downhole equipment from the test wells. Decontaminate all downhole equipment in accordance with Roux's Non-Disposable and Non-Dedicated Sampling Equipment Decontamination FOP. Download pressure data from each transducer/data logger and water quality data logger to a laptop computer and make backup copies of all data. Lock and replace the well protective cap or cover at each well involved with the constant rate pump test.

ATTACHMENTS

Field Activity Daily Log (FADL) (sample)
Aquifer Test Data Sheet (sample)
Step-Drawdown Test Data Sheet (sample)
Step-Drawdown Test Evaluation form (sample)

REFERENCES

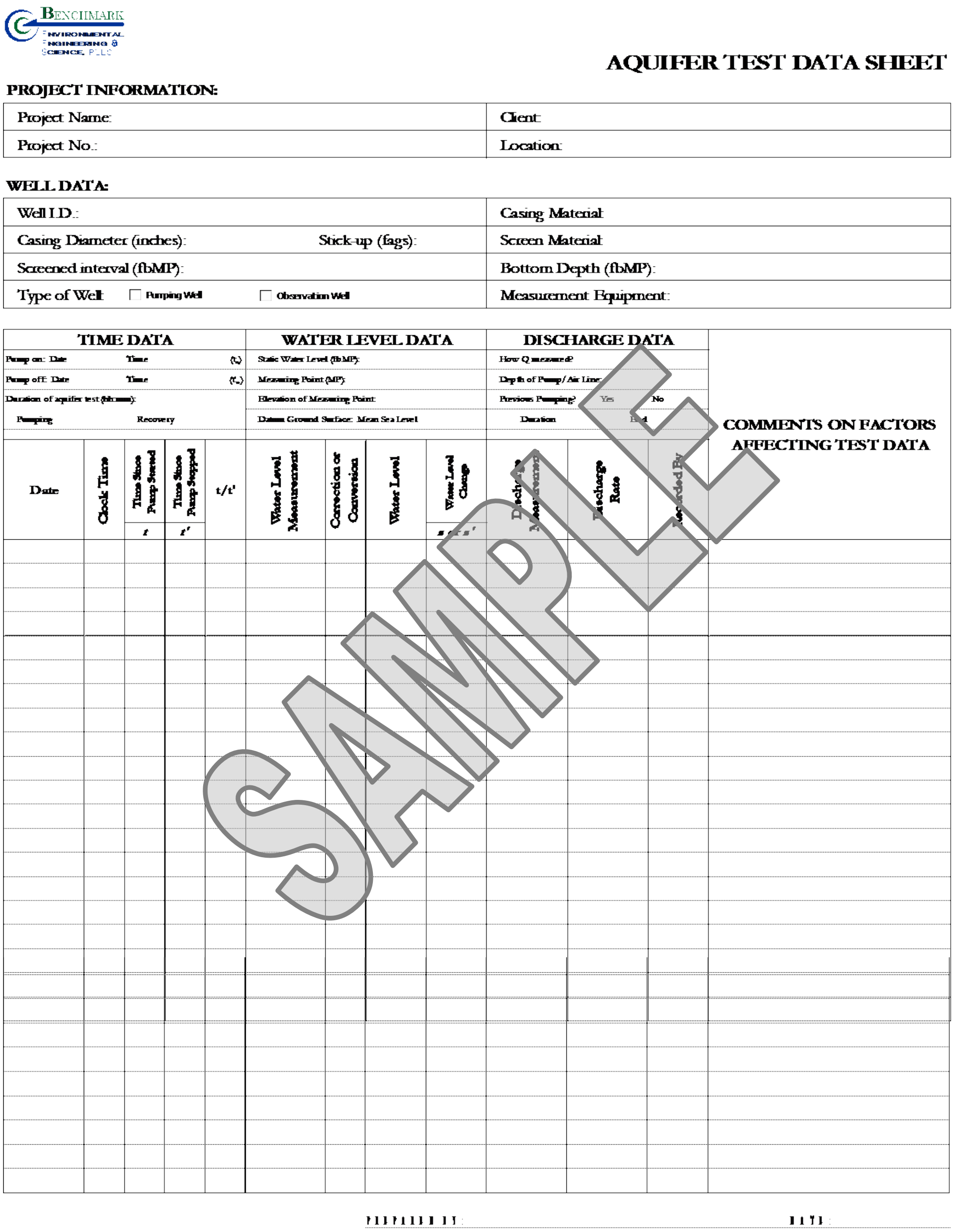
Batu, Vedat Ph.D., P.E., 1998. *Aquifer Hydraulics: A Comprehensive Guide to Hydrogeologic Data Analysis.*

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

Weight, D.W. and Sonderegger, J.L, Manual of Applied Field Hydrogeology, McGraw Hill, pp. 363 – 402.

Roux FOPs:

015	*Documentation Requirements for Drilling and Well Installation*
024	*Groundwater Sample Collection Procedures*
040	*Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*



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AQUIFER TEST DATA SHEET

PROJECT INFORMATION:

Project Name:	Client:
Project No.:	Location:

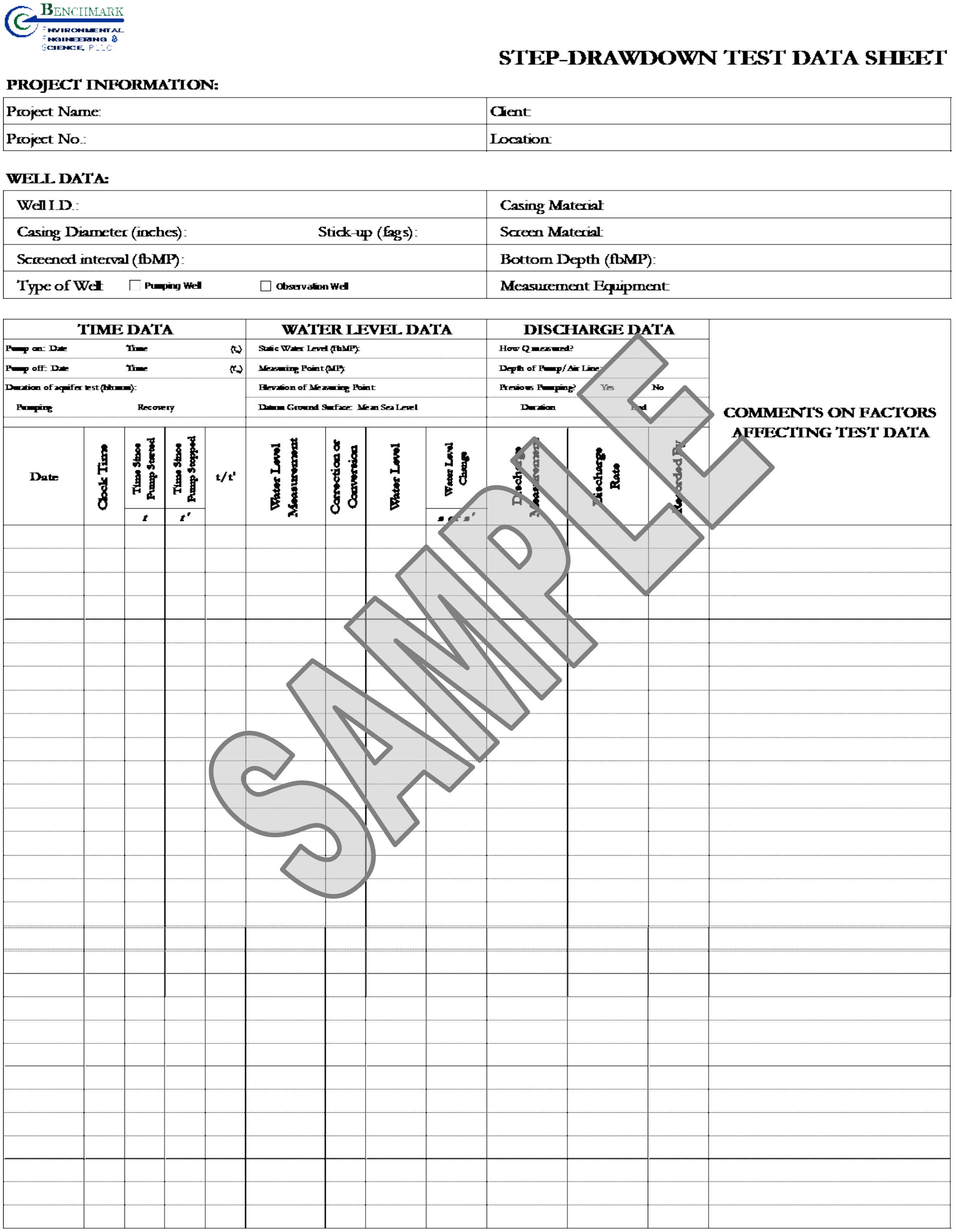
WELL DATA:

Well I.D.:	Casing Material:
Casing Diameter (inches): Stick-up (fags):	Screen Material:
Screened interval (fbMP):	Bottom Depth (fbMP):
Type of Well: ☐ Pumping Well ☐ Observation Well	Measurement Equipment:

TIME DATA	WATER LEVEL DATA	DISCHARGE DATA
Pump on: Date Time (t_o)	Static Water Level (fbMP):	How Q measured?
Pump off: Date Time (t_e)	Measuring Point (MP):	Depth of Pump/Air Line:
Duration of aquifer test (hh:mm):	Elevation of Measuring Point:	Previous Pumping? Yes No
Pumping Recovery	Datum Ground Surface: Mean Sea Level	Duration End

Date	Clock Time	Time Since Pump Started t	Time Since Pump Stopped t'	t/t'	Water Level Measurement	Correction or Conversion	Water Level	Water Level Change s or s'	Discharge Measurement	Discharge Rate	Recorded By	COMMENTS ON FACTORS AFFECTING TEST DATA

PREPARED BY: DATE:



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STEP-DRAWDOWN TEST DATA SHEET

PROJECT INFORMATION:

Project Name:	Client:
Project No.:	Location:

WELL DATA:

Well I.D.:		Casing Material:
Casing Diameter (inches):	Stick-up (fags):	Screen Material:
Screened interval (fbMP):		Bottom Depth (fbMP):
Type of Well: ☐ Pumping Well	☐ Observation Well	Measurement Equipment:

TIME DATA	WATER LEVEL DATA	DISCHARGE DATA
Pump on: Date Time (t_o)	Static Water Level (fbMP):	How Q measured?
Pump off: Date Time (t_1)	Measuring Point (MP):	Depth of Pump/Air Line:
Duration of aquifer test (hh:mm):	Elevation of Measuring Point:	Previous Pumping? Yes No
Pumping Recovery	Datum Ground Surface: Mean Sea Level	Duration End

Date	Clock Time	Time Since Pump Started	Time Since Pump Stopped	t/t'	Water Level Measurement	Correction or Conversion	Water Level	Water Level Change	Discharge Measurement	Discharge Rate	Recorded By	COMMENTS ON FACTORS AFFECTING TEST DATA
		t	t'					s or s'				

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STEP-DRAWDOWN TEST EVALUATION

PROJECT INFORMATION:

Project Name: **0**	Client: **0**
Project No.: **0**	Location: **0**

STEP-DRAWDOWN DATA:

Step No.	Q (gpm)	Δ Q (gpm)	Δ Q (ft^3/sec)	Δ s (ft)
1				
2				
3				

DETERMINE THE TURBULENCE FACTOR, C:

$$C = \frac{\left(\frac{\Delta s_n}{\Delta Q_n}\right) - \left(\frac{\Delta s_{n-1}}{\Delta Q_{n-1}}\right)}{\Delta Q_n + \Delta Q_{n-1}}$$

C = turbulence factor, in ft/(ft^3/sec)^2

Δs_n = the change in drawdown from step n1 to n, in ft.

ΔQ_n = the change in pumping rate from step n1 to n, in ft^3/sec.

Qualitative values for Turbulence Factor, C

Turbulence Factor, C (ft/(ft^3/sec)^2)	Comments
< 5	Great
5 - 10	Good
10 - 40	Fair to poor, redevolpe well
> 40	Bad, abandon and re-intall

$C_{1,2}$ = ft/(ft^3/sec)^2

$C_{2,3}$ = ft/(ft^3/sec)^2

DETERMINE THE WELL LOSSES:

Step 2: s = $(C_{1,2})^2$ x $(Q_2 + Q_1)^2$
=

Step 3: s = $(C_{2,3})^2$ x $(Q_3 + Q_2 + Q_1)^2$
=

Qualitative Values for Percent Loss	
90 - 100	very efficient
75 - 90	efficient
50 - 75	marginal
< 65	not efficient

DETERMINE THE RELATIVE PERCENT LOSSES:

Step 2: % loss = s (from above) x ($\Delta s_1 + \Delta s_2$) x 100%
=
=

Step 3: % loss = s (from above) x ($\Delta s_1 + \Delta s_2 + \Delta s_3$) x 100%
=
=

ROUX

FIELD OPERATING PROCEDURES

Documentation Requirements for Drilling and Well Installation

FOP 015.0

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. Roux 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 Roux 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 Roux 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 Roux 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 Roux field supervisor and the driller's representative, and provided to the Roux 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)

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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					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
	Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery			

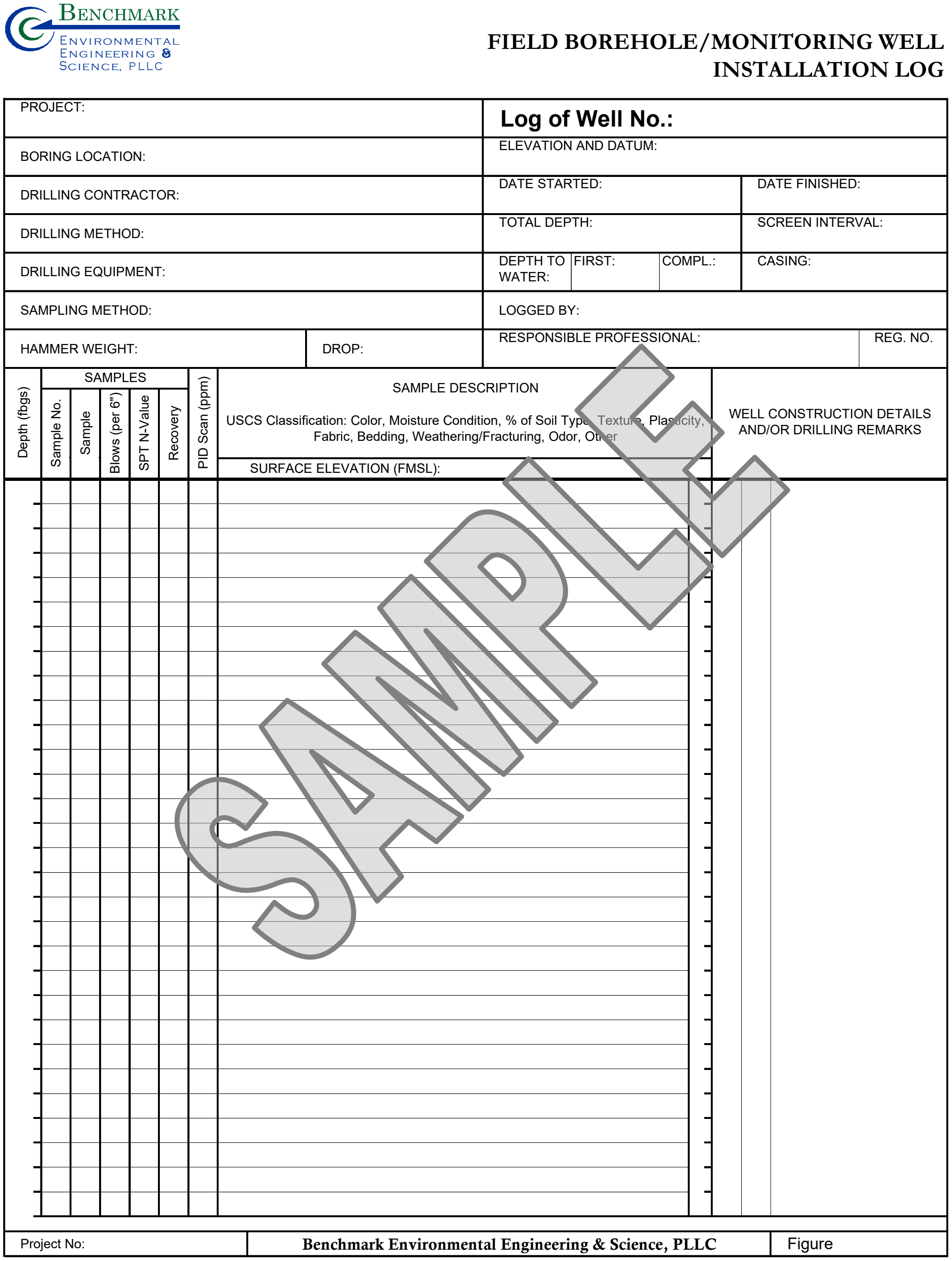
ABANDONMENT:

Volume of cement/bentonite grout required:	$V = \pi r^2 \times 7.48 =$	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:	**Benchmark Environmental Engineering & Science, PLLC**	Figure



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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:	**Benchmark Environmental Engineering & Science, PLLC**	Figure

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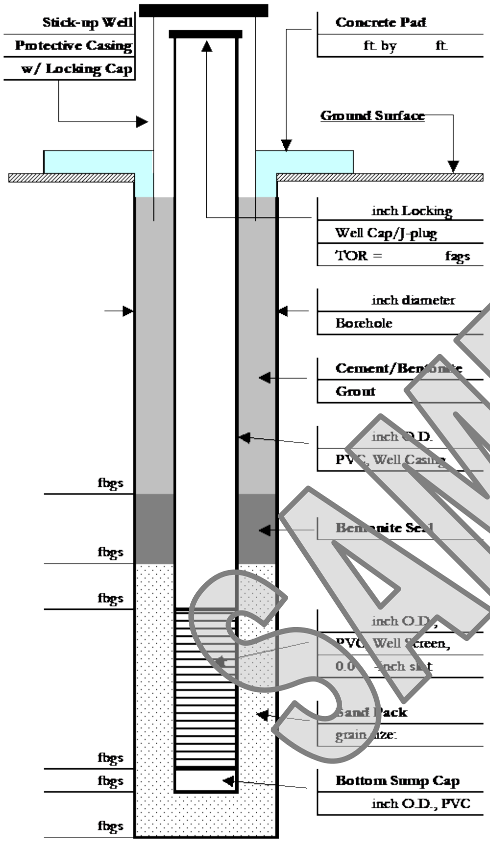
STICK-UP WELL/PIEZOMETER COMPLETION DETAIL

Project Name:
Client:
Boring Location:
WELL NUMBER:
Date Installed:
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)

Material 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:

PREPARED BY: DATE:

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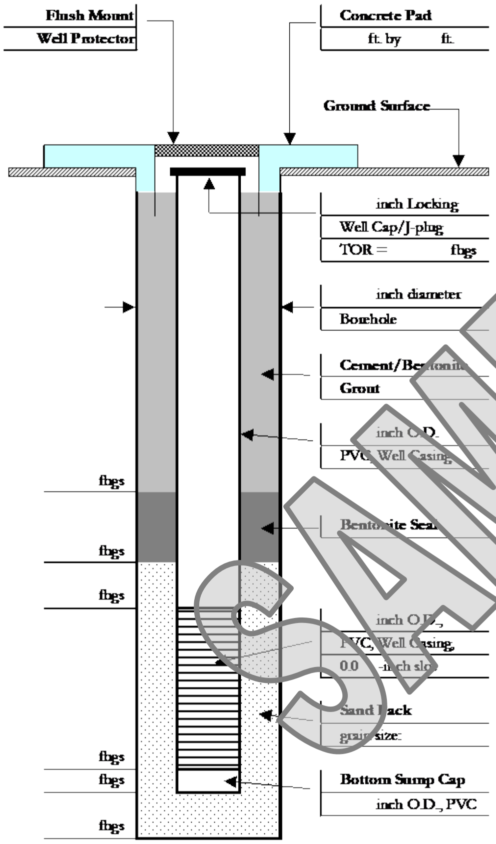
FLUSHMOUNT WELL/PIEZOMETER COMPLETION DETAIL

Project Name: WELL NUMBER:
Client: Date Installed:
Boring Location: Project Number:



Driller Information	
Company:	
Driller:	
Helper:	
Permit Number:	
Drill Rig Type:	

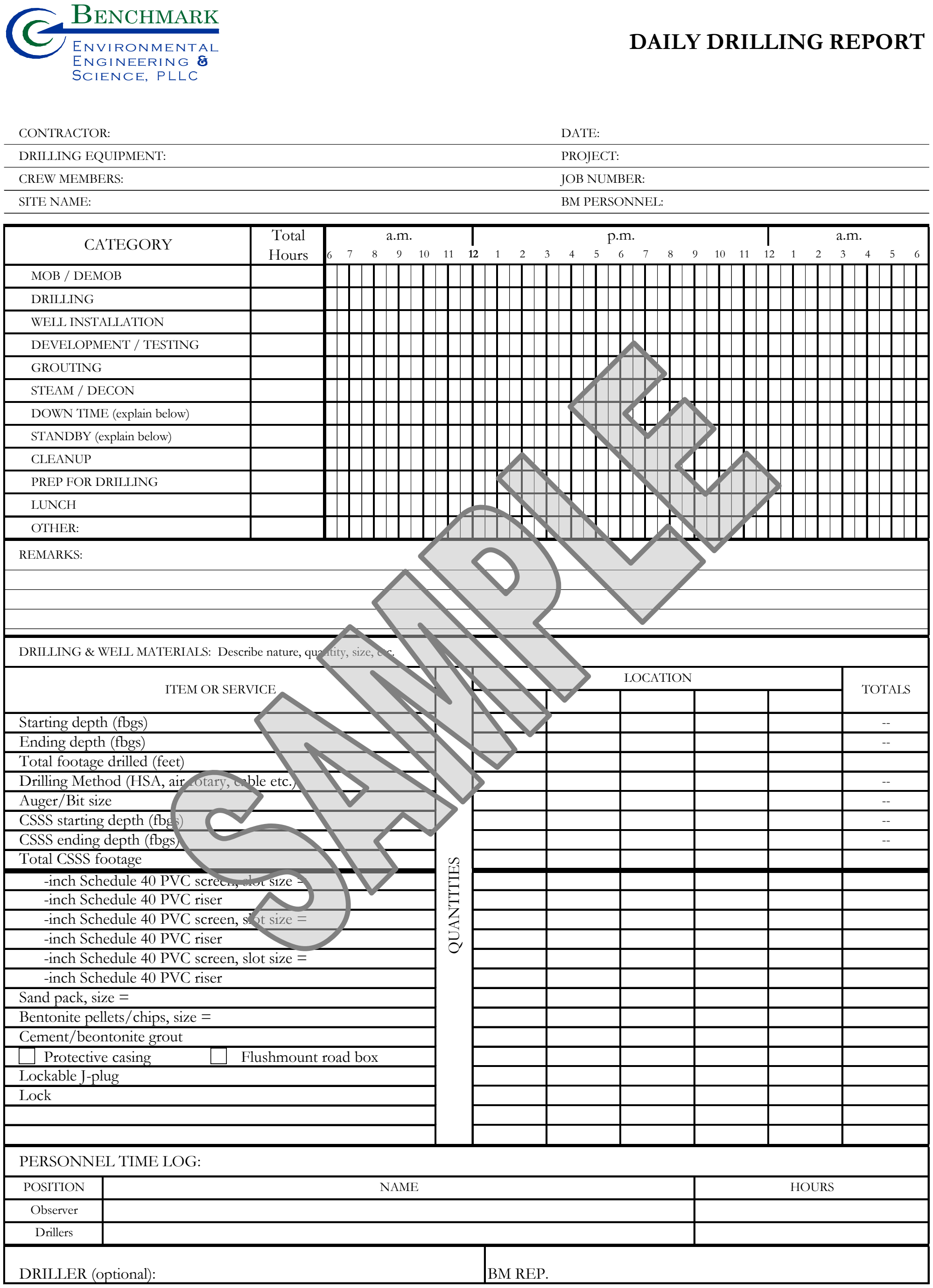
Well Information	
Land Surface Elevation:	fmsl (approximate)
Drilling Method:	
Soil Sample Collection Method:	
Drilling Fluid:	
Fluid Loss During Drilling:	gallons (approximate)

Material 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:



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DAILY DRILLING REPORT

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

CATEGORY	Total Hours	a.m.						p.m.												a.m.						
		6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	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.

SAMPLE

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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

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 Roux Field Operating Procedure for Management of Investigation-Derived Waste.

ATTACHMENTS

none

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.

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FIELD OPERATING PROCEDURES

Groundwater Level Measurement

FOP 022.0

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 Roux 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

Roux FOPs:
040 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination

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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 Purging Procedures Prior to Sample Collection

FOP 023.1

GROUNDWATER PURGING PROCEDURES PRIOR TO SAMPLE COLLECTION

PURPOSE

This procedure describes the methods for monitoring well/piezometer purging prior to groundwater sample collection in order to collect representative groundwater samples. The goal of purging is to remove stagnant, non-representative groundwater from the well and/or prevent stagnant water from entering collected samples. Purging involves the removal of at least three to five volumes of water in wells with moderate yields and at least one well volume from wells with low yields (slow water level recovery).

Purge and sample wells in order of least-to-most contaminated (this is not necessary if dedicated or disposable equipment is used). If you do not know this order, sample the upgradient wells first, then the furthest down-gradient or side-gradient wells, and finally the wells closest to, but down-gradient of the most contaminated area. Sampling should commence immediately following purging or as soon as the well has adequately recharged and not more than 24-hours following end time of evacuation.

PROCEDURE

1. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Roux 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 Roux 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. Inspect the interior and exterior of the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Field Form and/or Groundwater Well Inspection Form (samples attached). Specifically, inspect

the integrity of the following: concrete surface seal, lock, protective casing and well cover, well riser and J-plug/cap. Report any irregular findings to the Project Manager.

3. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.

4. Calibrate the photoionization detector (PID) in accordance with the Roux Field Operating Procedure for Calibration and Maintenance of Portable Photoionization Detector.

5. 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.

6. Lower the e-line probe slowly into the monitoring well and record the initial water level in accordance with the procedures referenced in the Roux Field Operating Procedure for Groundwater Level Measurement.

7. Following static water level determinations, 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. Continue with purging activities observing 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 field activities.

8. Calculate the volume of water in the well based on the water level below the top of riser and the total depth of the well using the following equation:

$$V = 0.0408[(B)^2 \text{ x } \{(A) - (C)\}]$$

Where,

A = Total Depth of Well (feet below measuring point)
B = Casing diameter (inches)
C = Static Water Level (feet below measuring point)

9. **For wells where the water level is 20 feet or less below the top of riser**, a peristaltic pump may be used to purge the well. Measure the purged volume using a calibrated container (i.e., graduated 5-gallon bucket) and record measurements on the attached Groundwater Well Development and Purge Log. Use new and dedicated tubing for each well. During the evacuation of shallow wells, the intake opening of the pump tubing should be positioned just below the surface of the water. As the water level drops, lower the tubing as needed to maintain flow. For higher yielding wells, the intake level should not be lowered past the top of the screen. Pumping from the top of the water column will ensure proper flushing of the well. Continue pumping until the required volumes are removed (typically three well volumes). For higher yielding wells, adjust the purging rate to maintain the water level above the screen. For lower yielding wells or wells where the screen straddles the water table, maintain purging at a rate that matches the rate of recovery of the well (well yield). If the well purges to dryness and is slow to recharge (greater than 15 minutes), terminate evacuation. **A peristaltic pump and dedicated tubing cannot be used to collect VOC or SVOC project-required samples; only non-organic compounds may be collected using this type of pump.**

10. **For wells where the water level is initially below 20 feet,** or drawn down to this level because of slow recharge rate, conduct purging using one of three devices listed below:

- <u>Bailer</u> – A bottom filling dedicated polyethylene bailer attached to a length of dedicated hollow-braid polypropylene rope. Purging a well utilizing a bailer should be conducted smoothly and slowly as not to agitate the groundwater or damage the well.

- <u>Well Wizard Purge Pump (or similar)</u> – This pneumatic bladder pump uses compressed air to push water to the surface. Groundwater is not in contact with the drive air during the pumping process, therefore the pump may be used for sample collection.

- Submersible Pump (12 or 24 volt, or similar) – These submersible pumps are constructed of PVC or stainless steel and are capable of pumping up to 70 feet from ground surface using a 12 volt battery (standard pump) and standard low flow controller. For depths up to 200 feet from ground surface, a high performance power booster controller is used with a 12 volt battery. Unless these pumps are dedicated to the monitoring well location, decontamination between locations is necessary and an equipment blank may be required.

- Waterra™ Pump – This manually operated pump uses dedicated polyethylene tubing and a check valve that can be used as an optional method for purging deeper wells. The pump utilizes positive pressure to evacuate the well, therefore the pump may be used for sample collection, and however over-agitation groundwater should be avoided.

Prior to use in a well, non-dedicated bailers, exterior pump bodies and pump tubing should be cleaned in accordance with the Roux Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination. Dedicated and/or disposable equipment should be contained within the sealed original manufacturers packaging and certified pre-cleaned by the manufacturer with a non-phosphate laboratory detergent and rinsed using de-ionized water.

8. Purging will continue until a predetermined volume of water has been removed (typically three well volumes) or to dryness. Measurements for pH, temperature, specific conductance, dissolved oxygen (optional), Eh (optional), and turbidity will be recorded following removal of each well volume. Purge the well to dryness or until the readings for indicator parameters listed above (or well-specific indicator parameters) stabilize within the following limits for each parameter measured:

Field Parameter	Stabilization Criteria
Dissolved Oxygen	± 0.3 mg/L
Turbidity	± 10 %
Specific Conductance	± 3 %
Eh	± 10 mV
PH	± 0.1 unit

Stabilization criteria presented within the project Work Plan will take precedence.

DOCUMENTATION AND SAMPLE COLLECTION

This section pertains to the documentation of collected field data during and following purging activities and sample collection.

1. Record all data including the final three stable readings for each indicator parameter on the attached Groundwater Well Purge & Sample Log.
2. Record, at a minimum, the "volume purged," "purging stop-time," "purged dry (Y/N)," "purged below sand pack (Y/N)," and any problems purging on the attached Groundwater Well Purge & Sample Log.
3. Collect groundwater samples in accordance with the Roux Field Operating Procedure for Groundwater Sample Collection. Record "sample flow rate" as an average, "time sample collected," and any other pertinent information related to the sampling event on the attached Groundwater Well Purge & Sample Log.
4. Restore the well to its capped/covered and locked condition.

ALTERNATIVE METHODS

Alternative purging and sampling methods and equipment, other than those described herein are acceptable if they provide representative groundwater samples. The purging and sampling method and equipment must not adversely affect sample integrity, chemistry, temperature, and turbidity. In addition, alternative equipment must have minimal or no effect on groundwater geochemistry, aquifer permeability and well materials. Equipment materials must also minimize sorption and leaching. The field team is responsible for documenting and describing any alternative equipment and procedures used to purge a well and collect samples.

ATTACHMENTS

Groundwater Field Form
Groundwater Well Inspection Form

REFERENCES

<u>Roux FOPs:</u>

011	*Calibration and Maintenance of Portable Photoionization Detector*
022	*Groundwater Level Measurement*
024	*Groundwater Sample Collection Procedures*
040	*Non-disposable and Non-dedicated Sampling Equipment Decontamination*

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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 ☐ Sample
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:			Date: (if different from above)						
	S1								
	S2								

Well No.	Diameter (inches):	Sample Time:
Product Depth (fbTOR):	Water Column (ft):	DTW when sampled:
DTW (static) (fbTOR):	Casing Volume:	Purpose: ☐ Development ☐ Sample
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:			Date: (if different from above)						
	S1								
	S2								

REMARKS:

Note: All water level 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

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GROUNDWATER WELL INSPECTION FORM

Project:	**WELL I.D.:**
Client:	
Job No.:	
Date:	
Time:	

EXTERIOR INSPECTION

Protective Casing:

Lock:

Hinge/Lid:

Concrete Surface Seal:

Bollards:

Label/I.D.:

Other:

INTERIOR INSPECTION

Well Riser:

Annular Space:

Well Cap:

Water Level (fbTOR):

Total Depth (fbTOR):

Other:

Comments/Corrective Actions:

PREPARED BY: DATE:

ROUX

FIELD OPERATING PROCEDURES

PFAS Groundwater/Surface Water Sample Collection Procedures

FOP 024.3

PFAS GROUNDWATER/ SURFACE WATER SAMPLE COLLECTION PROCEDURES

PURPOSE

This procedure describes the methods for collecting per-and polyfluoroalkyl substances (PFAS) groundwater samples from monitoring wells, following purging and sufficient recovery, and surface water locations. This procedure is specific to sites where PFAS sample analysis is required, and analysis specific collection and handling procedures are needed. PFAS sample analysis will be completed when Site analysis requires sampling of the full TAL/TCL analyte list. This field operating procedure (FOP) describes the personal protective equipment (PPE) and sampling equipment/materials appropriate for PFAS sample collection. PFAS laboratory analysis is performed using extremely low detection limits (parts per trillion). Therefore, cross contamination from potential sources (i.e., field equipment, consumer products) must be minimized to the extent possible.

PROCEDURE

Prior to sampling, discuss with the Site's Project Manager whether the monitoring wells that are to be sampled for the PFAS analytical parameters are new monitoring wells or existing monitoring wells. The specific handing and collection procedures for PFAS sampling are solely based on job preparation and sampling equipment used for the job. The standard practice of a 10 volume surge and purge of a newly installed monitoring well for development as discussed in Roux's FOP 036.0 – Monitoring Well Development Procedures and three volume well purge and/or low flow sampling that are discussed in Roux's FOP 023.1 – Groundwater Procedures Prior to Sample Collection remain the same. FOP 064.0 – Surface Water Sampling Procedures remains the same with the exceptions made in this FOP for PFAS sampling. The field sampling personnel must be prepared with appropriate clothing, equipment, and sampling containers for PFAS sampling as discussed below.

FIELD CLOTHING

Unacceptable Field Clothing

- No Gore-Tex®, this includes but not limited to boots, gloves, coveralls, hats, and coats.
- No Tyvex®, this includes but not limited to coveralls, boots, hoods and head coverings. Tyvex® is also found in everyday items such as envelopes, receipts, and adhesives.
- No clothes, jackets, boots, or gloves that have been pretreated with Teflon® water proofing. Teflon® can be found in everyday items such as scissors, plumbers' tape, adhesive tapes, Teflon ® paper for crafting and cookware utensils.
- No clothing that has been waterproofed with PFAS materials
- No brand-new unwashed cotton clothing.
- Clothing that has been washed with fabric softeners prior to sampling.

Acceptable Field Clothing

- Well-worn, washed clothes, jackets, hats, and coveralls without fabric softener usage.
- Rain Gear made from PVC, polyurethane, or rubber only (it cannot contain any of the products listed above).
- Disposable powder free nitrile gloves.

FIELD EQUIPMENT

Unacceptable Field Equipment

- Sampling Equipment containing Teflon® or Low-Density Polyethylene (LDPE). Sampling equipment that may contain these materials include submersible pumps, bailers, tubing, braided poly rope or cord, fishing line.
- No LDPE or glass lined sampling containers, or Teflon®-lined caps.

- Waterproof field books, binders, plastic clip boards, spiral hard cover notebooks.
- No adhesives or permanent markers can be used (i.e., Post-It® notes and Sharpies).
- No Aluminum foil or sampling tins.
- No blue ice packs
- Avoid using paper towels

Acceptable Field Equipment

- Sampling Equipment made from High Density Polyethylene (HDPE), stainless steel, acetate, silicon, or polypropylene.
- Sampling Containers made from HDPE polypropylene

Acceptable Field Equipment (continued)

- Sampling Equipment (i.e. bailers) made from Poly Vinyl Chloride (PVC)
- Nylon rope/twine
- Ice
- Alconox

ADDITIONAL PROCEDURES

- Keep all bottle ware in a dedicated cooler containing only PFAS sample containers.
- Avoid consumption of food or drink prior to and during the sampling event.
- Do not apply cosmetics or moisturizers prior to sampling.
- Do not use standard commercial sunscreen or insect repellents. Use only all natural or organic products.

- Collect PFAS sample from each location prior to collecting other samples for analysis to avoid contact with other sample containers and packing materials.
- New disposable nitrile gloves will be donned at each sampling location.
- Don new disposable nitrile gloves while handling empty sample containers, filling sampling containers, sealing sample containers, and placing containers into sampling coolers.
- Single use (dedicated) or disposable sampling equipment is preferred when multiple locations are sampled.
- Perform a standard two-step decontamination using Alconox detergent and laboratory provided PFAS-free water for all non-dedicated sampling equipment.
- Equipment blanks should be comprised of laboratory provided PFAS-free water. The water should be poured over and/or brought into direct contact with all sampling equipment (bailer, rope, tubing, gloves, water level meter, etc.). The equipment blank will then be sealed and returned to the sample cooler. One equipment blank will be collected each day PFAS samples are collected, or once every 20 samples, whichever is more frequent. Additional equipment blanks may be collected as needed.
- One field duplicate and one matrix spike/matrix spike duplicate (MS/MSD) will be collected for every 20 samples.
- Field blanks should be comprised of laboratory provided PFAS-free water. The field blank should be uncapped and placed near the field crew while purging/sampling preparations take place (i.e. prepare bottle set, calibrate groundwater quality meters, prepare bailers for sampling, etc.). The intent of the uncapped blank is to capture any ambient PFAS compounds that may emanate from the field crew or equipment during typical preparations associated with groundwater/surface water sampling. The field blank will then be capped and returned to the sample cooler.

ATTACHMENTS

Groundwater Field Form (sample)

FOP 024.3

PFAS GROUNDWATER/ SURFACE WATER SAMPLE COLLECTION PROCEDURES

Surface Water Quality Field Collection Log (Sample)

REFERENCES

Roux FOPs:

036.0 Monitoring Well Development Procedures
023.1 Groundwater Purging Procedures Prior to Sample Collection
064.0 Surface Water Sampling Procedures

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GROUNDWATER FIELD FORM

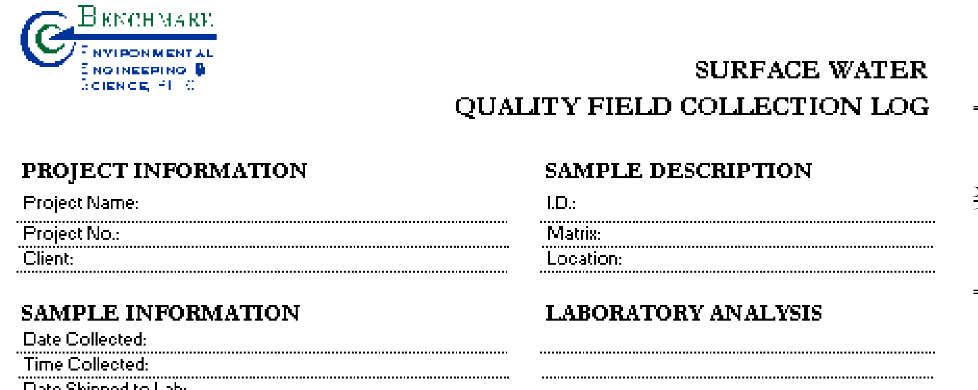
Project Name:
Date:
Location:
Project No.:
Field Team:

Well No.	Diameter (inches):	Sample Time:
Product Depth (fbTOR):	Water Column (ft):	DTW when sampled:
DTW (static) (fbTOR):	Casing Volume:	Purpose: ☐ Development ☐ Sample
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								

FOP 024.3

PFAS GROUNDWATER/ SURFACE WATER SAMPLE COLLECTION PROCEDURES



SURFACE WATER
QUALITY FIELD COLLECTION LOG

PROJECT INFORMATION

Project Name:

Project No.:

Client:

SAMPLE DESCRIPTION

I.D.:

Matrix:

Location:

SAMPLE INFORMATION

Date Collected:

Time Collected:

LABORATORY ANALYSIS

ROUX

FIELD OPERATING PROCEDURES

Hand Augering Procedures

FOP 025.0

HAND AUGERING PROCEDURES

PURPOSE

This guideline presents a method for hand augering, which enables the recovery of representative surface and shallow subsurface samples for classification and sample collection (ASTM D1452).

PROCEDURE

1. Review project objectives and the Project Health and Safety Plan (HASP).
2. Follow Roux's FOP: Drill Site Selection Procedure prior to implementing any hand augering activity.
3. Establish a central staging area for storage of augering supplies and for equipment decontamination (include plastic-covered work bench/table as necessary). Locate a secure storage area for augered samples.
4. Assemble auger and decontaminate in accordance with Roux's FOP: Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.
5. Cover the area to be sampled with plastic sheeting, as determined by the Project Work Plan.
6. Make the auger boring through the plastic sheeting by rotating and advancing the auger to the desired depth below ground surface.
7. Withdraw the auger from the hole and remove soil for examination, soil classification, on-site testing (if applicable) and laboratory physical/chemical sample collection (if applicable) in accordance with specific Roux FOPs (Soil Description Procedures Using the Unified Soil Classification System; Composite Sample Collection Procedure for Non-Volatile Organic Analysis; and/or Soil Sample Handling for VOC Analysis) and as directed by the Project Work Plan.

8. Document all properties and sample locations in the Project Field Book and Hand Auger Borehole Log (sample attached). Specifically, total depth, borehole diameter, depth of sample collection, personnel, etc. should be recorded.

9. Place sample in appropriate container(s), label and store for future reference or ship to laboratory for analysis in accordance with Roux's Field Operating Procedure for Sample Labeling, Storage and Shipment.

