Remedial Investigation / Interim Remedial Measures Work Plan

December 2017 0369-016-001

Prepared For:

Affinity Elmwood Gateway Properties LLC

Prepared By:

Benchmark Environmental Engineering & Science, PLLC

In Association With:

TurnKey Environmental Restoration, LLC

WORK PLAN
FOR
REMEDIAL INVESTIGATION/INTERIM REMEDIAL MEASURES

1111 ELMWOOD AVENUE SITE
BUFFALO, NEW YORK

December 2017 0369-016-001

Prepared for:

Affinity Elmwood Gateway Properties LLC

Prepared by:

BENCHMARK
ENVIRONMENTAL
ENGINEERING &
SCIENCE, PLLC

In Association With:

TURNKEY
ENVIRONMENTAL
RESTORATION, LLC

Certification

I, Thomas H. Forbes, certify that I am currently a NYS registered professional engineer and that this December 2017 Remedial Investigation/Interim Remedial Measures (RI/IRM) Work Plan for the 1111 Elmwood Avenue Site 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).

12-11-17

Date

THOMAS H. FORBES

No. 70950-1

RI/IRM WORK PLAN

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Buffalo, New York
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1.0 INTRODUCTION

This document presents the proposed scope of work and implementation procedures for completion of a Remedial Investigation (RI) and planned Interim Remedial Measures (IRM) at the 1111 Elmwood Avenue Site (Site), located at 1111 Elmwood Avenue, Buffalo, New York (see Figures 1 and 2).

The Applicant, Affinity Elmwood Gateway Properties LLC, acting as a Volunteer has elected to pursue cleanup and redevelopment of the Site under the New York State Brownfield Cleanup Program (BCP) and has submitted a BCP Application to the New York State Department of Environmental Conservation (NYSDEC) in conjunction with this work plan. The planned redevelopment is to develop the Site into a 4-story mixed-use residential/commercial project. The RI/IRM will be completed by Benchmark Environmental Engineering & Science, PLLC (Benchmark) in association with TurnKey Environmental Restoration, LLC (TurnKey), on behalf of the Applicant. The work will be completed in accordance with NYSDEC DER-10 guidelines (Ref. 1).

1.1 Site Background

The Site consists of one (1) parcel (SBL No. 89.62-1-1.1211) totaling ±0.97 acres, at the southeast corner of Elmwood and Forest Avenues, in the City of Buffalo, Erie County, New York.

The Site is currently improved with ten (10), 3 story commercial and/or residential buildings which will be demolished prior to implementation of the RI/IRM. The remaining portion of the Site consists of vegetative, asphalt and concrete surface cover.

The Site has a long history of being utilized for various residential and commercial uses since the early 1900s.

Previous environmental investigations completed at the Site have identified elevated levels of semi-volatile organic compounds (SVOCs) and metals at concentrations exceeding applicable regulatory guidelines, specifically Part 375 Restricted-Residential Soil Cleanup Objectives (RRSCOs). Details of the previous investigations 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. However, due to the timing of the project schedule, an IRM component has been included in this work plan to address the known contamination and that identified during the RI. The primary objectives of this RI/IRM 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 potential to migrate off-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/IRM, 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 data confidence levels will be employed in the RI: screening level data and definitive level data. In general, screening level confidence will apply to field measurements, including PID measurements, groundwater elevation measurements, and field analyses (i.e., pH, temperature, dissolved oxygen, specific conductivity, and turbidity). Definitive level confidence will apply to samples for chemical analysis. The applicability of these levels of data will be further specified in the Quality Assurance Project Plan (QAPP) in Section 5.0. Sampling and analytical acceptance and performance criteria such as precision, accuracy, representativeness, comparability, completeness, and sensitivity, are defined in the QAPP.

An IRM will be completed to immediately address known environmental impacts at the Site and those identified during the RI. An IRM will quickly mitigate risks to public health and the environment. In general, IRM activities may include: excavation of impacted soil/fill; removal of above or underground storage tanks, if identified, along with any associated impacted soil/fill; and, off-Site disposal of impacted soil/fill. This Work Plan presents the scope of anticipated IRM activities based on current information and may be modified, subject to NYSDEC approval, immediately after the RI fieldwork is completed.

The Volunteer's intent is for the planned IRM to substantially constitute the final remedy for those areas of the Site, and as such will strive to achieve 6NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (USCOs). The final remedial objectives for the Site will be presented in the Alternatives Analysis Report (AAR) based on the findings of the RI and IRM(s).

Details of anticipated IRM activities are included in Section 4.0.

1.3 Project Organization and Responsibilities

The Applicant, Affinity Elmwood Gateway Properties LLC, has applied to the New York State BCP as a non-responsible party (volunteer) per ECL§27-1405. Benchmark, in association with TurnKey, herein referred to jointly as Benchmark-TurnKey, will complete the remedial investigation and manage the brownfield cleanup on behalf of the Applicant. Benchmark-TurnKey will also be responsible to verify and certify that the brownfield remedial action was completed in conformance with the approved IRM 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/IRM Work Plan, and NYSDEC DER-10 guidance (May 2010) by Benchmark-TurnKey.

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

Company	Role	Name	Contact Information
Affinity Elmwood Gateway Properties LLC	Applicant contact	Jeff Birtch	(716) 833-1000
Benchmark/TurnKey	Project Officer	Thomas H. Forbes, P.E.	(716) 856-0599
Benchmark/TurnKey	Project Manager	Christopher Boron	(716) 856-0635
TBD	Analytical Testing	TBD	TBD
TBD	Drilling Services	TBD	TBD
TBD	Excavation Services	TBD	TBD
Data Validation Services	DUSR	Judy Harry	TBD

2.0 SITE DESCRIPTION

2.1 General

The Site is located in a highly developed mixed use commercial and residential area, being bound by Forest Avenue to the north, Elmwood Avenue to the west, commercial use to the south, and residential use to the east. The Site is currently improved with a twelve (12) 3-story commercial and/or residential buildings at the corner of Elmwood and Forest Avenues which will be demolished for site redevelopment (see Figures 1, 2, 3).

2.2 Site Topography and Drainage

The Site is generally flat lying with topographic relief sloping towards Elmwood Avenue and Forest Avenue. The surface of the Site is covered with the existing buildings, asphalt/concrete, gravel and green space. Precipitation (i.e., rain or melting snow) moves to the storm drains in the roadways via overland flow. Surface and shallow groundwater flow are likely affected by various cycles of development and filling, as well as utilities and foundations.