10. Decontaminate auger in accordance with Roux's Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.

11. Advance auger to next sample interval and repeat steps 7 through 12 as necessary.

12. Backfill auger holes in accordance with approved procedures outlined in the Project Work Plan.

ATTACHMENTS

Hand Auger Borehole Log (sample)

REFERENCES

<u>Roux FOPs:</u>

013	*Composite Sample Collection Procedure for Non-Volatile Organic Analysis*
017	*Drill Site Selection Procedure*
040	*Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*
046	*Sample Labeling, Storage and Shipment*
054	*Soil Description Procedures Using the Unified Soil Classification System*
057	*Soil Sample Handling for Volatile Organic Compound Analysis – Encore Sampling*

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HAND AUGER BOREHOLE LOG

Project:	BOREHOLE I.D.:
Project No.:	Excavation Date:
Client:	Excavation Method:
Location:	Logged / Checked By:

Hand Auger Location: *NOT TO SCALE*

Hand Auger Cross Section:

Grade - 0'
2'
4'
6'
8'
10'

TIME	BOREHOLE DIMENSIONS	
Start:	Diameter:	(approx.)
End:	Depth:	(approx.)

Depth (fbgs)	SAMPLE DESCRIPTION USCS Classification: Color, Moisture Condition, % of Soil Type, Texture, Plasticity, Fabric, Bedding, Weathering/Fracturing, Odor, Other	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.:

ROUX

FIELD OPERATING PROCEDURES

Hollow Stem Auger 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 Roux'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 Roux'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 Roux'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 Roux field supervisor.

10. Collect soil samples via split spoon sampler in accordance with Roux's Field Operating Procedure for Split Spoon Sampling.

11. Check augers periodically during drilling to ensure the boring is plumb. Adjust rig position as necessary to maintain plumb.

12. Continue drilling until reaching the assigned total depth, or until auger refusal occurs. Auger refusal is when the drilling penetration drops below 0.1 feet per 10 minutes, with the full weight of the rig on the auger bit, and a center bit (not center plug) in place.

13. Plug and abandon boreholes not used for well installation in accordance with Roux'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 Roux 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 Roux 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

Roux FOPs:

001	*Abandonment of Borehole Procedures*
010	*Calibration and Maintenance of Portable Flame Ionization Detector*
011	*Calibration and Maintenance of Portable Photoionization Detector*
017	*Drill Site Selection Procedure*
018	*Drilling and Excavation Equipment Decontamination Procedures*
058	*Split Spoon Sampling Procedures*

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DRILLING SAFETY CHECKLIST

Project: **Supplemental Phase II RFI/ICMs**
Date:
Project No.: **0041-009-500**
Drilling Company:
Client: **RealCo., Inc.**
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?		
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?		

ITEMS TO CHECK	OK	ACTION NEEDED

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DRILLING SAFETY CHECKLIST

Project: **Supplemental Phase II RFI/ICMs**
Date:
Project No.: **0041-009-500**
Drilling Company:
Client: **RealCo., Inc.**
Drill Rig Type:

ITEMS TO CHECK	OK	ACTION NEEDED
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 **Benchmark 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:

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TAILGATE SAFETY MEETING FORM

Project Name: Date: Time:
Project Number: Client:
Work Activities:

HOSPITAL INFORMATION:

Name:
Address: *City:* *State:* *Zip:*
Phone No.: *Ambulance Phone No.*

SAFETY TOPICS PRESENTED:

Chemical Hazards:

Physical Hazards: Slips, Trips, Falls

PERSONAL PROTECTIVE EQUIPMENT:

Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D

New Equipment:

Other Safety Topic (s): Environmental Hazards (aggressive fauna)
Eating, drinking, use of tobacco products is prohibited in the Exclusion Zone (EZ)

ATTENDEES

Name Printed	Signatures

Meeting conducted by:

FIELD OPERATING PROCEDURES

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

FOP 031.2

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 Roux'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 Roux's Groundwater Level Measurement FOP and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Roux'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 Roux'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 Roux'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 Roux'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.) slowly into the well until the pump/tubing intake is approximately in the middle of the screened interval. Rapid insertion of the pump will increase the turbidity of well water, and can increase the required purge time. This step can be eliminated if dedicated tubing is already within the well.

   Placement of the pump close to the bottom of the well will cause increased entrainment of solids, which may have settled in the well over time. Low-flow purging has the advantage of minimizing mixing between the overlying stagnant casing water and water within the screened interval. The objective of low-flow purging is to maintain a purging rate, which minimizes stress (drawdown) of the water level in the well. Low-flow refers to the velocity with which water enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen.

10. Lower the e-line back down the well as water levels will be frequently monitored during purge and sample activities.

11. Begin pumping to purge the well. The pumping rate should be between 100 and 500 milliliters (ml) per minute (0.03 to 0.13 gallons per minute) depending on site hydrogeology. Periodically check the well water level with the e-line adjusting the flow rate as necessary to stabilize drawdown within the well. If possible, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 feet or less). If the water level exceeds 2 feet below static and declining, slow the purge rate until the water level generally stabilizes. Record each pumping rate and water level during the event. If the water level continues to drop and will not stabilize, the monitoring location is not conducive to low-flow sampling and conventional purge and sample methods should be performed.

    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 or at least a minimum of three (3) well volumes have been removed. 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 Roux's Groundwater Sample Collection Procedures FOP. **A peristaltic pump and dedicated tubing cannot be used to collect VOC or SVOC project-required samples; only non-organic compounds may be collected using this type of pump.** 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.

ATTACHMENTS

Groundwater Field Form (sample)

REFERENCES

United States Environmental Protection Agency, 540/S-95/504, 1995. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures.*

Roux 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*

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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 ☐ Sample			
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:			Date: (if different from above)						
	S1								
	S2								

Well No.			Diameter (inches):			Sample Time:			
Product Depth (fbTOR):			Water Column (ft):			DTW when sampled:			
DTW (static) (fbTOR):			Casing Volume:			Purpose: ☐ Development ☐ Sample			
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:			Date: (if different from above)						
	S1								
	S2								

REMARKS:

Note: All water level 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:

ROUX

FIELD OPERATING PROCEDURES

Management of Investigative-Derived Waste (IDW)

FOP 032.2

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 Roux 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 Roux'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 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

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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):

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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

FOP 033.0

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 Roux'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 Roux'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 Roux Field Operating Procedure for Monitoring Well Development.

18. Manage all waste materials generated during well installation and development as described in the Roux Field Operating Procedure for Management of Investigation Derived Waste.

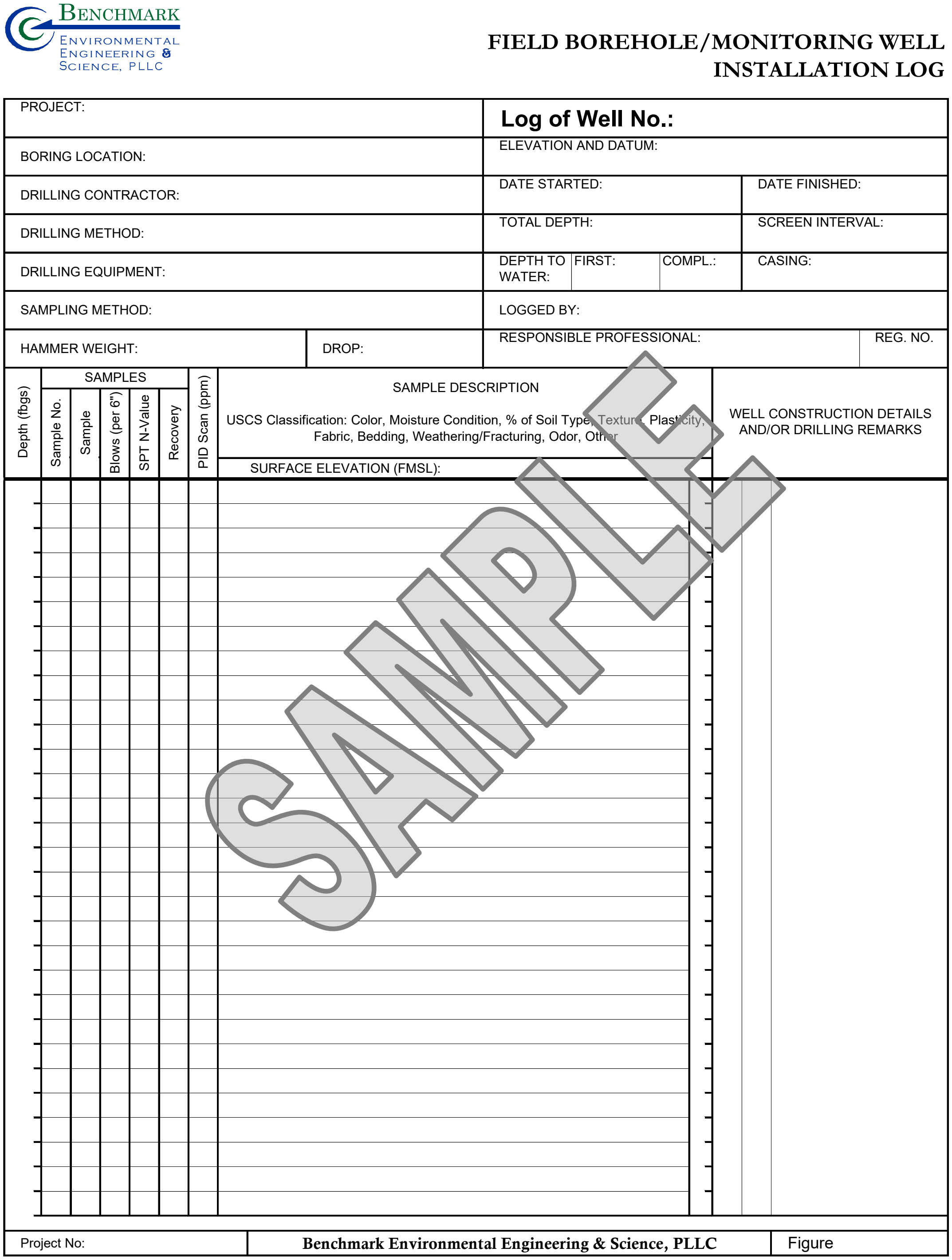
ATTACHMENTS

Field Borehole/Monitoring Well Installation Log (sample)
Typical Monitoring Well Detail (Figure 1)

REFERENCES

Roux FOPs:

015	*Documentation Requirements for Drilling and Well Installation*
026	*Hollow Stem Auger Drilling Procedures*
032	*Management of Investigation Derived Waste*
036	*Monitoring Well Development Procedures*



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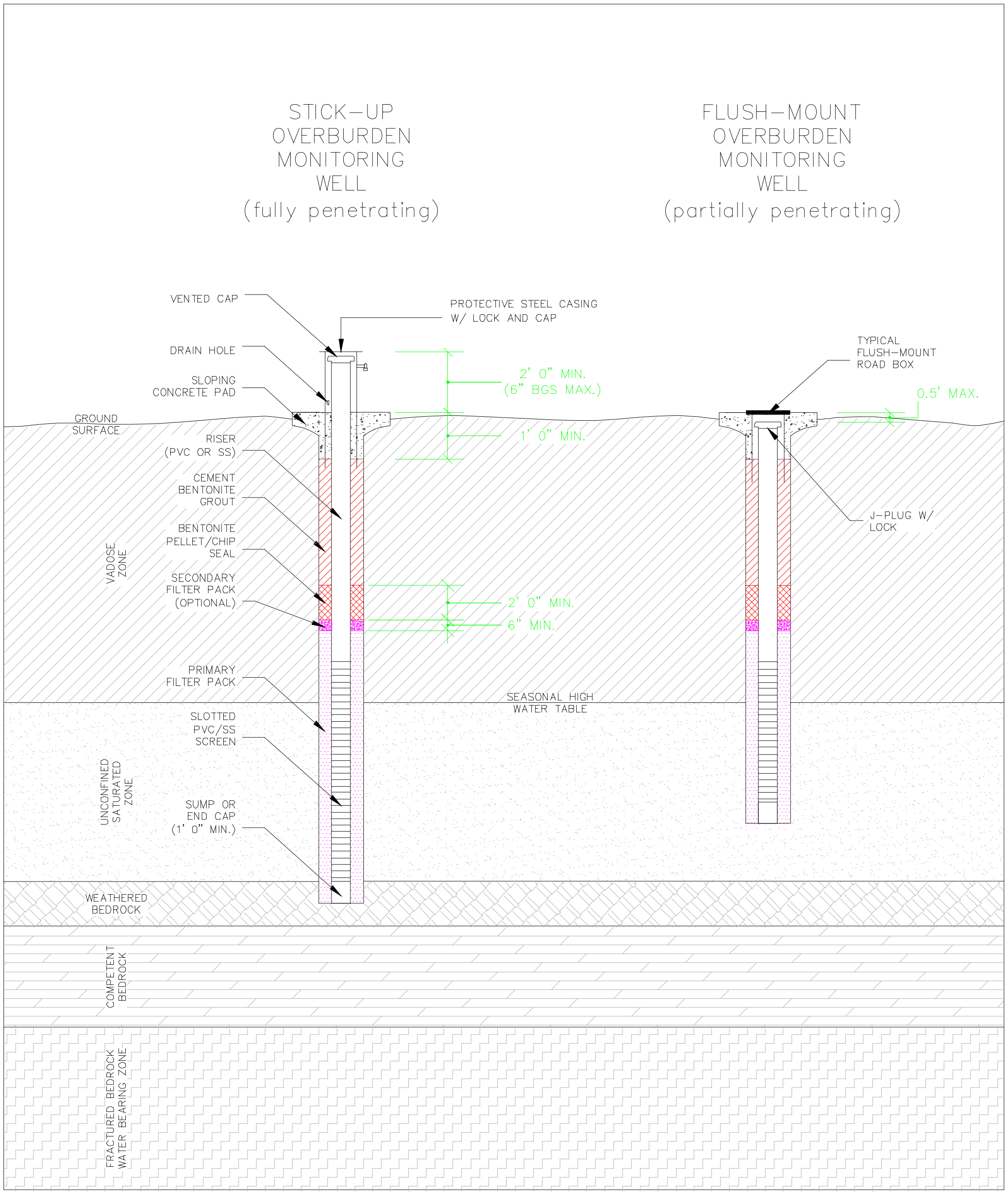
FIELD BOREHOLE/MONITORING WELL INSTALLATION LOG

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:	**Benchmark Environmental Engineering & Science, PLLC**	Figure

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
2' 0" MIN.
(6" BGS MAX.)
1' 0" MIN.
TYPICAL
FLUSH–MOUNT
ROAD BOX
0.5' MAX.
RISER
(PVC OR SS)
CEMENT
BENTONITE
GROUT
BENTONITE
PELLET/CHIP
SEAL
SECONDARY
FILTER PACK
(OPTIONAL)
J–PLUG W/
LOCK
VADOSE
ZONE
2' 0" MIN.
6" MIN.
PRIMARY
FILTER PACK
SEASONAL HIGH
WATER TABLE
SLOTTED
PVC/SS
SCREEN
UNCONFINED
SATURATED
ZONE
SUMP OR
END CAP
(1' 0" MIN.)
WEATHERED
BEDROCK
COMPETENT
BEDROCK
FRACTURED BEDROCK
WATER BEARING ZONE

ROUX

FIELD OPERATING PROCEDURES

Monitoring Well Development Procedures

FOP 036.0

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 Roux 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 Roux 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 Roux Groundwater Well Development Log (sample attached).

ATTACHMENTS

Groundwater Well Development Log (sample)

REFERENCES

<u>Roux FOPs:</u>

040 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination

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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 [$(B)^2$ x { (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 (µS/cm)	Turbidity (NTU)	DO (mg/L)	ORP (mV)	Appearance & Odor

REMARKS:

PREPARED BY:

FIELD OPERATING PROCEDURES

Non-Aqueous Phase Liquid (NAPL) Detection and Sample Collection Procedure

FOP 039.1

NON-AQUEOUS PHASE LIQUID DETECTION AND SAMPLE COLLECTION PROCEDURE

PURPOSE

This procedure describes the methods to detect the presence and sample collection of Non-Aqueous Phase Liquid (NAPL) in groundwater monitoring wells prior to purging activities. If NAPL is suspected, all activities should be performed with proper personnel protective equipment (PPE).

DETECTION PROCEDURE

Groundwater monitoring wells suspected of containing NAPL will be sounded with an interface probe, or similar device, in accordance with the following.

1. 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.

2. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.

3. Calibrate the photoionization detector (PID) in accordance with the Roux Field Operating Procedure for Calibration and Maintenance of Portable Photoionization Detector.

4. 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 the Groundwater Field Form (sample attached).

5. Slowly lower the interface probe down the well, avoiding contact with the well casing. Upon contact with the static liquid level in the well, the interface

probe will signal contact with an audible tone and/or a visible light mounted inside the reel.

Note:

- If the signal is constant, the probe is in contact with groundwater; and
- If the signal oscillates, the probe is in contact with NAPL.

6. Record the depth, type of liquid encountered (if applicable) and any other related information in the Project Field Book and on a Groundwater Field Form (sample attached).

7. Slowly lower the interface probe to the well bottom. Record the depth(s) and type(s) of any additional phases encountered.

8. Slowly raise the interface probe to the surface, avoiding contact with the well casing.

9. Place the interface probe and storage reel in a plastic bag for subsequent decontamination in accordance with the Roux's Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.

SAMPLE COLLECTION PROCEDURE

All NAPL samples collected from groundwater monitoring wells will be collected in accordance with the following.

1. Place plastic sheeting on the ground around the well to prevent equipment from coming in contact with soil and also to prevent the surface transmission of NAPL.

2. All sampling personnel will don the appropriate PPE in accordance with the site health and safety plan.

3. Measure the static water level and NAPL level(s) using an interface probe as described in the previous section.

4. Determine depth to NAPL layer and thickness. Record appropriate data in the Project Field Book and on a Groundwater Sample Collection Log form (sample attached).

DNAPL SAMPLE COLLECTION

The following procedure should be used in sampling dense, heavier than water NAPL (i.e., with a high specific gravity) (DNAPL).

1. Collect samples using a translucent double check valve bailer (i.e., a bailer with a ball valve on both the top and bottom) constructed of Teflon, polyethylene or PVC which is connected to polypropylene rope for lowering into the well. All non-dedicated equipment shall be decontaminated in accordance with the Roux Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.

2. Remove wrapping (i.e., aluminum foil, manufacturers packaging etc.), attach bailer to new polypropylene rope and slowly lower the bailer until it contacts the well bottom.

3. Slowly raise and lower the bailer to create a gentle surging action thereby inducing DNAPL into the bailer past the bottom ball valve.

4. Slowly raise the bailer to the surface. Avoid contact of the bailer line with the well casing and/or ground surface.

5. Observe the DNAPL through the translucent wall of the bailer and check if the immiscible phases have separated. If not, allow the bailer to stand upright until the phases have separated.

6. Carefully attach a bottom-emptying device with stopcock to the bottom of the bailer and discharge the DNAPL gently down the side of the sample bottle to minimize turbulence.

7. Repeat steps 2 through 6 until a sufficient sample volume is obtained.

8. Cap the sample bottle and label, preserve and ship samples in accordance with the Roux Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

9. Place the used plastic sheeting, bailer and polyethylene rope in a plastic bag for subsequent decontamination or disposal.

10. Document the sampling procedures and related information in the Project Field Book and on a Groundwater Sample Collection Log form (sample attached).

LNAPL SAMPLE COLLECTION

The following procedure should be used in sampling lighter than water NAPL (i.e., with a low specific gravity) (LNAPL).

1. Collect samples using a translucent double check valve bailer (i.e., a bailer with a ball valve on both the top and bottom) constructed of Teflon, polyethylene or PVC which is connected to polypropylene rope for lowering into the well. All non-dedicated equipment shall be decontaminated in accordance with the Roux Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.

2. Remove wrapping (i.e., aluminum foil, manufacturers packaging etc.), attach bailer to new polypropylene rope and slowly lower the bailer down the well into the immiscible phase of LNAPL. Care should be taken to lower the bailer just through the LNAPL layer, but not significantly down into the underlying groundwater.

3. Slowly raise the bailer to the surface. Avoid contact of the bailer line with the well casing and/or ground surface.

4. Observe the LNAPL through the translucent wall of the bailer and check if the immiscible phases have separated. If not, allow the bailer to stand upright until the phases have separated.

5. Carefully attach a bottom-emptying device with stopcock to the bottom of the bailer and decant the denser groundwater portion of the bailer contents into a DOT-approved 55-gallon drum for proper disposal.

6. Discharge the LNAPL gently down the side of the sample bottle to minimize turbulence.

7. Repeat steps 2 through 6 until a sufficient sample volume is obtained.

8. Cap the sample bottle and label, preserve and ship samples in accordance with the Roux Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

9. Place the used plastic sheeting, bailer and polyethylene rope in a plastic bag for subsequent decontamination or disposal.

10. Document the sampling procedures and related information in the Project Field Book and on a Groundwater Sample Collection Log form (sample attached).

ATTACHMENTS

Groundwater Well Purge & Sample Collection Log (sample)

REFERENCES

<u>Roux FOPs:</u>

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*

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GROUNDWATER WE
PURGE & SAMPLE COLLECTION L

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):	Ground Surface Elevation (fmsl):
Elevation Top of Screen (fmsl):	Stick-up (feet):

PURGING DATA: DATE: START TIME: END TIME:

Method:	Is purge equipement dedicated to sample location?	yes
No. of Well Volumes Purged:	Was well purged to dryness?	yes
Standing Volume (gallons):	Was well purged below top of sand pack?	yes
Volume Purged (gallons):	Condition of Well:	
Purge Rate (gal/min):	Field Personnel:	

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 by subtracting C from A, then multiplying by the volume calculation in the table per well diamter.

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

Stabilization Criteria

Parameter	Criteria
pH	+/- 0.1 ur
SC	+/- 3%
Turbidity	+/- 10%
DO	+/- 0.3 m
ORP	+/- 10 m

EVACUATION STABILIZATION TEST DATA:

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

SAMPLING DATA: DATE: START TIME: END TIME:

Method:	Is sampling equipement dedicated to sample location?	yes
Initial Water Level (fbTOR):	Was well sampled to dryness?	yes
Final Water Level (fbTOR):	Was well sampled below top of sand pack?	yes
Air Temperature (°F):	Field Personnel:	
Source and type of water used in the field for QC purposes:		

PHYSICAL & CHEMICAL DATA:

DESCRIPTION OF WATER SAMPLE		
Odor		
Color		
NAPL		
Contains Sediment?	yes	no

WATER QUALITY MEASUREMENTS								
Sample	Time	pH (units)	TEMP. (°C)	SC (uS)	TURB. (NTU)	DO (ppm)	ORI (mV)
initial							
final							

REMARKS:

PREPARED BY:

ROUX

FIELD OPERATING PROCEDURES

Non-Disposable and Non-Dedicated Sampling Equipment Decontamination

FOP 040.1

NON-DISPOSABLE AND NON-DEDICATED
SAMPLING EQUIPMENT DECONTAMINATION

PURPOSE

This procedure is to be used for the decontamination of non-disposable and non-dedicated equipment used in the collection of environmental samples. The purpose of this procedure is to remove chemical constituents from previous samples from the sampling equipment. This prevents these constituents from being transferred to later samples, or being transported out of controlled areas.

HEALTH AND SAFETY

Nitric acid is a strong oxidizing agent as well as being extremely corrosive to the skin and eyes. Solvents such as acetone, methanol, hexane and isopropanol are flammable liquids. Limited contact with skin can cause irritation, while prolonged contact may result in dermatitis. Eye contact with the solvents may cause irritation or temporary corneal damage. Safety glasses with protective side shields, neoprene or nitrile gloves and long-sleeve protective clothing must be worn whenever acids and solvents are being used.

PROCEDURE – GENERAL EQUIPMENT

Bailers, split-spoons, steel or brass split-spoon liners, Shelby tubes, submersible pumps, soil sampling knives, and similar equipment will be decontaminated as described below.

1. Wash equipment thoroughly with non-phosphate detergent and potable-quality water, using a brush where possible to remove any particulate matter or surface film. If the sampler is visibly coated with tars or other phase-separated hydrocarbons, pre-wash with acetone or isopropanol, or by steam cleaning. Decontamination will adhere to the following procedure:

   a. Rinse with potable-quality water; if the sampling equipment is very oily and use of a solvent is necessary, rinse with pesticide-grade isopropanol.

   b. Rinse with potable-quality water;

   c. Rinse with deionized water demonstrated analyte-free, such as distilled water;

   d. Air dry; and

   e. Store in a clean area or wrap in aluminum foil (shiny side out) or new plastic sheeting as necessary to ensure cleanliness.

2. All non-dedicated well evacuation equipment, such as submersible pumps and bailers, which are put into the well, must be decontaminated following the procedures listed above. All evacuation tubing must be dedicated to individual wells (i.e., tubing cannot be reused). However, if submersible pump discharge tubing must be reused, the tubing and associated sample valves or flow-through cells used in well purging or pumping tests will be decontaminated as described below:

   a. Pump a mixture of potable water and a non-phosphate detergent through the tubing, sample valves and flow cells, using the submersible pump.

   b. Steam clean or detergent wash the exterior of the tubing, sample valves, flow cells and pump.

   c. Pump potable water through the tubing, sample valve, and flow cell until no indications of detergent (e.g. foaming) are observed.

   d. Double rinse the exterior of the tubing with potable water.

   e. Rinse the exterior of the tubing with distilled water.

  f. Store in a clean area or wrap the pump and tubing assembly in new plastic sheeting as necessary to ensure cleanliness until ready for use.

3. All unused sample bottles and sampling equipment must be maintained in such a manner that there is no possibility of casual contamination.

4. Manage all waste materials generated during decontamination procedures as described in the Roux Field Operating Procedure for Management of Investigation Derived Waste.

PROCEDURE – SUBMERSIBLE PUMPS

Submersible pumps used in well purging or purging tests will be decontaminated thoroughly each day before use as well as between well locations as described below:

Daily Decontamination Procedure:

1. Pre-rinse: Operate the pump in a basin containing 8 to 10 gallons of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

2. Wash: Operate the pump in 8 to 10 gallons of non-phosphate detergent solution (i.e., Alconox) for 5 minutes and flush other equipment with fresh detergent solution for 5 minutes.

3. Rinse: Operate the pump in a basin of potable water for 5 minutes and flush other equipment with potable water for 5 minutes.

4. Disassemble pump.

5. Wash pump parts with a non-phosphate detergent solution (i.e., Alconox). Scrub all pump parts with a test tube brush or similar device.

6. Rinse pump with potable water.

7. Rinse the inlet screen, the shaft, the suction interconnection, the motor lead assembly, and the stator housing with distilled/deionized water.

8. Rinse the impeller assembly with 1% nitric acid (HNO_3).

9. Rinse the impeller assembly with isopropanol.

10. Rinse the impeller assembly with distilled/deionized water.

Between Wells Decontamination Procedure:

1. Pre-rinse: Operate the pump in a basin containing 8 to 10 gallons of potable water for 5 minutes.

2. Wash: Operate the pump in 8 to 10 gallons of non-phosphate detergent solution (i.e., Alconox) for 5 minutes.

3. Rinse: Operate the pump in a basin of potable water for 5 minutes.

4. Final rinse the pump in distilled/deionized water.

ATTACHMENTS

None

REFERENCES

Roux FOPs:
032 Management of Investigation-Derived Waste

ROUX

FIELD OPERATING PROCEDURES

Overburden Casing Installation Procedure

FOP 041.0

OVERBURDEN CASING INSTALLATION PRCEDURES

PURPOSE

This guideline presents a method for the installation of casing to prevent downhole contamination of hazardous compounds from shallow overburden material. This method is particularly applicable where contaminated strata overlie uncontaminated strata of lower permeability. The method can be used with hollow stem auger drilling or rotary wash drilling (where temporary casing is used). This guideline also presents a method for the evaluation of the integrity of the grout seal around an overburden casing, which has been positioned into a confining layer.

CASING INSTALLATION PROCEDURE

1. Advance boring by appropriate drilling methods, through the contaminated strata a short distance (1 to 2 feet) into an underlying lower permeable unit.

2. Calculate the volume of the borehole base on the bit/auger head or steel casing diameter plus 10% and determine the volume of grout to be emplaced. Generally, the total mixed volume is the borehole volume plus 20%.

3. Identify the equipment to be used for the preparation and mixing of the grout. Ensure the volume of the tanks to be used for mixing has been measured adequately. Document these volumes on the Field Borehole/Monitoring Well Installation Log (sample attached).

4. Identify the source of the water to be used for the grout and determine its suitability for use. In particular, water with high sulfate, or chloride levels or heated water should not be used. These types of waters can cause operational difficulties or modify the set-up for the grout.

5. Identify the equipment to be used for emplacing the grout. Ensure that the pump to be used has adequate pressure to enable complete return to surface.

6. Identify the volumes to be pumped at each stage or in total if only one stage is to be used.

7. Begin mixing the grout to be emplaced. Grout specifications generally have mixture ratios as follows:

Grout Slurry Composition (% Weight)

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

8. Record the type and amount of materials used during the mixing operation. Ensure the ratios are within specifications tolerance.

9. Begin pumping the grout through the return line bypass system to confirm all pump and surface fittings are secure.

10. Remove drill rods and center plug (or clean out temporary casing) and insert a tremie pipe to the bottom of the boring. Pump the cement/bentonite grout slurry through the tremie pipe until grout return is observed at grade and no bridging of the slurry is evident. Slowly withdraw the augers (or casing) from the boring while maintaining the grout level at grade. Record the times and volumes emplaced on the Field Borehole/Monitoring Well Installation Log (sample attached).

11. Document the return circulation of grout. This may be facilitated by using a colored dye or other tagging method if a mudded borehole condition exists prior to grout injection.

12. Place a drillable plug (preferably untreated wood) at the downhole end of black steel or other appropriate casing, insert the casing through the slurry, and seat it into the underlying formation.

13. Allow grout to set for 24 to 48 hours.

HYDROSTATIC TESTING OF CASING PROCEDURE

1. Following adequate setting time for the grout, drill through the grout inside the casing until the top of the confining layer has been reached (refer to Field Borehole/Monitoring Well Installation Log during casing installation).

2. Fill the casing with potable water and measure the water level within the casing with a water level indicator to the nearest 0.01-foot and record the measurement on the Pipe Leakage Testing Log (sample attached).

3. Monitor the water level for 30 minutes and record the final water level within the casing with a water level indicator to the nearest 0.01-foot and record the measurement on the Pipe Leakage Testing Log (sample attached).

4. Should the water level drop more than the allowable volume calculated using the following equation, the seal shall be regrouted at the Subcontractor's expense.

   $Q_{(allowable)} = 2.75\ DKH$

   Where:
   $Q_{(allowable)}$ = Flow rate during a 30 minute test
   D = Inside diameter of overburden casing
   K = Confining layer hydraulic conductivity (see Table 1)
   H = Head of water applied

   Note: Be sure to use consistent units of measure.

ATTACHMENTS

Field Borehole/Monitoring Well Installation Log (sample)
Pipe Leakage Testing Log (sample)

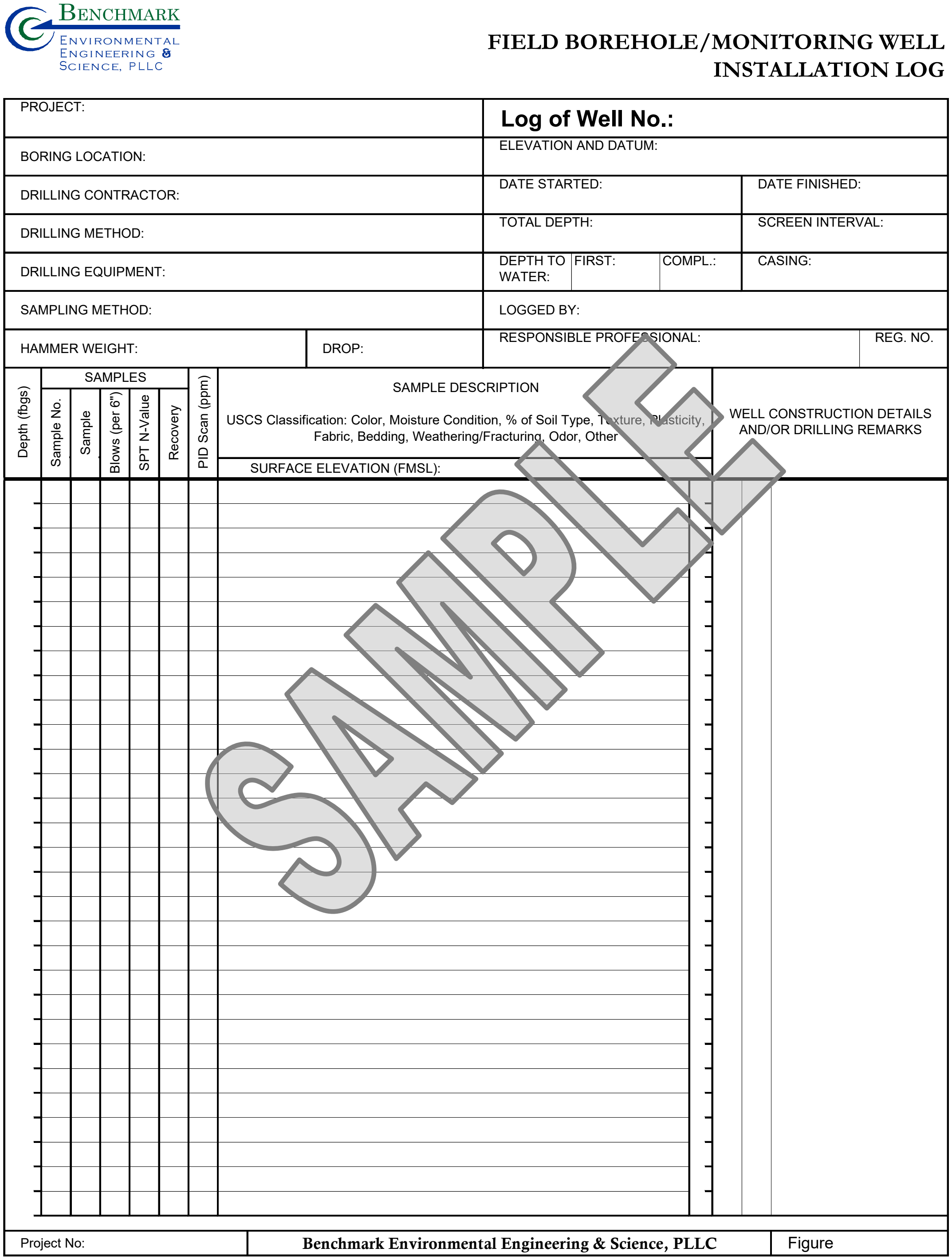
Table 1 – Range of Values of Hydraulic Conductivity and Permeability

REFERENCES

Freeze, R.A. and J.A. Cherry. 1979. *Groundwater*. Prentice-Hall, Inc., Englewood, New Jersey, 604 p.

Roux FOPs:

018 Drilling and Excavation Equipment Decontamination Protocols



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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:	**Benchmark Environmental Engineering & Science, PLLC**	Figure

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PIPE LEAKAGE TESTING LOG

Project: Location:

Client: Date:

Job No: BM Personnel:

Location Description	Test Procedure (Air or Hydrostatic)	QC Initials	Readings				Elapsed Time (minutes)	Change in Pressure/ Water Level (psi/fbMP)	Pass/Fail	Passing Retest Date	Comments/Notes
			Start		End						
			Pressure or Water Level	Time	Pressure or Water Level	Time					

Prepared By: Date:

TABLE 1: (From Freeze and Cherry, page 29.)

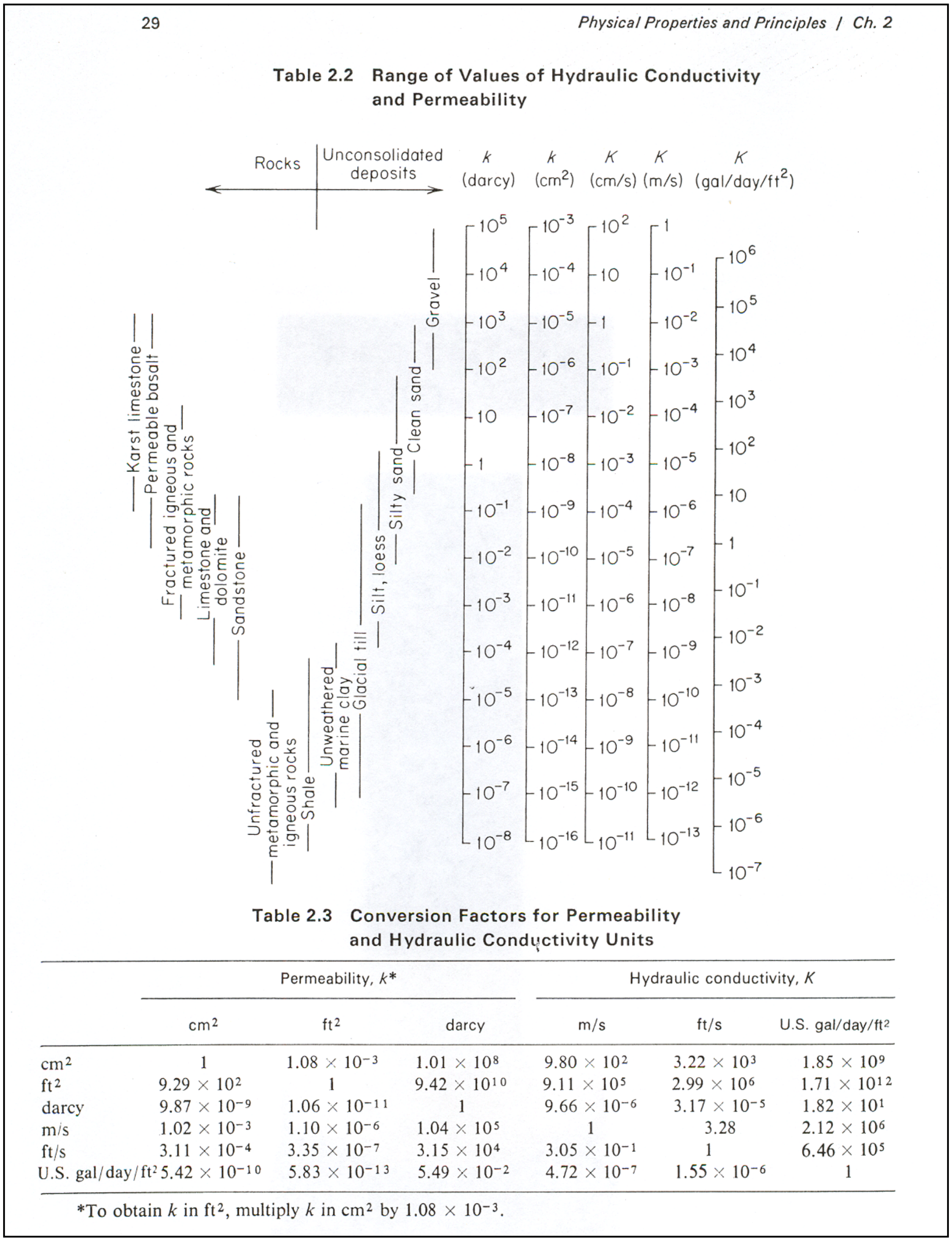

Table 2.2 Range of Values of Hydraulic Conductivity and Permeability

Table 2.3 Conversion Factors for Permeability and Hydraulic Conductivity Units

	Permeability, *k**			Hydraulic conductivity, *K*		
	cm²	ft²	darcy	m/s	ft/s	U.S. gal/day/ft²
cm²	1	1.08×10^{-3}	1.01×10^{8}	9.80×10^{2}	3.22×10^{3}	1.85×10^{9}
ft²	9.29×10^{2}	1	9.42×10^{10}	9.11×10^{5}	2.99×10^{6}	1.71×10^{12}
darcy	9.87×10^{-9}	1.06×10^{-11}	1	9.66×10^{-6}	3.17×10^{-5}	1.82×10^{1}
m/s	1.02×10^{-3}	1.10×10^{-6}	1.04×10^{5}	1	3.28	2.12×10^{6}
ft/s	3.11×10^{-4}	3.35×10^{-7}	3.15×10^{4}	3.05×10^{-1}	1	6.46×10^{5}
U.S. gal/day/ft²	5.42×10^{-10}	5.83×10^{-13}	5.49×10^{-2}	4.72×10^{-7}	1.55×10^{-6}	1

*To obtain *k* in ft², multiply *k* in cm² by 1.08×10^{-3}.

ROUX

FIELD OPERATING PROCEDURES

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 Roux 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 Roux 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

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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 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.

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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. 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 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.

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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

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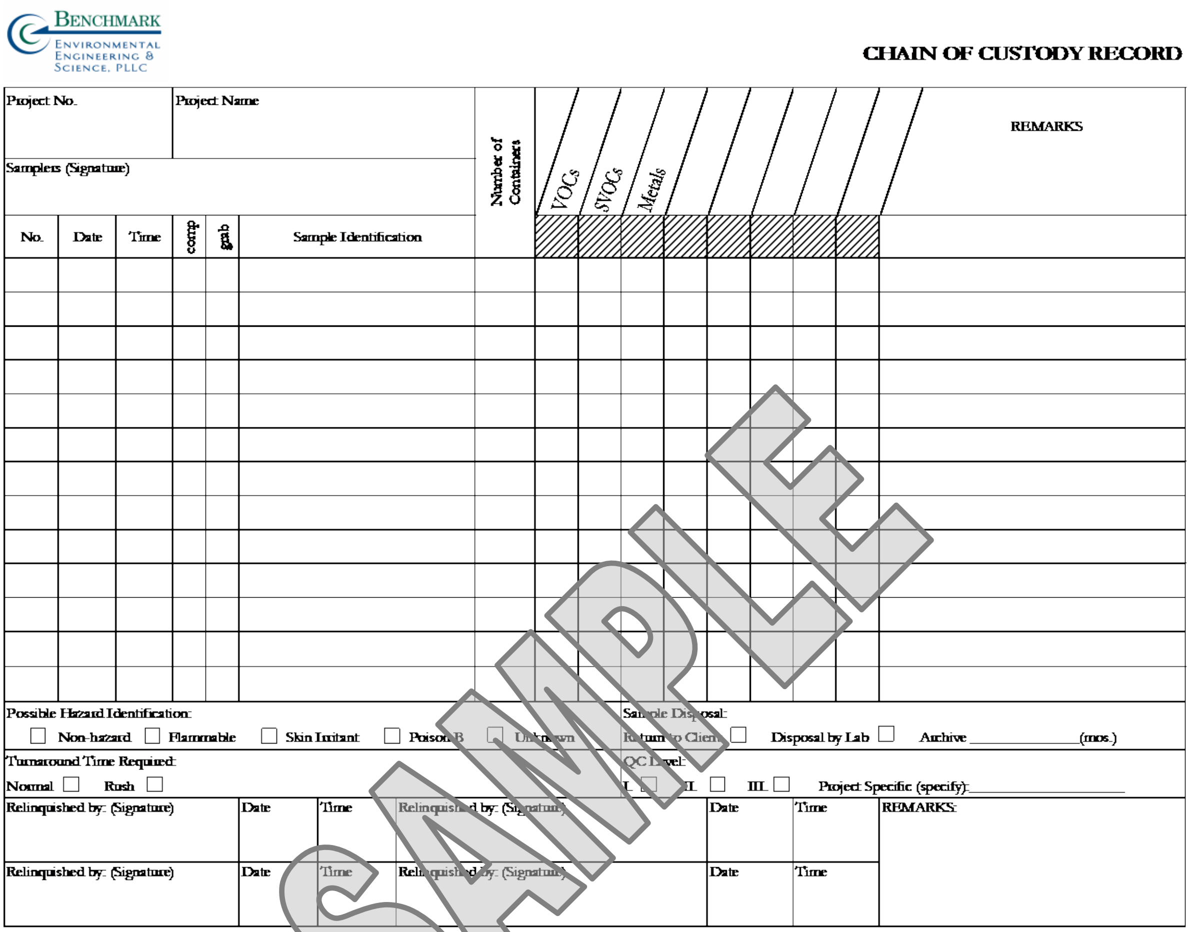
AIR SAMPLE COLLECTION SUMMARY LOG

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.



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CHAIN OF CUSTODY RECORD

Project No.

Project Name

Samplers (Signature)

No.	Date	Time	comp	grab	Sample Identification	Number of Containers	VOCs	SVOCs	Metals						REMARKS
							▨	▨	▨	▨	▨	▨	▨	▨	

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	

FIELD OPERATING PROCEDURES

Screening of Soil Samples for Organic Vapors During Drilling Activities

FOP 047.0

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 Roux's Field Operating Procedures or manufacturers recommendations for calibration of field meters.

2. Collect split-spoon (or other sampler) samples in accordance with Roux'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° 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.

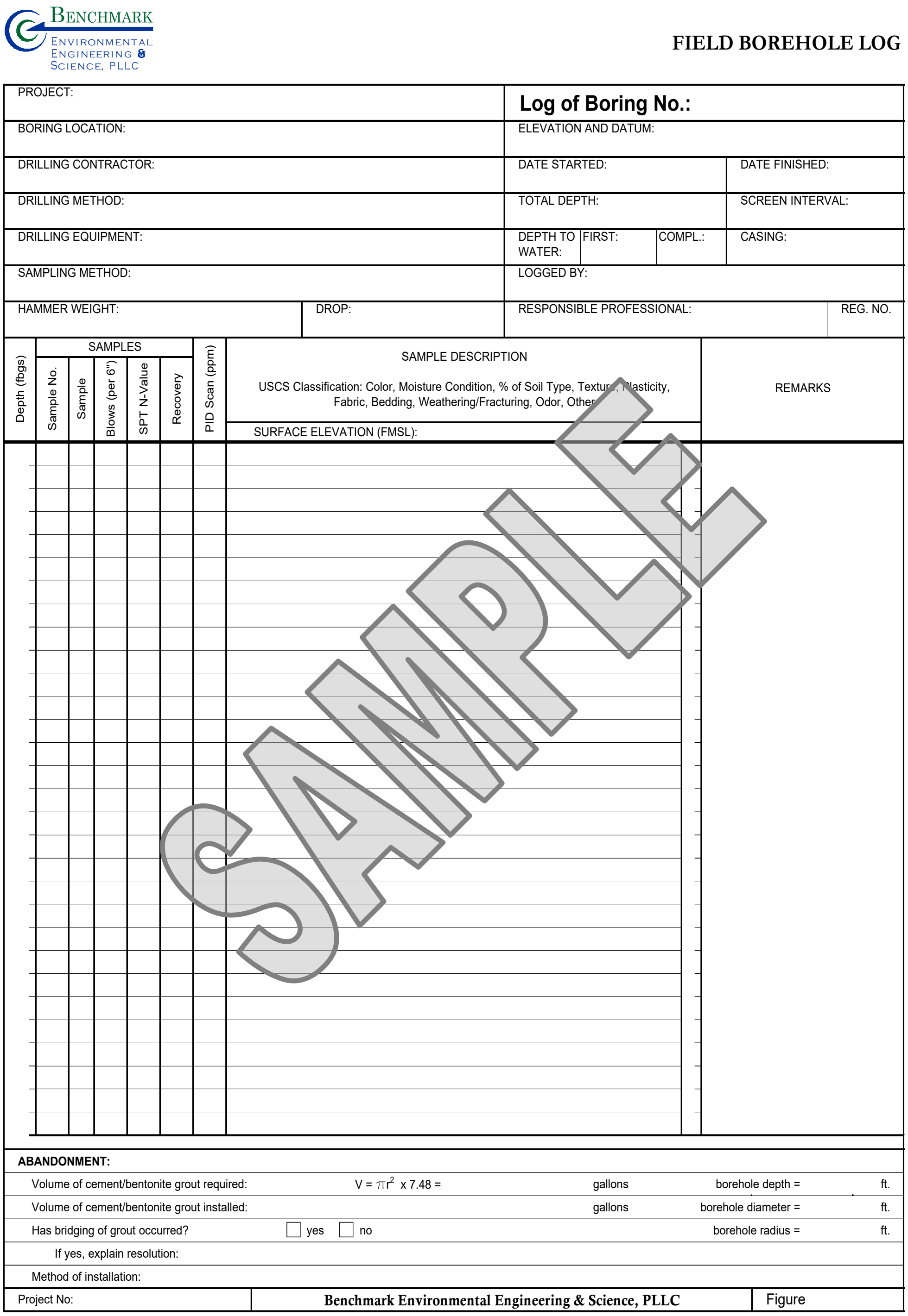
ATTACHMENTS

Field Borehole Log (sample)
Field Borehole/Monitoring Well Installation Log (sample)

REFERENCES

Roux FOPs:

010	*Calibration and Maintenance of Portable Flame Ionization Detector*
011	*Calibration and Maintenance of Portable Photoionization Detector*
015	*Documentation Requirements for Drilling and Well Installation*
058	*Split Spoon Sampling Procedures*



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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 = πr^2 x 7.48 = gallons borehole depth = ft.

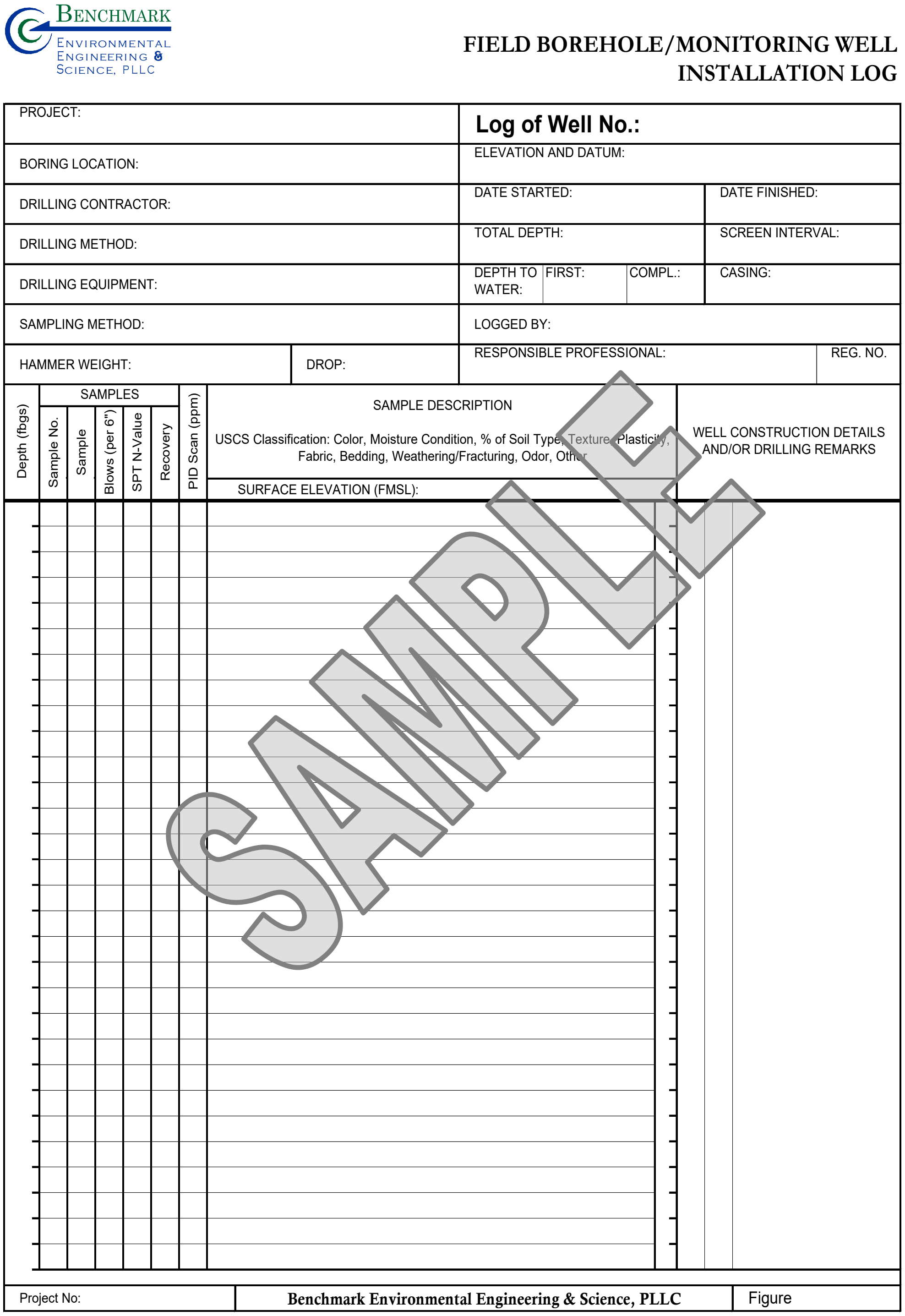
Volume of cement/bentonite grout installed: gallons borehole diameter = ft.

Has bridging of grout occurred? ☐ yes ☐ no borehole radius = ft.

If yes, explain resolution:

Method of installation:

Project No:	Benchmark Environmental Engineering & Science, PLLC	Figure



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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:	**Benchmark Environmental Engineering & Science, PLLC**	Figure

FIELD OPERATING PROCEDURES

Screening of Soil Samples for Organic Vapors During Impacted Soil Removal Activities

FOP 048.0

SCREENING OF SOIL SAMPLES FOR ORGANIC VAPORS DURING IMPACTED SOIL REMOVAL ACTIVITIES

PURPOSE

This procedure is used to screen soil samples for the presence of volatile organic constituents (VOCs) using a field organic vapor meter. The field meter should either be a photoionization detector (PID) or flame-ionization detector (FID) type. This type of screening is generally performed during underground storage tank (UST) and/or impacted soil removal activities as a procedure for ensuring the health and safety of the community and personnel at the site as well as to identify potential VOC-impacted soil samples for laboratory analysis (i.e., confirmatory or verification samples). Soil samples are also screened in the field to provide assessment criteria to determine horizontal and vertical extents of VOC-impacts in order to ensure soils that may have been impacted by volatile organic substances are removed.

PROCEDURE

1. Calibrate air-monitoring equipment in accordance with the appropriate Roux's Field Operating Procedures or manufacturers recommendations for calibration of field meters.

2. Perform community air monitoring in accordance with the Project Work Plan and/or Roux's FOP: Real-Time Air Monitoring During Intrusive Activities.

3. Upon proper removal of any identified UST in accordance with NYSDEC Division of Environmental Remediation, Spill Response Unit or Bulk Storage Unit guidelines and/or Roux's FOP: Underground Storage Tank Removal Procedures; examine the four sidewalls and bottom of the excavation for visually impacted (i.e., stained) soils.

4. If visually impacted soils are identified, direct the excavating equipment operator to scrape the impacted area (i.e., sidewall or bottom of the

excavation) and present the scraped soil for evaluation. NOTE: Under no circumstances should anyone enter an excavation greater than 4 feet in depth, unless absolutely necessary. Excavation entry may only occur under strict confined space entry procedures following implementation of specific engineering controls (i.e., continuous air monitoring, excavation shoring, trench box installation, benching).

5. Visually inspect and perform an open air PID/FID scan of the scraped soil sample noting stratification, visible staining, or other evidence of impact (i.e., presence of non-aqueous phase liquid, NAPL).

6. Collect a representative sample (approximately 100 milligrams (mg)) of soil using a decontaminated or dedicated stainless steel sampling tool (i.e., spoon, spatula, scoop, or approved equivalent), for field headspace determination of VOC-impact. Place the representative soil sample 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 sample may be placed into a clean, re-sealable plastic bag and sealed. Be sure to leave adequate headspace above the soil sample within either sealed container.

7. Place the field screening sample (i.e., jar or bag) in a location where the ambient temperature is at least 70^{o} Fahrenheit for at least 15 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 depth, sample location (i.e., sidewall, bottom) and <u>maximum</u> reading in parts per million by volume (ppmv) in the Project Field Book and Impacted Soil Excavation Log (sample attached), at the depth interval corresponding to the depth of sample collection.

10. The representative soil samples collected from the excavation will be used to assess the vertical and horizontal limits of VOC-impact and guide the impacted soil removal activities in accordance with project requirements (i.e., PID scans less than 20 ppm will not require removal unless laboratory analytical results exceed regulatory limits).

11. Collect verification/confirmation samples in accordance with NYSDEC Division of Environmental Remediation, Spill Response Unit or Bulk Storage Unit guidelines and/or Roux's FOP: Surface and Subsurface Soil Sampling Procedures.

ATTACHMENTS

Impacted Soil Excavation Log (sample)

REFERENCES

<u>Roux FOPs:</u>

010 Calibration and Maintenance of Portable Flame Ionization Detector
011 Calibration and Maintenance of Portable Photoionization Detector
063 Surface and Subsurface Soil Sampling Procedures
073 Real-Time Air Monitoring During Intrusive Activities
074 Underground Storage Tank Removal Procedures

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IMPACTED SOIL EXCAVATION LOG

Project:	EXCAVATION I.D.:
Project No.:	Excavation Date:
Client:	Excavation Method:
Location:	CQA Observer:

Excavation Location: *NOT TO SCALE*
(approximate)

Excavation Cross Section:

Grade - 0'
2'
4'
6'
8'
10'
12'
14'
16'
18'
20'

TIME		
Start:	Length:	(approx.)
	Width:	(approx.)
End:	Depth:	(approx.)

Verification Sample I.D.	Depth (fbgs)	Location Within Excavation (sidewall/bottom)	PID Scan (ppm)	PID Headspace (ppm)	Photos Y / N	

COMMENTS:

UST ENCOUNTERED: ☐ yes ☐ no If yes, Describe (type, material, size, capacity etc.):

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:

QUANTITY OF IMPACTED SOIL REMOVED:

FINAL DESTINATION OF IMPACTED SOIL:

TYPE OF BACKFILL:

SURFACE COMPLETION:

ROUX

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 Roux's Field Operating Procedures or manufacturers recommendations for calibration of field meters.

2. Collect desired soil sample in accordance with appropriate Roux 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 Roux'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 Roux's Sample Labeling, Storage and Shipment Procedures FOP.

9. All remaining soil from soil sample collection activities shall be containerized in accordance with Roux'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, <u>low</u> 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:

<u>Coarse-grained Soil</u>

POORLY GRADED FINE SAND w/ SILT: Dark grey, wet, mostly fine sand with some non-plastic fines, some iron-stained mottling, laminated, medium dense

<u>Fine-grained Soil</u>

LEAN CLAY: Dark reddish/brown, moist, mostly fines, medium plasticity, firm, no dilatency, medium dry strength, root holes.

<u>Soil/Fill (option 1) – visual evidence of fill</u>

FILL: Black, moist, mostly fines with some fine sand, slag, cinders, metal, brick, non-plastic, loose when disturbed, strong odor

<u>**Soil/Fill (option 2) – no visual evidence of fill, suspected reworked material**</u>

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, Roux 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.

<u>Remember:</u> all field logs should be <u>NEAT</u>, <u>ACCURATE</u>, and <u>LEGIBLE</u>. 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).*

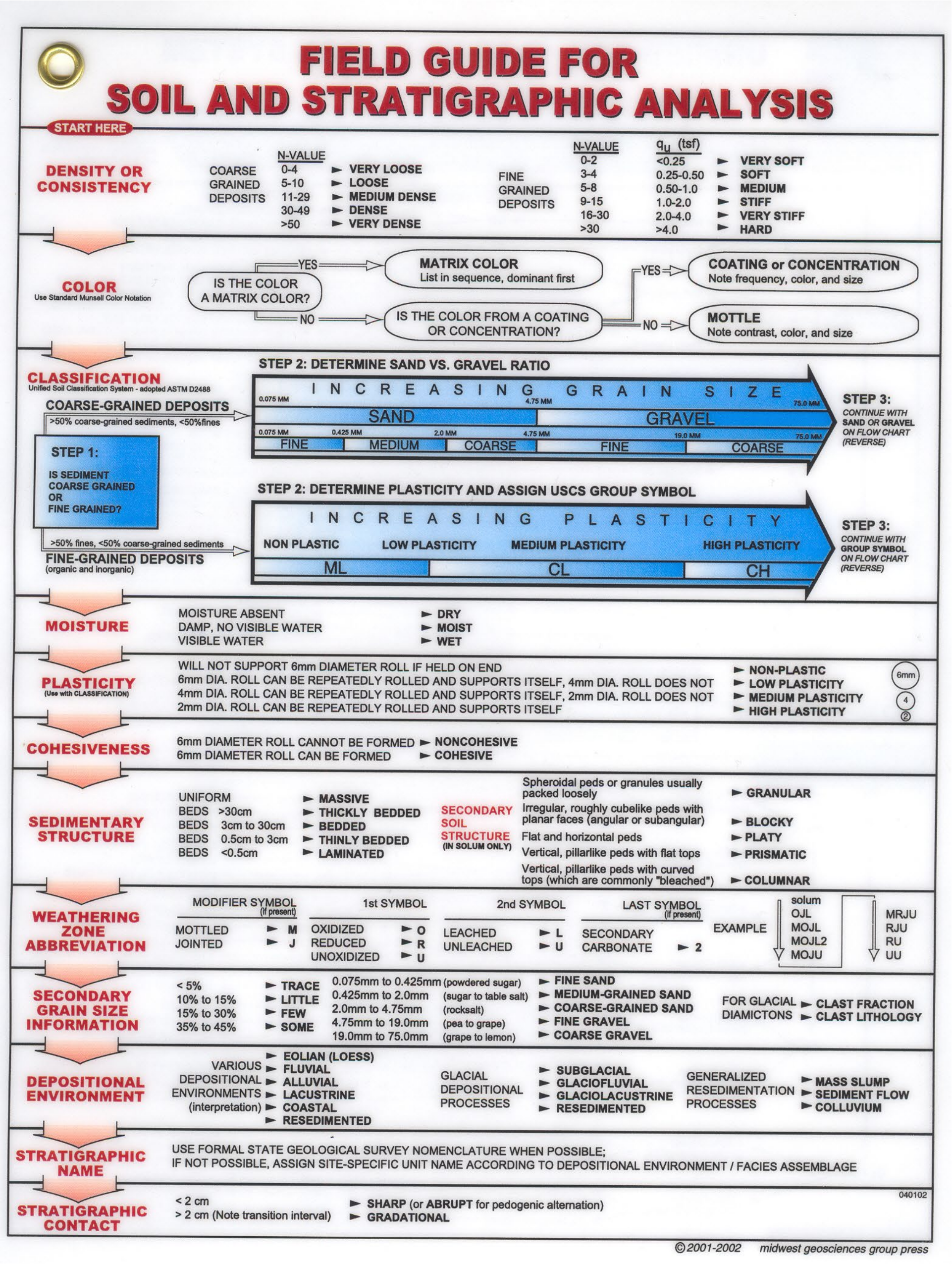
State of California, Department of Transportation, Engineering Service Center, Office of Structural Foundations, August 1996. *Soil & Rock Logging Classification Manual (Field Guide), by Joseph C. de Larios.*

Roux 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



FIELD GUIDE FOR SOIL AND STRATIGRAPHIC ANALYSIS

START HERE

DENSITY OR CONSISTENCY

COARSE GRAINED DEPOSITS N-VALUE		FINE GRAINED DEPOSITS N-VALUE	q_u (tsf)	
0-4	► VERY LOOSE	0-2	<0.25	► VERY SOFT
5-10	► LOOSE	3-4	0.25-0.50	► SOFT
11-29	► MEDIUM DENSE	5-8	0.50-1.0	► MEDIUM
30-49	► DENSE	9-15	1.0-2.0	► STIFF
>50	► VERY DENSE	16-30	2.0-4.0	► VERY STIFF
		>30	>4.0	► HARD

COLOR
Use Standard Munsell Color Notation

IS THE COLOR A MATRIX COLOR?
YES ⇒ MATRIX COLOR: List in sequence, dominant first
NO ⇒ IS THE COLOR FROM A COATING OR CONCENTRATION?
YES ⇒ COATING or CONCENTRATION: Note frequency, color, and size
NO ⇒ MOTTLE: Note contrast, color, and size

CLASSIFICATION
Unified Soil Classification System - adopted ASTM D2488

STEP 1: IS SEDIMENT COARSE GRAINED OR FINE GRAINED?

COARSE-GRAINED DEPOSITS
>50% coarse-grained sediments, <50%fines

STEP 2: DETERMINE SAND VS. GRAVEL RATIO

INCREASING GRAIN SIZE

0.075 MM – 4.75 MM – 75.0 MM

SAND | GRAVEL

0.075 MM – 0.425 MM – 2.0 MM – 4.75 MM – 19.0 MM – 75.0 MM

FINE | MEDIUM | COARSE | FINE | COARSE

STEP 3: *CONTINUE WITH SAND OR GRAVEL ON FLOW CHART (REVERSE)*

FINE-GRAINED DEPOSITS
(organic and inorganic)
>50% fines, <50% coarse-grained sediments

STEP 2: DETERMINE PLASTICITY AND ASSIGN USCS GROUP SYMBOL

INCREASING PLASTICITY

NON PLASTIC | LOW PLASTICITY | MEDIUM PLASTICITY | HIGH PLASTICITY

ML | CL | CH

STEP 3: *CONTINUE WITH GROUP SYMBOL ON FLOW CHART (REVERSE)*

MOISTURE

MOISTURE ABSENT ► DRY
DAMP, NO VISIBLE WATER ► MOIST
VISIBLE WATER ► WET

PLASTICITY
(Use with CLASSIFICATION)

WILL NOT SUPPORT 6mm DIAMETER ROLL IF HELD ON END ► NON-PLASTIC
6mm DIA. ROLL CAN BE REPEATEDLY ROLLED AND SUPPORTS ITSELF, 4mm DIA. ROLL DOES NOT ► LOW PLASTICITY
4mm DIA. ROLL CAN BE REPEATEDLY ROLLED AND SUPPORTS ITSELF, 2mm DIA. ROLL DOES NOT ► MEDIUM PLASTICITY
2mm DIA. ROLL CAN BE REPEATEDLY ROLLED AND SUPPORTS ITSELF ► HIGH PLASTICITY

6mm ④ ②

COHESIVENESS

6mm DIAMETER ROLL CANNOT BE FORMED ► NONCOHESIVE
6mm DIAMETER ROLL CAN BE FORMED ► COHESIVE

SEDIMENTARY STRUCTURE

UNIFORM ► MASSIVE
BEDS >30cm ► THICKLY BEDDED
BEDS 3cm to 30cm ► BEDDED
BEDS 0.5cm to 3cm ► THINLY BEDDED
BEDS <0.5cm ► LAMINATED

SECONDARY SOIL STRUCTURE (IN SOLUM ONLY)

Spheroidal peds or granules usually packed loosely ► GRANULAR
Irregular, roughly cubelike peds with planar faces (angular or subangular) ► BLOCKY
Flat and horizontal peds ► PLATY
Vertical, pillarlike peds with flat tops ► PRISMATIC
Vertical, pillarlike peds with curved tops (which are commonly "bleached") ► COLUMNAR

WEATHERING ZONE ABBREVIATION

MODIFIER SYMBOL (if present)	1st SYMBOL	2nd SYMBOL	LAST SYMBOL (if present)
MOTTLED ► M	OXIDIZED ► O	LEACHED ► L	SECONDARY CARBONATE ► 2
JOINTED ► J	REDUCED ► R	UNLEACHED ► U	
	UNOXIDIZED ► U		

EXAMPLE
solum
OJL
MOJL
MOJL2
MOJU
MRJU
RJU
RU
UU

SECONDARY GRAIN SIZE INFORMATION

< 5% ► TRACE
10% to 15% ► LITTLE
15% to 30% ► FEW
35% to 45% ► SOME

0.075mm to 0.425mm (powdered sugar) ► FINE SAND
0.425mm to 2.0mm (sugar to table salt) ► MEDIUM-GRAINED SAND
2.0mm to 4.75mm (rocksalt) ► COARSE-GRAINED SAND
4.75mm to 19.0mm (pea to grape) ► FINE GRAVEL
19.0mm to 75.0mm (grape to lemon) ► COARSE GRAVEL

FOR GLACIAL DIAMICTONS ► CLAST FRACTION ► CLAST LITHOLOGY

DEPOSITIONAL ENVIRONMENT

VARIOUS DEPOSITIONAL ENVIRONMENTS (interpretation)
► EOLIAN (LOESS)
► FLUVIAL
► ALLUVIAL
► LACUSTRINE
► COASTAL
► RESEDIMENTED

GLACIAL DEPOSITIONAL PROCESSES
► SUBGLACIAL
► GLACIOFLUVIAL
► GLACIOLACUSTRINE
► RESEDIMENTED

GENERALIZED RESEDIMENTATION PROCESSES
► MASS SLUMP
► SEDIMENT FLOW
► COLLUVIUM

STRATIGRAPHIC NAME

USE FORMAL STATE GEOLOGICAL SURVEY NOMENCLATURE WHEN POSSIBLE;
IF NOT POSSIBLE, ASSIGN SITE-SPECIFIC UNIT NAME ACCORDING TO DEPOSITIONAL ENVIRONMENT / FACIES ASSEMBLAGE

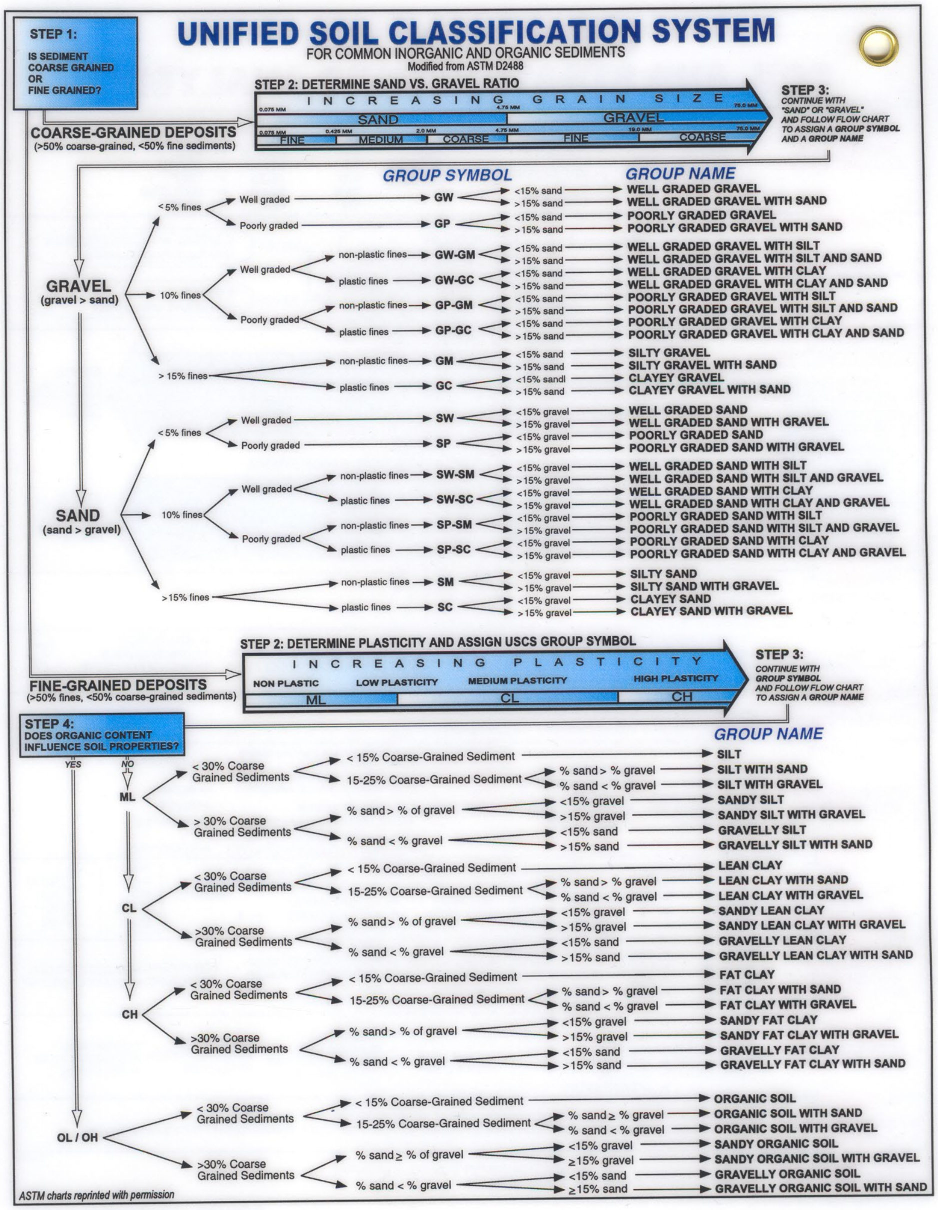
STRATIGRAPHIC CONTACT

040102

< 2 cm ► SHARP (or ABRUPT for pedogenic alternation)
> 2 cm (Note transition interval) ► GRADATIONAL

FIGURE 2

USCS SOIL CLASSIFICATION FLOW CHART (MODIFIED FROM ASTM D2488)



ASTM charts reprinted with permission

FIGURE 3

ILLUSTRATION OF PARTICLE SIZES

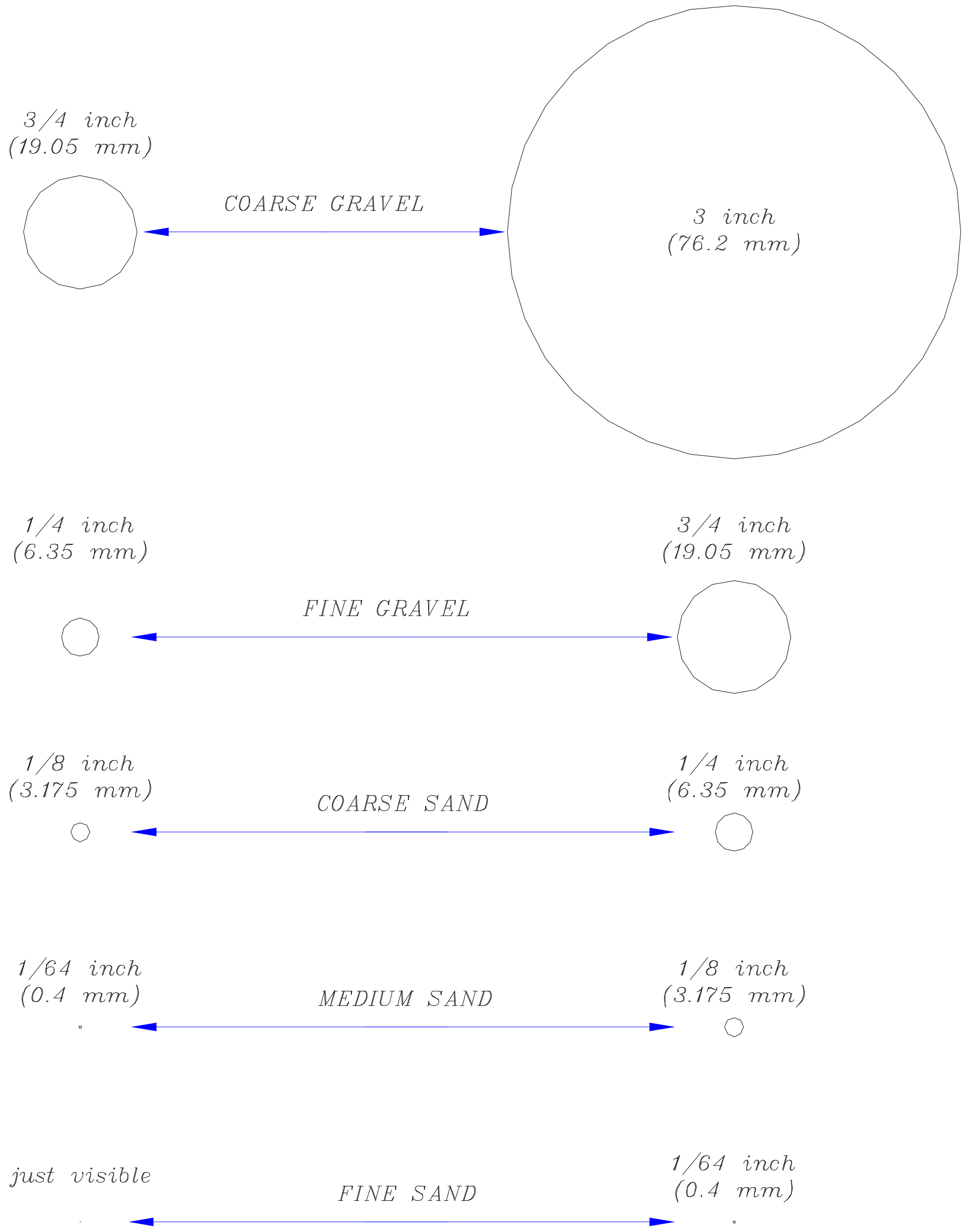


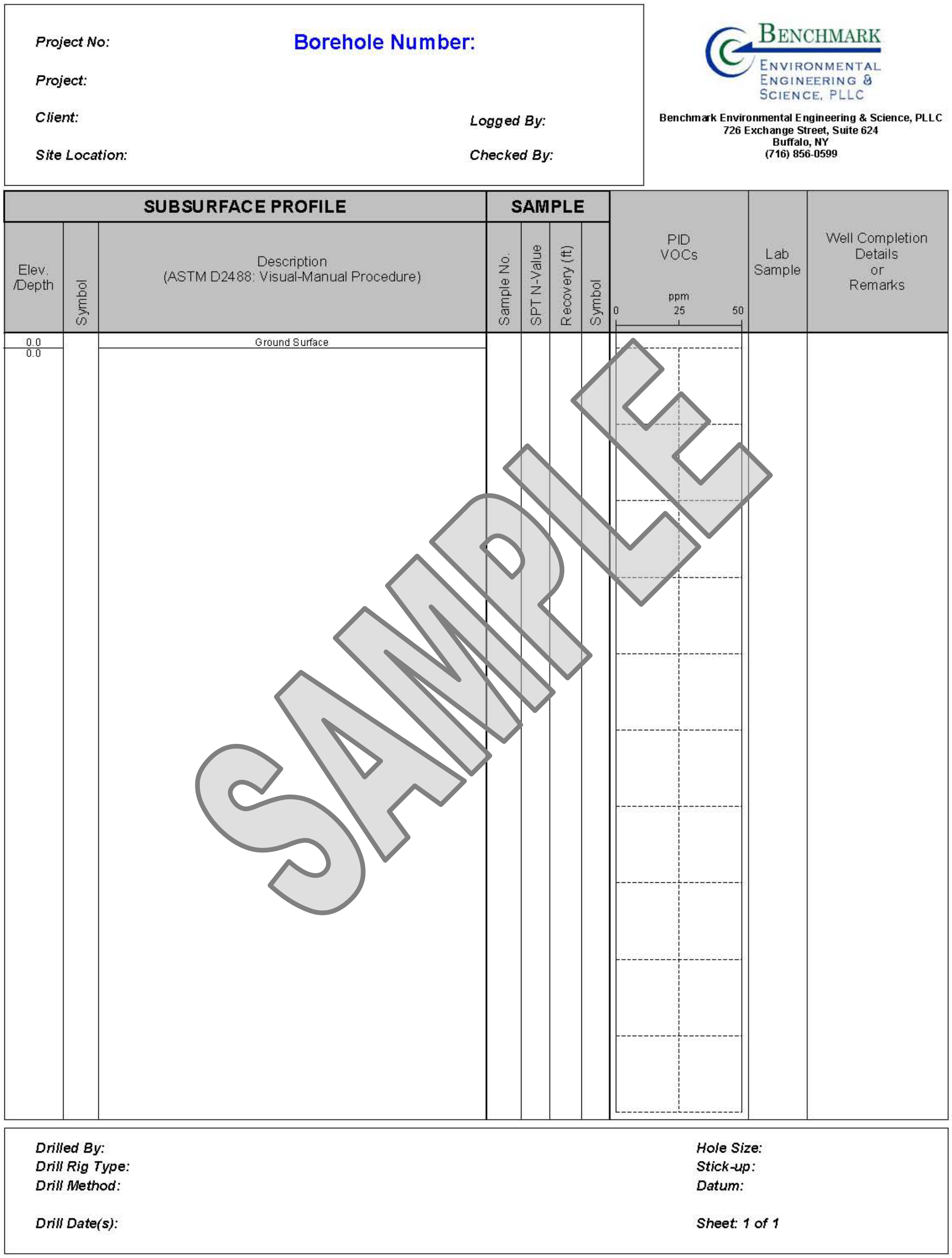
FIGURE 4

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:*

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

Benchmark Environmental Engineering & Science, PLLC
726 Exchange Street, Suite 624
Buffalo, NY
(716) 856-0599

SUBSURFACE PROFILE			SAMPLE				PID VOCs	Lab Sample	Well Completion Details or Remarks
Elev. /Depth	Symbol	Description (ASTM D2488: Visual-Manual Procedure)	Sample No.	SPT N-Value	Recovery (ft)	Symbol	ppm 0 25 50		
0.0 0.0		Ground Surface							

Drilled By:
Drill Rig Type:
Drill Method:

Drill Date(s):

Hole Size:
Stick-up:
Datum:

Sheet: 1 of 1

FIELD OPERATING PROCEDURES

Soil Sample Collection for VOC Analysis (EnCore Sampling)

FOP 057.0

SOIL SAMPLE COLLECTION FOR VOC ANALYSIS – ENCORE SAMPLING

BACKGROUND AND PURPOSE

This procedure describes the methods for collecting soil samples for VOC analysis to ensure that the sample adequately represents the VOC concentrations in the soil in accordance with SW-846 Method 5035A (effective July 1, 2002). These compounds tend to volatilize from the soil after disturbance or introduction to the atmosphere. Therefore, care must be exercised to ensure that the sample collected is not altered during the collection and storage procedures. A variety of sampling options are allowed and Appendix A of Method 5035A provides details regarding the many options available for sample collection. The collection and preservation procedures are intended to prevent loss of VOCs during sample transport, handling and analysis.

Method 5035A is a method designed for volatile sample collection and analysis of soils and solid wastes for volatile organic compounds. This method is described in Update III to the Third Edition of SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, and is required for all analytical methods using purge and trap techniques (8021, 8015B, and 8260B). Alternative protocols may be used in some states (including New York), however this method is strongly recommended.

The volatile analysis is performed over two ranges:

	GC/MS (µg/kg)	GC (µg/kg)
Low Level	5 – 300	Not Available
High Level	>250	>20

The different levels require different sampling techniques. The low level method can only handle samples within a specific concentration range (these samples CANNOT be diluted), therefore a high level sample MUST be collected to ensure that all the target analytes can be quantified.

Naturally occurring carbonates in some soils may cause effervescence (foaming) on contact with the sodium bisulfate (NaHSO4) solution used as preservative for the low-level preparation. This interference makes it necessary for the laboratory to use the high-level prep or an alternative technique for low level. Check with the NYSDEC to discuss acceptable options.

Typically, analytical laboratories will support the following options for the two levels:

Option	No. of Containers	Sample Size (g)	Holding Time (days)
A – Low Level EnCore™ Samplers	3*	5	14**
B – High Level EnCore™ Sampler	1*	5	14**
C – High Level Methanol vial w/syringe	1	10	14
* Additional EnCore™ Samplers are required for MS/MSD. ** The sample MUST be extracted and preserved in sodium bisulfate or methanol within 48 hours of collection.			

NOTE: The EnCore™ Sampler is disposable – it can only be used ONCE. It CANNOT be cleaned and/or reused. The samplers MUST be used in conjunction with an EnCore™ T-handle.

PROCEDURE

The preferred method for collecting and storing a soil sample for VOC analysis is using the EnCore™ method. This field procedure is described in this FOP.

1. The sampling team should reference the manufacturers' directions prior to sample collection (attached).
    a. Ensure that the EnCore™ Sampler is present at the sampling location before collecting the sample from the borehole or surface sample location. The necessary parts of the EnCore™ Sampler will consist of three disposable coring bodies, three disposable caps, and a reusable stainless steel T-handle.
    b. Retrieve the sampling tool from the borehole or sample location.
    c. Expose a surface of the soil sample. For Shelby tube samples, this would require the extrusion of the sample. For split spoon samples, this would require the spoon be disassembled and opened. If liners are being used in conjunction with a split spoon or solid barrel sampler, this would require the removal of the liners from the sampler, so that the soil at the liner's end is exposed.
    d. Following the manufacturer's directions for the use of the EnCore™ Sampler (attached), collect three aliquots of soil from the exposed soil surface, using the three coring bodies. After the collection of each aliquot, cap and label each aliquot. The manufacturer's direction for use of the EnCore™ Sampler are attached
2. If the use of the EnCore™ Sampler is not possible due to soil texture (e.g. gravels) the sample must be field preserved with acid and methanol in accordance with SW-846 Method 5035A.