2.3 Geology and Hydrogeology

2.3.1 Overburden

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. According to the United States Department of Agriculture (USDA) Web soil survey (Ref. 2), Site soils are generally characterized as Urban Land (UmA) Collamer complex. This complex consists of nearly level and gently sloping areas of urban land and silty, deep and moderately well drained Collamer soils. This complex is in urban areas in the City of Buffalo and its metropolitan areas, ranging from 5 to 500 acres and are in oblong or irregular shapes. The presence of overburden fill material is widespread and common throughout the City of Buffalo. 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 Onondaga Formation of the Middle Devonian Series. The Onondaga Formation is comprised of a varying texture from coarse to very finely crystalline with a dark gray to tan color and chert and fossils within. The unit has an approximate thickness of 110 to 160 feet. Structurally, the bedrock formations strike in an east-west direction and exhibit a regional dip that approximates 40 feet per mile (0.4 degrees) toward the south and southwest. Depth to and type of bedrock below the Site is assumed to be 10 to 15 feet and Onondaga limestone, respectively, and will be confirmed by investigation activities.

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 northwesterly, towards the Niagara River, and along the flow path of Scajaquada Creek, which are located west and north, respectively from the Site. Scajaquada Creek flows towards and discharges into the Niagara River. Local groundwater flows, are likely influenced by subsurface features, such as utilities, and localized subgrade development conditions. Localized on-Site groundwater flow will be investigated during the RI, if encountered in overburden soil.

2.4 Climate

The City of Buffalo has a cold continental climate, with moisture from Lake Erie causing increased precipitation. Average annual precipitation is reportedly 40.5 inches and snowfall is 94 inches. Average temperature is 48.3 degrees Fahrenheit. The ground and lakes typically remain frozen from December to March. Winds are generally from the southwest (USClimateData.com).

2.5 Population and Land Use

The City of Buffalo, encompassing 40.38 square miles, has a population of 261,310 (2010 US Census Bureau). The Site is located in Census Tract 63.02, in the area of the city zoned for commercial/residential use.

The current zoning for the Site is N-2C: Neighborhood center (mixed use commercial areas at a neighborhood scale).

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

2.6 Utilities and Groundwater Use

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

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

2.7 Wetlands and Floodplains

There are no State or Federal wetlands or floodplains located on Site or adjacent to the Site.

2.8 Previous Investigations

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

2.8.1 March 2017 – Phase II Environmental Site Assessment

TurnKey Environmental Restoration completed a Phase II Environmental Investigation on the Site in March 2017. Findings of the Phase II investigation are detailed below:

- The Site, located at the southeast corner of Elmwood and Forest Avenues, is in a mixed-use area in the Elmwood Village in the City of Buffalo.
- SVOCs were detected at or above their respective Part 375 RRSCOs (i.e., the applicable SCOs for the intended Site reuse) at three (3) investigation locations, SB-6, HA-6 and TP-4. Benzo(a)pyrene was also detected at two (2) locations (SB-6 and TP-4) in exceedance of its Industrial SCO (ISCO).

- Metal analytes were detected above their respective RRSCOs at seven (7) investigation locations, SB-1, HA-1, HA-5, TP-2, TP-3, TP-4, and TP-6.
  - Arsenic exceeded its ISCO at two (2) locations (HA-1 and TP-6).
  - Chromium exceeded its Commercial SCO (CSCO) at one (1) location, TP-2.
  - Lead exceeded its CSCO at four (4) locations ((SB-1, HA-5, TP-3 and TP-4) and the ISCO at one (1) locations (TP-2).

A summary of previous investigation analytical results, described above, is provided on the table and figure 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:*** SVOCs and metals

3.0 REMEDIAL INVESTIGATION SCOPE OF WORK

The RI scope of work is focused on 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. 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 outdoor 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 1.

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 business days in advance of the work and informed of the intent to perform excavation work at the Site. If underground utilities are present on the property and are anticipated to interfere with intrusive activities, the Applicant and the NYSDEC will be contacted to discuss mitigating measures.

3.2 Building Demolition

Prior to initiating the RI, the existing structures at the Site will be demolished. As required by the City of Buffalo Demolition permit process, asbestos-containing materials (ACM) demolition surveys and ACM abatement will be completed, as necessary. Copies of the demolition permits will be provided the NYSDEC, if requested. The building demolition will be completed in accordance with local, state and federal laws.

Once the buildings are removed, and the area is cleared and accessible, the RI activities will begin. If additional concerns are noted during the RI, any proposed scope of work modifications will be discussed with the NYSDEC/NYSDOH personnel prior to implementation.

3.3 RI Soil/Fill Investigation

A soil/fill investigation will be completed across the Site to further assess whether additional impact exists 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 to allow for characterization of subsurface soil/fill material and sample collection. The proposed RI sample locations are presented on Figure 4 and the sampling and analytical program is presented on Table 1.

3.3.1 Surface Soil/Fill Investigation

No surface soil/fill sampling is proposed as part of the RI. Based on the historic investigations, the soil/fill present above the native soil is impacted and will be removed during the IRM to achieve the planned cleanup objectives (Unrestricted Track 1 cleanup).

3.3.2 Subsurface Soil/Fill Investigation

Fourteen (14) subsurface soil/fill exploratory locations will be completed after the buildings and garages are demolished. One test pit will be completed within the footprint of each structure after it is removed. These investigation locations, identified as RI-TP-1 through RI-TP-14, will be completed to approximately 15 feet below ground surface (fbgs) or bedrock refusal, whichever comes first.

Soil/fill samples retrieved from the soil borings will be field screened for the presence of volatile organics using a calibrated photoionization detector (PID) with a 10.6 eV lamp, as a procedure for ensuring the health and safety of personnel at the Site, and to identify potential impacts in soil samples for laboratory analysis. Upon reaching the completion depth of each location, field visual/olfactory and PID results will be reviewed. If significant field evidence of impact is encountered, soil borings will be expanded or supplemental step-back borings will be advanced in an attempt to delineate the extent of the impacts.

Observations for the presence of groundwater will also be made during the test pit investigation. Four (4) test pit locations will be left open overnight, to assess for the present of groundwater if not immediately observed during completion of the test pits.

If groundwater is determined to be present in the overburden soil, three (3) soil borings will be completed at a later date to install three (3) groundwater monitoring wells, identified as RI-MW-1 through RI-MW-3, as discussed in Section 3.4.

3.3.3 Soil/Fill Sample Collection and Analysis

Table 1 summarizes the proposed sample collection and analytical program. The soil samples identified as the most impacted, as described above, (i.e., greatest PID scan result and/or evidence of visual/olfactory impact) will be selected for analysis. In the event that either the impacts are ubiquitous from grade to final depth or no impacts are identified, the soil/fill sample interval will be collected to delineate previously identified impacts and uniformly characterize the Site as detailed on Table 1. If differentiable impacts are noted during the investigation, additional sample location(s) will be collected. The Department will be made aware of the differing impacts when they are encountered.

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. Soil samples will be analyzed in accordance with the Sampling and Analysis Plan presented on Table 1.

3.4 Groundwater Investigation

If the overburden groundwater is observed in the test pit investigation at the Site, three (3) groundwater monitoring wells, identified as RI-MW-1 through RI-MW-3, will be advanced across the Site to assess groundwater quality data and flow direction.

Unless the RI investigation identifies the presence of a contaminant that has a specific gravity greater than water at a depth greater than 10 fbgs, which has potential to impact bedrock groundwater, monitoring wells will be terminated at or before the top of bedrock.

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.

3.4.1 Monitoring Well Installation

The monitoring wells will be installed following the advancement of soil borings RI-MW-1 through RI-MW-3 with a rotary drill rig. Each well boring will be advanced to approximately 15 fbgs, or refusal, with a target minimum depth of five (5) feet below the first encountered groundwater. In the absence of groundwater contact during boring advancement, the soil boring will be advanced to the top of bedrock. 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.

Drill cuttings will be spread on-Site unless gross contamination (i.e., visible product) is encountered, in which case they will be placed in sealed NYSDOT-approved drums and labeled for subsequent characterization and disposal, if necessary.

3.4.2 Well Development

After installation, but not within 24 hours, newly installed monitoring wells will be developed in accordance with Benchmark-TurnKey and NYSDEC protocols. Development of the monitoring wells will be accomplished with dedicated disposable polyethylene bailers via surge and purge methodology. Field parameters including pH, temperature, turbidity, dissolved oxygen, oxidation-reduction potential (ORP) and specific conductance will be measured periodically (i.e., every well volume or as necessary) during development. Field measurements will continue until they became relatively stable. Stability will be defined as variation between measurements of approximately 10 percent or less with no overall upward or downward trend in the measurements. A minimum of three (3) well volumes will be evacuated from each monitoring well. Development water from the monitoring wells will be discharged to the ground surface in the vicinity of the monitoring well being developed. If impacts are noted during development including odors, sheen, light non-aqueous phase liquid (LNAPL), dense non-aqueous phase liquid (DNAPL), well development water 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.

3.4.3 Groundwater Sample Collection

Prior to sample collection, 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 dedicated polyethylene 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, turbidity, DO, ORP, specific conductance 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.

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

- **Submersible Pump with Dedicated Pump Tubing**

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

- **Polyethylene Disposable Bailer**

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

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

3.4.4 Groundwater Sample Analyses

The three (3) groundwater wells will be sampled for Target Compound List (TCL) plus CP-51 List VOCs, TCL SVOCs, Target Analyte List (TAL) Metals, PCBs, pesticides and herbicides. 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.

3.5 Field Specific Quality Assurance/Quality Control Sampling

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

3.6 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 Benchmark-TurnKey's field operating procedures presented in Appendix E. 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). 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. Benchmark-TurnKey will employ a handheld GPS unit to identify the locations of soil borings and monitoring wells relative to State planar grid coordinates. Monitoring well elevations will be measured by Benchmark-TurnKey's surveyor. An isopotential map showing the general direction of groundwater flow will be prepared based on water level measurements relative to USGS vertical datum. Maps will be provided with the RI report.

3.8 Documentation

Remedial Investigation and IRM field activities will be documented in a Project Field Book and/or handheld Rugged Reader® PDA. This logbook/PDA 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 C):

- 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

4.0 INTERIM REMEDIAL MEASURES

An IRM will be completed to address known environmental concerns previously identified (SVOCs and metals present in the historic fill) and other environmental concerns identified during the RI to expedite remedial activities and overall project schedule. Specifically, the planned IRM will address the historic soil/fill present at the Site with contaminants present above the Part 375 Unrestricted Soil Cleanup Objectives (USCOs).

This Work Plan includes planned IRM activities based on current information and may be modified, subject to NYSDEC approval, after the RI fieldwork is completed. The planned IRM includes the following tasks:

- Removal and landfill disposal of approximately 5,000 tons of soil/fill from across the Site; and
- Collection of post-excavation confirmatory samples.

The collection of post-excavation confirmatory samples will be from the extent of contamination excavation and/or BCP Site limits. The results of the IRM post-excavation samples will be used to assess if contamination present at the Site extends to off-site locations.

It has been estimated that approximately 5,000 tons of soil/fill will be removed from across the Site. Based on previous investigations, the depth of fill ranged from approximate 1 foot to greater than 5 feet. We estimated an average 2 foot cut across the 0.97 acre Site (42,253 square feet) and used a conversion of 1.6 tons per cubic yard to estimate the tonnage. The extent and depth of excavation (see Figure 5) may change based on the findings of the RI, actual field conditions encountered during the IRM and results of the confirmation samples. We note the amount of fill material adjacent to and beneath the structures is unknown.

The planned IRM is intended to constitute the NYSDEC-approved final remedy for the Site. We do not anticipate the need for an environmental easement or post-remedial requirements as the objective is to achieve a Track 1 Unrestricted cleanup. The final remedy for the Site will be determined in the Alternatives Analysis Report (AAR) for the project.

4.1 Utility Clearance

Prior to any intrusive activities, Dig Safely New York (Call 811) will be contacted by the site contractor a minimum of three business days in advance of the work and informed of the intent to perform excavation work at the Site. If underground utilities are present on the property and are anticipated to interfere with intrusive activities, the Applicant and the NYSDEC will be contacted to discuss mitigating measures. The location of identified subgrade utilities will be recorded and included on base drawings as part of the RI-IRM-AA Report.

4.2 Waste Characterization

Waste characterization samples will be collected in accordance with the disposal and/or recycling facilities requirements. Pre-characterization of the soil/fill will allow for direct loading and off-site transportation at the time of the impacted soil removal. Based on the results of the waste characterization sampling, impacted soil will be managed according to all federal, state and local waste disposal regulations.

4.3 Removal of Impacted Soil/Fill

The soil/fill present across the entire approximate 1.09 acre Site will be excavated and removed from proper landfill disposal.

Remedial excavation work will be directed by an experienced Benchmark-TurnKey professional to remove impacted soil/fill material. A PID and visual/olfactory observations will be used to screen soil/fill materials and assist in verifying removal of impacted soil/fill. Vertical excavation will continue, as described above, until the impacted soil/fill is removed and the Part 375 USCOs are achieved. The lateral extents of the remedial excavation will be to the boundary of the Site. These criteria will be satisfied unless excavation has reached the property line or NYSDEC agrees that no further excavation is required.

4.4 Excavation Confirmation Sampling

Post excavation confirmatory samples will be collected from the excavated areas, with bias toward material exhibiting evidence of visual and olfactory contamination, if remaining. Post-excavation confirmatory sample locations from the excavated areas will include samples from excavation sidewalls and bottom in accordance with DER-10. A minimum of one sample per 30 linear feet of sidewall and one sample for each 900 square feet of excavation bottom will be collected in accordance with DER-10. If the excavation is completed to bedrock, no bottom samples will collected.