3. If the soil material is too coarse for sampling with the EnCore™ Sampler and contains excessive calcium carbonate material that reacts with the acid preservative, the sample will be retained in the brass or stainless steel liner of the split-spoon sampler or similar device. The ends of these liners will be covered with Teflon™ rounds, capped and sealed with tape.

4. Record all information associated with sample collection in the Project Field Book.

5. The samples will be labeled, stored and shipped in accordance with the Roux Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

ATTACHMENTS

EnCore™ Sampling Procedure (manufacturers instructions)

REFERENCES

Roux FOPs:
046 Sample Labeling, Storage and Shipment Procedures

ATTACHMENT

EnCore™ Sampling Procedure (manufacturers instructions)

Disposable
En Core® Sampler

En Novative Technologies, Inc.
1241 Bellevue Street
Green Bay, WI 54302
Phone: 920-465-3960 • Fax: 920-465-3963
Toll Free: 888-411-0757
www.ennovativetech.com

Sampling Procedures

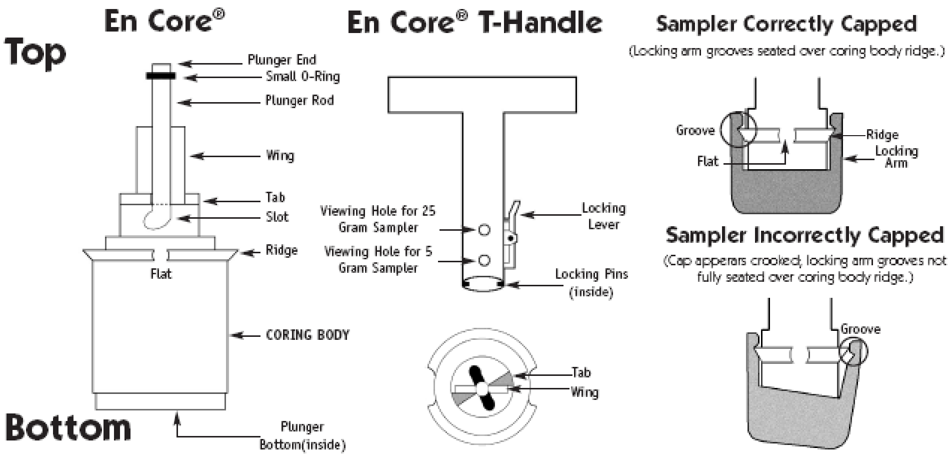
Using The
En Core® T-Handle

NOTE:

1. En Core® Sampler is a SINGLE USE device. It cannot be cleaned and/or reused.

2. En Core® Sampler is designed to store soil. Do not use En Core Sampler to store solvent or free product!

3. En Core® Sampler must be used with En Core® T-Handle and/or En Core® Extrusion Tool exclusively. (These items are sold separately.)



BEFORE TAKING SAMPLE:

1. Hold **coring body** and push **plunger rod** down until **small o-ring** rests against **tabs**. This will assure that plunger moves freely.

2. Depress **locking lever** on En Core T-Handle. Place coring body, **plunger end first**, into open end of T-Handle, *aligning the (2) **slots** on the coring body with the (2) **locking pins** in the T-Handle.* Twist coring body clockwise to lock pins in slots. Check to ensure Sampler is locked in place. Sampler is ready for use.

TAKING SAMPLE:

3. Turn T-Handle with T-up and coring body down. This positions plunger bottom flush with bottom of coring body (ensure that plunger bottom is in position). Using T-Handle, push Sampler into soil until coring body is completely full. When full, small o-ring will be centered in T-Handle **viewing hole**. Remove Sampler from soil. Wipe excess soil from coring body exterior.

4. Cap coring body while it is still on T-handle. *Push* **cap** over **flat** area of **ridge** *and twist* to lock cap in place. **CAP MUST BE SEATED TO SEAL SAMPLER (see diagram).**

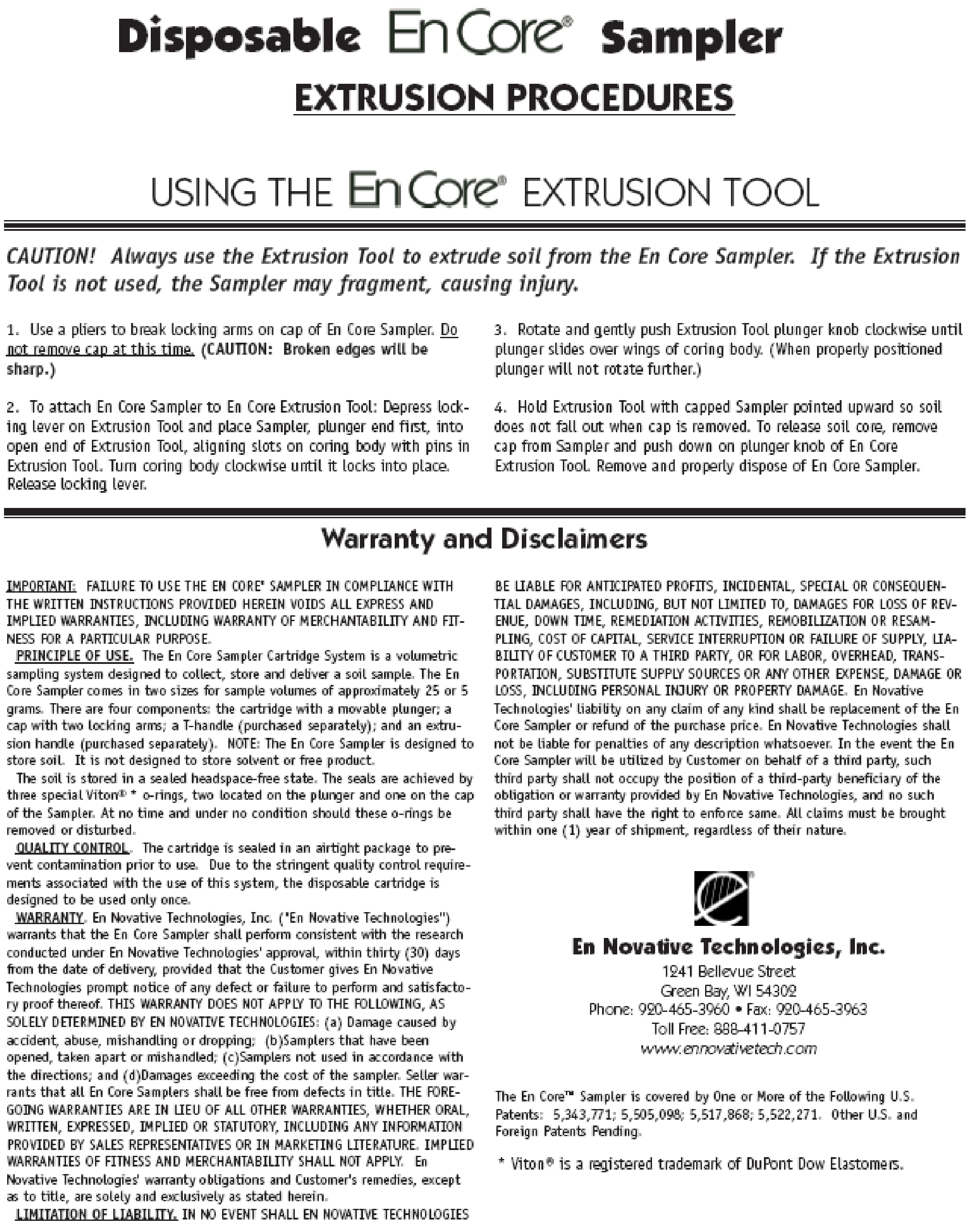
PREPARING SAMPLER FOR SHIPMENT:

5. Remove the capped Sampler by depressing locking lever on T-Handle while twisting and pulling Sampler from T-Handle.

6. Lock plunger by rotating extended plunger rod fully counter-clockwise until **wings** rest firmly against tabs (see plunger diagram).

7. Attach completed tear-off label (from En Core Sampler bag) to cap on coring body.

8. Return full En Core Sampler to zipper bag. Seal bag and put on ice.



Disposable En Core® Sampler

EXTRUSION PROCEDURES

USING THE En Core® EXTRUSION TOOL

CAUTION! Always use the Extrusion Tool to extrude soil from the En Core Sampler. If the Extrusion Tool is not used, the Sampler may fragment, causing injury.

1. Use a pliers to break locking arms on cap of En Core Sampler. Do not remove cap at this time. **(CAUTION: Broken edges will be sharp.)**
2. To attach En Core Sampler to En Core Extrusion Tool: Depress locking lever on Extrusion Tool and place Sampler, plunger end first, into open end of Extrusion Tool, aligning slots on coring body with pins in Extrusion Tool. Turn coring body clockwise until it locks into place. Release locking lever.
3. Rotate and gently push Extrusion Tool plunger knob clockwise until plunger slides over wings of coring body. (When properly positioned plunger will not rotate further.)
4. Hold Extrusion Tool with capped Sampler pointed upward so soil does not fall out when cap is removed. To release soil core, remove cap from Sampler and push down on plunger knob of En Core Extrusion Tool. Remove and properly dispose of En Core Sampler.

Warranty and Disclaimers

IMPORTANT: FAILURE TO USE THE EN CORE® SAMPLER IN COMPLIANCE WITH THE WRITTEN INSTRUCTIONS PROVIDED HEREIN VOIDS ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

PRINCIPLE OF USE. The En Core Sampler Cartridge System is a volumetric sampling system designed to collect, store and deliver a soil sample. The En Core Sampler comes in two sizes for sample volumes of approximately 25 or 5 grams. There are four components: the cartridge with a movable plunger; a cap with two locking arms; a T-handle (purchased separately); and an extrusion handle (purchased separately). NOTE: The En Core Sampler is designed to store soil. It is not designed to store solvent or free product.

The soil is stored in a sealed headspace-free state. The seals are achieved by three special Viton® * o-rings, two located on the plunger and one on the cap of the Sampler. At no time and under no condition should these o-rings be removed or disturbed.

QUALITY CONTROL. The cartridge is sealed in an airtight package to prevent contamination prior to use. Due to the stringent quality control requirements associated with the use of this system, the disposable cartridge is designed to be used only once.

WARRANTY. En Novative Technologies, Inc. ("En Novative Technologies") warrants that the En Core Sampler shall perform consistent with the research conducted under En Novative Technologies' approval, within thirty (30) days from the date of delivery, provided that the Customer gives En Novative Technologies prompt notice of any defect or failure to perform and satisfactory proof thereof. THIS WARRANTY DOES NOT APPLY TO THE FOLLOWING, AS SOLELY DETERMINED BY EN NOVATIVE TECHNOLOGIES: (a) Damage caused by accident, abuse, mishandling or dropping; (b)Samplers that have been opened, taken apart or mishandled; (c)Samplers not used in accordance with the directions; and (d)Damages exceeding the cost of the sampler. Seller warrants that all En Core Samplers shall be free from defects in title. THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY INFORMATION PROVIDED BY SALES REPRESENTATIVES OR IN MARKETING LITERATURE. IMPLIED WARRANTIES OF FITNESS AND MERCHANTABILITY SHALL NOT APPLY. En Novative Technologies' warranty obligations and Customer's remedies, except as to title, are solely and exclusively as stated herein.

LIMITATION OF LIABILITY. IN NO EVENT SHALL EN NOVATIVE TECHNOLOGIES BE LIABLE FOR ANTICIPATED PROFITS, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF REVENUE, DOWN TIME, REMEDIATION ACTIVITIES, REMOBILIZATION OR RESAMPLING, COST OF CAPITAL, SERVICE INTERRUPTION OR FAILURE OF SUPPLY, LIABILITY OF CUSTOMER TO A THIRD PARTY, OR FOR LABOR, OVERHEAD, TRANSPORTATION, SUBSTITUTE SUPPLY SOURCES OR ANY OTHER EXPENSE, DAMAGE OR LOSS, INCLUDING PERSONAL INJURY OR PROPERTY DAMAGE. En Novative Technologies' liability on any claim of any kind shall be replacement of the En Core Sampler or refund of the purchase price. En Novative Technologies shall not be liable for penalties of any description whatsoever. In the event the En Core Sampler will be utilized by Customer on behalf of a third party, such third party shall not occupy the position of a third-party beneficiary of the obligation or warranty provided by En Novative Technologies, and no such third party shall have the right to enforce same. All claims must be brought within one (1) year of shipment, regardless of their nature.

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The En Core™ Sampler is covered by One or More of the Following U.S. Patents: 5,343,771; 5,505,098; 5,517,868; 5,522,271. Other U.S. and Foreign Patents Pending.

* Viton® is a registered trademark of DuPont Dow Elastomers.

ROUX

FIELD OPERATING PROCEDURES

Split-Spoon Sampling Procedures

FOP 058.0

SPLIT-SPOON SAMPLING PROCEDURES

PURPOSE

This guideline presents the methods for using a split-spoon sampler 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 Roux 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 Roux FOP: Soil Description Procedures Using the Unified Soil Classification System (USCS).

13. Record all information in accordance with Roux's FOP: Documentation Requirements for Drilling and Well Installation.

14. Collect a portion of the sample for field screening as described in the Roux 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 Roux's FOP: Sample Labeling, Storage and Shipment Procedures.

ATTACHMENTS

none

REFERENCES

Roux FOPs:

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)*

ROUX

FIELD OPERATING PROCEDURES

Surface and Subsurface Soil Sampling Procedures

FOP 063.3

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 Roux's Field Operating Procedures or manufacturers recommendations for calibration of field meters.
4. Commence intrusive activities in accordance with specific Roux 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 Roux's FOP Real-Time Air Monitoring During Intrusive Activities. Record all results on the Real Time Air Monitoring Log (sample attached).
6. Decontaminate all <u>non-dedicated</u> stainless steel (or Pyrex glass) equipment in accordance with Roux'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/fill 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/fill 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/NEAR-SURFACE/SUBSURFACE SOIL SAMPLING PROCEDURES

1. Collect all soil samples using dedicated (or decontaminated non-dedicated) sampling tools (i.e., spoons, trowels, bowls, EnCore™ Samplers, etc.), preferably constructed of stainless steel.

   Surface soil samples are typically collected from 0 to 6 inches below ground surface (bgs). Near-surface samples are typically sampled from 0 to 2 feet below ground surface (fbgs). 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 Roux'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 Roux 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>: After a fresh surface of the solid cohesive material is exposed to the atmosphere, sample collection should be completed in the least amount of time in order to minimize the loss of VOCs due to volatilization. Depending on soil cohesiveness and grain size(s), two different methods should be utilized as described below.

   a. **Cohesive soils** collected for VOC analysis should be sampled via USEPA Method 5035 using an EnCore™ Sampler (or equivalent) in a "closed-system-purge-and-trap" process for the collection, preparation, and analysis of VOCs in soils, sediments, and solid waste.

The EnCore™ sampler is a sampling device that can be used as both a simultaneous coring tool for cohesive soils and a transport device to a support laboratory (field or off-site). The EnCore™ sampler is intended to be a combined sampler-storage device for soils until a receiving laboratory can initiate either immediate VOC analysis, or preserve extruded soil aliquots for later VOC analysis. It is meant to be disposed after use. The commercially available device is constructed of an inert composite polymer. It uses a coring/storage chamber to collect either a 5 g or 25 g sample of cohesive soils. It has a press-on cap with hermetically vapor tight seal and locking arm mechanism. It also has a vapor tight plunger for the nondisruptive extrusion of the sample into an appropriate container for VOC analysis of soil. An individual disposable EnCore™ sampler (or equivalent) is needed for each soil aliquot collected for vapor partitioning or methanol sample preparation. Upon soil sample collection, the EnCore™ sampler is stored at 4 ± 2EC until laboratory receipt within 48 hours. Upon laboratory receipt, soil aliquots are extruded to appropriate tared and prepared VOA vials.

Sample collection using EnCoreTM samplers will require:
2 EnCoreTM 5g samplers for low level analysis
1 EnCoreTM 5g sampler for medium level analysis
1 four ounce jar for percent total solids determination
T-handle for sampling

b. 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>Roux 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*

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

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

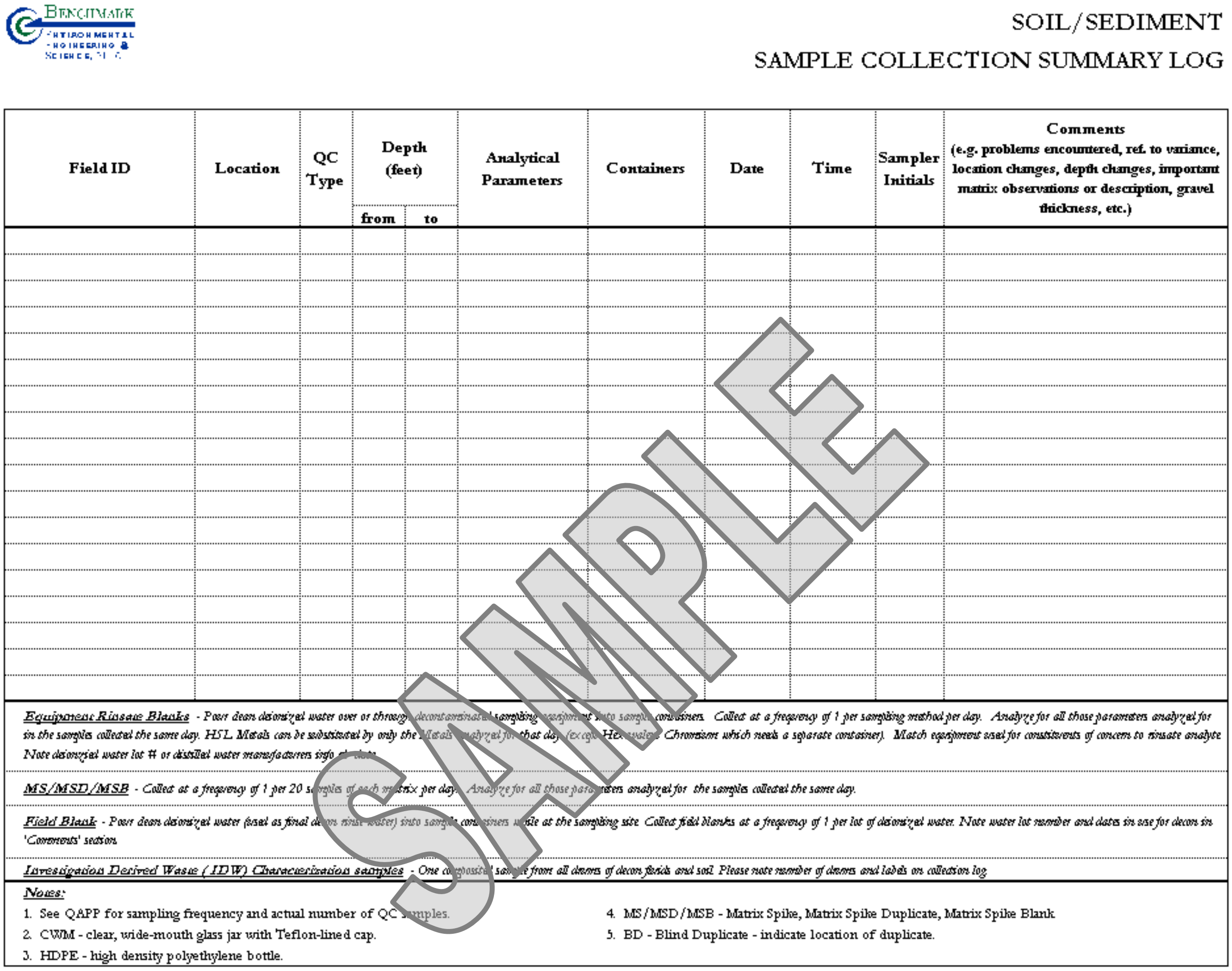
New Equipment:

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 deionized water lot # or distilled water manufacturers info & date.*

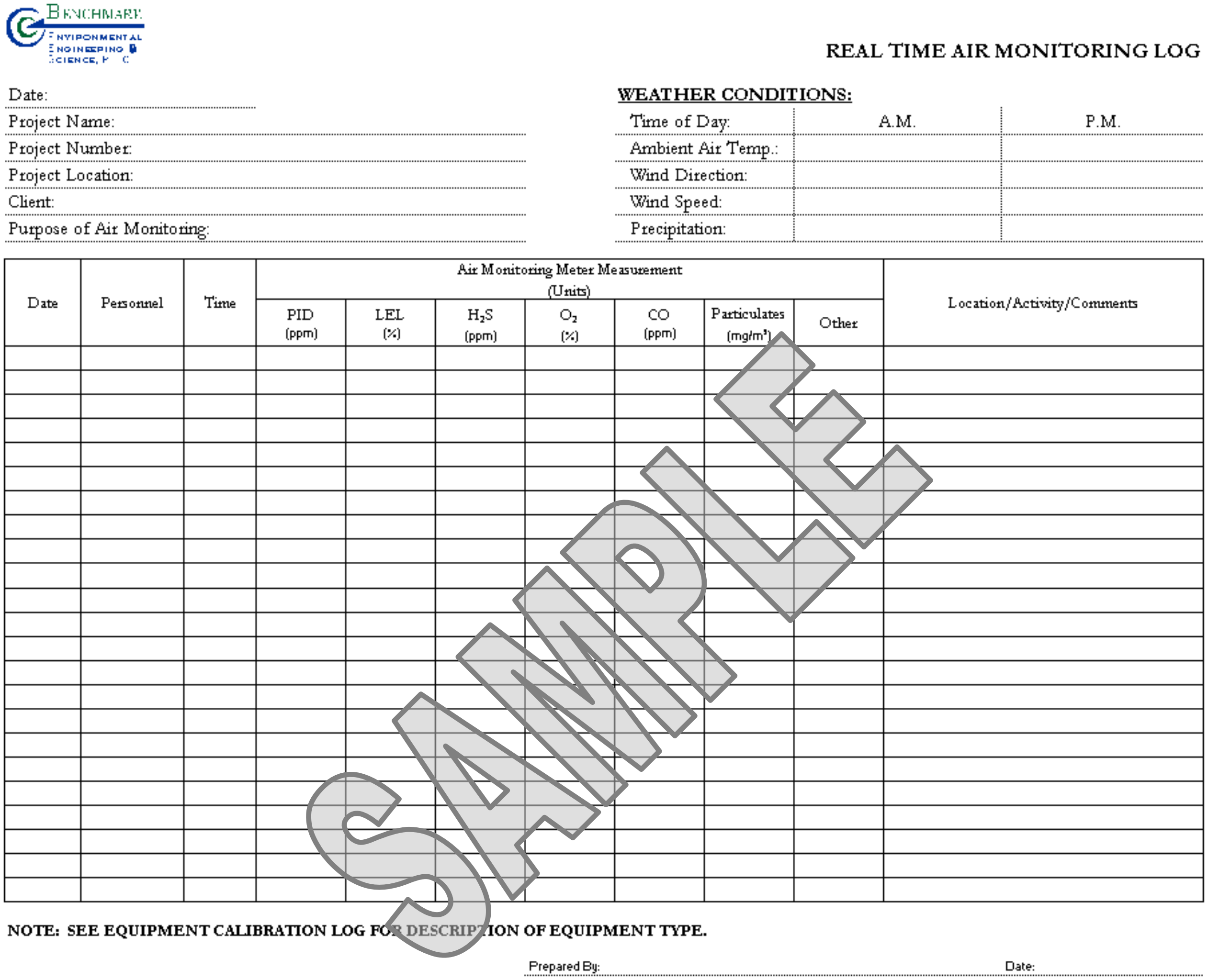
MS/MSD/MSB - *Collect at a frequency of 1 per 20 samples of each matrix per day. Analyze for all those parameters analyzed for the samples collected the same day.*

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 composite 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 AIR MONITORING LOG

Date:
Project Name:
Project Number:
Project Location:
Client:
Purpose of Air Monitoring:

WEATHER CONDITIONS:

Time of Day:	A.M.	P.M.
Ambient Air Temp.:		
Wind Direction:		
Wind Speed:		
Precipitation:		

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Location/Activity/Comments
			PID (ppm)	LEL (%)	H_2S (ppm)	O_2 (%)	CO (ppm)	Particulates (mg/m^3)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By: Date:

FIELD OPERATING PROCEDURES

Test Pit Excavation and Logging Procedures

FOP 065.1

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 Roux'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 Roux'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 Roux 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 Roux'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 Roux 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.

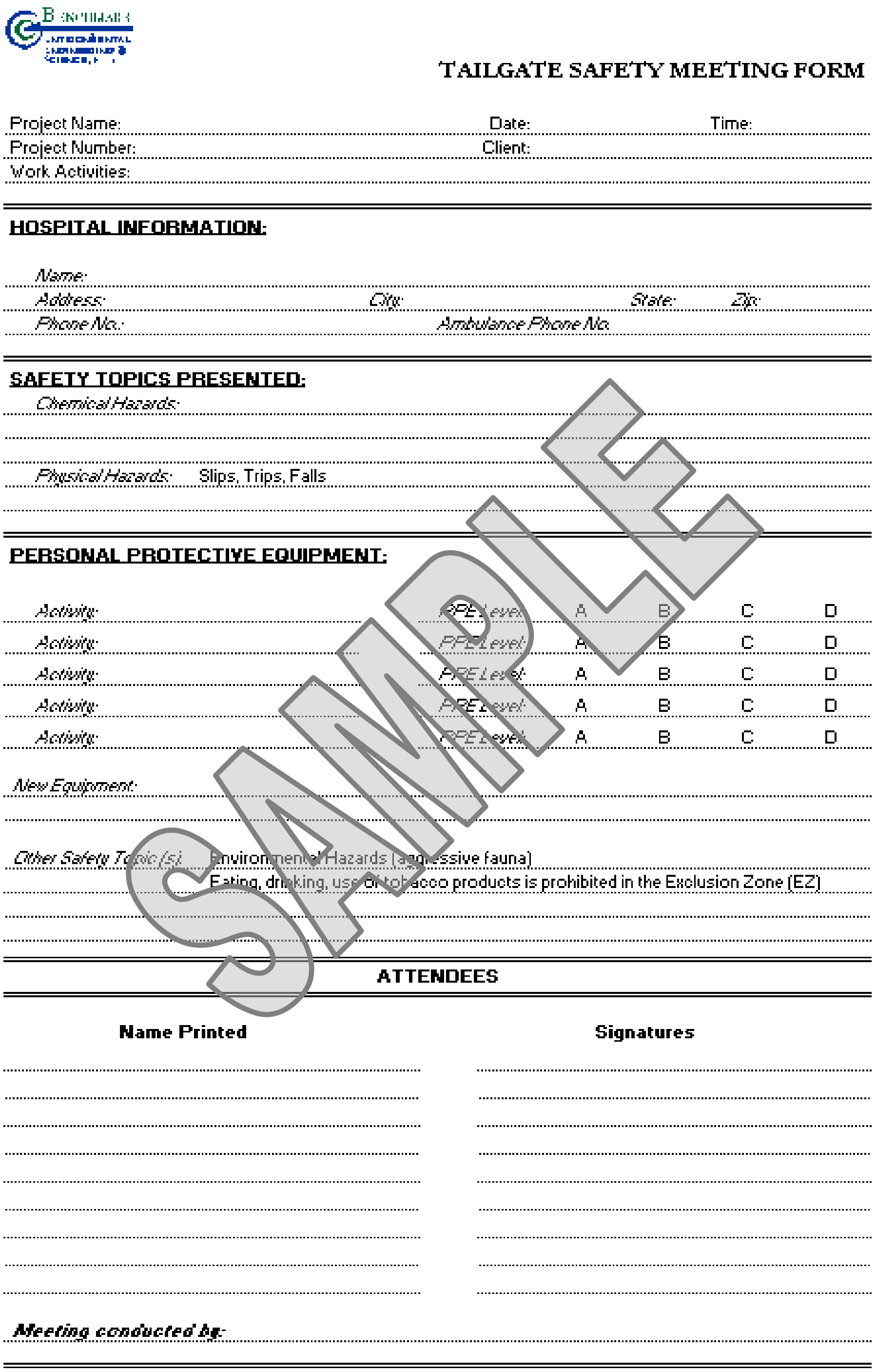
ATTACHMENTS

Tailgate Safety Meeting Form (sample)
Real Time Air Monitoring Log (sample)
Test Pit Excavation Log (sample)

REFERENCES

Roux FOPs:

006	*Calibration and Maintenance of Combustible Gas/Oxygen Meter*
010	*Calibration and Maintenance of Portable Flame Ionization Detector*
011	*Calibration and Maintenance of Portable Photoionization Detector*
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 AIR MONITORING LOG

Date:
Project Name:
Project Number:
Project Location:
Client:
Purpose of Air Monitoring:

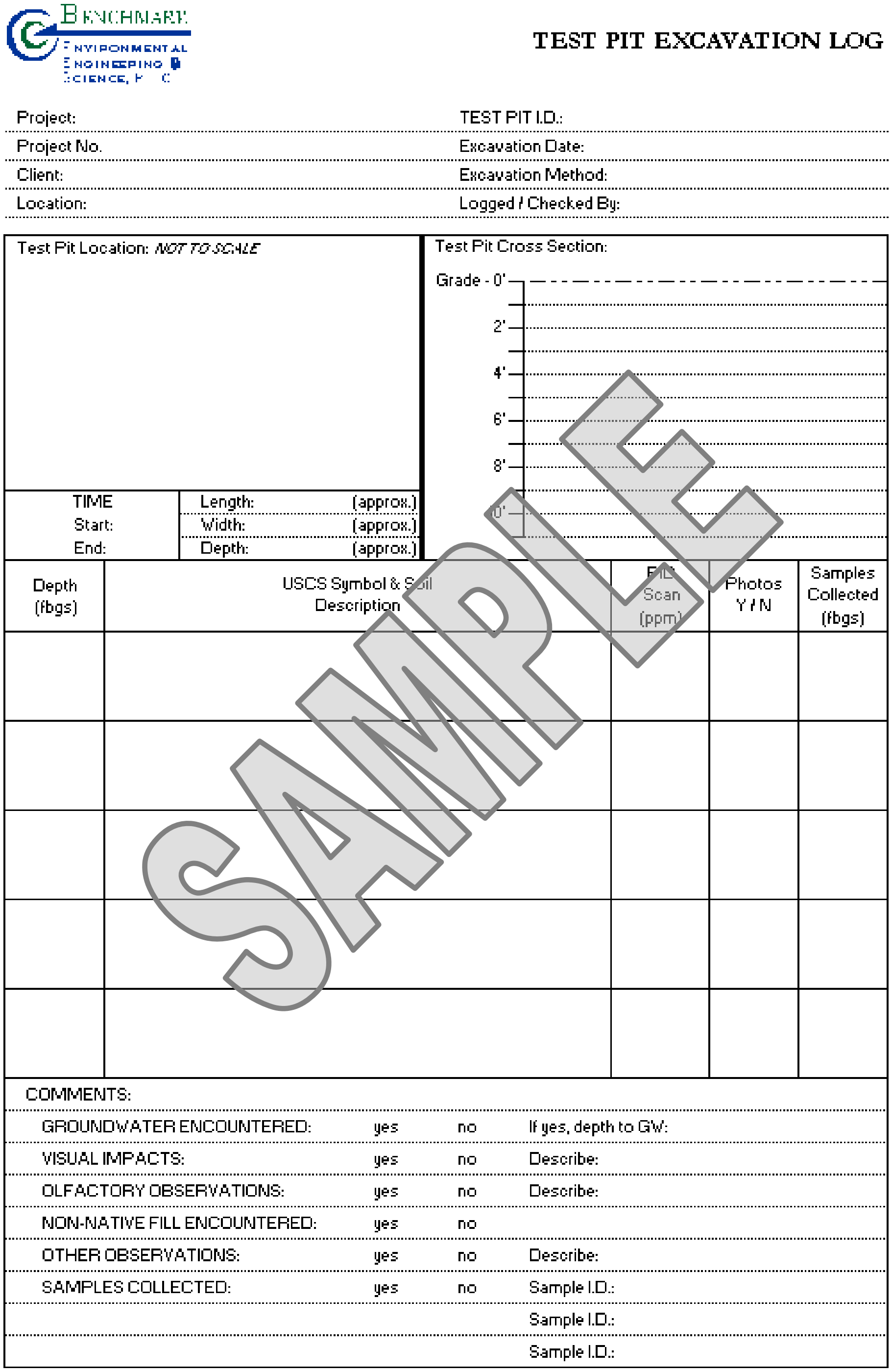
WEATHER CONDITIONS:

Time of Day:	A.M.	P.M.
Ambient Air Temp.:		
Wind Direction:		
Wind Speed:		
Precipitation:		

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Location/Activity/Comments
			PID (ppm)	LEL (%)	H_2S (ppm)	O_2 (%)	CO (ppm)	Particulates (mg/m^3)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By: Date:



Benchmark Environmental Engineering & Science, PLLC

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:

TIME	
Start:	Length: (approx.)
End:	Width: (approx.)
	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.:

FIELD OPERATING PROCEDURES

Well/Piezometer Construction Materials and Design

FOP 070.0

WELL/PIEZOMETER CONSTRUCTION MATERIALS AND DESIGN

PURPOSE

This guideline presents construction materials and design requirements for monitoring well/piezometer installations in accordance with NYSDEC recommended specifications (6NYCRR Part 360).

CONSTRUCTION MATERIALS

1. Well Screen and Riser – Only new flush threaded screen and riser materials will be used. Screen and riser materials, well dimensions, screen slot opening size and length to be determined based on formation characteristics and suspect water quality or as specified by the project geologist/hydrogeologist. A vented cap or J-plug should be placed over the riser. A V-slot cut in the riser or permanent marking, both placed on the north side of the riser, will act as a monitoring reference point.

2. Bentonite Well Seal – The bentonite should be from a commercial source free of chemical additives (granular or powdered for grout and pelletized for seal).

3. Concrete – Low heat of hydration concrete should be used for grout and cementing protective casing if well construction materials are composed of PVC (ASTM Type II or Type IV Portland Cement).

4. Water – Water should be from a potable source of known chemistry and free of chemical constituents which may compromise integrity of installation.

5. Grout – Mixture of bentonite, cement and water in accordance with the following specifications. Premix bentonite and water prior to adding cement.

<u>Grout Slurry Composition (% Weight)</u>

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

6. Filter Pack – The filter pack should consist of clean, inert, siliceous, rounded to subrounded particles. Filter pack particle size is dependent on the formation and the slot size of the screen.

   A secondary filter about 6-inches thick may be placed between filter pack and the bentonite seal and potentially between the bentonite seal and the grout backfill, to minimize grout penetration of the seal. A uniformly graded fine sand (100% passing No. 30 sieve) should be used as a secondary filter.

7. Protective Casing, Locking Cap and Lock – Protective casing with a lockable cap should be cemented in place around the riser. The inside diameter of the protective casing should be a minimum of 2-inches larger than the outside diameter of the well riser. The annular space between the casing and the riser should be filled with pea gravel or coarse sand. A weep hole should be drilled near the base of the casing to facilitate drainage of standing water. If more than one well is installed, all locks should be keyed alike.

8. A sample of all cement, bentonite and sand used in well construction should be saved in a labeled, Teflon-sealed, precleaned glass jar.

REFERENCES

New York State Department of Environmental Conservation, July 1988, *Drilling and Monitoring Well Installation Guidance Manual.*

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

Sara, M. N., *Proposed Recommended Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers: ASTM Subcommittee D18.21.*

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 predetermined, 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 (μg/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 μg/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 μg/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 μg/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.

Visual Assessment

In conjunction with the real-time monitoring program, TurnKey personnel and any subcontractors thereof will be responsible for visually assessing fugitive dust migration from the site. If airborne dust is observed leaving the site, the work will be stopped until supplemental dust suppression techniques are employed in those areas.

Supplemental Dust Suppression

Supplemental dust suppression techniques may include but are not necessarily limited to the following measures:

- Reducing the excavation size, number of excavations or volume of material handled.
- Restricting vehicle speeds.
- Applying water on buckets during excavation and dumping.
- Wetting equipment and excavation faces.
- Wetting haul roads.
- Restricting work during extreme wind conditions.
- Use of a street sweeper on paved haul roads, where feasible.

Work can resume using supplemental dust suppression techniques provided that the measures are successful in reducing the sustained downwind particulate concentration to below 150 ug/m^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.

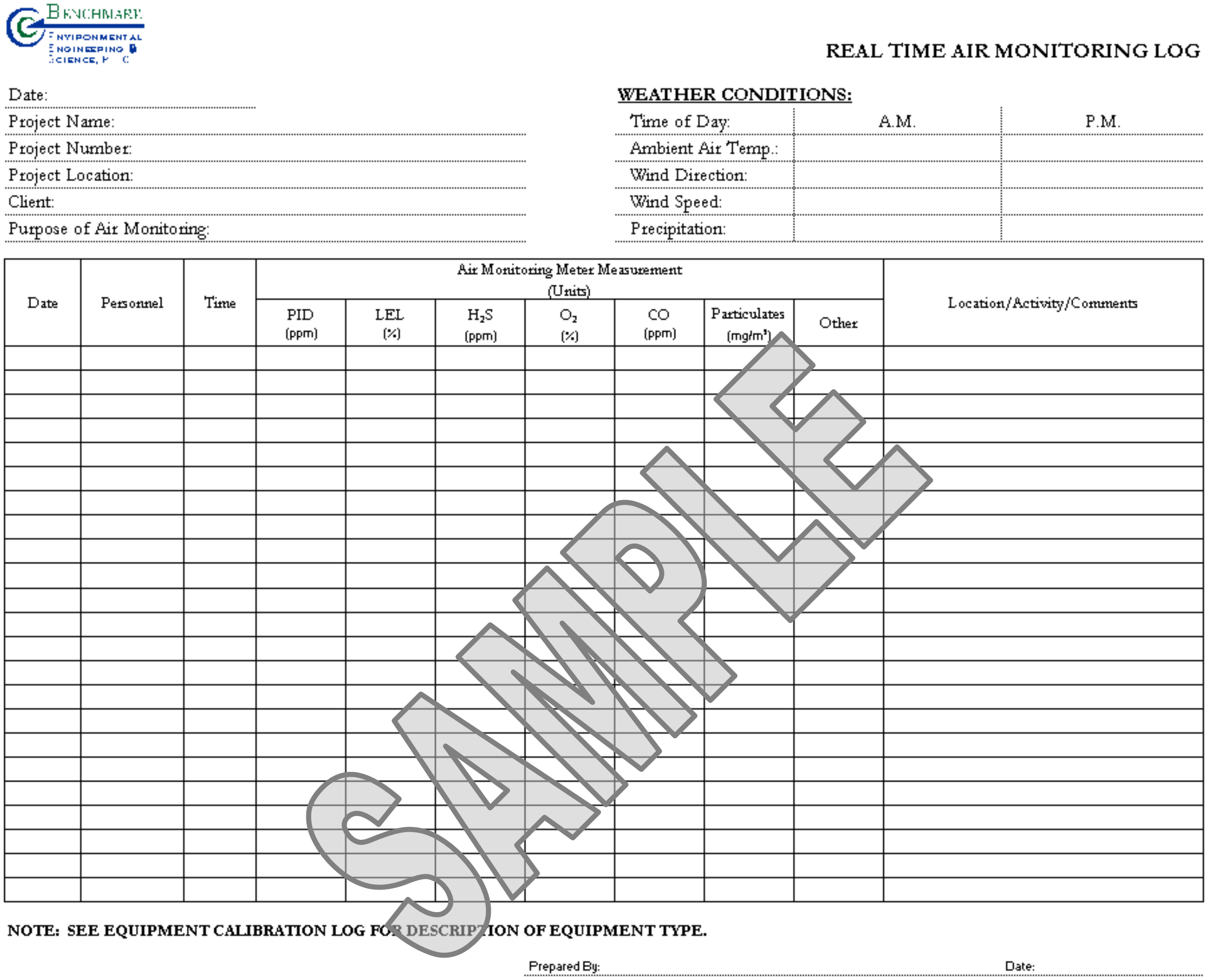
- If the sustained oxygen level at the downwind perimeter of the site persists at levels exceeding 25% (fire hazard potential), work activities should be discontinued and all personnel must leave the area immediately.

ATTACHMENTS

Real-Time Air Monitoring Log (sample)

REFERENCES

<u>TurnKey FOPs:</u>
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



BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

REAL TIME AIR MONITORING LOG

Date:
Project Name:
Project Number:
Project Location:
Client:
Purpose of Air Monitoring:

WEATHER CONDITIONS:

Time of Day:	A.M.	P.M.
Ambient Air Temp.:		
Wind Direction:		
Wind Speed:		
Precipitation:		

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Location/Activity/Comments
			PID (ppm)	LEL (%)	H_2S (ppm)	O_2 (%)	CO (ppm)	Particulates (mg/m^3)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By: Date:

FIELD OPERATING PROCEDURES

Underground Storage Tank Excavation & Removal Procedures

FOP 074.0

UNDERGROUND STORAGE TANK EXCAVATION AND REMOVAL PROCEDURES

PURPOSE

This procedure describes the methods for conducting underground storage tank (UST) removal activities. In most cases, the USTs will be mechanically excavated, using a backhoe, trackhoe, excavator or other equipment. Because the pits and other excavations created during UST exhumation can represent a substantial physical hazard, it requires a particular focus on safety procedures. The Project Health and Safety Plan and/or Project Work Plan should identify practices related to excavation permits, entry, and control that must be incorporated into UST excavation activities.

PRE-EXCAVATION PROCEDURES

1. Conduct a Phase I Site Assessment in accordance with ASTM E 1527 “Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process” or at a minimum conduct an EDR search of the subject property to obtain some information about the number and location of potential USTs.

2. Review project objectives outlined in the Project Work Plan and the Project Health and Safety Plan (HASP).

3. Check locations with owner/operator to ensure excavation operations will not interfere with site operations, and select appropriate access routes.