Samples from the excavations will be analyzed for TCL SVOCs and TAL metals (unless additional contaminant classes are identified during the RI), in accordance with USEPA Methodology with an equivalent Category B deliverables package to facilitate data evaluation by a third-party validation expert. Expedited turnaround times may be requested for the analytical results to minimize the time that the excavation(s) remains open. Additional analytical parameters may be analyzed from post-excavation confirmatory samples, based on the results of the RI and consultation with the Department.

4.5 Groundwater Management

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

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

4.6 Excavation Backfill

As the goal of the remedial activities is to achieve the USCOs and allow redevelopment activities begin, backfill at the Site will not likely occur until subsurface redevelopment activities are complete. Materials brought to the Site for use during redevelopment will be in accordance with DER-10 requirements.

The imported materials will be placed in accordance with redevelopment requirements to achieve design grades necessary to facility redevelopment activities (e.g., geotechnical requirements). Table 2 includes the chemical criteria for import of backfill material to the Site. Backfill will comply with DER-10 guidance.

5.0 QUALITY ASSURANCE PROJECT PLAN

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

The QAPP will assure the accuracy and precision of data collection during the Site characterization and data interpretation periods. The QAPP identifies procedures for sample collection to mitigate the potential for cross-contamination, as well as analytical requirements necessary to allow for independent data validation. The QAPP has been prepared in accordance with USEPA's Requirements for Quality Assurance Project Plans for Environmental Data Operations (Ref. 3); the EPA Region II CERCLA Quality Assurance Manual (Ref. 4), and NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

5.1 Scope of the QAPP

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

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

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

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

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

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

5.2 QAPP Organization and Responsibility

The principal organizations involved in verifying achievement of data collection goals for the 1111 Elmwood Avenue Site include: the NYSDEC, NYSDOH, Affinity Elmwood Gateway Properties LLC (Volunteer), Benchmark Environmental Engineering and Science, PLLC and TurnKey Environmental Restoration, LLC (Volunteer's Consultants), the drilling subcontractor(s), the independent environmental laboratory, and the independent third party data validator. Roles, responsibilities, and required qualifications of these organizations are discussed in the following subsections. Resumes are included in Appendix A.

5.2.1 NYSDEC and NYSDOH

It is the responsibility of the YSDEC), in conjunction with the NYSDOH, to review the RI/IRM Work Plan and supporting documents, for completeness and conformance with the site-specific cleanup objectives and to make a decision to accept or reject these documents based on this review. The NYSDEC also has the responsibility and authority to review and approve all QA documentation collected during brownfield cleanup construction and to confirm that the QA Plan was followed.

5.2.2 Volunteer

Affinity Elmwood Gateway Properties LLC ("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.

5.2.3 Environmental Consultant

Benchmark Environmental Engineering & Science, PLLC (Benchmark) in association with TurnKey Environmental Restoration, LLC (TurnKey), are the prime engineering and scientific consultants, respectively, on this project and are responsible for the implementation of the RI/IRM Work Plan, including, but not limited to, field operations, laboratory testing, data management, data analysis and reporting. Any one member of Benchmark's or TurnKey's staff may fill more than one of the identified project positions (e.g., field team leader and site safety and health officer). The various quality assurances, field, laboratory, and management responsibilities of key project personnel are defined below.

- *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.

- *Project Manager (PM):* *Christopher Boron*

  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:* *Christopher Boron*

  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.

5.3 Quality Assurance (QA) Responsibilities

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

- *Project QA Officer:* *Lori E. Riker*

  Specific function and duties include:
  - 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

5.4 Field Responsibilities

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

5.5 Quality Assurance Objectives for Measurement Data

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

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

5.6 Level of QC Effort for Sample Parameters

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

- Field and trip blanks consisting of distilled water will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field-sampling program. Field (equipment) blank samples are analyzed to check for procedural chemical constituents at the facility that may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage.

- Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures.

- Duplicate samples are analyzed to check for sampling and analytical reproducibility.

- MS/MSD and MS/Duplicate samples provide information about the effect of the sample matrix on the digestion and measurement methodology. Depending on site-specific circumstances, one MS/MSD or MS/Duplicate should be collected for every 20 or fewer investigative samples to be analyzed for organic and inorganic chemicals of a given matrix (see Table 4).

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

5.7 Sampling and Analysis Plan

Methods and protocol to be used to collect environmental samples (i.e., soil, groundwater, and sub-slab vapor) for this investigation are described in the Benchmark-TurnKey Field Operating Procedures (FOPs), summarized on Table 3 and presented electronically in Appendix E.

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

5.7.1 Custody Procedures

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

5.7.2 Sample Storage

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

5.7.3 Sample Custody

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

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

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

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

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

5.7.4 Sample Tracking

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

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

5.7.5 Split Sampling

The Department may split any soil, groundwater, or collect additional air samples at the Department's expense, during this RI/IRM. Benchmark-TurnKey personnel will cooperate with the Department to facilitate split sampling, as requested.

5.8 Calibration Procedures and Frequency

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

5.8.1 Field Instrument Calibration

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

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

5.9 Analytical Procedures

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

5.9.1 Field Analytical Procedures

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

5.10 Data Usability Evaluation

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

5.10.1 Procedures Used to Evaluate Field Data Usability

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

5.10.2 Procedures Used to Evaluate Laboratory Data Usability

Data evaluation will be performed by the third party data validator using the most current methods and quality control criteria from the USEPA's Contract Laboratory Program (CLP) *National Functional Guidelines for Organic Data Review* (Ref. 5), and Contract Laboratory Program, *National Functional Guidelines for Inorganic Data Review* (Ref. 6). The data review guidance will be used only to the extent that it is applicable to the SW-846 methods; SW-846 methodologies will be followed primarily and given preference over CLP when differences occur. Also, results of blanks, surrogate spikes, MS/MSDs, and laboratory control samples will be reviewed/evaluated by the data validator. All sample analytical data for each sample matrix shall be evaluated. The third party data validation expert will also evaluate the overall completeness of the data package. Completeness checks will be administered on all data to determine whether deliverables specified in this QAPP are present. The reviewer will determine whether all required items are present and request copies of missing deliverables.

6.0 INVESTIGATION SUPPORT DOCUMENTS

6.1 Health and Safety Protocols

Benchmark-TurnKey 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 D, includes the following site-specific information:

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

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

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

6.1.1 Community Air Monitoring

Real-time community air monitoring will be performed during the RI and IRM activities at the Site. A CAMP is included within Benchmark-TurnKey's HASP (see HASP Appendix D). Particulate and VOC monitoring will be performed along the downwind perimeter of the work area during subgrade excavation, grading and soil/fill handling activities in accordance with this plan. The CAMP is consistent with the requirements for community air monitoring at remediation sites as established by the New York State Department of Health (NYSDOH) and NYSDEC. Accordingly, it follows procedures and practices outlined under NYSDEC's DER-10 (May 2010) Appendix 1A (NYSDOH's Generic Community Air Monitoring Plan) and Appendix 1B (Fugitive Dust and Particulate Monitoring).