4. Stake locations in the field and measure distance from locations to nearest landmarks. Survey location, if required.

5. Obtain clearances from appropriate utilities and, if buried waste/metallic objects are suspected, screen location with appropriate geophysical methods, as necessary. Utility clearances are required 72 hours prior to commencing intrusive activities. Typically, the UST contractor will obtain the required utility clearances and permits.

6. Conduct a pre-construction meeting, as necessary. Include the client, state and/or federal regulatory agencies (as necessary) and the UST contractor.

7. Become familiar with the site by conducting a site reconnaissance. Note and identify the following: the prevailing wind direction; adjacent property zones (i.e., residential, commercial or industrial); any potential for unauthorized site access by onlookers; overhead utilities; temporary staging areas for impacted soils and USTs; and any other site features that may inhibit the progress of work.

8. During the site recon, locate the surface fill ports, if applicable, and determine the approximate size, liquid type and liquid quantity of the UST. Determine tank size (diameter and capacity) and liquid quantity by sticking the tank through the fill port with a long measuring stick. Determine the type of liquid contained within the UST; keeping in mind this may involve sample collection and profile characterization by a laboratory.

EXCAVATION PROCEDURES

1. 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.

2. Conduct tailgate health and safety meeting with project team and excavation operator(s) by completing the Tailgate Safety Meeting Form (sample attached).

3. Discuss with excavation contractor personnel the scope of work and what will be expected of them.

4. Calibrate air-monitoring equipment in accordance with the appropriate Roux'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 in accordance with Roux's FOP: Real-Time Air Monitoring During Intrusive Activities. Record all results on the Real Time Air Monitoring Log (sample attached).

6. Decontaminate excavation equipment in accordance with Roux's Drilling and Excavation Equipment Decontamination procedures as necessary.

7. Mobilize the excavation equipment to the site and position over the required UST location.

8. If liquid was encountered in the UST during the initial site reconnaissance, purge, contain and dispose of the UST contents in accordance with state and federal regulations as well as Roux's FOP: Management of Investigation-Derived Waste (IDW).

9. Excavate the UST(s) in compliance with applicable safety regulations and NYSDEC Division of Environmental Remediation, Spill Response Unit or Bulk Storage Unit guidelines and/or this FOP. In uncontrolled areas, UST excavations being conducted over several days and/or time allowed for laboratory analytical results to be returned will be covered and/or barricaded and flagged with caution/hazard tape. These open pits should be backfilled with clean fill as soon as possible.

10. Each UST contractor has their own means and methods of exhuming USTs and impacted soil and Roux personnel should not direct the contractor's activities, however, the methods performed by the contractor should be monitored closely to ensure safety is a priority. Typically, the UST fill ports will be unearthed and the top of the tank will be exposed to determine the exact size of the tank. Once the size is determined, the UST contractor will excavate along one side to the bottom of the tank and roll the tank on its side.

11. Once the UST is "loosened", the contractor should remove the tank with webbing or chains, while keeping the tank in its original horizontal position, and place the exhumed tank on a polyethylene tarp.

12. The UST contractor will then clean and dispose of the tank in accordance with state and federal regulations.

13. The Roux field geologist or experienced professional will determine the horizontal and vertical limits of excavation based upon soil scans with a calibrated photoionization detector (PID) in accordance with Roux's FOP: Screening of Soil Samples for Organic Vapors During UST Removal Activities.

    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). Excavation depths exceeding the practical limits of the machine may be required as long as the groundwater table has not been encountered. Terminate all excavations at the first water bearing zone and consult the Project Manager. Typically, groundwater remediation will be required (i.e., pump and treat).

14. At no time should an excavation 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.

15. During impacted soil removal activities, record all required transportation information on an Impacted Soil Transportation Log (sample attached).

16. Collect a representative soil sample from each of the four sidewalls and one from the bottom and scan with a PID (i.e., initial surface scan and headspace determination) until excavated soils PID results fall below the project-required limit, typically 20 ppm. Sidewall samples shall be collected from a depth equal to the bottom and no higher than the middle of the pre-exhumation UST position.

17. Upon determining the limits of impact, collect one confirmation/verification soil sample from each of the four sidewalls and bottom of the excavation in accordance with Roux's Surface and Subsurface Soil Sampling Procedures.

Sidewall samples shall be collected from a depth equal to the bottom and no higher than the middle of the pre-exhumation UST position.

If the test pit is greater than 4 feet in depth, it will <u>not</u> be entered for sampling. In this event, collect samples using the excavation equipment filling laboratory-provided 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.

18. If excessive water enters the excavation, via perched groundwater or precipitation, it shall be purged and contained as IDW until proper disposal can be determined (i.e., pumped through granular activated carbon vessels and discharged to the sanitary sewer). The Project Manager and NYSDEC representative should be consulted upon detection of excess water to determine proper disposal methods. On the other hand, minor amounts of water within the excavation that can be sufficiently mixed with excavated soil material is an acceptable disposal method.

19. Record UST excavation observations in the Project Field Book and/or an Impacted Soil Excavation Log (sample attached). Information recorded should include:

    - Physical dimension of the pit;
    - A scaled sketch of one side of the excavation showing the position of the UST and 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, excavation 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);

- General information about the UST such as diameter, length, quantity of liquid removed, construction material etc.;
- Rate of groundwater inflow, depth to groundwater and time of measurement, as necessary; and
- Unified Soil Classification System (USCS) designation of each distinctive unit in accordance with Roux's FOP: Soil Description Procedures Using the Unified Soil Classification System (USCS).

20. Photograph the progress of UST exhumation, impacted soil excavation and clean fill backfilling, highlighting unique or important features. Use a ruler or other suitable item for scale. Include a label with the excavation designation so the developed picture will be labeled, as necessary.

21. Backfill the excavation to match the existing grade compacting in 2 to 3 foot lifts with clean fill and as directed in the Project Work Plan. Excavated soils designated as "clean" via PID scan can be placed back into the hole. The Roux 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)
Impacted Soil Excavation Log (sample)
Impacted Soil Transportation Log (sample)

REFERENCES

<u>Roux 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*
032	*Management of Investigation-Derived Waste (IDW)*
048	*Screening of Soil Samples for Organic Vapors During UST Removal Activities*
054	*Soil Description Procedures Using the Unified Soil Classification System (USCS)*
063	*Surface and Subsurface Soil Sampling Procedures*
073	*Real-Time Air Monitoring During Intrusive Activities*

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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:

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REAL TIME AIR MONITORING LOG

Date:
Project Name:
Project Number:
Project Location:
Client:
Purpose of Air Monitoring:

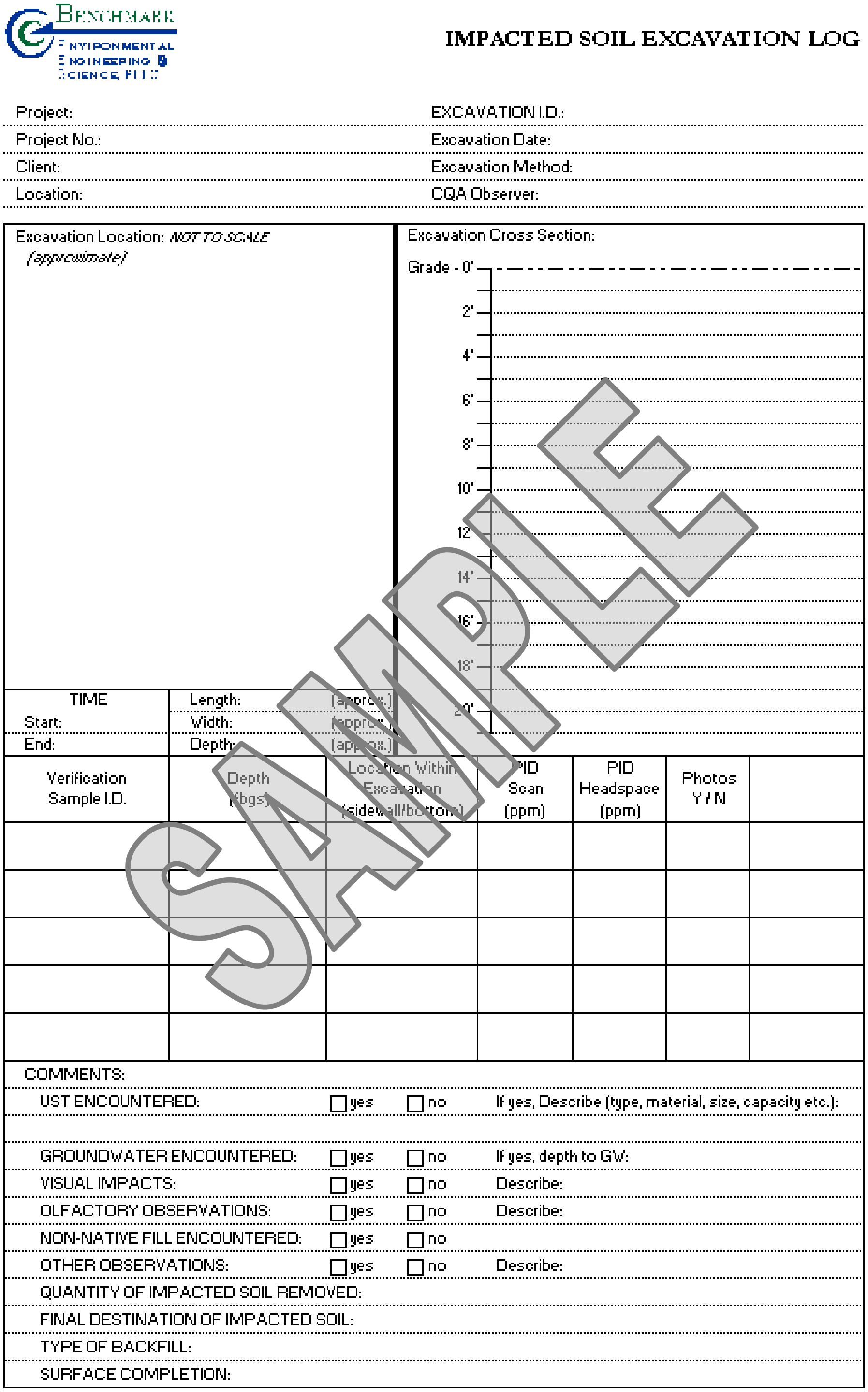
WEATHER CONDITIONS:

Time of Day:	A.M.	P.M.
Ambient Air Temp.:		
Wind Direction:		
Wind Speed:		
Precipitation:		

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Location/Activity/Comments
			PID (ppm)	LEL (%)	H_2S (ppm)	O_2 (%)	CO (ppm)	Particulates (mg/m^3)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By: Date:



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IMPACTED SOIL EXCAVATION LOG

Project:	EXCAVATION I.D.:
Project No.:	Excavation Date:
Client:	Excavation Method:
Location:	CQA Observer:

Excavation Location: *NOT TO SCALE (approximate)*

Excavation Cross Section:

TIME		
Start:	Length:	(approx.)
End:	Width:	(approx.)
	Depth:	(approx.)

Verification Sample I.D.	Depth (fbgs)	Location Within Excavation (sidewall/bottom)	PID Scan (ppm)	PID Headspace (ppm)	Photos Y / N	

COMMENTS:

UST ENCOUNTERED: ☐ yes ☐ no If yes, Describe (type, material, size, capacity etc.):

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

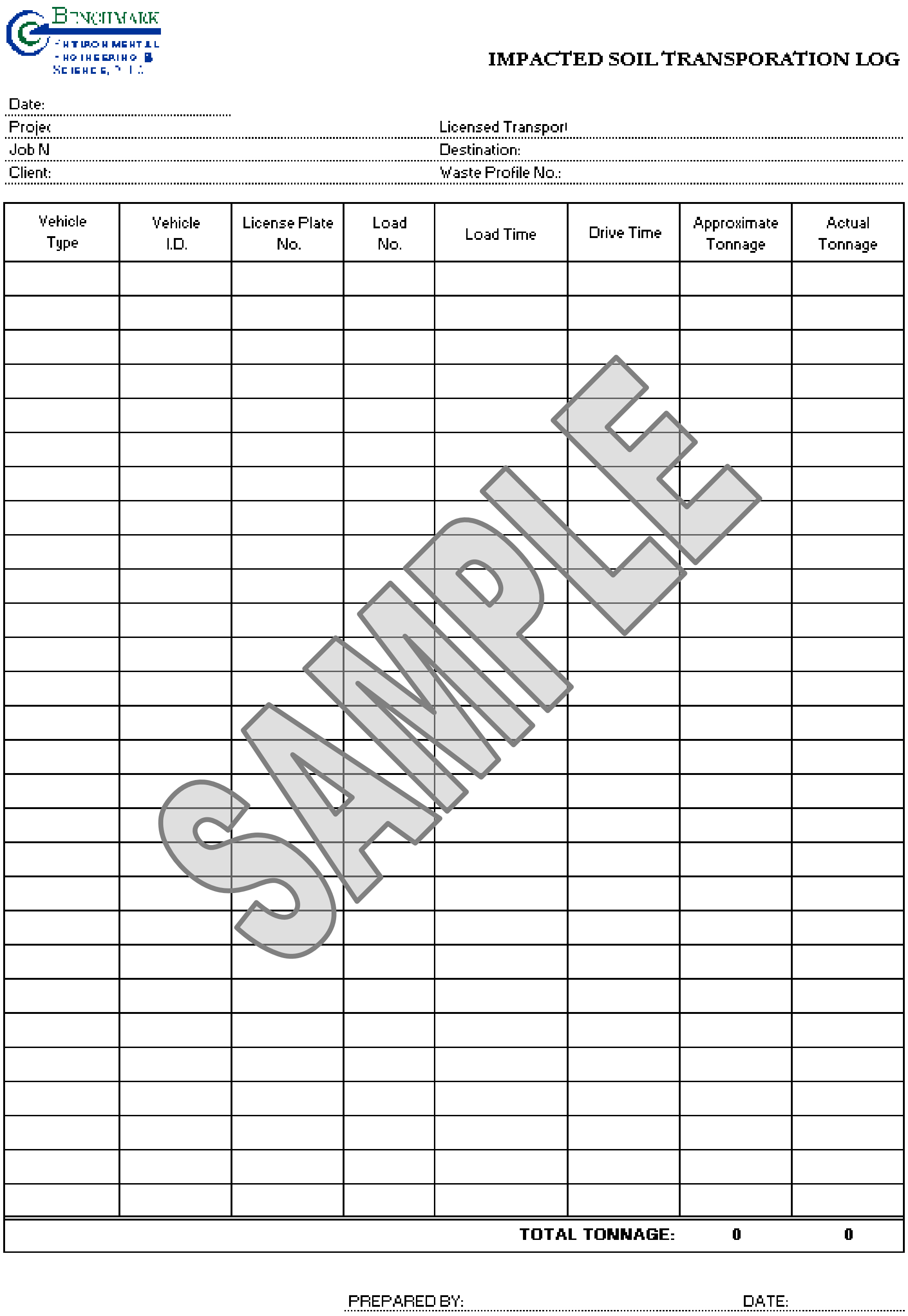
OTHER OBSERVATIONS: ☐ yes ☐ no Describe:

QUANTITY OF IMPACTED SOIL REMOVED:

FINAL DESTINATION OF IMPACTED SOIL:

TYPE OF BACKFILL:

SURFACE COMPLETION:



IMPACTED SOIL TRANSPORATION LOG

Date:

Projec

Licensed Transpor

Job N

Destination:

Client:

Waste Profile No.:

Vehicle Type	Vehicle I.D.	License Plate No.	Load No.	Load Time	Drive Time	Approximate Tonnage	Actual Tonnage
					TOTAL TONNAGE:	**0**	**0**

PREPARED BY:

DATE:

FIELD OPERATING PROCEDURES

"Before Going Into The Field" Procedure

FOP 076.0

"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

ROUX

FIELD OPERATING PROCEDURES

Temporary Well (Piezometer) Construction Procedures

FOP 077.0

TEMPORARY WELL (PIEZOMETER) CONSTRUCTION PROCEDURES

PURPOSE

Temporary wells (or piezometers) will be installed within selected geoprobe boreholes or test pits for the purpose of evaluating groundwater characteristics, such as flow direction and generally quality. This procedure describes temporary well construction and installation for boreholes drilled using direct push and test pit methodologies. Refer to Roux's Geoprobe Drilling Procedure FOP and Test Pit Excavation and Logging Procedures FOP prior to installing a temporary well. Nominal dimensions and materials for the temporary well are shown in the attached temporary well construction diagram.

GEOPROBE PROCEDURE

1. Advance borehole in accordance with Roux's Geoprobe Drilling Procedure FOP to the required depth. The nominal inside diameter (ID) of the direct-push stem used should be at least 1 inch larger than the outside diameter (OD) of the riser and screen selected for the temporary well installation.

2. Remove the direct-push rods from the borehole and verify the depth using weighted measuring tape confirming the depth to groundwater observed during sample evaluation. If the borehole annulus collapses due to non-cohesive soils (i.e., sand and gravel), additional attempts should be made by the direct push rig to clear the sloughed material. If sloughing continues and the borehole cannot remain open, discontinue temporary well installation and consult the Project Manager and/or Work Plan.

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 direct-push 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. Due to the transient nature of the temporary well(s), a sand filter pack and well development is not required.

5. Measure the length of the 1-inch PVC temporary well string (i.e. riser and screen), and lower the temporary well string into the borehole annulus to the desired depth. All measurements during the temporary well installation process will be accurate to 0.1 foot.

6. Following well string installation, place cement bentonite chips or pellets around the surface to create a watertight seal and hydrate with potable water. A typical temporary well completion detail is attached as Figure 1.

7. Leave the uncapped temporary well undisturbed for at least 1 hour to allow the bentonite chips/pellets surface seal to adequately hydrate as well as to allow shallow groundwater within the screened formation to stabilize within the well.

8. Permanently label the temporary well with the appropriate alphanumeric identifier as determined by the Project Manager or specified in the Work Plan.

9. Permanently mark a survey location on the north side at the top of the PVC riser with a saw cut. Survey all temporary 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 surveys at the Site. Information obtained will include location (*x* and *y*) of the temporary well, and elevation (*z*) of the ground surface and the top of riser.

10. Place a lockable J-plug and dedicated lock on the temporary well, and keep the temporary well locked when not actively attended.

11. Manage all waste materials generated during temporary well installation as described in the Roux Field Operating Procedure for Management of Investigation Derived Waste.

12. Record the temporary well construction details on a Field Geoprobe Borehole/Temporary Well Installation Log (sample attached) and Temporary Well Completion Detail (sample attached).

13. Refer to Roux's Documentation Requirements for Drilling and Well Installation FOP.

TEST PITTING PROCEDURE

1. Advance test pit a minimum of five feet into the shallow groundwater bearing zone in accordance with Roux's Test Pit Excavation and Logging Procedures FOP to the required depth.

2. At one end of the test pit, excavate an additional small pilot hole to place the 1-inch PVC temporary well string in a vertical position.

3. Verify the depth using weighted measuring tape confirming the depth to groundwater observed during test pit evaluation.

4. Construct the temporary well with a 1-inch diameter (minimum) PVC well screen and riser according to the observed/measured depth to groundwater. Measure the length of the temporary well string (i.e. riser and screen) and lower the string into the open test pit to the desired depth. All measurements during the temporary well installation process will be accurate to 0.1 foot.

5. Slowly backfill around the temporary well with test pit spoils, making sure to keep the well as close to vertical as possible.

6. Due to the transient nature of the temporary well(s), a sand filter pack and well development is not required.

7. Following well string installation, place cement bentonite chips or pellets around the surface to create a watertight seal and hydrate with potable water. A typical temporary well completion detail is attached as Figure 1.

8. Leave the uncapped temporary well undisturbed for at least 1 hour to allow the bentonite chips/pellets surface seal to adequately hydrate as well as to allow shallow groundwater within the screened formation to stabilize within the well.

9. Permanently label the temporary well with the appropriate alphanumeric identifier as determined by the Project Manager or specified in the Work Plan.

10. Permanently mark a survey location on the north side at the top of the PVC riser with a saw cut. Survey all temporary 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 surveys at the Site. Information obtained will include location (*x* and *y*) of the temporary well, and elevation (*z*) of the ground surface and the top of riser.

11. Place a lockable J-plug and dedicated lock on the temporary well, and keep the temporary well locked when not actively attended.

12. Manage all waste materials generated during temporary well installation as described in the Roux Field Operating Procedure for Management of Investigation Derived Waste.

13. Record the temporary well construction details on a Temporary Well Completion Detail (sample attached).

14. Refer to Roux's Documentation Requirements for Drilling and Well Installation FOP.

ATTACHMENTS

Figure 1 Typical Temporary Well Construction Detail (Figure 1)

Field Geoprobe Borehole/Temporary Well Installation Log (sample)
Temporary Well Completion Detail (sample)

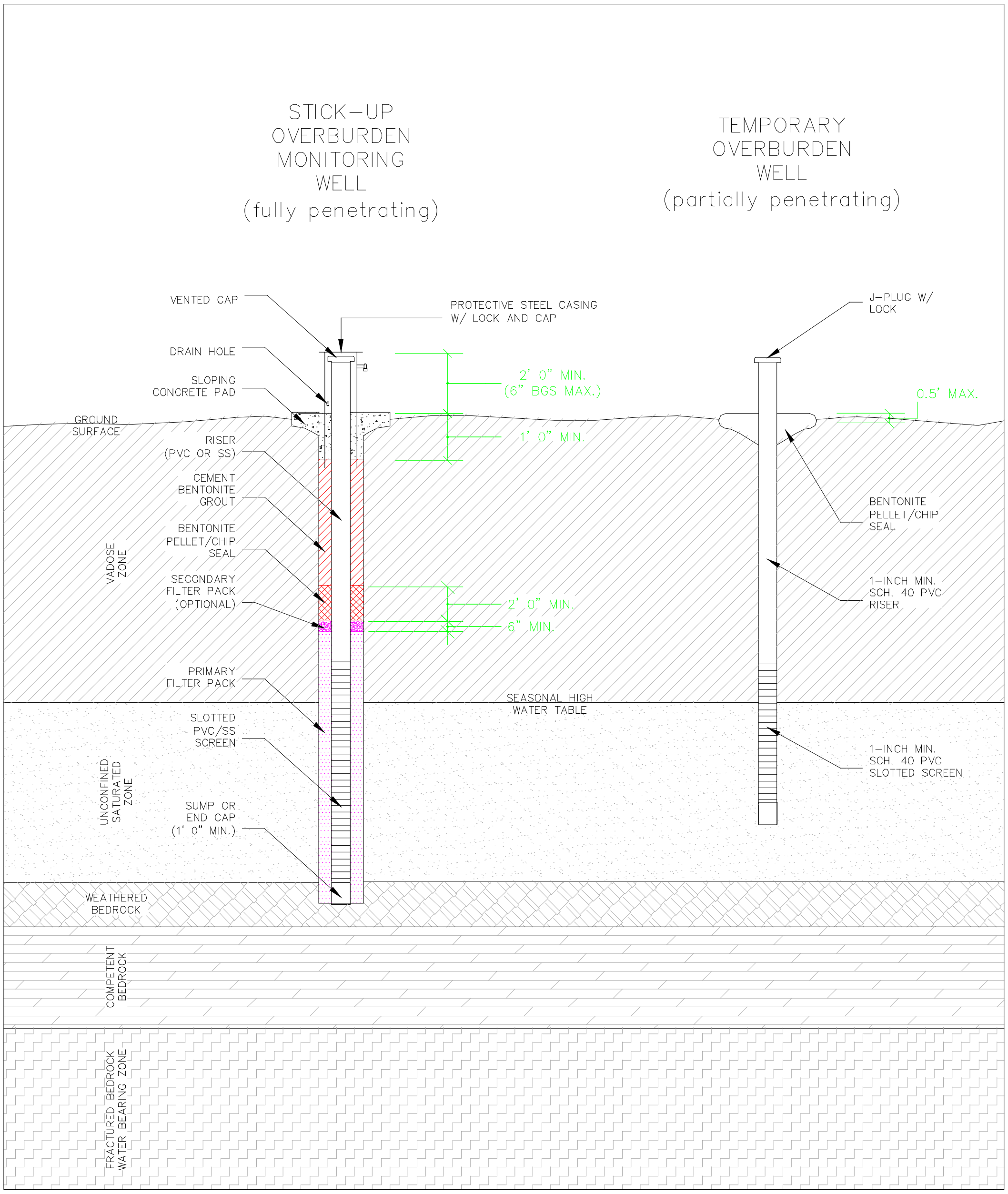
REFERENCES

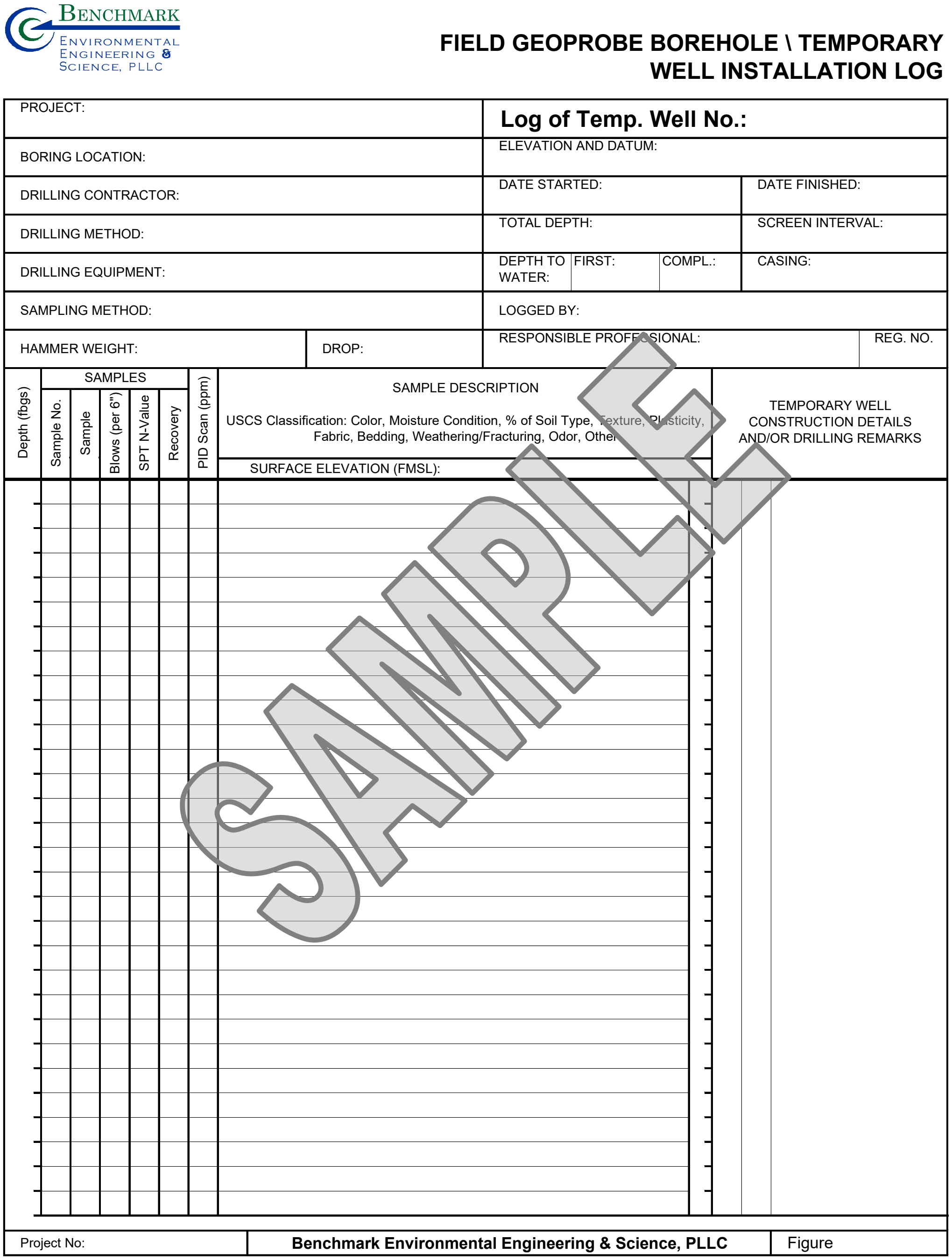
Roux FOPs:

015	*Documentation Requirements for Drilling and Well Installation*
032	*Management of Investigation Derived Waste*
065	*Test Pit Excavation and Logging Procedures*
078	*Geoprobe Drilling Procedures*

FIGURE 1

TYPICAL TEMPORARY WELL CONSTRUCTION DETAIL





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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):	TEMPORARY WELL CONSTRUCTION DETAILS AND/OR DRILLING REMARKS

Project No:	**Benchmark Environmental Engineering & Science, PLLC**	Figure

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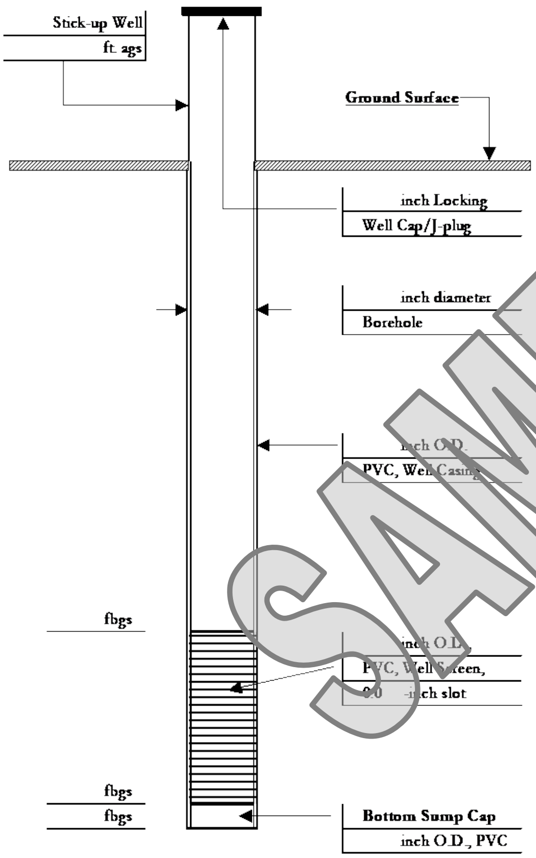
TEMPORARY WELL
COMPLETION DETAIL

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)

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

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

NOT APPLICABLE

Comments:

PREPARED BY: DATE:

ROUX

FIELD OPERATING PROCEDURES

Geoprobe Drilling Procedures

FOP 078.0

GEOPROBE DRILLING PROCEDURES

PURPOSE

This guideline presents a method for direct-push drilling a borehole through unconsolidated materials, including soils or overburden.

PROCEDURE

The following procedure will be used to drill a borehole for sampling and/or well installation, using direct-push methods and equipment.

1. Follow Roux's Field Operating Procedure (FOP) for Drill Site Selection Procedure prior to implementing any drilling activity.
2. Perform drill rig safety checks with the driller by completing the Drilling Safety Checklist form (sample attached).
3. Conduct tailgate health and safety meeting with project team and drillers by completing the Tailgate Safety Meeting Form (sample attached).
4. Calibrate air-monitoring equipment in accordance with the appropriate Roux's FOPs or manufacturers recommendations.
5. Ensure all drilling equipment (i.e., rods, 4-foot sampler, dedicated PVC sleeves) appear clean and free of soil prior to initiating any subsurface intrusion. Decontamination of drilling equipment should be in accordance with Roux's Drilling and Excavation Equipment Decontamination Procedures FOP.
6. Mobilize the Geoprobe™ rig to the site and position over the borehole.
7. Level and stabilize the rig and recheck the rig location against the planned drilling location.

8. Fully advance the sampler into the subsurface using an ATV-mounted direct-push Geoprobe™ drill rig and 1.5-inch diameter sampler, typically 4-feet in length and fitted with a dedicated PVC sleeve, for each four-foot core of soil.

9. Retrieve the 4-foot sample core from the driller, place on a piece of polyethylene tarp, and cut open using a sharp utility knife.

10. Visually characterize each 4-foot soil core using the Unified Soil Classification System (USCS) in accordance with Roux's Soil Description Procedures Using the USCS FOP.

11. Scan each 4-foot core for total volatile organic vapors with a calibrated Photovac 2020 PID equipped with a 10.6 eV lamp, and report any visual and/or olfactory observations. Record PID scan measurements in the Project Field Book and appropriate field forms.

12. If required, collect a representative soil sample for headspace determinations. In general, soil samples representative of each 4-foot core interval are collected, placed in a sealable plastic bag, and kept at or near room temperature (approximately 65-70° F) for a minimum of 15 minutes prior to measurement. Record PID headspace determination measurements in the Project Field Book and appropriate field forms.

13. Check sampler and rods periodically during drilling to ensure the boring is plumb. Adjust rig position as necessary to maintain plumb.

14. Continue drilling until reaching the assigned total depth, or until sampler refusal occurs. Sampler refusal is when the drilling penetration drops below 0.1 feet per 2 minutes, with the full weight of the rig on the sampler.

15. Plug and abandon boreholes not used for temporary well installation in accordance with Roux's Field Operating Procedure for Abandonment of Borehole. Boreholes to be used as temporary wells should be completed in accordance with Roux's Temporary Well (Piezometer) Construction Procedures FOP.

16. Decontaminate all non-dedicated drilling tools between boring locations using potable tap water and a phosphate-free detergent (i.e., Alconox™) in accordance with Roux's Drilling and Excavation Equipment Decontamination Procedures FOP.

OTHER PROCEDURAL ISSUES

- Borings will not be over drilled (rat holed) without the express permission of the Roux field supervisor. All depth measurements should be accurate to the nearest 0.1 foot, to the extent practicable.

- Potable water may be placed in the sampler stem if critically necessary for borehole control or to accomplish sampling objectives. This will be performed only with the express permission of the Roux field supervisor.

ATTACHMENTS

Drilling Safety Checklist (sample)
Tailgate Safety Meeting Form (sample)

REFERENCES

Roux FOPs:

001	*Abandonment of Borehole Procedures*
017	*Drill Site Selection Procedure*
018	*Drilling and Excavation Equipment Decontamination Procedures*
054	*Soil Description Procedures Using the USCS*
077	*Temporary Well (Piezometer) Construction Procedures*

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DRILLING SAFETY CHECKLIST

Project: **Supplemental Phase II RFI/ICMs**	Date:
Project No.: **0041-009-500**	Drilling Company:
Client: **RealCo., Inc.**	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?		
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?		

ITEMS TO CHECK	OK	ACTION NEEDED

Benchmark Environmental Engineering & Science, PLLC

DRILLING SAFETY CHECKLIST

Project: **Supplemental Phase II RFI/ICMs**
Date:
Project No.: **0041-009-500**
Drilling Company:
Client: **RealCo., Inc.**
Drill Rig Type:

ITEMS TO CHECK	OK	ACTION NEEDED
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 **Benchmark 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:

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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

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Meeting conducted by:

FIELD OPERATING PROCEDURES

Stockpile Sampling Procedures for Chemical Analysis

STOCKPILE SAMPLING PROCEDURES FOR CHEMICAL ANALYSIS

PURPOSE

This guideline presents a method for collecting representative soil samples from stockpiled borrow source material for chemical analysis.

GENERAL

In general, off-site soil that is brought to a Site for use as supplemental fill is subject to Quality Assurance sampling and analysis. If QA is required, all off-site soil proposed for use as Site backfill shall be documented by the subcontractor in writing to have originated from locations having no evidence of disposal or release of hazardous, toxic or radioactive substances, wastes or petroleum products. If the subcontractor designates a source as "virgin" soil, it shall be further documented in writing to be native soil material having not supported any known past industrial or commercial development or agricultural use. Borrow soils can be used as backfill once concentrations are confirmed to meet project designated criteria for the Constituents of Primary Concern (COPCs) and NYSDEC TAGM HWR-94-4046 recommended soil cleanup objectives (SCOs) or NYSDEC 6NYCRR Part 375 SCOs.

Sample collection equipment will include stainless steel mixing bowls, stainless steel mixing spoons, and a stainless steel hand auger with extension rods or a stainless steel spade or equivalent. It may be necessary to use a backhoe or drilling rig to facilitate sample collection.

SAMPLING PLAN

1. Virgin Sources – Virgin borrow sources will be confirmed acceptable for use as site backfill through collection of a single composite soil sample representative of the borrow pit or stockpile.

2. Non-Virgin Sources – Prior to sampling, determine the amount of soil that will be sampled. The soil will be tested via collection of one composite sample per 250 cubic yards of material from each source area. If more than 1,000 cubic yards of soils are excavated from a given off-site source area and all samples of the first 1,000 cubic yards meet project designated criteria, the sample collection frequency may be reduced to one composite for each additional 1,000 cubic yards of soils from the same source area, up to 5,000 cubic yards. For borrow sources greater than 5,000 cubic yards, sampling frequency may be reduced to one sample per 5,000 cubic yards, providing all earlier samples meet project designated criteria. Sampling procedure for non-virgin sources is described in the next section.

SAMPLE COLLECTION AND HANDLING

The following procedure will be used to collect representative soil samples from a non-virgin soil stockpile.

1. Using a stainless steel spade (or hand auger), a backhoe, or drilling rig, penetrate the pile to a depth of approximately 2 to 3 feet and collect four (4) representative grab samples of approximate equal volume from the top, middle, and bottom.

2. Transfer each grab into a small stainless steel mixing bowl.

3. **VOC Analysis:** Using a clean stainless steel spoon, transfer equal amounts from each small mixing bowl into a laboratory-supplied, 4 oz. VOC sample jar. This should be performed by randomly transferring several small aliquots from each bowl, taking care to minimize disturbance of the soil.

4. **Other COPCs:** Transfer equal aliquots from each small bowl into a large mixing bowl and homogenize the sample. Fill the remaining laboratory-supplied jars with the homogenized soil for all other project required COPCs (i.e., SVOCs, PCBs, Pesticides, Herbicides, inorganics, etc.).

5. Label each set of jars with the following information:
   - Project and site name
   - Sample Code
   - Project Number
   - Date/Time
   - Sample type (soil composite or grab)
   - Sampler's initials
   - Sample Preservation
   - Required analysis

   The sample code will consist of a unique, alphanumeric identification code keyed to the sampling location. Identify the sampling location on a field sketch.

6. Record all information associated with sample collection in the Project Field Book.

7. Label, store, and ship the samples in accordance with the Roux Field Operating Procedure for Sample Labeling, Storage and Shipment Procedures.

8. Clean the sampling and mixing equipment with Alconox and deionized water and repeat steps 1 through 7 for the remaining samples.

REFERENCES

<u>Roux FOPs:</u>
046 Sample Labeling, Storage and Shipment Procedures

ROUX

FIELD OPERATING PROCEDURES

Waste Sampling Procedures

FOP 082.0

WASTE SAMPLING PROCEDURES

PURPOSE

This guideline describes the equipment and procedures that can safely be used to collect waste samples from open and closed units.

INTRODUCTION

Hazardous wastes are regulated by the USEPA under 40 CFR Parts 260-265. Therefore, many of the methods that are used to manage, store, treat, and dispose hazardous wastes and potential hazardous wastes are of concern to both the regulators and the regulated community. Samples are often required of regulated or potentially regulated materials. While it is understood that each facility and waste stream may present its own unique sampling and analytical challenges, this procedure will list equipment and enumerate procedures that have been used by the USEPA to safely and successfully sample specific waste units.

SAFETY

Sampling of waste units should be assessed for potential hazards by both the Project Manager (PM) and the site safety officer (SSO). It is the SSOs responsibility to enforce the site Health and Safety Plan (HASP), and to ensure that procedures used during waste sampling are in accordance with current company protocol. Sampling equipment contaminated during waste sampling investigations should be cleaned with laboratory detergent and rinsed with tap water prior to returning the equipment from the field. Contaminated sampling equipment that is to be discarded must be disposed of properly in accordance with the site-specific Work Plan.

It should be noted that although Roux does not readily perform field activities with highly hazardous materials, we do occasionally oversee contractors who do. Therefore, it is prudent on our part to recognize those situations and be prepared to ensure the activities of our subcontractors comply with the site-specific HASP as well as those procedures discussed herein. Any reference within this procedure to personal protective equipment (PPE) upgrades above a modified level C (i.e., Tyvek, nitrile gloves, and full-face respirator) relates solely to our subcontractors.

QUALITY CONTROL PROCEDURES

In some instances, special decontamination procedures will be necessary and should be developed on a case-by-case basis according to the specific material encountered. Any cleaning procedures and equipment repairs conducted in the field deviating from those specified in the associated FOPs or the site-specific Work Plan, should be discussed with the Project Manager, and thoroughly documented in the Project Field Book.

All air monitoring and field analytical/screening equipment (i.e., photoionization detectors) should be checked and calibrated per manufacturer's specifications before being used to collect any waste stream unit sample (open or closed). The Field Team Leader should record all calibration results on appropriate field forms.

WASTE UNIT TYPES

Waste management units can be generally categorized into two types: open and closed. In general, open units are larger than closed units and include waste piles and surface impoundments whereas closed units include containers and tanks as well as ancillary tank equipment. Besides containers and tanks, sumps may also be considered closed units because they are designed to collect the spillage of liquid wastes and are sometimes configured as a confined space.

Although both may pose hazards, units that are open to the environment are generally less hazardous than closed units. Sampling of closed units is considered a higher hazard risk because of the potential of exposure to toxic gases and flammable/explosive atmospheres. Because closed units prevent the dilution of the wastes by environmental influences, they are more likely to contain materials that have concentrated levels of hazardous constituents. While opening closed units for sampling purposes, investigators/contractor's shall use Level B PPE, air monitoring instruments to ensure that the working environment does not contain hazardous levels of flammable/explosive gasses or toxic vapors, and follow the appropriate safety requirements stipulated in the site-specific HASP.

Buried waste materials should be located and excavated with extreme caution. Once the buried waste is uncovered, the appropriate safety and sampling procedures utilized will depend on the type of waste unit.

Open Units

While open units may contain many types of wastes and come in a variety of shapes and sizes, they can be generally regarded as either waste piles or surface impoundments.

Definitions of these two types of open units from 40 CFR Part 260.10 are:

- Waste pile -- any non-containerized accumulation of solid, non-flowing hazardous waste that is used for treatment or storage and that is not a containment building.
- Surface impoundment -- "...a facility or part of a facility which is a natural topographic depression, man-made excavation, or diked area formed primarily of earthen materials (although it may be lined with man-made materials), which is designed to hold the accumulation of liquid wastes or wastes containing free liquids, and which is not an injection well. Examples of surface impoundments are holding, storage, settling and aeration pits, ponds, and lagoons."

One of the distinguishing features between waste piles and surface impoundments is the state of the waste. Waste piles typically contain solid or non-flowing materials whereas liquid wastes are usually contained in surface impoundments. The nature of the waste will also determine the mode of delivering the waste to the unit. Wastes are commonly pumped or gravity fed into impoundments while heavy equipment or trucks may be used to dump wastes in piles. Once the waste has been placed in an open unit, the state of the waste may be altered by environmental factors (e.g., temperature, precipitation, etc.).

Surface impoundments may contain several phases such as floating solids, liquid phase(s), and sludges. Waste piles are usually restricted to solids and semi-solids. All of the potential phases contained in a waste unit should be considered in developing the sample design to meet the study's objective.

Closed Units

There are a variety of designs, shapes, sizes, and functions of closed units. In addition to the challenges of the various designs and the safety requirements for sampling them, closed units are difficult to sample because they may contain liquid, solid, semi-solid/sludge, or any combination of phases. Based on the study's design, it may be necessary to obtain a cross sectional profile of the closed unit in an attempt to characterize the unit. The following are definitions of types of closed waste units described in 40 CFR Part 260.10:

- Container -- any portable device in which a material is stored, transported, treated, disposed, or otherwise handled. Examples of containers are drums, overpacks, pails, totes, and roll-offs.

- Tank -- a stationary device, designed to contain an accumulation of hazardous waste constructed primarily of non-earthen materials, which provide structural support.

Portable tanks, tank trucks, and tank cars vary in size and may range from simple to extremely complex designs. Depending on the unit's design, it may be convenient to consider some of these storage units as tanks for sampling purposes even though they meet the definition of a container.

- Ancillary equipment (tank) -- any device including, but not limited to, such devices as piping, fittings, flanges, valves, and pumps that is used to distribute, meter, or control the flow of hazardous waste from its point of generation to a storage or treatment tank(s), between hazardous waste storage and treatment tanks to a point of disposal on-site, or to a point of shipment for disposal off-site.

- Sump -- any pit or reservoir that meets the definition of a tank and those troughs/trenches connected to it that serve to collect hazardous wastes.

Note: some outdoor sumps may be considered open units/surface impoundments.

Although any of the closed units may not be completely sealed and may be partially open to the environment, the unit needs to be treated as a closed unit for sampling purposes until a determination can be made. Once a closed unit is opened, a review of the proposed sampling procedures and level of protection can be performed to determined if the (PPE) is suitable for the site conditions.

Samples collected from different waste units should not be composited into one sample container without additional analytical and/or field screening data to determine if the materials are compatible and will not cause an inadvertent chemical reaction.

EQUIPMENT

Selecting appropriate equipment to sample wastes is a challenging task due to the uncertainty of the physical characteristics and nature of the wastes. It may be difficult to separate, homogenize and/or containerize a waste due to its physical characteristics (viscosity, particle size, etc.). In addition, the physical characteristics of a waste may change with temperature, humidity, or pressure. Waste streams may vary depending on how and when a waste was generated, how and where it was stored/disposed, and the conditions under which it was stored/disposed. Also, the physical location of the wastes or the unit configuration may prevent the use of conventional sampling equipment.

Given the uncertainties that a waste may present, it is desirable to select sampling equipment that will facilitate the collection of samples that will meet the study's objective, and that will not unintentionally bias the sample by excluding some of the sample population that is under consideration. However, due to the nature of some waste matrices or the physical constraints of some waste units, it may be necessary to collect samples knowing that a portion of the desired population was omitted due to limitations of the equipment. Any deviations from the study plan or difficulties encountered in the field concerning sample collection that may have an effect on the study's objective should be documented in a log book, reviewed with the analytical data, and presented in the report.

WASTE SAMPLING EQUIPMENT

Waste sampling equipment should be made of non-reactive materials that will neither add to nor alter the chemical or physical properties of the material that is being sampled. The attached Table 1 lists some conventional equipment for sampling waste units/phases and some potential limitations of the equipment. Another reference for selecting sampling equipment is the ASTM, Standard Guide for Selection of Sampling Equipment for Wastes and Contaminated Media Data Collection Activities, D6232-98.

WASTE SAMPLING PROCEDURES

Waste Piles

Waste piles vary in size, shape, composition, and compactness, and may vary in distribution of hazardous constituents and characteristics (strata). These variables will affect safety and access considerations. The number of samples, the type of sample(s), and the sample location(s) should be based on the study's objectives. Commonly used equipment to collect samples from waste piles are listed in Table 1. All equipment should be compatible with the waste and should have been cleaned to prevent any cross contamination of the sample.

Surface Impoundments

Surface impoundments vary in size, shape, and waste content, and may vary in distribution of hazardous constituents and characteristics (strata). The number of samples, the type of sample(s), and the sample location(s) should be based on the study's objectives. Commonly used equipment to collect samples from surface impoundments are listed in Table 1. All equipment should be compatible with the waste and should have been cleaned to prevent any cross contamination of the sample.

Because of the potential danger of sampling waste units suspected of containing elevated levels of hazardous constituents, personnel should never attempt to sample surface impoundments used to manage potentially hazardous wastes from a boat. All sampling should be conducted from the banks or piers of surface impoundments. Any exception must be approved by the appropriate site safety officer and/or the Occupational Health and Safety Designee (OHSD).

Drums

Drums are the most frequent type of containers sampled by field investigators for chemical analyses and/or physical testing. Caution should be exercised by the field investigators when sampling drums because of the potential presence of explosive/flammable gases and/or toxic vapors. Therefore, the following procedures should be used when collecting samples from drums of unknown material:

1. Visually inspect all drums that are being considered for sampling for the following:
    - pressurization (bulging/dimples);
    - crystals formed around the drum opening;
    - leaks, holes, stains;

- labels, markings;
- composition and type (steel/poly and open/bung);
- condition, age, rust
- sampling accessibility

Drums showing evidence of pressurization and crystals should be furthered assessed to determine if remote drum opening is needed. If drums cannot be accessed for sampling, heavy equipment is usually necessary to stage drums for the sampling activities. Adequate time should be allowed for the drum contents to stabilize after a drum is handled.

2. Identify each drum that will be opened (e.g., paint sticks, spray paint, cones, etc).

LEVEL "B" PROTECTION IS REQUIRED FOR THE FOLLOWING PROCEDURES.

3. Before opening, ground each metal drum that is not in direct contact with the earth using grounding wires, alligator clips, and a grounding rod or metal structure. If a metal drum is in an overpack drum, the metal drum should be grounded.

4. Touch the drum opening equipment to the bung or lid and allow an electrical conductive path to form. Slowly remove the bung or drum ring and/or lid with spark resistant tools (brass/beryllium).

5. Screen drums for explosive gases and toxic vapor with air monitoring instruments as bung or drum lid is removed. Depending on site conditions screen for one or more of the following:
    - radioactivity
    - cyanide fumes
    - halogen vapors
    - pH
    - flash point (requires sample for testing)

    Note the state, quantity, phases, and color of the drum contents. Record all relevant results, observations, and information in a logbook.

6. Select the appropriate sampling equipment based on the state of the material and the type of container. Sampling equipment should be made of non-reactive materials that will meet the study's objective(s).

7. Place oil wipe (as necessary), sampling equipment, and sample containers near drum(s) to be sampled.

AIR MONITORING FOR TOXIC VAPORS AND EXPLOSIVE GASES AND OXYGEN DEFICIENT ATMOSPHERES SHOULD BE CONDUCTED DURING DRUM SAMPLING.

Liquids -- Slowly lower the COLIWASA or drum thief to the bottom of the container. Close the COLIWASA with the inner rod or create a vacuum with the sampler's gloved thumb on the end of the thief and slowly remove the sampling device from the drum. Release the sample from the device into the sample container. Repeat the procedure until a sufficient sample volume is obtained.

Solids/Semi-Solids -- Use a push tube, bucket auger, or screw auger or if conditions permit a pneumatic hammer/drill to obtain the sample. Carefully use a clean stainless steel spoon to place the sample into container(s) for analyses.

8. Close the drums when sampling is complete. Segregate contaminated sampling equipment and investigative derived wastes (IDW) containing incompatible materials as determined by the drum screening procedure (Step #5). At a minimum, contaminated equipment should be cleaned with laboratory detergent and rinsed with tap water prior to returning it from the field.

Tanks

Sampling tanks is considered hazardous due to the potential for them to contain large volumes of hazardous materials and therefore, appropriate safety protocols must be followed. Unlike drums, tanks may be compartmentalized or have complex designs.

Preliminary information about the tank's contents and configuration should be reviewed prior to the sampling operation to ensure the safety of sampling personnel and that the study's objectives can be achieved.

In addition to having discharge valves near the bottom of tanks and bulk storage units, most tanks have hatches at the top. It is desirable to collect samples from the top hatch because of the potential for the tank's contents to be stratified. Additionally, when sampling from the discharge valve, there is a possibility of a stuck or broken valve which could cause an uncontrolled release. Investigators should not utilize valves on tanks or bulk storage devices unless they are operated by the owner or operator of the facility, or a containment plan is in place should the valve stick or break. If the investigator must sample from a tank discharge valve, the valving arrangement of the particular tank must be clearly understood to insure that the compartment(s) of interest is sampled.

Because of the many different types of designs and materials that may be encountered, only general sampling procedures that outline sampling a tank from the top hatch are listed below:

1. All relevant information concerning the tank such as the type of tank, the tank capacity, markings, condition, and suspected contents should be documented in a logbook.

2. The samplers should inspect the ladder, stairs, and catwalk that will be used to access the top hatch to ensure that they will support the samplers and their equipment.

LEVEL "B" PROTECTION IS REQUIRED FOR THE FOLLOWING PROCEDURES.

3. Before opening, ground each metal tank using grounding wires, alligator clips, and a grounding rod or metal structure.

4. Any vents or pressure release valves should be slowly opened to allow the unit to vent to atmospheric pressure. Air monitoring for explosive/flammable gases and toxic vapors should be conducted during the venting with the results recorded in a log book. If dangerous concentrations of gases evolve from the vent or the pressure is too great, leave the area immediately.

5. Touch tank opening equipment to the bolts in the hatch lid and allow electrical conductive path to form. Slowly remove bolts and/or hatch with spark resistant tools (brass/beryllium). If a pressure build up is encountered or detected, cease opening activities and leave the area.

6. Screen tanks for explosive/flammable gases and toxic vapors with air monitoring instruments. Depending on the study objectives and site conditions, conduct characteristic screening (e.g., pH, halogen, etc.) as desired. Collect a small volume of sample for flash point testing, if warranted. Note the state, quantity, number of phases, and color of the tank contents. Record all relevant results, observations, and information in a logbook. Compare the screening results with any pre-existing data to determine if the tank should be sampled.

7. Select the appropriate sampling equipment based on the state of the material and the type of tank. Sampling equipment should be constructed of non-reactive materials that will meet the study's objective(s).

8. Place oil wipe (as necessary), sampling equipment, and sample containers near tanks(s) to be sampled.

AIR MONITORING FOR TOXIC VAPORS, EXPLOSIVE GASES AND OXYGEN DEFICIENT ATMOSPHERES SHOULD BE CONTINUOUS DURING TANK SAMPLING.

Liquids -- Slowly lower the bailer, bacon bomb, DipstickTM, COLIWASA, or Teflon® tubing to the desired sampling depth. (NOTE: In work areas where explosive/flammable atmospheres could occur, peristaltic pumps powered by 12 V. batteries should not be used.) Close the sampling device or create a vacuum and slowly remove the sampling device from the tank. Release the sample from the device into the sample container. Repeat the procedure until a sufficient sample volume is obtained.

Solids/Semi-Solids - Use a push tube, bucket auger, screw auger, MucksuckerTM, or if conditions permit a pneumatic hammer/drill to obtain the sample. Carefully extrude the sample from the sampling device or use a clean stainless steel spoon to place the sample into containers for analyses.

9. Close the tank when sampling is complete. Segregate contaminated sampling equipment and investigative derived wastes (IDW) containing incompatible materials as determined by the screening procedure (Step #6). At a minimum, contaminated equipment should be cleaned with laboratory detergent and rinsed with tap water prior to returning it from the field. IDW should be managed according to Section 5.15, and Region 4's Contaminated Media Policy.

Miscellaneous Contaminated Materials

Sampling may be required of materials or equipment (e.g., documents, building materials, equipment, etc.) to determine whether or not various surfaces are contaminated by hazardous constituents, or to evaluate the effectiveness of decontamination procedures.

Wipe or swab samples may be taken on non-absorbent, smooth surfaces such as metal, glass, plastic, etc. The wipe materials must be compatible with the solvent used and the analyses to be performed, and should not come apart during use. The wipes are saturated with a solvent; methylene chloride, hexane, isopropanol or analyte free water depending on the parameters to be analyzed. The laboratory performing the analyses can provide the appropriate solvent. Wipe samples should not be collected for volatile organic compounds analysis. Sampling personnel should be aware of hazards associated with the selected solvent and should take appropriate precautions to prevent any skin contact or inhalation of these solvents. All surfaces and areas selected for sampling should be based on the study's objectives. Typically, 10 cm by 10 cm templates are prepared from aluminum foil which are secured to the surface of interest. The prepared (saturated with solvent) wipe(s) is removed from its container with tongs or gloves, and used to wipe the entire area with firm strokes using only one side of the wipe. The goal is to systematically wipe the whole area. The wipe is then folded with the sample side inward and placed into the sample container. This procedure is repeated until the area is free of visible contamination or no more wipes remain. Care should be taken to keep the sample container tightly sealed to prevent evaporation of the solvent. Samplers must also take care to not touch the used side of the wipe.

For items with porous surfaces such as documents (usually business records), insulation, wood, etc., actual samples of the materials are required. It is therefore important, that during the collection and/or analyses of the sample that evidentiary material is not destroyed.

All secondary containing pails will be secured in the vehicles while transporting the samples from the field to the laboratory for analyses. In addition, each pail should indicate when protective equipment is recommended to handle the actual waste/sample material

REFERENCES

United States Environmental Protection Agency. November 2001. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual.*

Roux FOPs:

011 *Calibration and Maintenance of Portable Photoionization Detector*

046 *Sample Labeling, Storage and Shipment Procedures*

TABLE 1

SAMPLING EQUIPMENT for VARIOUS WASTE UNITS

Equipment	Waste Units/Phases	Limitations
scoop with bracket/conduit	impoundments, piles, containers, tanks/liquids, solids, sludges	Can be difficult to collect deeper phases in multiphase wastes. Depth constraints.
spoon	impoundments, piles, containers/solids, sludges	Similar limitations as the scoop. Generally not effective in sampling liquids.
push tube	piles, containers/cohesive solids, sludges	Should not be used to sample solids with dimensions >'/2 the diameter of the tube. Depth constraints
auger	impoundments, piles, containers / solids	Can be difficult to use in an impoundment or a container, or for solidified wastes.
sediment sampler	impoundments, piles/solids, sludges	Should not be used to sample solids with dimensions >'/2 the diameter of the tube.
ponar dredge	impoundments/solids, sludges	Must have means to position equipment to desired sampling location. Difficult to decon.
COLIWASA or drum	impoundments, containers,	Not good with viscous wastes. Devices >_ 7'
thief	tanks/liquids	Require 2 samplers to use effectively.
DipstickTM /	impoundments, containers,	Not recommended for tanks >11 feet deep.
MucksuckerTM	tanks/liquids, sludges	Devices _> 7' require 2 samplers to use effectively
bacon bomb	impoundments, tanks/ liquids	Not good with viscous wastes.
bailer	impoundments, tanks/ liquids	Only if waste is homogeneous. Not good with viscous wastes
peristaltic pump with vacuum jug assembly	impoundments, tanks/liquids	Cannot be used in flammable atmospheres. Not good with viscous wastes
back-hoe bucket	piles/solids, sludges	May be difficult to access desired sampling location. Difficult to decon. Can lose volatiles.
split-spoon	piles/solids	Requires drill rig or direct push equipment.
roto-hammer	piles, containers/solids	Physically breaks up sample. May release volatiles. Not for flammable atmospheres.

ROUX

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

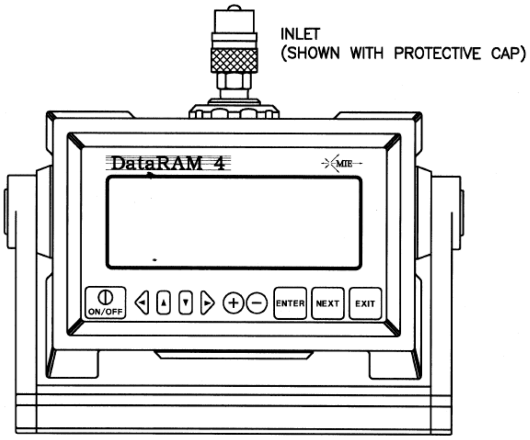


FIGURE 1. FRONT–PANEL VIEW OF DataRAM

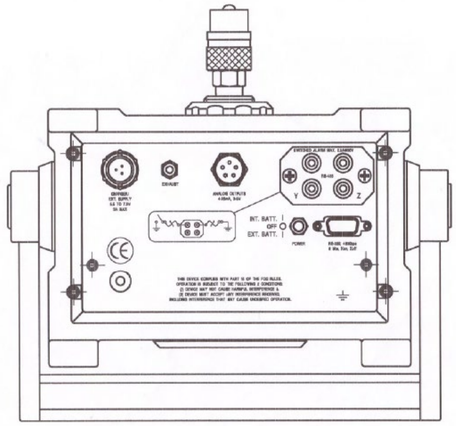


FIGURE 2. BACK–PANEL VIEW OF DataRAM

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).

Instrument Storage

If the DataRAM 4 is to be stored for an extended period of time (i.e., 3 months or more), place the 3-position switch on the back panel in its OFF position (mid-position), in order to minimize gradual battery discharge. This will have no effect on data retention or internal clock function. It is recommended, however, that the battery be recharged every 3 months in order to prolong battery life.

During storage always snap on quick-connect cap over the instrument inlet to protect the sensing optics from gradual dust contamination. Store DataRAM 4 in a dry environment.

Filter Replacement

To replace either of two types of filters used with DataRAM 4, place the instrument on its back rubber feet (front panel facing upward). On the bottom surface of the DataRAM, locate the large threaded plastic filter cover and holding the cross bar, rotate this cover counterclockwise. Remove cover and the filter holder within the open cavity.

HEPA Filter Cartridge Replacement

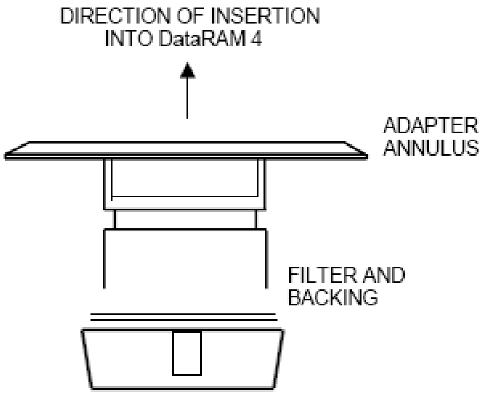
The DataRAM 4 is shipped from the factory with the HEPA filter cartridge installed. This cartridge can be identified by its metallic cover. Remove this cartridge. Clean the internal black rubber gasket against which the cartridge is normally compressed. Install new HEPA-type cartridge (MIE part no. MSA-95302) by inserting its wider ridged end first. Reposition threaded plastic cover engaging threads carefully; rotate cover clockwise, hand tightening firmly. Properly dispose of used cartridge to prevent inadvertent re-use.

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

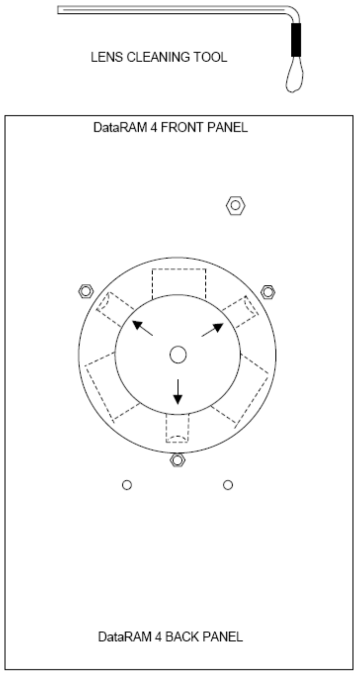
Although the DataRAM 4 incorporates filtered air shielding of the critical optical sensing surfaces, continued sampling of airborne particles at high concentrations may result in gradual build-up of contamination on those interior surfaces of the sensing chamber components. This may cause an excessively 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

ROUX

FIELD OPERATING PROCEDURES

Field Quality Control Procedures

FOP 085.0

FIELD QUALITY CONTROL PROCEDURES

PURPOSE

In addition to traditional environmental samples (e.g., soil, groundwater, wipe, vapor etc.) described in each project work plan, site-specific field quality assurance/quality control (QA/QC) samples are typically collected and analyzed to support the required third-party data usability assessment effort of a project. Site-specific QA/QC samples generally include matrix spikes, matrix spike duplicates, blind duplicates (where appropriate), and trip blanks which accompany aqueous volatile organic compound (VOC) samples only.

The number of QA/QC field samples (blind duplicate, matrix spike/matrix spike duplicate, trip blank, field blank, or equipment blank) will be designated prior to field mobilization, but final QC sample locations will be contingent upon field conditions. This procedure outlines and discusses each QA/QC sample that may be required during a project.

PROCEDURE

A brief summary of each QA/QC sample identified above is presented below. Where appropriate, the procedure to be used to collect these samples is also presented.

- **Trip Blanks** – A sufficient number of trip blanks for VOC analysis must be prepared by the laboratory and delivered to the sampling team prior to a sampling event, typically two or three 40-ml VOA vials with organic free reagent water. One sealed blank will be carried into the field per day along with the sample containers for each day that water matrix volatile organic samples are collected. Trip blanks will be transported and handled in the same manner as the actual samples. The results of the trip blank analysis will be reviewed to evaluate if the potential for sample contamination during transportation and handling exists. The trip blanks will be analyzed for the same VOCs (and method) as the project groundwater samples.

- **Blind Duplicate** – One blind duplicate must be collected and analyzed per 20 samples collected per matrix (i.e., soil, groundwater, soil vapor, etc.). The location of the sample collection point will not be disclosed to the analytical laboratory, therefore the field sample containers will be returned to the laboratory identified only as the "blind duplicate." The well or sample location will be recorded in the Project Field Book or handheld RuggedReader® Pocket PC and on the field data sheets, and the results will be compared to review analytical precision. Sample analysis will be identical to the original sample per the project work plan. The Blind Duplicate sample must be collected simultaneously from the same source under identical conditions as the original sample.

- **Matrix Spike/Matrix Spike Duplicate (MS/MSD)** – A sufficient volume of sample will be collected at one sampling location per sampling event for MS/MSD analysis per matrix (i.e., soil and groundwater only). The laboratory will report the results of the MS/MSD analysis, which will be reviewed for sampling and analysis precision and accuracy. Sample analysis will be identical to the original sample per the project work plan. The MS/MSD sample must be collected simultaneously from the same source under identical conditions as the original sample.

- **Equipment (Rinsate) Blank** – In general, dedicated sampling equipment is used to minimize field decontamination time and avoid the need for equipment blanks; however there may be instances where the use of non-dedicated equipment cannot be avoided. An equipment blank will be collected for each day of sampling activity when non-dedicated sampling equipment is used. These equipment blank samples will be used as a QC check of the decontamination procedures for sampling equipment. Sample analysis for the equipment blank will consist of the most comprehensive parameter list used for risk assessment in which the non-dedicated equipment was used for environmental sample collection. During most projects, every effort to use dedicated sampling equipment should be made in order to minimize field decontamination time and avoid the need for equipment blanks. Equipment Blank sampling procedure is as follows:
    - Non-dedicated equipment are to be decontaminated in accordance with Roux's Non-disposable and Non-dedicated Sampling Equipment Decontamination procedures prior to use in the field. If organic-free

deionized water (generally provided by the laboratory) is not available for decontamination, equipment will be allowed to thoroughly air dry.

- Once properly rinsed or allowed to air dry, analyte-free water (provided by the laboratory) is poured appropriately over or through the decontaminated sample collection device, collected in a sample container, and returned to the laboratory as a sample.

- **Field Blank** – A field blank is a sample of the unused final decontamination rinse water that is collected at the sampling site and returned to the laboratory as a sample. Sample analysis for the field blank will consist of the most comprehensive parameter list used during the investigation.

- **Split Sample** – A split sample is a sample that has been portioned into two or more containers from a single sample container or sample mixing container. Samples for VOC analysis should never be mixed prior to splitting.

- **Blank Wipe Samples** – There are two types of blank wipe samples, an equipment blank and a field blank that may be required per the project work plan, both are described below:
    - Equipment Blank – Required only if reusable templates are used for wipe sample collection. The decontaminated template is wiped with a hexane saturated swab. The swab is placed in the appropriate sample container and returned to the laboratory as a sample.
    - Field Blank – Clean disposable gloves are wiped with a hexane saturated swab. The swab is placed in the appropriate sample container and returned to the laboratory as a sample.

REFERENCES

Roux FOPs:

040 Non-disposable and Non-dedicated Sampling Equipment Decontamination

FIELD OPERATING PROCEDURES

Underground Piping Decommissioning Procedures

FOP 088.0

UNDERGROUND PIPING DECOMMISSIONING PROCEDURES

PURPOSE

This procedure describes the method for the excavation and removal of underground piping requiring decommissioning that may contain hazardous or flammable material. Prior to each day or as necessary, the project Health and Safety Plan (HASP) will be reviewed with field personnel (e.g., tailgate safety meeting). It is the responsibility of field personnel to ensure all field equipment is in proper working order and calibrated according to manufacturer's recommendations.

PROCEDURE

1. Review project objectives and the Project HASP with the Contractor.
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). Discuss with excavation contractor personnel the scope of work and what will be expected of them.
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 community air monitoring as required by the HASP and/or Project Work Plan. Record all results on the Real Time Air Monitoring Log (sample attached), as necessary.
6. Mobilize the excavation equipment to the site and position over the required location.

7. Pre-stake locations in the field and measure distance from locations to nearest landmarks or survey the location using a handheld GPS unit, as required.

8. Wear appropriate protective gear (i.e., latex gloves, safety glasses), as required in the project HASP.

9. Excavate and expose underground piping requiring decommissioning in accordance with TurnKey's Test Pit Excavation & Logging Procedures FOP. Great care should be taken to avoid damaging the pipe and allowing the contents, if any, to be released to the environment.

10. Once exposed, over excavate the area around the section of pipe to be cut and place a container below the pipe. Tap two test holes in the top of the pipe using an intrinsically safe drill with non-sparking drill bit approximately 15 feet from the open end of the pipe (above the container).

11. Continue monitoring the ambient air space within the excavation for worker safety until work is complete. Refer to the project HASP for action levels.

12. Remove any solids and/or liquids within the first 15 to 20 feet of exposed pipe to the extent practicable.

13. Insert an appropriately sized double pipe seal apparatus into the open end of the pipe.

14. Using a single pipe seal apparatus attached to a steel rod, push the double pipe seal into the pipe beyond the tap holes (approximately 16 feet or so). Be sure to capture any residuals flowing out of the two tap holes with the previously mentioned container.

15. Retract the single pipe seal and push rod leaving an approximate 1 to 2 foot void space between the single and double pipe seal.

16. Through one of the tap holes, test the ambient air quality of the newly created void space between seals with an oxygen meter and explosimeter. If the air quality within the pipe indicates 0% oxygen on the oxygen meter and less than

10% Lower Explosive Limit (LEL) on the explosimeter, proceed with cutting the pipe into workable sections.

17. If the void space air quality exceeds either of those levels, inject nitrogen (or approved other inert gas) through the tap holes into the void air-space until safe levels are achieved. Nitrogen is 3% less dense than ambient air.

18. Cut the pipe into manageable sections (typically 15 feet) while periodically monitoring the ambient air within the pipe and injecting additional nitrogen (or approved other inert gas), as necessary.

19. Once section of pipe is removed, proceed with final cleaning activities in accordance with the project Work Plan and any local, state, and/or federal regulations.

20. Record all observations in the Project Field Book, including but not limited to length of recovered pipe, air monitoring observations, depths, diameters, etc.

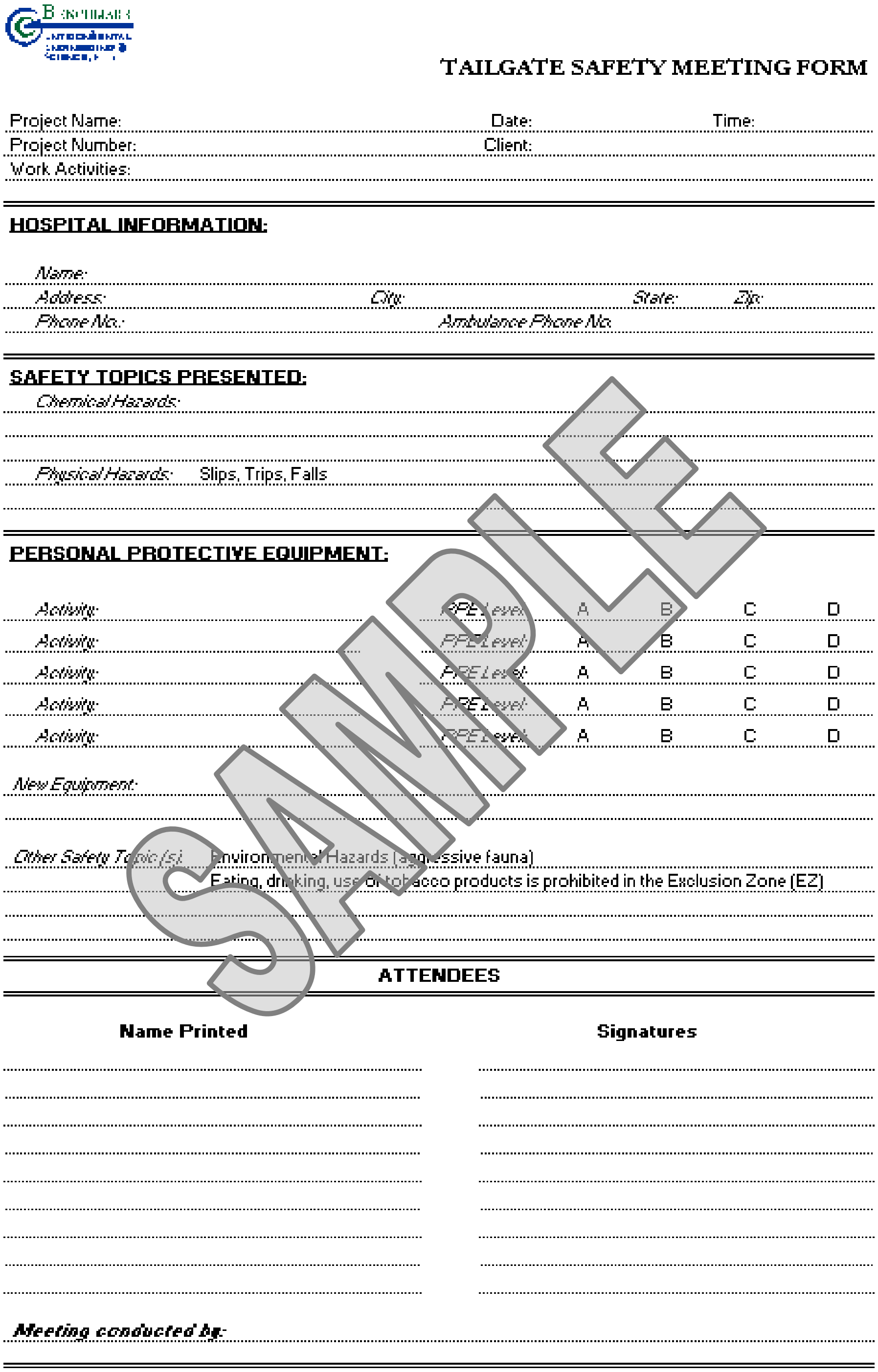
ATTACHMENTS

Tailgate Safety Meeting Form (sample)
Real Time Air Monitoring Log (sample)

REFERENCES

<u>TurnKey FOPs:</u>

006	*Calibration and Maintenance of Combustible Gas/Oxygen Meter*
065	*Test Pit Excavation & Logging 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:

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

REAL TIME AIR MONITORING LOG

Date:
Project Name:
Project Number:
Project Location:
Client:
Purpose of Air Monitoring:

WEATHER CONDITIONS:

Time of Day:	A.M.	P.M.
Ambient Air Temp.:		
Wind Direction:		
Wind Speed:		
Precipitation:		

Date	Personnel	Time	Air Monitoring Meter Measurement (Units)							Location/Activity/Comments
			PID (ppm)	LEL (%)	H_2S (ppm)	O_2 (%)	CO (ppm)	Particulates (mg/m³)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By: Date:

ROUX

FIELD OPERATING PROCEDURES

Outdoor Ambient Air VOC Sample Collection Procedure

FOP 090.0

OUTDOOR AMBIENT AIR VOC SAMPLE COLLECTION PROCEDURE

PURPOSE

This procedure describes the methods for collecting outdoor ambient air samples for volatile organic compound (VOC) analysis via USEPA Method TO-15 using Summa® canisters (or approved other). Typically, outdoor air samples are collected to characterize and document site-specific VOCs that may be present in outdoor ambient air. For sample collection associated with intrusive activities that may potentially release VOCs to the ambient air, sample location(s) typically are collected downwind of the intrusive activity at the perimeter of the work area and/or exclusion zone for the Site. Upwind sample location(s) may be utilized if regional facilities (e.g. gasoline service station, factories) are located proximate to the Site to assess off-site ambient VOC contributions (background).

SAMPLE COLLECTION PROCEDURES

The following actions should be taken to document conditions during outdoor air sampling and ultimately to aid in the interpretation of the analytical results:

- A site map should be prepared to indicate the outdoor ambient air sample locations including all site improvements (e.g., buildings, access roads, etc.), public roads/streets (if applicable), the location of potential VOC contributors (e.g., gasoline stations, factories, lawn movers, etc.), compass orientation (north), and scale.

- Weather conditions (e.g., precipitation, wind speed, outdoor temperature, and barometric pressure) should be reported on the Air Canister Field Record (sample attached); and

- Any pertinent observations, such as odors, readings from field instrumentation, and significant activities in the vicinity (e.g., operation of heavy equipment or dry cleaners) should be recorded.

The following describes the outdoor air sampling procedure:

1. Typically, a 6-liter, passivated (inert), stainless steel, evacuated sampling sphere (e.g., Summa canister) (or approved other) will be supplied by the laboratory that will be conducting the analysis. The canister should be received from the laboratory, certified clean, evacuated, and prepared for sampling.

2. Sampling will take place in accordance with the project work plan. Selected sample locations will be sufficiently spaced to allow location(s) to be field modified, if necessary.

3. The number of Summa canisters required as well as the flow rate of the constant differential low volume flow controllers will be supplied by the laboratory in accordance with the project work plan.

4. Prior to placement, complete an Air Canister Field Record (sample attached) of each canister, which includes: project information, field staff, weather conditions, canister serial number, flow controller number, sample date(s)/time(s), shipping date(s), canister lab vacuum, field vacuum check, initial field vacuum, final field vacuum, and duration of sample collection.

5. The pressure in the canisters must be monitored with the laboratory provided pressure gauge at the beginning and the end of the sampling period as well as before and after shipment of the canisters at the laboratory. The **target final field vacuum must be approximately 5 inches of mercury. Samples with a final field vacuum of greater than 10 inches of mercury, or equal to zero, will be flagged** and usability of the data will depend on the sample volume and reporting limits that can be achieved.

6. Canisters may be placed on the ground provided there is a clear plastic sheet beneath it to prevent cross contamination. The intake tubing, however, must be positioned at a height of approximately 3 to 5-feet above grade to collect air at an elevation representative of ambient air within the breathing zone. Typically, the canister is chained and locked to a secure step ladder with the intake tubing tethered to the ladder.

7. Ship the canisters to the laboratory under chain-of-custody command within three days of sample collection so that no sample will exceed the 30-day holding time (since receipt from the lab) per USEPA TO-15.

8. Air samples will be analyzed by Gas Chromatography/Mass Spectroscopy (GC/MS) in accordance with EPA Method TO-15, or as specified. Analytical results will be reported as concentrations of each VOC at each location during each sampling event, typically in parts per billion by volume (ppbv).

9. Sample collection should take place on warm, dry days. If rain or high humidity conditions develop during sampling, the sampling event should be suspended. Temperature, barometric pressure, and wind speed should be monitored during the sampling event, for use in analysis of the results. The combination of sampling location, height, and meteorological conditions will assure that sampling will measure VOCs at their highest concentrations.

QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

Extreme care should be taken during all aspects of sample collection to ensure that sampling error is minimized and high quality data are obtained. The sampling team members should avoid actions (e.g., fueling vehicles, using permanent marking pens, and wearing freshly dry-cleaned clothing or personal fragrances), which can cause sample interference in the field. Appropriate QA/QC protocols must be followed for sample collection and laboratory analysis, such as use of certified clean sample devices, meeting sample holding times and temperatures, sample accession, chain of custody, etc. Samples should be delivered to the analytical laboratory as soon as possible after collection. In addition, laboratory accession procedures must be followed including field documentation (sample collection information and locations), chain of custody, field blanks, field sample duplicates, and laboratory duplicates, as appropriate.

Some methods require collecting samples in duplicate to assess errors. Duplicate and/or split samples should be collected in accordance with the requirements of the sampling and analytical methods being implemented.

For certain regulatory programs, a Data Usability Summary Report (DUSR) may be required to determine whether or not the data, as presented, meets the site or project specific criteria for data quality and data use. This requirement may dictate the level of QC and the category of data deliverable to request from the laboratory. Guidance on preparing a DUSR is available by contacting the NYSDEC's Division of Environmental Remediation.

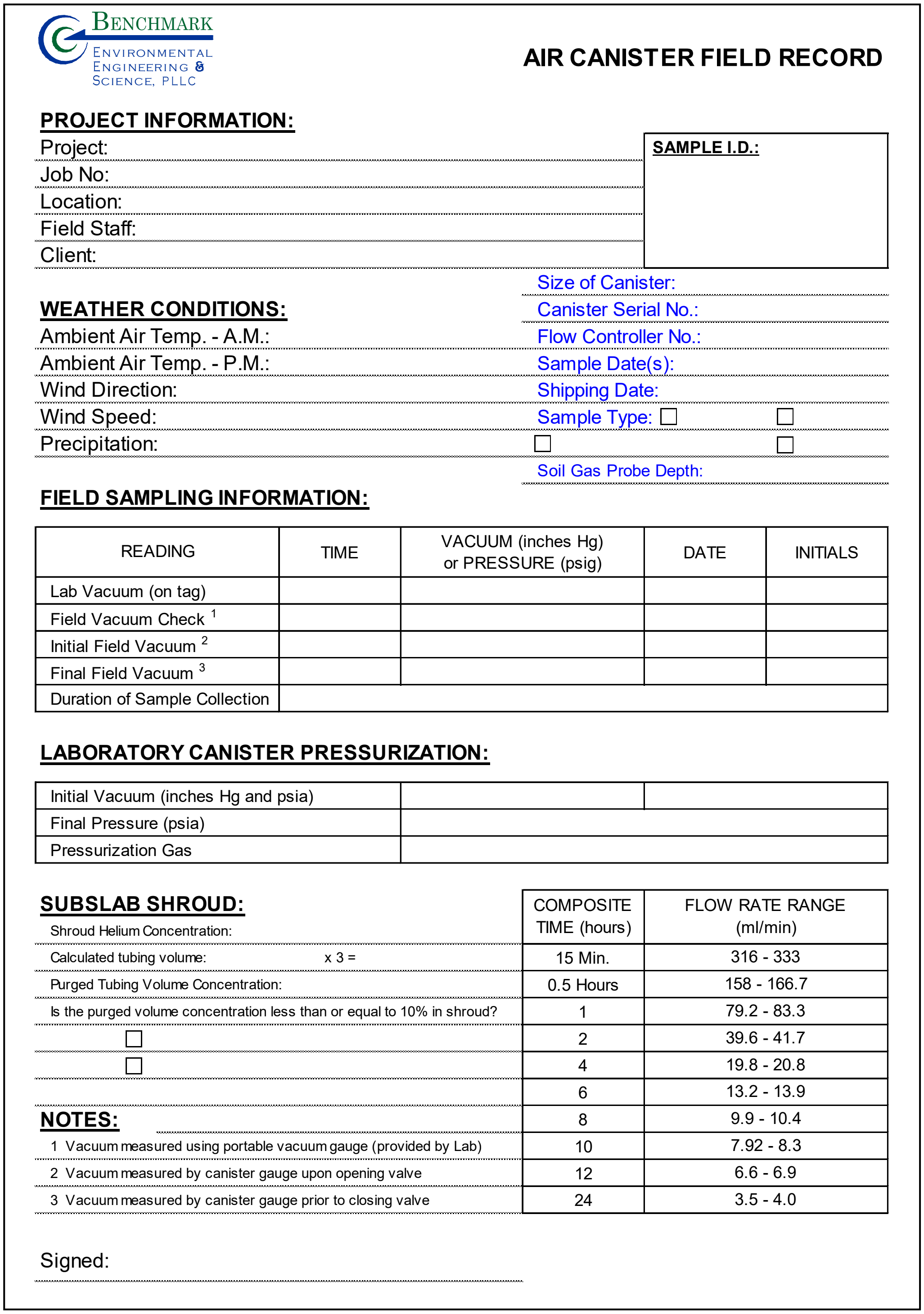
New York State Public Health Law requires laboratories analyzing environmental samples collected from within New York State to have current Environmental Laboratory Approval Program (ELAP) certification for the appropriate analyte and environmental matrix combinations. If ELAP certification is not currently required for an analyte (e.g., trichloroethene); then the analysis should be performed by a laboratory that has ELAP certification for similar compounds in air and uses analytical methods with detection limits similar to background (e.g., tetrachloroethene via EPA Method TO-15).