6.1.2 Storm Water Pollution Prevention Plan

A storm water pollution prevention plan (Ref. 7) has been prepared for the Site and has been included as Appendix F. During the excavation and regrading activities, the contractor will undertake specific measures to assure proper management of storm water and preclude migration of contaminants to surface waters or other areas of the Site. These will include:

- Protection of active catch basins with silt socks surrounding the catch basin and/or temporary filter fabric placed beneath the catch basin cover.
- Direct loading of trucks or roll-offs, where feasible, to avoid staging of impacted materials.
- Use of poly sheeting for lay-down and daily cover if staging of impacted materials is necessary.
- Prompt regrading of excavations upon completion.

6.2 Citizen Participation Activities

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

7.0 REPORTING AND SCHEDULE

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

7.1 Remedial Investigation Reporting

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

- 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, IRM activities, 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 Work Plan;
- The data obtained during the RI and historical investigations, considered by Benchmark-TurnKey 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, 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, Benchmark-TurnKey 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.

7.2 IRM Reporting

A qualified environmental professional (QEP) will be on-Site to document IRM activities. Such documentation will include, at minimum, daily reports of IRM activities, community air monitoring results, photographs and corrective measures report, if necessary.

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

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

7.3 Alternatives Analysis Report

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

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

Based on the remedial action objectives and SCOs, volumes and areas of media potentially requiring additional remediation will be calculated. General response actions will then be delineated to address each of the site problem areas. These response actions will form the foundation for the development and screening of applicable remedial alternatives against the following criteria as described in 6NYCRR 375-1.8(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.

8.0 PROJECT SCHEDULE

A tentative project schedule for the major tasks to be performed in support of the RI/ IRM/AAR is presented as Figure 5.

9.0 REFERENCES

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

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

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

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

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

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

7. Carmina Wood Morris, D.P.C. *Stormwater Pollution Prevention Plan for Construction Activities at 1111 Elmwood Avenue, City of Buffalo, Erie County, New York.* April 2017.

TABLES

TABLE 1

SAMPLING AND ANALYSIS PLAN

RI/IRM WORK PLAN

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

Matrix	Investigation Location		Estimated Number of Samples	Full List VOCs [1]	TCL SVOCs	TAL Metals	PCBs	Pesticides	Herbicides
	TP-1	Subsurface Soil/Fill	2	1	2	2	1	1	1
	TP-2		2		2	2			
	TP-3		2	1	2	2	1	1	1
	TP-4		2		2	2			
	TP-5		2	1	2	2	1	1	1
	TP-6		2		2	2			
	TP-7		2	1	2	2	1	1	1
	TP-8		2		2	2			
	TP-9		2	1	2	2	1	1	1
	TP-10		2		2	2			
	TP-11		2	1	2	2	1	1	1
	TP-12		2		2	2			
QA/QC	Soil	MS	1	1	2	2	1	1	1
		MSD	1	1	2	2	1	1	1
		Blind Dup	1	1	2	2	1	1	1
TOTAL SOIL & AIR SAMPLES:				**9**	**30**	**30**	**9**	**9**	**9**
Groundwater	MW-1	Northern	1	1	1	1	1	1	1
	MW-2	Central	1	1	1	1	1	1	1
	MW-3	Southern	1	1	1	1	1	1	1
QA/QC	Groundwater	MS	1	1	1	1	1	1	1
		MSD	1	1	1	1	1	1	1
		Blind Dup	1	1	1	1	1	1	1
	Submersible Pump	Equipment Blank	1	1	1	1	1	1	1
TOTAL GROUNDWATER SAMPLES:				**7**	**7**	**7**	**7**	**7**	**7**

Notes:

1. Full List VOCs = TCL plus CP-51 List VOCs via Method 8260.
2. All locations shall be sampled and archived by the laboratory for potential analysis / reanalysis.
3. GW field parameters including: pH, specific conductance, temperature, DO, ORP, and turbidity will be collected and recorded.

Acronyms:

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

TABLE 2

CRITERIA FOR USE OF OFF-SITE SOIL

1111 ELMWOOD AVENUE SITE

BUFFALO, 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 2

CRITERIA FOR USE OF OFF-SITE SOIL

1111 ELMWOOD AVENUE SITE

BUFFALO, 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 2

CRITERIA FOR USE OF OFF-SITE SOIL

1111 ELMWOOD AVENUE SITE

BUFFALO, 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

Benchmark Environmental Engineering & Science, PLLC

TurnKey Environmental Restoration, LLC

TABLE 2

CRITERIA FOR USE OF OFF-SITE SOIL

1111 ELMWOOD AVENUE SITE

BUFFALO, 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 Restricted Residential 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 3

SAMPLE CONTAINER, VOLUME, PRESERVATION & HOLDING TIME REQUIREMENTS

1111 ELMWOOD AVENUE SITE

BUFFALO, 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
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

References:

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

Notes:

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

TABLE 4

SUMMARY OF FIELD OPERATING PROCEDURES

REMEDIAL INVESTIGATION / INTERIM REMEDIAL MEASURES WORK PLAN

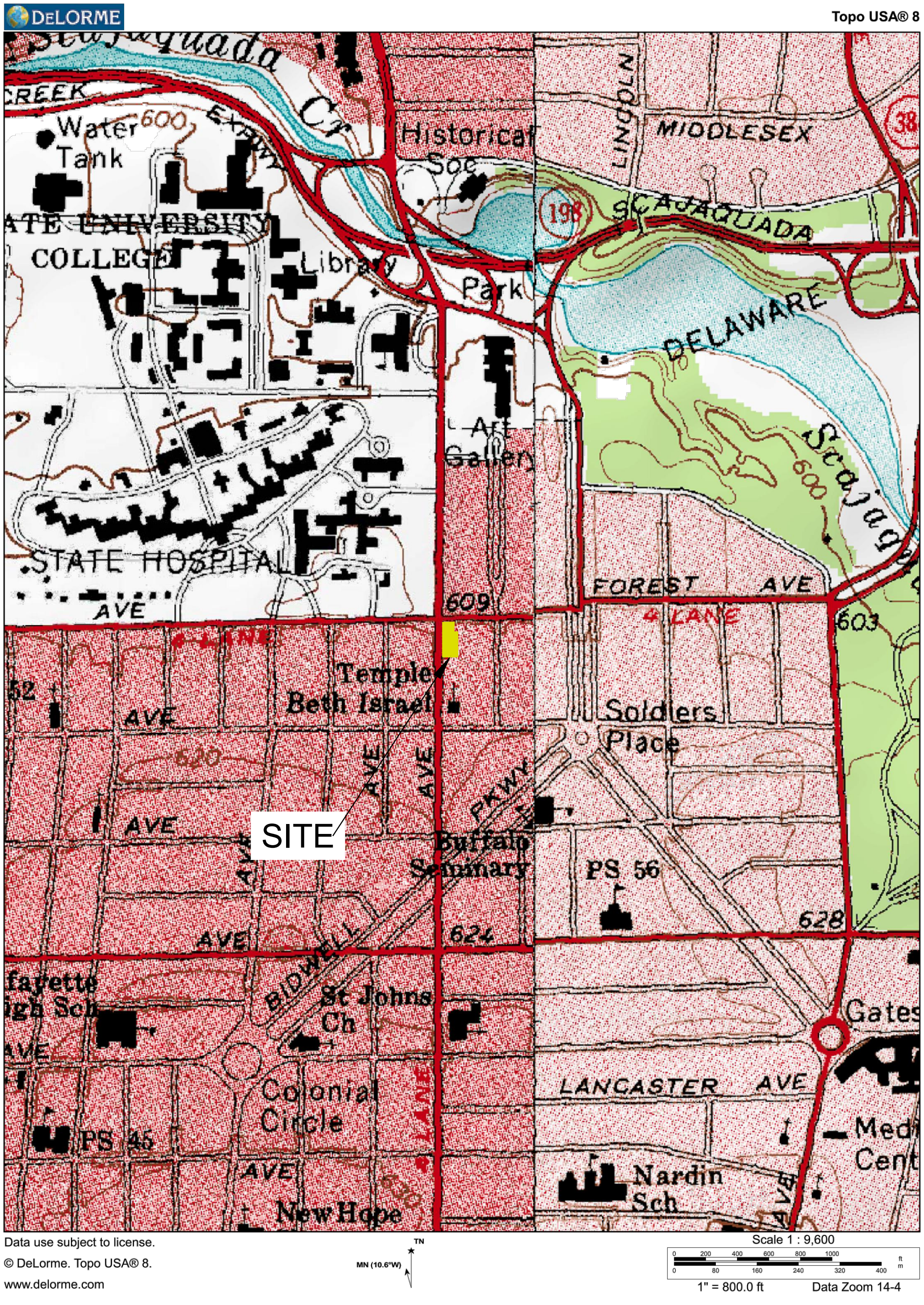
1111 Elmwood Avenue Site

Buffalo, New York

FOP No.	Procedure
001.1	Abandonment of Borehole Procedures
002.0	Abandonment of Monitoring Wells Procedure
007.0	Calibration and Maintenance of Portable Dissolved Oxygen Meter
008.0	Calibration and Maintenance of Portable Field pH/Eh Meter
009.0	Calibration and Maintenance of Portable Field Turbidity Meter
011.1	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
015.0	Documentation Requirements for Drilling and Well Installation
017.0	Drill Site Selection Procedure
018.0	Drilling and Excavation Equipment Decontamination Procedures
021.0	Establishing Horizontal and Vertical Control
022.0	Groundwater Level Measurement
023.1	Groundwater Purging Procedures Prior to Sample Collection
024.1	Groundwater Sample Collection Procedures
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 Impacted Soil Removal Activities
054.2	Soil Description Procedures Using The Visual-Manual Method
058.0	Split-Spoon Sampling Procedures
063.2	Surface and Subsurface Soil Sampling Procedures
065.1	Test Pit Excavation and Logging Procedures
073.2	Real-Time Air Monitoring During Intrusive Activities
078.0	Geoprobe Drilling Procedure
079.0	Stockpile Sampling Procedures for Chemical Analysis
080.0	Stockpile & Borrow Source Sampling Procedures for Physical Analysis
082.0	Waste Sampling Procedures
084.0	Calibration and Maintenance of Portable Particulate Meter
085.0	Field Quality Control Procedures

FIGURES

FIGURE 1



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BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

TURNKEY ENVIRONMENTAL RESTORATION, LLC

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

PROJECT NO.: 0369-016-001

DATE: DECEMBER 2017

DRAFTED BY: KRR-CMC

SITE LOCATION AND VICINITY MAP

RI / IRM WORK PLAN

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

FIGURE 2

BENCHMARK
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ENVIRONMENTAL
RESTORATION, LLC

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

PROJECT NO.: 0369-016-001

DATE: DECEMBER 2017

DRAFTED BY: CMC

SITE PLAN

RI / IRM WORK PLAN

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

FIGURE 3

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

LEGEND:

━ BCP SITE PROPERTY BOUNDARY

BENCHMARK
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ENVIRONMENTAL
RESTORATION, LLC

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PROJECT NO.: 0369-016-001

DATE: DECEMBER 2017

DRAFTED BY: CMC

PRELIMINARY PROJECT RENDERING

RI / IRM WORK PLAN

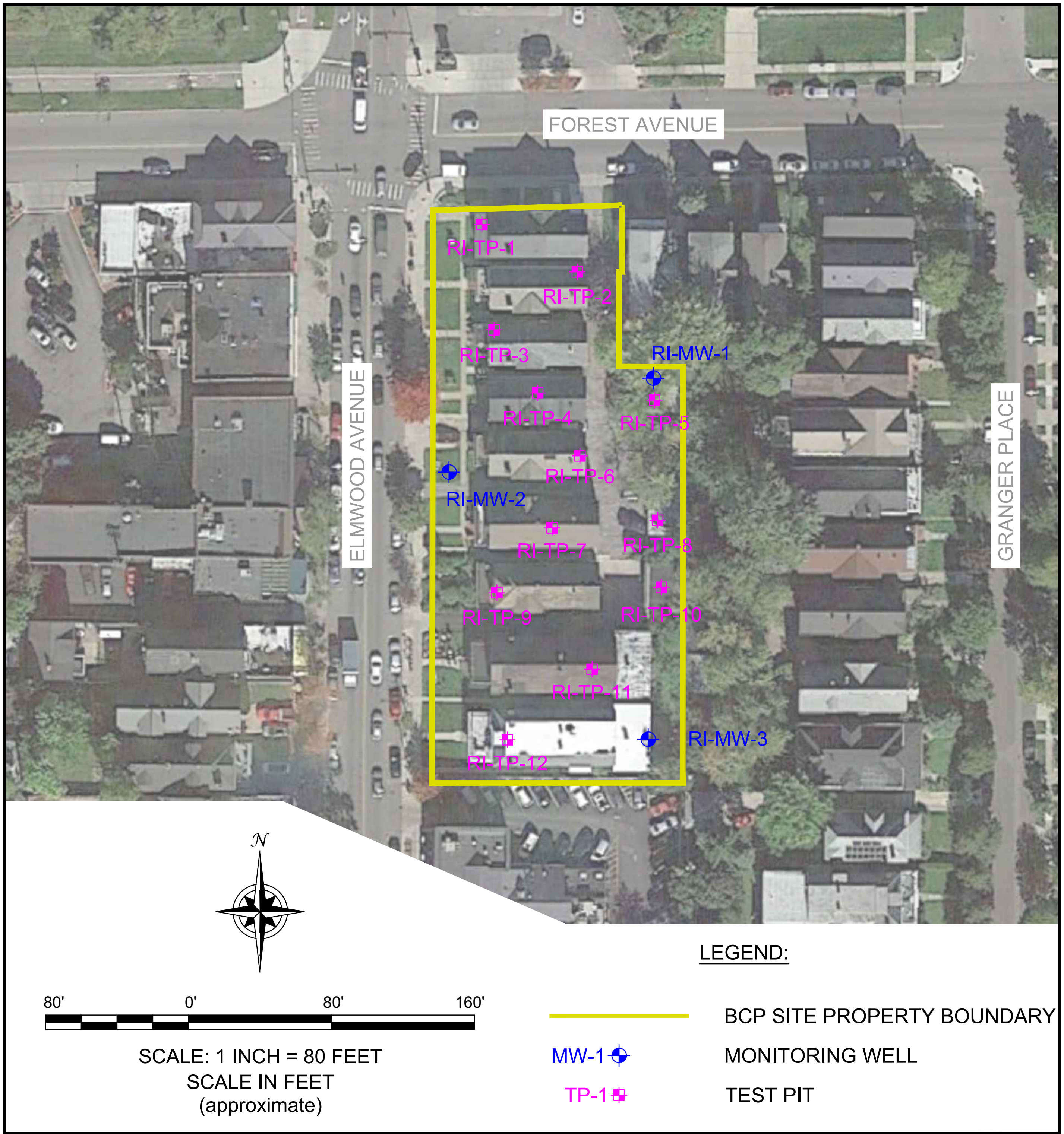
1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

FIGURE 4



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PROJECT NO.: 0369-016-001

DATE: DECEMBER 2017

DRAFTED BY: CMC

PROPOSED REMEDIAL INVESTIGATION LOCATIONS

RI / IRM WORK PLAN

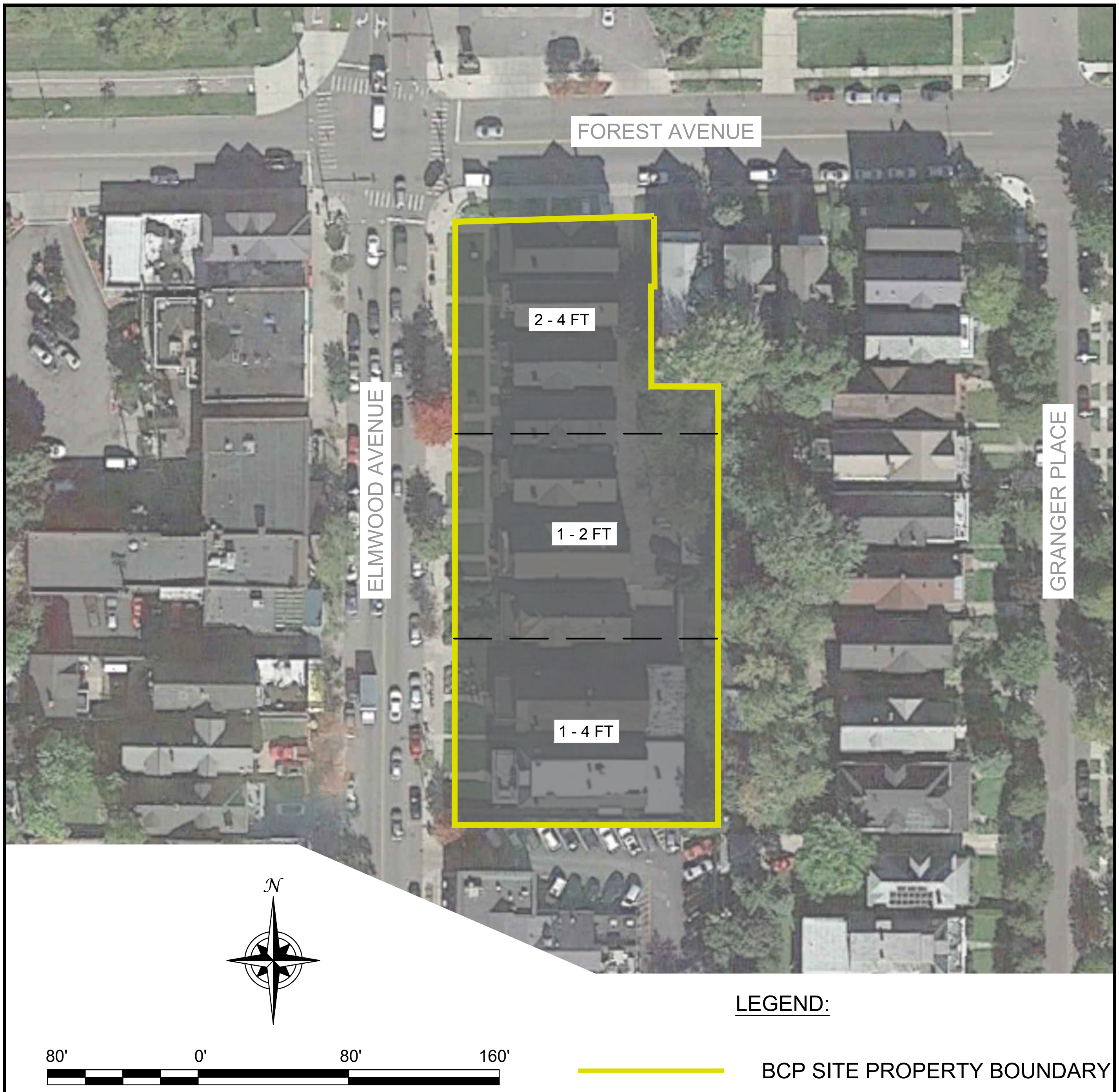
1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