ATTACHMENTS

Air Canister Field Record (sample)

REFERENCES

United States Environmental Protection Agency. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air*. Second Addition (EPA/625/R-96/010b). January 1999.



Benchmark
Environmental
Engineering &
Science, PLLC

AIR CANISTER FIELD RECORD

PROJECT INFORMATION:

Project:
Job No:
Location:
Field Staff:
Client:

SAMPLE I.D.:

Size of Canister:
Canister Serial No.:
Flow Controller No.:
Sample Date(s):
Shipping Date:
Sample Type: ☐ ☐
☐ ☐
Soil Gas Probe Depth:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:
Ambient Air Temp. - P.M.:
Wind Direction:
Wind Speed:
Precipitation:

FIELD SAMPLING INFORMATION:

READING	TIME	VACUUM (inches Hg) or PRESSURE (psig)	DATE	INITIALS
Lab Vacuum (on tag)				
Field Vacuum Check [1]				
Initial Field Vacuum [2]				
Final Field Vacuum [3]				
Duration of Sample Collection				

LABORATORY CANISTER PRESSURIZATION:

Initial Vacuum (inches Hg and psia)		
Final Pressure (psia)		
Pressurization Gas		

SUBSLAB SHROUD:

Shroud Helium Concentration:
Calculated tubing volume: x 3 =
Purged Tubing Volume Concentration:
Is the purged volume concentration less than or equal to 10% in shroud?
☐
☐

COMPOSITE TIME (hours)	FLOW RATE RANGE (ml/min)
15 Min.	316 - 333
0.5 Hours	158 - 166.7
1	79.2 - 83.3
2	39.6 - 41.7
4	19.8 - 20.8
6	13.2 - 13.9
8	9.9 - 10.4
10	7.92 - 8.3
12	6.6 - 6.9
24	3.5 - 4.0

NOTES:

1 Vacuum measured using portable vacuum gauge (provided by Lab)
2 Vacuum measured by canister gauge upon opening valve
3 Vacuum measured by canister gauge prior to closing valve

Signed:

APPENDIX D

Project Document Forms

ROUX

EQUIPMENT CALIBRATION LOG

PROJECT INFORMATION:

Project Name:

Date:

Project No.:

Client:

Instrument Source: ☐ BM ☐ Rental

METER TYPE	UNITS	TIME	MAKE/MODEL	SERIAL NUMBER	CAL. BY	STANDARD	POST CAL. READING	SETTINGS
☐ pH meter	units		Myron L Company Ultra Meter 6P	6213516 ☐ 6243084 ☐ 6212375 ☐ 6243003 ☐ 6223973 ☐		4.00		
						7.00		
						10.01		
☐ Turbidity meter	NTU		Hach 2100P or 2100Q Turbidimeter	06120C020523 (P) ☐ 13120C030432 (Q) ☐ 17110C062619 (Q) ☐		10 NTU verification		
						<0.4		
						20		
						100		
						800		
☐ Sp. Cond. meter	uS mS		Myron L Company Ultra Meter 6P	6213516 ☐ 6243084 ☐ 6212375 ☐ 6243003 ☐ 6223973 ☐		______ mS @ 25 °C		
☐ PID	ppm		MinRAE 2000			open air zero		MIBK response factor = 1.0
						_____ ppm Iso. Gas		
☐ Dissolved Oxygen	ppm		HACH Model HQ30d	171932597009 ☐ 100500041867 ☐ 22293299821 ☐		100% Satuartion		
☐ Particulate meter	mg/m^3					zero air		
☐ Radiation Meter	uR/H					background area		

ADDITIONAL REMARKS:

PREPARED BY:

DATE:

ROUX

DAILY LOG			
DATE			
NO.			
SHEET	OF		

FIELD ACTIVITY DAILY LOG

PROJECT NAME:	PROJECT NO.
PROJECT LOCATION:	CLIENT:

FIELD ACTIVITY:

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:

TIME	DESCRIPTION

VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS: A.M.: P.M.:	IMPORTANT TELEPHONE CALLS:

PERSONNEL ON SITE:

SIGNATURE

DATE:

ROUX

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 (ASTM D 2488)** USCS Classification: Color, Moisture Condition, Primary Soil Type, Secondary Soil Type (<5% Trace, 5-10% Few, 15-25% Little, 30-45% Some), Structure (varved, stratified, thinly bedded, bedded, thickly bedded, laminated, fissured, blocky, lensed, massive), Consistency/Density (Standard Penetration Test, SPT), Weathering/Fracturing, Odor, Fill Materials (if present), Other SURFACE ELEVATION (FMSL):	REMARKS

ABANDONMENT:

Volume of cement/bentonite grout required:	$V = \pi r^2 \times 7.48 =$ 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:		Figure

Prepared By: __________

ROUX

GROUNDWATER FIELD FORM

Project Name: Date:

Location: Project No.: Field Team:

Well No.	Diameter (inches):	Sample Date / Time: 1/12/2024
Product Depth (fbTOR):	Water Column (ft):	DTW when sampled:
DTW (static) (fbTOR):	One Well Volume (gal):	Purpose: ☐ Development ☐ Sample ☑ Purge & Sample
Total Depth (fbTOR):	Total Volume Purged (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 Date / Time: 1/12/2024
Product Depth (fbTOR):	Water Column (ft):	DTW when sampled:
DTW (static) (fbTOR):	One Well Volume (gal):	Purpose: ☐ Development ☐ Sample ☑ Purge & Sample
Total Depth (fbTOR):	Total Volume Purged (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 water level 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:

ROUX

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:

ROUX

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*

TIME	Length:	(approx.)
Start:	Width:	(approx.)
End:	Depth:	(approx.)

Test Pit Cross Section:

Grade - 0'
2'
4'
6'
8'
10'

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:			Sample I.D.:
			Sample I.D.:
			Sample I.D.:

ROUX

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

Health and Safety Plan (HASP) including CAMP

Health and Safety Plan

22 Fillmore Avenue
Tonawanda, Erie County, New York

January 11, 2024

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
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& Management
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Appendices

ACKNOWLEDGEMENT

Plan Reviewed by (initial):

Corporate Health and Safety Director:	Brian Hobbs
Project Manager:	Christopher Boron, P.G.
Designated Site Safety and Health Officer:	Paul W Werthman, P.G.

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

1. 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 and Roux Environmental Engineering & Geology, DPC (Roux) employees during Remedial Investigation (RI) and Interim Remedial Measure (IRM) activities at 22 Fillmore Avenue (Site) located in the City of Tonawanda, Erie County, New York. This HASP presents procedures for Roux employees who will be involved with RI/IRM field activities; it does not cover the activities of other contractors, subcontractors or other individuals on the Site. These firms will be required to develop and enforce their own HASPs as discussed in Section 2.0. Roux 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 three (3) tax parcels totaling approximately ±1.63-acres, located on the southwest side of Fillmore Avenue in a highly developed mixed use residential and commercial area of the City of Tonawanda, Erie County, New York. The Site is bordered by East Niagara Street (north); Ellicott Creek and a commercial marina (south); Fillmore Avenue (east); and East Niagara Street and Delaware Street (west).

The Site is currently improved with two (2) structures. 30 Fillmore Avenue contains an approximate 6,000 square foot vacant building which is planned to be demolished and the remainder of the parcel is vacant. 40 Fillmore Avenue contains an approximate 5,000 square foot vacant building which is planned to be demolished and occupies approximately 50% of the parcel (see Figure 2). 20 Fillmore Avenue is vacant.

Historic operations across the Site included a coal and wood yard, boiler shop, welding operation, a repair shop, and boat storage. A gasoline underground storage tank (UST) was also identified on historic Sanborn maps. Petroleum impacts along with the presence of urban fill materials were identified through a previous investigation at the Site.

1.3 Known and Suspected Environmental Conditions

A summary of the previous investigation that has occurred at the Site is presented below.

Phase II Environmental Investigation Report – February 2018

- TurnKey Environmental Restoration, LLC completed a Phase II Environmental Investigation at the Site in May 2022. Twelve (12) test pits (designated TP-1 through TP-12) were completed across the Site to characterize and collect samples of soil/fill for analysis.

- Environmental impacts have been identified at the Site. VOCs above their respective CP-51 SCLs were identified in addition to visual and olfactory evidence of petroleum contamination in the vicinity of the gasoline UST, and Spill No. 2200862 was assigned by NYSDEC. Petroleum impacts were present on both the 30 and 40 Fillmore Avenue parcels; however, it is unknown if the UST or related piping is still present at the Site.
- SVOCs and metals were also detected in the fill material present across the Site (20, 30, and 40 Fillmore Avenue) at concentrations above their respective RRSCOs, which are applicable for the intended reuse of the Site. Fill material varies in depth up to 4 fbgs. The soil/fill material and any other contaminated material generated during redevelopment of the Site will require remediation and handling as contaminated soil. Additional sampling will be required to confirm the soil/fill can be managed as non-hazardous waste.
- Based on the existing data and evidence of a petroleum release, the Site is a candidate for the BCP. The Site meets the definition of a BCP site per the current BCP law which states a “brownfield site or site shall mean any real property where a contaminant is present at levels exceeding the soil cleanup objectives or other health-based or environmental standards, criteria, or guidance adopted by the department that are applicable based on the reasonably anticipated use of the property, in accordance with applicable regulations.”
- Remedial work will be required to address the petroleum contamination identified on the 30 and 40 Fillmore Avenue parcels. Additionally, an electromagnetic survey should be completed to determine if the UST is still present in the ground. If the Site were to be accepted in to the BCP, the additional work required to assess for the presence of the UST and remediation of the petroleum contamination could be completed under the BCP, along with remediation of other soil contamination present at the Site.

The RI/IRM will be performed in support of the Brownfield Cleanup Program (BCP) to further determine and address the nature and extent of impacts from these known environmental conditions, address building demolition for safety concerns, investigate and address open Spill No. 2200862 and determine if a gasoline underground storage tank (UST) with associated piping is present, and determine if other impacts exist on-Site.

1.4 Parameters of Interest

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

- **pVOCs –** petroleum volatile organic compounds (pVOCs) present at elevated concentration may include 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, ethylbenzene, n-propylbenzene, and xylenes (total) in soil.
- **SVOCs –** SVOCs present at elevated concentrations include PAHs, which are byproducts of incomplete combustion and impurities in petroleum products. Specific analytes detected include: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

- **Inorganic Compounds –** The inorganic COPCs potentially present at elevated concentrations are chromium, lead, and mercury.

1.5 Overview of RI/IRM Activities

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

Remedial Investigation Activities

1. **Surface Soil Sampling:** Roux will collect surface soil samples from the upper 0-2 inches of soil/fill within existing greenspace areas and planned greenspace areas across the Site for **the** purpose of determining the nature and extent of potential COPC impacts in the surface soil/fill.
2. **Subsurface Soil Sampling:** Roux will complete test pits and soil borings and collect subsurface soil samples for the purpose of determining the nature and extent of potential COPC impacts in the subsurface soil/fill and determine volume of fill material to be removed from the Site.
3. **Monitoring Well Installation/Development and Sampling:** Roux will observe the installation of groundwater monitoring wells, develop the wells, and collect groundwater samples for the purpose of determining the nature and extent of potential COPC impacts.
4. **Soil Vapor Investigation:** Roux will observe the installation of five (5) soil vapor sampling probes, purge the probes and associated tubing, and collect soil vapor samples for the purpose of determining the nature and extent of potential COPC impacts.

Potential IRM Activities

1. **Building Demolition:** The remediation contractor would perform demolition of the two (2) existing building structures on-Site for safety purposes.
2. **Soil Excavation:** The remediation contractor would perform soil excavation within petroleum-impacted areas to address open Spill No. 2200862
3. **Verification Sampling:** The remediation contractor, in association with Roux will collect soil samples from the sidewalls and bottom of the excavations using a backhoe to verify that cleanup objectives have been met.
4. **Backfilling:** The remediation contractor would coordinate and perform backfilling activities.
5. **Groundwater and Surface Water Management:** The remediation contractor would direct groundwater/surface water collection during soil excavation activities and coordinate disposal of the collected water.

2. Organizational Structure

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

2.1 Roles and Responsibilities

All Roux 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 Roux Corporate Health and Safety Director is ***Mr. Brian Hobbs.*** The Corporate Health and Safety Director responsible for developing and implementing the Health and Safety program and policies for Roux, 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 Roux 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. Christopher Boron, P.G.*** The Project Manager has the responsibility and authority to direct all Roux 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 Roux 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 SSHO for this Site is ***Mr. Paul Wethman, P.G.*** The qualified alternate SSHO is ***Mr. Nathan Munley.*** The SSHO reports to the Project Manager. The SSHO is on-site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SSHO are:

- Managing the safety and health functions for Roux personnel on the Site.
- Serving as the point of contact for safety and health matters.
- Ensuring that Roux 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, excavation contractor, who will be responsible for developing, implementing and enforcing a Health and Safety Plan equally stringent or more stringent than Roux's HASP. Roux assumes no responsibility for the health and safety of anyone outside its direct employ. Each Contractor's HASP shall cover all non- Roux Site personnel. Each Contractor shall assign a SSHO who will coordinate with Roux's SSHO as necessary to ensure effective lines of communication and consistency between contingency plans.

In addition to Roux 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. 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, pVOCs, PAHs, and inorganic impacts have been identified at the Site. Table 1 lists exposure limits for airborne concentrations of the COPCs identified in Section 1.4 of this HASP. Brief descriptions of the toxicology of the prevalent COPCs and related health and safety guidance and criteria are provided below.

- **1,2,4-Trimethylbenzene (CAS #95-63-6)** is a common gasoline additive. Acute exposure predominantly results in skin irritation and inhalation causes chemical pneumonitis. Symptoms include headache, dizziness, fatigue, muscular weakness, drowsiness.
- **1,3,5-Trimethylbenzene (CAS #108-67-8)** is a colorless, odorless flammable liquid. The substance is irritating to the eyes , the skin and the respiratory tract . If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. The substance may cause effects on the central nervous system.
- **Ethylbenzene (CAS #100-41-4)** is a component of automobile gasoline. Over-exposure may cause kidney, skin liver and/or respiratory disease. Signs of exposure may include dermatitis, irritation of the eyes and mucus membranes, headache. Narcosis and coma may result in more severe cases.
- **N-Propylbenzene (CAS #103-65-1)** is a colorless to pale yellow flammable liquid. Inhalation or contact may irritate or burn skin and eyes. In case fire, smoke-vapor may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation.
- **Xylenes (o, m, and p) (CAS #95-47-6, 108-38-3, and 106-42-3)** are colorless, flammable liquids present in paint thinners and fuels. Acute exposure may cause central nervous system depression, resulting in headache, dizziness, fatigue, muscular weakness, drowsiness, and coordination loss. Repeated exposures may also cause removal of lipids from the skin, producing dry, fissured dermatitis. Exposure of high concentrations of vapor may cause eye irritation and damage, as well as irritation of the mucus membranes.

- **Polycyclic Aromatic Hydrocarbons (PAHs)** are formed as a result of the pyrolysis and incomplete combustion of organic matter such as fossil fuel. PAH aerosols formed during the combustion process disperse throughout the atmosphere, resulting in the deposition of PAH condensate in soil, water and on vegetation. In addition, several products formed from petroleum processing operations (e.g., roofing materials and asphalt) also contain elevated levels of PAHs. Hence, these compounds are widely dispersed in the environment. PAHs are characterized by a molecular structure containing three or more fused, unsaturated carbon rings. Seven of the PAHs are classified by USEPA as probable human carcinogens (USEPA Class B2). These are: benzo(a)pyrene; benzo(a)anthracene; benzo(b)fluoranthene; benzo(k)fluoranthene; chrysene; dibenzo(a,h)anthracene; and indeno(1,2,3-cd)pyrene. The primary route of exposure to PAHs is through incidental ingestion and inhalation of contaminated particulates. PAHs are characterized by an organic odor, and exist as oily liquids in pure form. Acute exposure symptoms may include acne-type blemishes in areas of the skin exposed to sunlight.

- **Chromium (CAS #7440-47-3)** is used in the production of stainless steel, chrome plated metals, and batteries. Two forms of chromium, hexavalent (CR+6) and trivalent (CR+3) are toxic. Hexavalent chromium is an irritant and corrosive to the skin and mucus membranes. Chromium is a potential occupational carcinogen. Acute exposures to dust may cause coughing, wheezing, headaches, pain and fever.

- **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.

- **Mercury (CAS #7439-97-6)** is used in industrial applications for the production of caustic and chlorine, and in electrical control equipment and apparatus. Overexposure to mercury may cause coughing, chest pains, bronchitis, pneumonia, indecision, headaches, fatigue, and salivation. Mercury is a skin and eye irritant.

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

3.2 Physical Hazards

RI/IRM field activities at 22 Fillmore Avenue may present the following physical hazards:

- The potential for physical injury during heavy construction equipment use, such as backhoes, excavators and drilling equipment.

- The potential for heat/cold stress to employees during the summer/winter months (see Section 10.0).

- The potential for slip and fall injuries due to rough, uneven terrain and/or open excavations.

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

4. Training

4.1 Site Workers

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

4.1.1 Initial and Refresher Training

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

- OSHA HAZWOPER regulations.
- Site safety and hazard recognition, including chemical and physical hazards.
- Medical monitoring requirements.
- Air monitoring, permissible exposure limits, and respiratory protection level classifications.
- Appropriate use of personal protective equipment (PPE), including chemical compatibility and respiratory equipment selection and use.
- Work practices to minimize risk.
- Work zones and Site control.
- Safe use of engineering controls and equipment.
- Decontamination procedures.
- Emergency response and escape.
- Confined space entry procedures.
- Heat and cold stress monitoring.
- Elements of a Health and Safety Plan.
- Spill containment.

Initial training also incorporates workshops for PPE and respiratory equipment use (Levels A, B and C), and respirator fit testing. Records and certification received from the course instructor documenting each employee's successful completion of the training identified above are maintained on file at Roux'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 Attachment 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-Roux 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. Medical Monitoring

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

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

Medical evaluations are conducted according to the Roux 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, Roux 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. Safe Work Practices

All Roux 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 Roux 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 Roux 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, Roux 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. Personal Protective Equipment

7.1 Equipment Selection

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. Exposure Monitoring

8.1 General

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

8.1.1 On-Site Work Zone Monitoring

Roux 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 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 Roux 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 downwind portion of the Site perimeter will be conducted. This will provide a real-time method for determination of vapor and/or particulate releases to the surrounding community as a result of ground intrusive investigation work.

Ground intrusive activities are defined in the Generic Community Air Monitoring Plan and attached as Attachment 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 Roux 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 Roux 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.
- 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.
- 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, re-evaluate and alter (if possible) construction methods to achieve lower vapor concentrations.
- Total atmospheric concentrations of unidentified vapors or gases above 50 ppm on the PID - Discontinue operations and exit the work zone immediately.

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

- Less than 50 mg/m^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 from the field equipment will be recorded and documented on the appropriate Project Field Forms. All instruments will be calibrated before use on a daily basis and the procedure will be documented on the appropriate Project Field Forms.

8.2.2 Community Air Monitoring Action Levels

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

ORGANIC VAPOR PERIMETER MONITORING:

- If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone exceeds 5 ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the sustained organic vapor decreases below 5 ppm over background, work activities can resume with continued monitoring.

- If the sustained ambient air concentration of organic vapors at the downwind perimeter of the exclusion zone are greater than 5 ppm over background but less than 25 ppm for the 15-minute average, activities can resume provided that: the organic vapor level 200 feet downwind of the working site or half the distance to the nearest off-site residential or commercial structure, whichever is less, but in no case less than 20 feet, is below 5 ppm over background; and more frequent intervals of monitoring, as directed by the Site Health and Safety Officer, are conducted.
- If the sustained organic vapor level is above 25 ppm at the perimeter of the exclusion zone for the 15-minute average, the Site Health and Safety Officer must be notified and work activities shut down. The Site Health and Safety Officer will determine when re-entry of the exclusion zone is possible and will implement downwind air monitoring to ensure vapor emissions do not impact the nearest off-site residential or commercial structure at levels exceeding those specified in the ***Organic Vapor Contingency Monitoring Plan*** below. All readings will be recorded and will be available for New York State Department of Environmental Conservation (DEC) and Department of Health (DOH) personnel to review.

ORGANIC VAPOR CONTINGENCY MONITORING PLAN:

- If the sustained organic vapor level is greater than 5 ppm over background 200 feet downwind from the work area or half the distance to the nearest off-site residential or commercial property, whichever is less, all work activities must be halted.
- If, following the cessation of the work activities or as the result of an emergency, sustained organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest off-site residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest off-site residential or commercial structure (20-foot zone).
- If efforts to abate the emission source are unsuccessful and if sustained organic vapor levels approach or exceed 5 ppm above background within the 20-foot zone for more than 30 minutes, or are sustained at levels greater than 10 ppm above background for longer than one minute, then the ***Major Vapor Emission Response Plan*** (see below) will automatically be placed into effect.
  - **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 (Attachment A) will be advised.
    2. The local police authorities will immediately be contacted by the Site Health and Safety Officer and advised of the situation.
    3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two sustained successive readings below action levels are measured, air monitoring may be halted or modified by the Site Health and Safety Officer.

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

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

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

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

- **AIRBORNE PARTICULATE COMMUNITY AIR MONITORING**

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

  - If the downwind PM-10 particulate level is 100 micrograms per cubic meter (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 (Attachment A).

9. Spill Release/Response

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

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

9.1 Potential Spills and Available Controls

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

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

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

- The potential for a “harmful quantity” of oil (including petroleum and non-petroleum-based fuels and lubricants) to reach navigable waters of the U.S. exists (40 CFR Part 112.4). Harmful quantities are considered by USEPA to be volumes that could form a visible sheen on the water or violate applicable water quality standards.
- The potential for any amount of petroleum to reach any waters of NY State, including groundwater, exists. Petroleum, as defined by NY State in 6NYCRR Part 612, is a petroleum-based heat source, energy source, or engine lubricant/maintenance fluid.

- The potential for any release, to soil or water, of petroleum from a bulk storage facility regulated under 6NYCRR Part 612. A regulated petroleum storage facility is defined by NY State as a site having stationary tank(s) and intra-facility piping, fixtures and related equipment with an aggregate storage volume of 1,100 gallons or greater.

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

9.2 Initial Spill Notification and Evaluation

Any worker who discovers a hazardous substance or oil/petroleum spill will immediately notify the Project Manager and SSHO. The worker will, to the best of his/her ability, report the material involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, if any, and any associated injuries. The Emergency Response Plan presented in Attachment A 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. 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 Roux employees. The Site Safety and Health Officer and/or his or her designee will be responsible for monitoring Roux 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 Roux employee will be permitted to continue wearing semi-permeable or impermeable garments when his/her oral temperature exceeds 100.6 degrees Fahrenheit.

10.2 Cold Stress Monitoring

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

- **Frostbite** occurs when body tissue (usually on the extremities) begins to freeze. The three states of frostbite are:
  1) **Frost nip** - This is the first stage of the freezing process. It is characterized by a whitened area of skin, along with a slight burning or painful sensation. Treatment consists of removing the victim from the cold conditions, removal of boots and gloves, soaking the injured part in warm water (102 to 108 degrees Fahrenheit) and drinking a warm beverage. Do not rub skin to generate friction/heat.
  2) **Superficial Frostbite** - This is the second stage of the freezing process. It is characterized by a whitish gray area of tissue, which will be firm to the touch but

will yield little pain. The treatment is identical for Frost nip.

3) **Deep Frostbite** - In this final stage of the freezing process the affected tissue will be cold, numb and hard and will yield little to no pain. Treatment is identical to that for Frost nip.

- **Hypothermia** is a serious cold stress condition occurring when the body loses heat at a rate faster than it is produced. If untreated, hypothermia may be fatal. The stages of hypothermia may not be clearly defined or visible at first, but generally include:
  1) Shivering
  2) Apathy (i.e., a change to an indifferent or uncaring mood)
  3) Unconsciousness
  4) Bodily freezing

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

  1) Remove the victim from the cold environment and remove wet or frozen clothing. (Do this carefully as frostbite may have started.)

  2) Perform active re-warming with hot liquids for drinking (Note: do not give the victim any liquid containing alcohol or caffeine) and a warm water bath (102 to 108 degrees Fahrenheit).

  3) Perform passive re-warming with a blanket or jacket wrapped around the victim.

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

- Education of workers to recognize the symptoms of frostbite and hypothermia.
- Workers should dress warmly, with more layers of thin clothing as opposed to one thick layer.
- Personnel should remain active and keep moving.
- Personnel should be allowed to take shelter in a heated area, 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. Work Zones and Site Control

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

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

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

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

Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be strictly controlled by the SSHO. Only personnel who are essential to the completion of the task will be allowed access to these areas and only if they are wearing the prescribed level of protection. Entrance of all personnel must be approved by the SSHO.

The SSHO will maintain a Health and Safety Logbook containing the names of Roux 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. Decontamination

12.1 Decontamination for Roux 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 Roux personnel on-site shall follow the procedure below, or the Contractor's procedure (if applicable), whichever is more stringent.

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

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

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

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

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

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

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

12.2 Decontamination for Medical Emergencies

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

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

12.3 Decontamination of Field Equipment

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

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

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

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

13. 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 Roux 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 Roux 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 Roux's corporate Health and Safety Director. Roux employees shall not enter a confined space without these procedures and permits in place.

14. 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 Attachment B will be completed by the SSHO and reviewed/issued by the Project Manager.

15. Emergency Information

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

16. References

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

TABLES

TABLE 1

TOXICITY DATA FOR CONSTITUENTS OF POTENTIAL CONCERN

SITE HEALTH & SAFETY PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Parameter	Synonyms	CAS No.	Code	Concentration Limits [1]		
				PEL	TLV	IDLH
Volatile Organic Compounds (VOCs): ppm						
1,2,4-Trimethylbenzene	Pseudocumene	95-63-6	*none*	25	25	--
1,3,5-Trimethylbenzene	Mesitylene	108-67-8	*none*	25	25	--
Ethylbenzene	Ethylbenzol, Phenylethane	100-41-4	*none*	100	100	800
n-Propylbenzene	Isocumene	103-65-1	*none*	50	50	--
Xylene, Total	o-, m-, p-isomers	1330-20-7	*none*	100	100	900
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*	--	--	--
Benzo(k)fluoranthene	*none*	207-08-9	*none*	--	--	--
Chrysene	*none*	218 01 9	*none*	--	--	--
Dibenzo(a,h)anthracene	*none*	53-70-3	*none*	--	--	--
Indeno(1,2,3-cd)pyrene	*none*	193-39-5	*none*	--	--	--
Inorganic Compounds: mg/m^{2}						
Chromium	*none*	7440-47-3	*none*	1	0.5	250
Lead	*none*	7439-92-1	*none*	0.05	0.15	100
Mercury	*none*	7439-97-6	C-0.1	0.1	0.05	10

Notes:

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

Explanation:

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

IDLH = Immediately Dangerous to Life or Health.

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

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

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

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

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

PEL = Permissible Exposure Limit, established by OSHA, equals the 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

SITE HEALTH & SAFETY PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Activity [1]	Direct Contact with Soil/Fill	Inhalation of Vapors or Dust	Direct Contact with Groundwater or Surface waters
Remedial Investigation Tasks			
1. Subsurface Soil Sampling	X	X	
2. Monitoring Well Installation/Development Sampling	X	X	X
3. Soil Vapor Investigation	X	X	
Interim Remedial Measures Tasks			
1. Soil Excavation	X	X	
2. Building Demolition	X	X	
3. Verification Sampling	X	X	
4. Backfilling	X	X	
5. Groundwater and Surface Water Management	X		X

Notes:

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

TABLE 3

REQUIRED LEVELS OF PROTECTION
FOR REMEDIAL INVESTIGATION/INTERIM REMEDIAL MEASURE TASKS

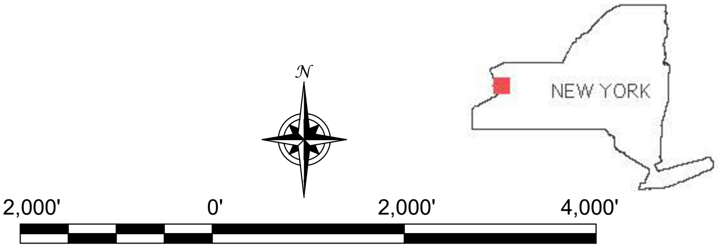
SITE HEALTH & SAFETY PLAN
22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

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

Notes:

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

FIGURES



SCALE: 1 INCH = 2,000 FEET
SCALE IN FEET
(approximate)

Title:

SITE LOCATION AND VICINITY MAP

HEALTH AND SAFETY PLAN

22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Prepared for:

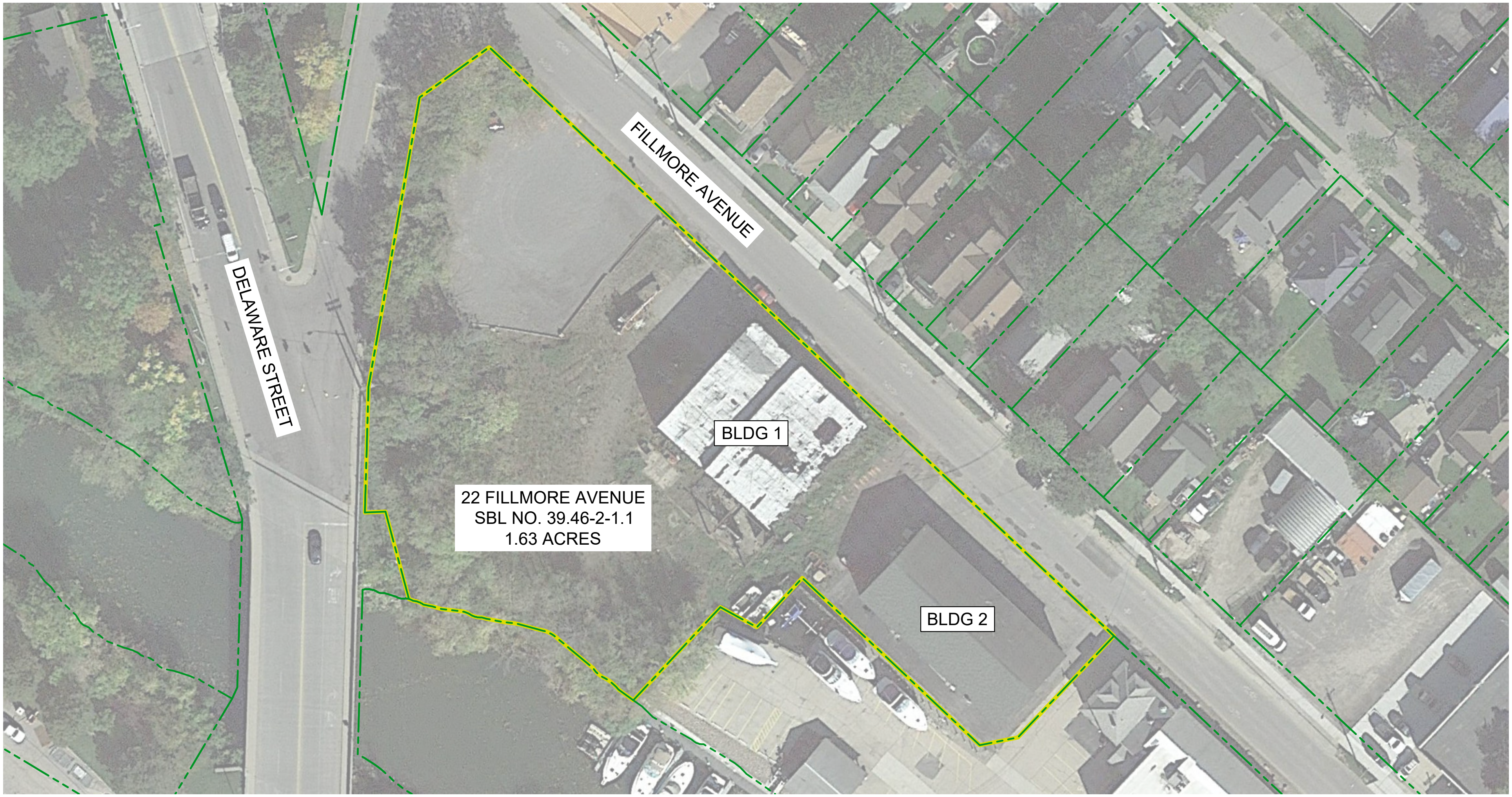
JC TONAWANDA TOWER QOZB LLC

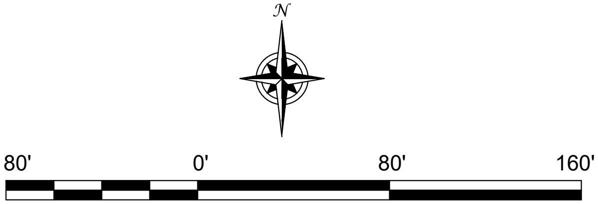
ROUX

Compiled by: RFL	Date: JANUARY 2024	FIGURE
Prepared by: CMS	Scale: AS SHOWN	
Project Mgr: CZB	Project: 0659-022-001	1
File: FIGURE 1; SITE LOCATION AND VICINITY MAPRFL.DWG		

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\HASP\FIGURE 1; SITE LOCATION AND VICINITY MAPRFL.DWG

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\HASP\FIGURE 2; SITE PLAN (AERIAL)RFL.DWG





SCALE: 1 INCH = 80 FEET
SCALE IN FEET
(approximate)

LEGEND:

▬	BCP SITE BOUNDARY
- - -	PARCEL BOUNDARIES

NOTES:
1. IMAGE TAKEN FROM GOOGLE EARTH 2021.

Title:

SITE PLAN (AERIAL)
HEALTH AND SAFETY PLAN

BCP SITE NO. C915395
22 FILLMORE AVENUE
TONAWANDA, NEW YORK

Prepared for:

JC TONAWANDA TOWER QOZB LLC

ROUX

Compiled by: RFL	Date: JANUARY 2024	FIGURE
Prepared by: CS	Scale: AS SHOWN	**2**
Project Mgr: CZB	Project: 0659-022-001	
File: FIGURE 2; SITE PLAN (AERIAL)RFL.DWG		

APPENDICES

A. Emergency Response Plan

B. Hot Work Permit Form

C. Community Air Monitoring Plan

APPENDIX A

Emergency Response Plan

EMERGENCY RESPONSE PLAN
for
BROWNFIELD CLEANUP PROGRAM
RI/IRM ACTIVITIES

22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

January 2024 0659-022-001

Prepared for:

JC TONAWANDA TOWER QOZB LLC

Prepared by:

Roux Environmental Engineering & Geology, DPC
2558 Hamburg Turnpike, Suite 300
Buffalo, NY 14218
716-856-0599

22 FILLMORE AVENUE
BCP SITE NO. C915395
HEALTH AND SAFETY PLAN FOR RI ACTIVITIES
ATTACHMENT A: EMERGENCY RESPONSE PLAN

TABLE OF CONTENTS

LIST OF FIGURES

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) Interim Remedial Measure (IRM) activities at 22 Fillmore Avenue, BCP Site No. C915395 (Site) in Tonawanda, New York. This attachment 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.

Evaluate hazards of activities identified in Section 1.5 of the HASP and address potential injuries from electrical and mechanical hazards, heavy equipment, environmental conditions, fire hazards, heavy lifting, and cold or heat exposure.

Type of Emergency:

1. Medical, due to physical injury

Source of Emergency:

1. Slip/trip/fall

Location of Source:

1. Non-specific

3.0 ON-SITE EMERGENCY RESPONSE EQUIPMENT

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

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

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

A minimum of 1 first aid kit and 1 fire extinguisher are required. Fire extinguishers should also be in each piece of heavy equipment. The contents and availability of the first aid kit should vary depending on the hazards identified in the specific activities outlined in section 1.5 of the HASP.

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 Roux personnel field vehicle.

5.0 EMERGENCY CONTACTS

The following identifies the emergency contacts for this ERP.

Emergency Telephone Numbers:

Project Manager: ***Christopher Boron, P.G.***
Work: (716) 856-0599
Mobile: (716) 864-2726

Corporate Health and Safety Director: Brian Hobbs
Work: (631) 630-2419
Mobile: (631) 807-0193

Site Safety and Health Officer (SSHO): ***Paul W. Werthman, P.G.***
Work: (716) 856-0599
Mobile: (716) 997-9584

Alternate SSHO: ***Nathan Munley***
Work: (716) 856-0599
Mobile: (716) 289-1072

DEGRAFF MEMORIAL HOSPITAL (ER):	(716) 694-4500
FIRE:	911
AMBULANCE:	911
BUFFALO POLICE:	911
STATE EMERGENCY RESPONSE HOTLINE:	(800) 457-7362
NATIONAL RESPONSE HOTLINE:	(800) 424-8802
NYSDOH:	(716) 847-4385
NYSDEC:	(716) 851-7220
NYSDEC 24-HOUR SPILL HOTLINE:	(800) 457-7252

The Site location is:

20, 30, 40 Fillmore Avenue
Tonawanda, New York 14150
Site Phone Number: Roux Staff Cell Phones to be used.

6.0 EMERGENCY ALERTING & EVACUATION

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

1) Emergency signals by portable air horn, siren, or whistle: two short blasts, personal injury; continuous blast, emergency requiring site excavation.

2) Visual signals: hand gripping throat, out of air/cannot breathe; hands on top of head, need assistance; thumbs up, affirmative/ everything is OK; thumbs down, no/negative; grip partner's wrist or waist, leave area immediately.

If evacuation notice is given, site workers leave the worksite with their respective buddies, if possible, by way of the nearest exit. Emergency decontamination procedures detailed in Section 12.0 of the HASP are followed to the extent practical without compromising the safety and health of site personnel. The evacuation routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by rehearsals and inputs from emergency response organizations. Wind direction indicators are located so that workers can determine a safe up wind or cross wind evacuation route and assembly area if not informed by the emergency response coordinator at the time the evacuation alarm sounds. Since work conditions and work zones within the site may be changing on daily basis, it shall be the responsibility of the construction Site Health and Safety Officer to review evacuation routes and procedures as necessary and to inform all Roux 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 (***Christopher Boron*** or ***Nathan Munley***) so that appropriate action can be initiated. Contractors and subcontractors on this site have coordinated their emergency response plans to ensure that these plans are compatible and that source(s) of potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

7.0 EXTREME WEATHER CONDITIONS

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

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

8.0 EMERGENCY MEDICAL TREATMENT & FIRST AID

Personnel Exposure:

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

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

- Inhalation: Move to fresh air and, if necessary, transport to Hospital.

- Ingestion: Decontaminate and transport to Hospital.

Personal Injury:

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

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

Directions to DeGraff Memorial Hospital (see Figure 1):

The following directions describe the best route from the Site to DeGraff Memorial Hospital:

- Travel northwest on Fillmore Avenue toward East Niagara Street
- Turn sharp left (southwest) onto East Niagara Street
- Turn sharp right (northwest) onto Delaware Street and continue onto Main Street
- Turn right (northeast) onto Tremont Street
- Turn right (southeast) into DeGraff Memorial Hospital
  (1.0 miles total)

9.0 EMERGENCY RESPONSE CRITIQUE & RECORD KEEPING

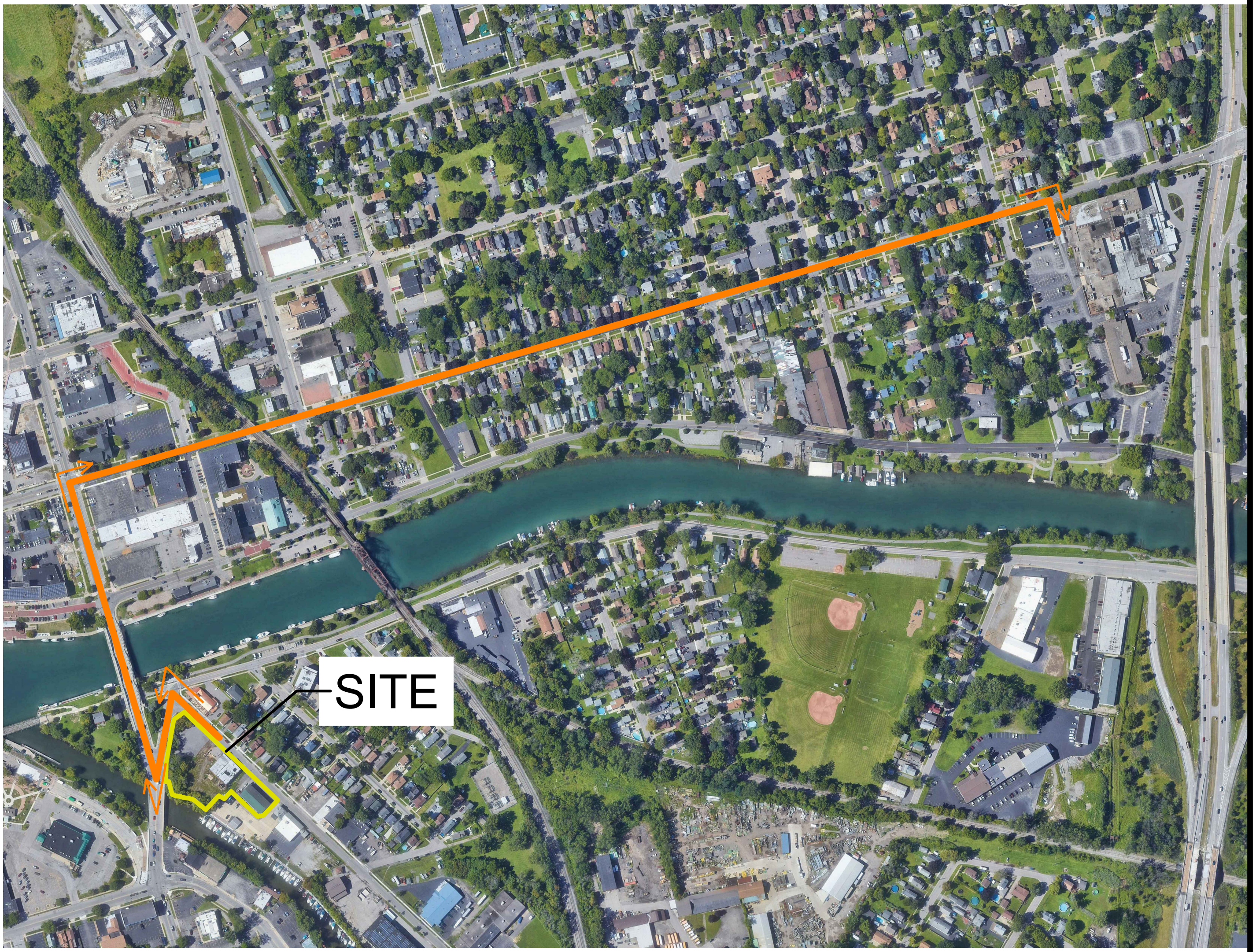
Following an emergency, the SSHO and Project Manager shall review the effectiveness of this Emergency Response Plan (ERP) in addressing notification, control and evacuation requirements. Updates and modifications to this ERP shall be made accordingly. It shall be the responsibility of each contractor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

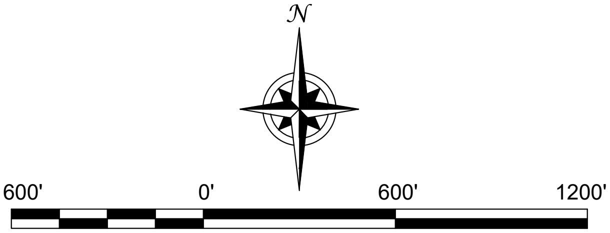
- Occupational injuries and illnesses.
- Accident investigations.
- Reports to insurance carrier or State compensation agencies.
- Reports required by the client.
- Records and reports required by local, state, federal and/or international agencies.
- Property or equipment damage.
- Third party injury 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.

FIGURE





SCALE: 1 INCH = 600 FEET
SCALE IN FEET
(approximate)

Directions to DeGraff Memorial Hospital:

- Travel northwest on Fillmore Avenue toward East Niagara Street.
- Turn sharp left (southwest) onto East Niagara Street.
- Turn sharp right (northwest) onto Delaware Street and continue onto Main Street.
- Turn right (northeast) onto Tremont Street.
- Turn right (southeast) in DeGraff Memorial Hospital (1.0 mile total).

LEGEND:

— BCP SITE BOUNDARY

Title:

HOSPITAL ROUTE MAP

EMERGENCY RESPONSE PLAN

22 FILLMORE AVENUE
BCP SITE NO. C915395
TONAWANDA, NEW YORK

Prepared for:

JC TONAWANDA TOWER QOZB LLC

ROUX

Compiled by: RFL	Date: JANUARY 2024	FIGURE
Prepared by: CMS	Scale: AS SHOWN	1
Project Mgr: CZB	Project: 0659-022-001	
File: FIGURE 1; HOSPITAL ROUTE MAP.DWG		

F:\CAD\BENCHMARK\JC TONAWANDA TOWER QOZB, LLC\RI-IRM WORK PLAN\HASP\ERP\FIGURE 1; HOSPITAL ROUTE MAP.DWG

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:

Prepared By: ___________

APPENDIX C

Community Air Monitoring Plan

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

Overview

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

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

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

Community Air Monitoring Plan

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

> **Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.
>
> **Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

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

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

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

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

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{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 F

Former 30 Fillmore Avenue Building Documentation

CITY OF TONAWANDA, NEW YORK
OFFICE OF THE BUILDING INSPECTOR
200 Niagara Street Tonawanda, New York 14150 – 1099
Phone: 716.695.1806 Fax: 716.743.8870

JOHN L. WHITE
Mayor

ERIK LINDHURST
Building Inspector

NOTICE OF CONDEMNATION

THIS BUILDING IS DECLARED UNFIT FOR HUMAN OCCUPANCY UNDER SECTION 107.1.1 OF THE PROPERTY MAINTENANCE CODE OF THE STATE OF NEW YORK

August 22, 2024

Property Description: 22 FILLMORE AVE., CITY OF TONAWANDA, NEW YORK 14150
SBL #39.46-2-1.1

Listed Owner: JC Tonawanda Tower QOZBLL

An inspection of the structure located at 22 FILLMORE AVENUE has revealed that the structure is in violation of Article 6. Unsafe Buildings, §14-391 of code of the City of Tonawanda that states:

All buildings or structures or any part thereof that are abandoned, dilapidated, deteriorated, decayed or unattractive from any cause so as to endanger the health, safety or welfare of the public shall be repaired, demolished or removed.

THIS BUILDING MAY NOT BE ENTERED FOR ANY REASON OTHER THAN FOR DEMOLITION OR WITH WRITTEN APPROVAL FROM THE BUILDING INSPECTOR.

Entering this property without permission is a violation of Section 107.4 of the Property Maintenance Code of the State of New York and is punishable by either fine or imprisonment.

Erik Lindhurst
Building Inspector
City of Tonawanda

CITY OF TONAWANDA, NEW YORK
OFFICE OF THE BUILDING INSPECTOR
200 Niagara Street Tonawanda, New York 14150 – 1099
Phone: 716.695.1806 Fax: 716.743.8870

JOHN L. WHITE
Mayor

ERIK C. LINDHURST
Building Inspector

March 19, 2025
22 Fillmore Ave.
Tonawanda, New York 14150

SBL # 39.46-2-1.1

To Whom It May Concern:

Please find attached a copy of the condemn notice for the above listed property. If you have any questions, please feel free to contact me at 716-695-1806.

Thank you.

Erik Lindhurst
Building Inspector
City of Tonawanda

cc: File

Pre-Demolition Asbestos Inspection Report

Project Location:

30 Fillmore Ave.
Tonawanda, NY 14150

Project ID: 22-0714JD-A

Conditions as of: *July 14, 2022*

Prepared for:

Justin Earl
JC Tonawanda Tower QOZB, LLC.
15 Cobblestone Ct.
Orchard Park, NY 14127

Prepared by:

AMD ENVIRONMENTAL

AMD Environmental Consultants, Inc.
72 E Niagara St. Suite 100
Tonawanda, NY 14150
OFFICE (716) 833-0043 | FAX (716) 241-8689
www.amdenvironmental.com

AMD
ENVIRONMENTAL

AMD Environmental Consultants, Inc.
72 E Niagara St. Suite 100
Tonawanda, NY 14150
Office: 716 833-0043 Fax: 716 241-8689
www.amdenvironmental.com

July 26, 2022

Justin Earl
JC Tonawanda Tower QOZB, LLC.
15 Cobblestone Ct.
Orchard Park, NY 14127

Re: Pre-Demolition Asbestos Inspection Report
30 Fillmore Ave.
Tonawanda, NY 14150
AMD Project ID: 22-0714JD-A

Mr. Earl:

I am pleased to present this summary of asbestos survey services at the above referenced address.

AMD Environmental Consultants conducted a pre-demolition asbestos inspection on the building slated for demolition, at the above referenced address on July 14, 2022. Asbestos containing materials (ACM) were identified above 1% in materials that were sampled. For more detail refer to the summary on page 4.

New York State asbestos regulations (12 NYCRR 56-5) require that asbestos surveys are conducted in order to determine whether or not the building or structure, or portion(s) thereof to be demolished, renovated, remodeled, contains asbestos containing building materials (ACBM), or presumed asbestos containing materials (PACM). These regulations also require that a copy of the pre-renovation survey be forwarded to the local New York State Department of Labor (NYSDOL) Asbestos Control Bureau immediately upon completion of the survey (Buffalo Office: 65 Court Street, Rm. 405, Buffalo, NY 14202). **If requested to AMD in writing, a copy of the survey will be submitted on your behalf to the NYSDOL, otherwise a copy must be submitted by the owner.**

AMD Environmental Consultants, Inc. surveys are intended to determine, to a reasonable extent, the presence, location, quantity, and condition of accessible asbestos containing materials (surfacing, thermal systems insulation, and miscellaneous materials). The information contained herein is representative of conditions found onsite during the date/time this survey was conducted. Environmental conditions, renovation, vandalism, etc. may alter conditions from the date/time that this survey was conducted, potentially creating new hazards.

Please do not hesitate to contact me if I may provide any additional information.

Sincerely,

David Batt

Joseph Hutton & David Batt
NYS Licensed Asbestos Inspectors

Table of Contents

1.0 Asbestos Inspection

1.1 Introduction

AMD Environmental Consultants, Inc (AMD) was retained by Justin Earl to inspect the building located at 30 Fillmore Ave. in Tonawanda, NY for the presence of materials suspected of containing asbestos in the building slated for demolition.

AMD was assigned to:

- Locate suspect asbestos containing materials (ACM),
- Sample these materials to determine asbestos content, and
- Identify the locations and estimated quantities of the confirmed asbestos containing materials.

The information following this introduction details the amount of asbestos present in this facility and the location of the ACBM (asbestos containing building materials). Although the report is a comprehensive analysis of the asbestos inspection work performed, it would be helpful to review all applicable federal, state and local rules, laws and regulations regarding the handling and treatment of ACBM.

The following is a list of suggested reading and information sources relating to asbestos:

- New York State Department of Labor Industrial Code Rule 56
- National Emission Standard for Hazardous Air Pollutants (NESHAPS)
- Occupational Safety and Health Administration
- (OSHA 1926.1101, 1910.134, 1910.1020, 1910.1200, 1910.145, 1910.95, 1926.58)
- Environmental Protection Agency rule CFR763.46 Asbestos Hazard Emergency Response Act

1.2 Executive Summary

The scope of services included the identification of suspect asbestos containing building materials in the building slated for demolition; sampling and analysis of the suspect materials; and identifying the locations, estimated quantities, and condition of the confirmed asbestos containing materials.

Sampling and analysis of the suspect materials under Polarized Light Microscopy (PLM), and where necessary, under Transmission Electron Microscopy (TEM), revealed the following materials as asbestos containing building materials (ACBM):

ASBESTOS CONTAINING MATERIALS SUMMARY

HAN	Material Description	SID (Space Identification Number)	Estimated Quantity SF*	Friability/ Condition
600	**Window Glazing Compound**	**Exterior**	**25 SF.**	**NF/D**
601	**Window Sill Tar**	**Exterior – Front of Building**	**< 10 SF.**	**NF/D**
701	**Roofing**	**Roof along with debris throughout interior and exterior of building.**	**6,000 SF.**	**NF/D**

*Quantities are approximate, and are only associated with areas of planned renovation. Additional asbestos containing materials may be located outside areas of planned renovation that were not surveyed, assessed or quantified during this inspection.

KEY TERMS AND DEFINITIONS:

HAN= Homogenous Area Number; number assigned to categorize materials of like composition, texture and appearance

SID=Space Identification Number: Sample Locations

Friability/Condition:

F= Friable: a material that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure, or is capable of being released into the air by hand pressure.

NF= Non Friable: a material that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure, or is incapable of being released into the air by hand pressure.

I= Intact: Asbestos material that has not crumbled, been pulverized, or otherwise been damaged or disturbed, and the material's matrix has not noticeably deteriorated.

D= Damaged: Asbestos material that has deteriorated or sustained physical injury demonstrated by separation of the ACM into layers, separation of the ACM from the substrate, flaking, blistering, crumbling, water damage, scrapes, gouges, or other signs of physical injury.

SD=Significantly Damaged: Damaged asbestos where the damage is extensive and severe.

ACM=Asbestos Containing Material: material analyzed and confirmed by laboratory to contain above 1% of asbestos

PACM= Presumed Asbestos Containing Material: this material was assumed to contain asbestos to either save the client on lab fees or because the material was adhered to another asbestos containing material (or adjacent to other materials needing abatement) and must be managed as such.

1.3 Purpose

The purpose of the asbestos inspection was to identify and quantify the types of asbestos containing building materials (ACBM) in areas of planned renovations. Samples of the suspect materials were collected for analysis by an independent laboratory, and the condition of each material noted in relation to its potential to be disturbed. The potential for fiber release was also considered.

The report is generated for the exclusive use of Justin Earl and his representatives or agents, and is not designed to serve as a specification for abatement. Before requesting bids for abatement of materials identified in this report, the owner is strongly encouraged to contract with a consultant to provide this valuable service. A specification assures that all contractors are bidding on the same methodology and following the specific requirements for the work to be performed.

The inspection was conducted by NYS DOL Certified Asbestos Inspectors John Doucette and David Batt on July 14, 2022 and revealed the following suspect asbestos containing building materials:

HOMOGENOUS MATERIALS & SAMPLE RESULTS

HAN	Suspect Asbestos Containing Material Description	SID (Space Identification Number)	Sample No.	ACM (Y/N)	Estimated Quantity SF*	Friability/ Condition
200	2' x 4' Ceiling Tile	1002	200-1, 200-1	No	N/A	F/I
600	**Window Glazing Compound**	**Exterior**	**600-1, 600-2**	**Yes**	**25 SF.**	**NF/I**
601	**Window Sill Tar**	**Exterior – Front of Building**	**601-1, 601-2**	**Yes**	**< 10 SF.**	**NF/I**
602	Electrical Panel Box Components	1000	602-1, 602-2	No	N/A	NF/I
700	Aluminum Roof Coating – Silver paint	Roof Debris-1000, 1001, 1002	700-1, 700-2	No	N/A	NF/I
701	**Roofing**	**Roof**	**701-1, 701-2**	**Yes**	**6,000 SF**	**NF/D**

*Quantities are approximate, and are only associated with areas of planned renovation. Additional asbestos containing materials may be located outside areas of planned renovation that were not surveyed, assessed or quantified during this inspection.

The above listed table provides a list of the materials that were sampled and tested for asbestos by Polarized Light Microscopy (PLM) and or Transmission Electron Microscopy (TEM), as applicable. Any sample determined to be a non-friable organically bound material (NOB), and which was found to be negative by Polarized Light Microscopy (PLM) analysis, was then analyzed by Transmission Electron Microscopy (TEM) analysis at American Science Team New York Inc. (AmeriSci) in New York, New York. AmeriSci is an ELAP Certified laboratory (ID: 11480) and conducts analysis according to EPA Method 198.1, 198.4 and 198.6. See Section 2.0 for the laboratory's analytical results.

1.4 Methodology

All work performed by AMD Environmental Consultants, Inc. was conducted in accordance with applicable regulations, including New York State Department of Labor standards 12NYCRR Part 56, National Emission Standards for Hazardous Air Pollutants (NESHAPS), and Occupational Safety and Health Administration regulations 29CFR1910.1101 and 29CFR1910.134. All AMD personnel assigned to conduct inspections have completed the Environmental Protection Agency (EPA) required training and New York State Department of Labor Division of Safety and Health certification program.

Each suspect asbestos containing building material (ACBM) was assigned a homogenous area number (HAN). Homogeneous areas consist of materials of like composition, texture and appearance.

Based on the homogeneous areas, samples of suspect materials were collected. Techniques used for sample collection were designed to minimize damage to suspected areas, reduce any potential for fiber release, and ensure the safety of the inspector and building occupants. Samples were collected by AMD personnel using the following procedures:

1. The surface to be sampled was sprayed with amended water (detergent and water) as necessary
2. A plastic sample bag was held to the surface sampled
3. The sample was collected using tools appropriate to the friability of the material sampled
4. Sample bags were labeled with a unique sample identification number
5. Samples were recorded on a Chain of Custody form, and submitted under strict chain-of-custody procedures to American Science Team New York Inc. (AmeriSci) in New York, New York. AmeriSci is an ELAP and NYSDOH approved, certified laboratory for PLM and TEM analysis (ELAP ID: 11480).

Samples were first analyzed using PLM, Polarized Light Microscopy in accordance with US Environmental Protection Agency Interim Method, 40CFRPt763, Supt F, App A(7-1-87). For the sample results not considered definitive, additional analysis was performed under Transmission Electron Microscopy (TEM) in accordance with NYSDOH ELAP Item 198.4, for Non-friable Organically Bound Bulk Material (NOB). The results of these analyses confirmed whether or not a suspect materials actually contained asbestos. All materials sampled are summarized in Section 1.3 of this report; the presumed asbestos containing materials and materials containing asbestos above 1.0% are listed in Section 1.2.

Location:
1000

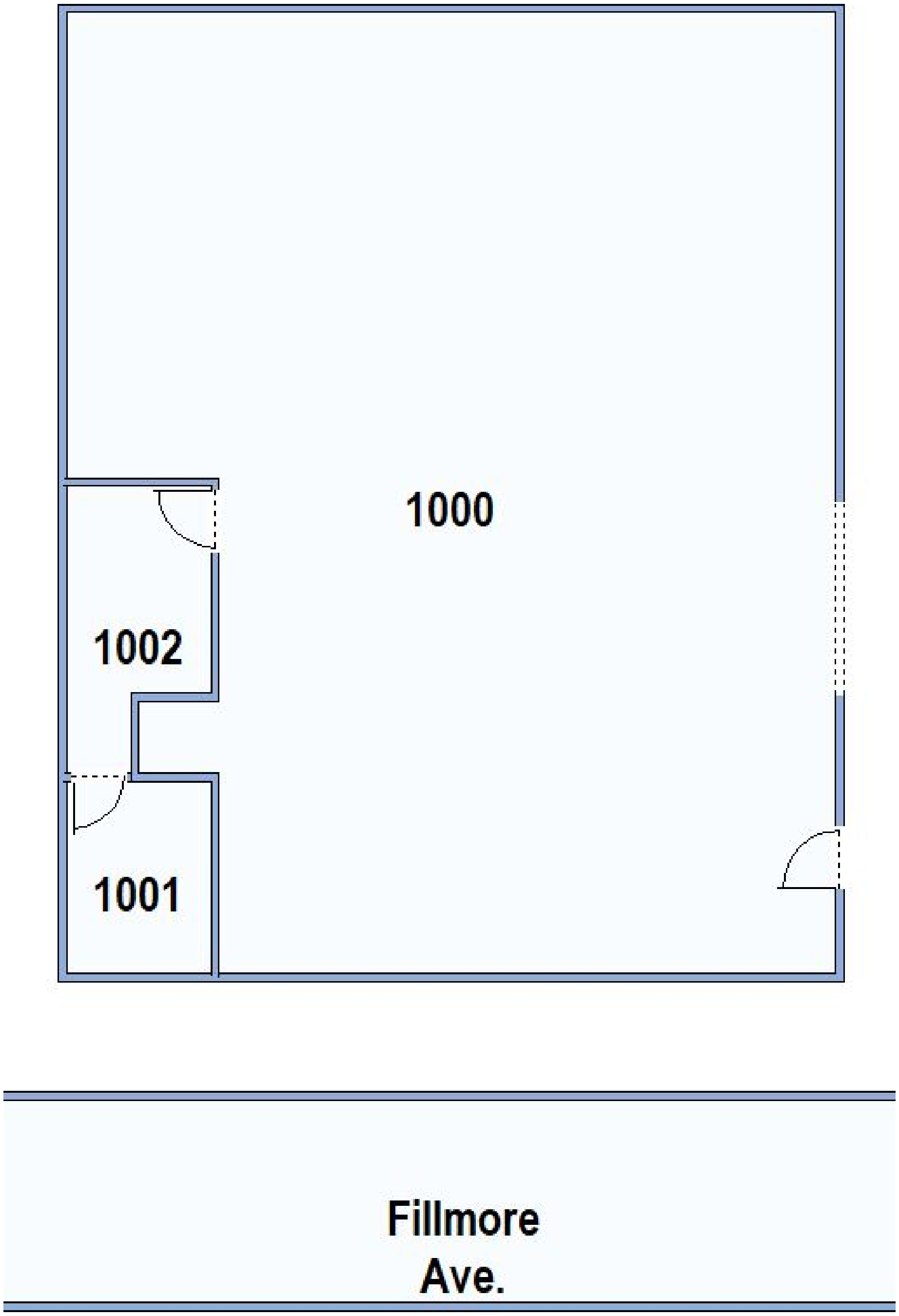
Observation:
Roofing and Debris confirmed to be asbestos-containing material

Location:
Front Exterior

Observation:
Window sill tar and window glazing confirmed to be asbestos-containing material

3.0 Site Map(s)

30 Fillmore Ave.



*Not drawn to scale

4.0 Laboratory Analytical Results

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

AMD Environmental Consultants, Inc.
Attn: John Wolf
72 East Niagara Street
Suite 100
Tonawanda, NY 14150

Date Received 07/18/22
Date Examined 07/21/22
ELAP # 11480
RE: 22-0714J2-A; 30 Fillmore Ave, NY

AmeriSci Job # 222072880
P.O. #
Page 1 of 3

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
200-1 1	222072880-01 **Location:** 1002 - 2 x 4 Ceiling Tile **Analyst Description:** White/Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 55.3%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 07/21/22
200-2 1	222072880-02 **Location:** 1002 - 2 x 4 Ceiling Tile **Analyst Description:** White/Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 42.8%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 07/21/22
600-1 2	222072880-03 **Location:** Exterior - Window Glazing Compound **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 5.7 % **Other Material:** Non-fibrous 17%	***Yes***	5.7% (by NYS ELAP 198.6) by Valeriu Voicu on 07/21/22
600-2 2	222072880-04 **Location:** Exterior - Window Glazing Compound **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**		NA/PS
601-1 3	222072880-05 **Location:** Exterior - Tar Patching On Window Sill **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 2.5 % **Other Material:** Non-fibrous 13.7%	***Yes***	2.5% (by NYS ELAP 198.6) by Valeriu Voicu on 07/21/22

See Reporting notes on last page

PLM Bulk Asbestos Report

22-0714J2-A; 30 Fillmore Ave, NY

Client No. / HGA	**Lab No.**	**Asbestos Present**	**Total % Asbestos**
601-2 3	222072880-06 **Location:** Exterior - Tar Patching On Window Sill **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**		NA/PS
602-1 4	222072880-07 **Location:** 1000 - Elect. Panel Components **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 07/21/22
602-2 4	222072880-08 **Location:** 1000 - Elect. Panel Components **Analyst Description:** Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 07/21/22
700-1 5	222072880-09 **Location:** 1000 - Alum. Roof Casting **Analyst Description:** Silver/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.2%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 07/21/22
700-2 5	222072880-10 **Location:** 1000 - Alum. Roof Casting **Analyst Description:** Silver/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 07/21/22
701-1 6	222072880-11 **Location:** 1000 - Roofing **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 2.4 % **Other Material:** Non-fibrous 26.5%	***Yes***	2.4% (by NYS ELAP 198.6) by Valeriu Voicu on 07/21/22

PLM Bulk Asbestos Report

22-0714J2-A; 30 Fillmore Ave, NY

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
701-2 6	222072880-12		NA/PS

Location: 1000 - Roofing

Analyst Description: Bulk Material
Asbestos Types:
Other Material:

Reporting Notes:

Analyzed by: Valeriu Voicu
Date: 7/21/2022

Reviewed by: Feyza Gungor

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

__________END OF REPORT_________

Table I
Summary of Bulk Asbestos Analysis Results
22-0714J2-A; 30 Fillmore Ave, NY

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	200-1	1	0.087	23.2	21.5	55.3	NAD	NAD
Location:	1002 - 2 x 4 Ceiling Tile							
02	200-2	1	0.110	18.8	38.4	42.8	NAD	NAD
Location:	1002 - 2 x 4 Ceiling Tile							
03	600-1	2	0.167	50.4	27.0	17.0	Chrysotile 5.7	NA
Location:	Exterior - Window Glazing Compound							
04	600-2	2	0.303	50.8	23.8	25.4	NA/PS	NA
Location:	Exterior - Window Glazing Compound							
05	601-1	3	0.464	51.0	32.8	13.7	Chrysotile 2.5	NA
Location:	Exterior - Tar Patching On Window Sill							
06	601-2	3	0.437	49.4	39.9	10.7	NA/PS	NA
Location:	Exterior - Tar Patching On Window Sill							
07	602-1	4	----	----	----	----	NAD	NA
Location:	1000 - Elect. Panel Components							
08	602-2	4	----	----	----	----	NAD	NA
Location:	1000 - Elect. Panel Components							
09	700-1	5	0.389	55.2	28.7	16.2	NAD	NAD
Location:	1000 - Alum. Roof Casting							
10	700-2	5	0.401	56.2	26.8	17.0	NAD	NAD
Location:	1000 - Alum. Roof Casting							
11	701-1	6	0.342	63.5	7.6	26.5	Chrysotile 2.4	NA
Location:	1000 - Roofing							
12	701-2	6	0.431	84.5	4.5	11.0	NA/PS	NA
Location:	1000 - Roofing							

Table I
Summary of Bulk Asbestos Analysis Results
22-0714J2-A; 30 Fillmore Ave, NY

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM

Analyzed by: John P. Koubiadis (FG) Reviewed by: Feyza Gungor
Date: 7/22/2022

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H600-Noran 7 System, Microscope, Serial #: 542-26-10. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

4.1 Analytical Key Terms and Definitions

PLM: Polarized Light Microscopy; type of analysis

TEM: Transmission Electron Microscopy; secondary analysis if applicable

NOB: Non-Friable Organically Bound; materials analyzed by PLM or TEM

NAD: No asbestos detected

NA: Not applicable

PS: Positive Stop

Trace: Less than 1% asbestos (Non ACM)

ACM: Asbestos Containing Material

5.0 Sample Chain(s) of Custody

Relinquished By: Date/Time: 7-14-22

Received By: Alexandru Voicu Date/Time: 7/18/22 1012

Relinquished By: Date/Time:

Received By: Date/Time:

AMERISCI

WWW.AMERISCI.COM

BULK CHAIN OF CUSTODY

AMERISCI NEW YORK
117 EAST 30TH STREET
NEW YORK, NY 10016
TOLL FREE: (800) 705-5227
PHONE: (212) 679-8600
FAX: (212) 679-9392

AMERISCI #:

Company: AMD Environmental

Street Address: 72 East Niagara Street STE 100

City: Tonawanda State: NY Zip: 14150

Phone: 716-833-0043 Cell:

Fax Results? Y ☐ Fax #:

Email Results? Y ☑ Email: to all parties listed below

Results to: jwolf@amdenv.com, anthony@amdenv.com,

Project:

Proj Mgr: Proj #: 22-0714JD-A

Proj Address: 30 Fillmore Ave Proj State: NY

Analysis: ☐ PLM; ☐ Positive Stop; ☐ TEM; ☒ NY ELAP PLM/TEM w/ NOB Prep.

ASTM Dust ☐ (Microvac) ☐ (Wipe); ☐ Qualitative; ☐ Other (describe in comments)

Turnaround Time: 5 Day ☒ Material Type: ☒ Bulk ☐ Dust ☐ Water

Sampled By: Doucette/Batt Date Sampled: 7-14-22

Special Instructions or Comments:
admin@amdenv.com, dbatt@amdenv.com, john.doucette@amdenv.com

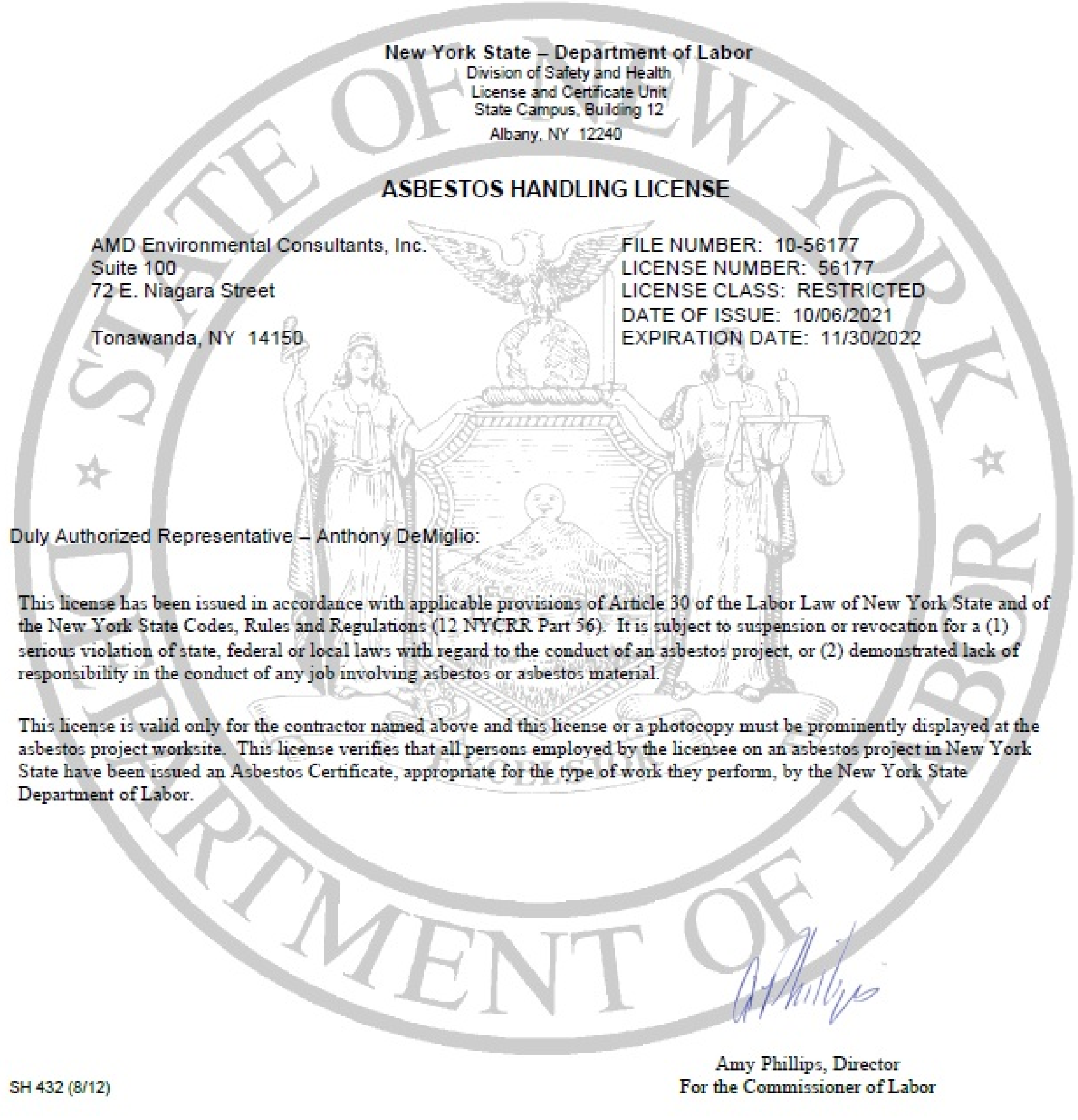
Lab ID	Field ID	Location	Sample Description (dust area)	Homogenous Area
	200-1,2	1002	2x4 Ceiling Tile	
	600-1,2	Exterior	Window glazing Compound	
	601-1,2	Exterior	Tar patching on Window sill	
	602-1,2	1000	Elect. Panel Components	
	700-1,2	1000	Alum. Roof Coating	
	701-1,2	1000	Roofing	

222072880

PAGE OF

AmeriSci, Bulk CoC, rev May 20, 2009

Appendix A: Firm Certification and Personnel License(s)



New York State – Department of Labor
Division of Safety and Health
License and Certificate Unit
State Campus, Building 12
Albany, NY 12240

ASBESTOS HANDLING LICENSE

AMD Environmental Consultants, Inc.
Suite 100
72 E. Niagara Street

Tonawanda, NY 14150

FILE NUMBER: 10-56177
LICENSE NUMBER: 56177
LICENSE CLASS: RESTRICTED
DATE OF ISSUE: 10/06/2021
EXPIRATION DATE: 11/30/2022

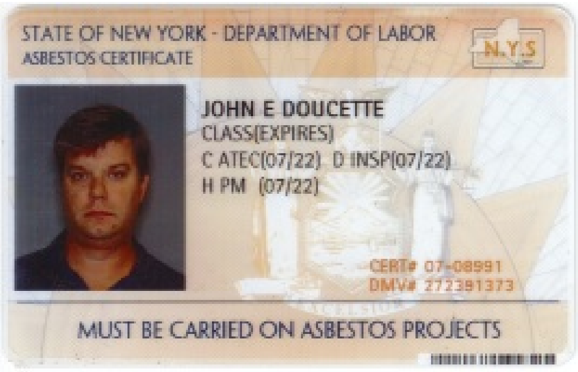
Duly Authorized Representative – Anthony DeMiglio:

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

SH 432 (8/12)

Amy Phillips, Director
For the Commissioner of Labor



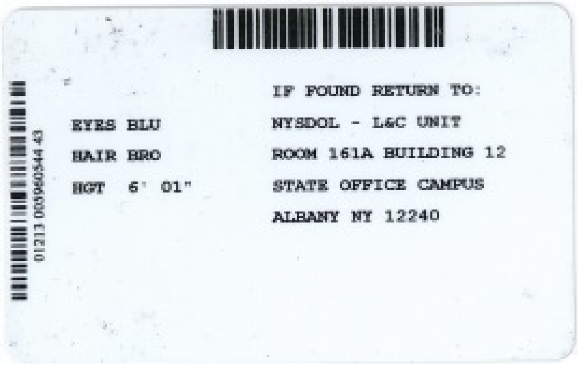
STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

JOHN E DOUCETTE
CLASS(EXPIRES)
C ATEC(07/22) D INSP(07/22)
H PM (07/22)

CERT# 07-08991
DMV# 272391373

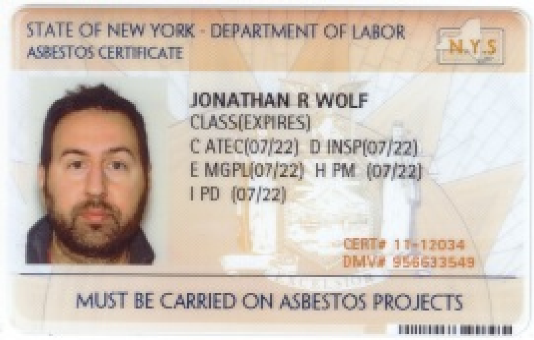
MUST BE CARRIED ON ASBESTOS PROJECTS



01213 003960544 43

EYES BLU
HAIR BRO
HGT 6' 01"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240



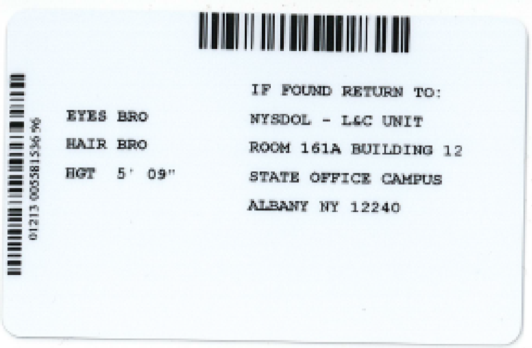
STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

JONATHAN R WOLF
CLASS(EXPIRES)
C ATEC(07/22) D INSP(07/22)
E MGPL(07/22) H PM (07/22)
I PD (07/22)

CERT# 11-12034
DMV# 956633549

MUST BE CARRIED ON ASBESTOS PROJECTS

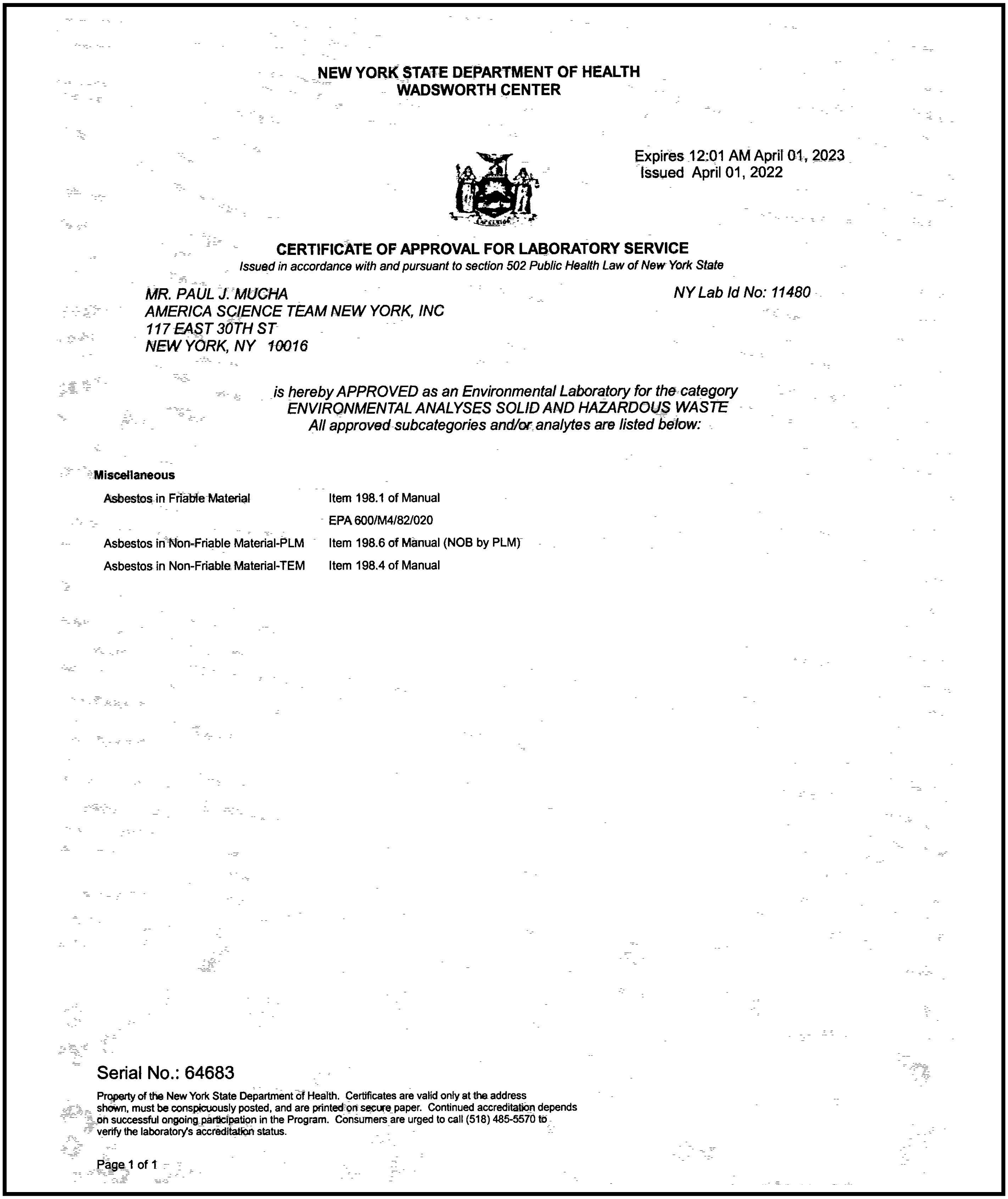


01213 005581536 96

EYES BRO
HAIR BRO
HGT 5' 09"

IF FOUND RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

Appendix B: Laboratory Certification



NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2023
Issued April 01, 2022

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. PAUL J. MUCHA
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 64683

Property of the New York State Department of Health. Certificates are valid only at the address shown, must be conspicuously posted, and are printed on secure paper. Continued accreditation depends on successful ongoing participation in the Program. Consumers are urged to call (518) 485-5570 to verify the laboratory's accreditation status.

Page 1 of 1

APPENDIX G

Fish & Wildlife Impact Analysis Decision Key

Appendix 3C **Fish and Wildlife Resources Impact Analysis Decision Key**	If YES Go to:	If NO Go to:
1. Is the site or area of concern a discharge or spill event?	[✓ 13]	2
2. Is the site or area of concern a point source of contamination to the groundwater which will be prevented from discharging to surface water? Soil contamination is not widespread, or if widespread, is confined under buildings and paved areas.	13	3
3. Is the site and all adjacent property a developed area with buildings, paved surfaces and little or no vegetation?	4	9
4. Does the site contain habitat of an endangered, threatened or special concern species?	Section 3.10.1	5
5. Has the contamination gone off-site?	6	14
6. Is there any discharge or erosion of contamination to surface water or the potential for discharge or erosion of contamination?	7	14
7. Are the site contaminants PCBs, pesticides or other persistent, bioaccumulable substances?	Section 3.10.1	8
8. Does contamination exist at concentrations that could exceed ecological impact SCGs or be toxic to aquatic life if discharged to surface water?	Section 3.10.1	14
9. Does the site or any adjacent or downgradient property contain any of the following resources? See Figure 5 i. Any endangered, threatened or special concern species or rare plants or their habitat ii. Any DEC designated significant habitats or rare NYS Ecological Communities iii. Tidal or freshwater wetlands iv. Stream, creek or river — Ellicott Creek adjacent to the Site and Tonawanda Creek is located to the north and west. v. Pond, lake, lagoon vi. Drainage ditch or channel vii. Other surface water feature viii. Other marine or freshwater habitat — Mussel Screening Stream Rare Plants and Rare Animals listed as Special Concern are located 0.25 miles south of Site. ix. Forest x. Grassland or grassy field xi. Parkland or woodland xii. Shrubby area xiii. Urban wildlife habitat xiv. Other terrestrial habitat	11	10
10. Is the lack of resources due to the contamination?	3.10.1	14
11. Is the contamination a localized source which has not migrated and will not migrate from the source to impact any on-site or off-site resources?	14	12
12. Does the site have widespread surface soil contamination that is not confined under and around buildings or paved areas?	Section 3.10.1	12
13. Does the contamination at the site or area of concern have the potential to migrate to, erode into or otherwise impact any on-site or off-site habitat of endangered, threatened or special concern species or other fish and wildlife resource? (See #9 for list of potential resources. Contact DEC for information regarding endangered species.) To Be Determined as Part of Remedial Investigation	Section 3.10.1	14
14. No Fish and Wildlife Resources Impact Analysis needed. To Be Determined as Part of Remedial Investigation		