FIGURE 5



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

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PROJECT NO.: 0369-016-001

DATE: DECEMBER 2017

DRAFTED BY: CMC

PROPOSED REMEDIAL INTERIM REMEDIAL MEASURES

RI / IRM WORK PLAN

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

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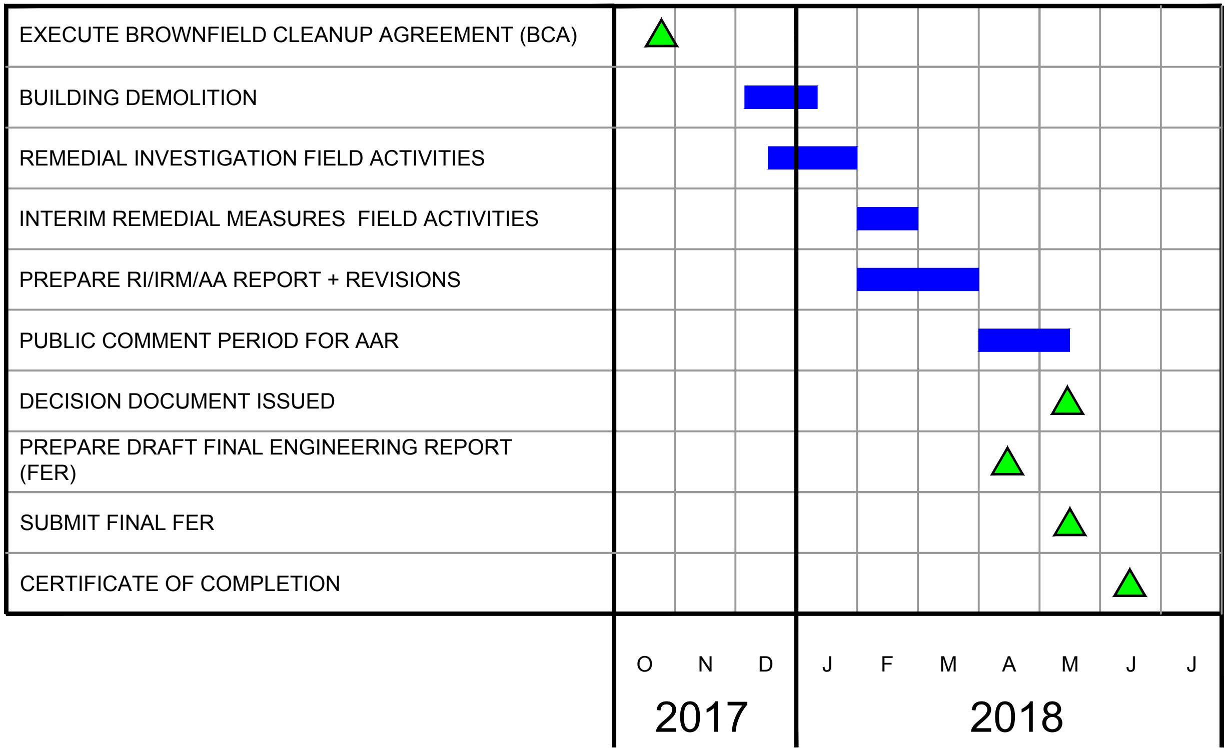
PROJECT TASKS:



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PROJECT NO.: 0369-016-001

DATE: DECEMBER 2017

DRAFTED BY: CMC

PRELIMINARY PROJECT SCHEDULE

RI / IRM WORK PLAN

1111 ELMWOOD AVENUE SITE
BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES, LLC

FIGURE 6

APPENDIX A

RESUMES

EDUCATION

BS (Chemical Engineering) 1988; State University of New York at Buffalo
Graduate of State University of New York at Buffalo School of Management Center for Entrepreneurial Leadership; 2002
Graduate-level courses in Biological Principles of Engineering and Hazardous Waste Management through the State University of New York at Buffalo Department of Environmental Engineering

REGISTRATION AND AFFILIATIONS

Professional Engineer, New York
Professional Engineer, Ohio
ISO 14000 Certified Lead Auditor - April 1998
Member - American Institute of Chemical Engineers
Member – New York Water Environment Association, Inc.

SUMMARY OF EXPERIENCE

Mr. Forbes has over 26 years of environmental engineering experience, with a particular focus on brownfield and hazardous waste site investigation and remediation; petroleum-impacted site remediation; due diligence for environmentally-impaired properties; groundwater and industrial wastewater treatment; and environmental regulatory compliance. Investigations and cleanups Mr. Forbes has directed have included well over 100 sites contaminated with a wide range of materials, including chlorinated solvents, PCBs, dioxins, heavy metals, cyanide, radioactive isotopes, and petroleum contamination. He has evaluated and successfully implemented on a conventional and design-build basis cost-saving and innovative treatment technologies (e.g. in-situ and ex-situ physical-chemical, thermal, and biological treatment) as well as removal and containment methods for remediation.

REPRESENTATIVE PROJECT EXPERIENCE

June 1998 to Present: **Benchmark Environmental Engineering & Science, PLLC**

- Served as project manager for the investigation and hydrogeological assessment of the 2001 Webster Block site on behalf of the City of Buffalo. Work included a Phase II Site investigation, underground storage tank removal, groundwater pump test, and utility capacity evaluation performed under USEPA Pilot grant.

- Currently serving as Project Officer for NYSDEC Brownfield Cleanup Program (BCP) investigation and remediation of the former Millard Fillmore Gates Circle hospital complex in Buffalo, NY.

- Project officer for NYSDEC BCP investigation and cleanup of 154 South Ogden Street in concert with construction of the South Buffalo Charter School.

- Serving as project manager for remedial investigation, alternatives analysis, and remedial construction to facilitate redevelopment of over 450-acres of former steel manufacturing site property encompassing 33 separate BCP sub-parcel sites in Lackawanna, New York. Contaminants of concern primarily include petroleum organics/solvents and heavy metals.

- Project manager for RI/FS, remedial design and remedial construction at the Sycamore Village Site, a 4-acre NY State Environmental Restoration Program (ERP) site in Buffalo, NY. Responsible for all technical and administrative aspects of the project, involving removal of over 18,000 cubic yards of soil from an impacted residential neighborhood and site restoration.

- Assisted western NY client's legal counsel prepare legal defense related to a multi-PRP suit by Orange County Water District, Fullerton, CA for primary drinking water aquifer contamination by chlorinated solvents and emergent organic contaminants. Served as technical consultant during mediation and settlement discussions; prepared expert report and lead technical arguments on behalf of defendant to support bankruptcy claim dismissal.

- Served as project manager and supervising contractor for design-build remedial activities at the Markhams National Priority List (NPL) site in Dayton, NY. Successfully implemented remedial measures leading to USEPA-designated Preliminary Site Closeout status in October 2008 and delisting in 2009.

- Served as project manager representing multiple potential responsible party (PRP)-led remedial construction activities to address heavy metal and chlorinated solvent impacts at the Peter Cooper Landfill NPL site. Responsible for oversight and coordination of RI/FS planning and implementation activities, lead technical contact with USEPA, and remedial measures design and construction. Achieved site closeout in 2011.

- Served as project manager for design-build cleanup of the Urbana Landfill Site, a Class 2 Hazardous Waste Landfill Site. Designed and successfully implemented a Soil Vapor Extraction system to address source area chlorinated organics in soils, achieving soil cleanup goals with 12 months, Also responsible for design, startup and continued operation of a downgradient perimeter groundwater extraction well system and groundwater remediation utilizing advanced oxidation treatment.

- Assisted in the development of a voluntary cleanup plan for remediation of a 120-acre former steel manufacturing site in Buffalo, NY which was contaminated with volatile organic compounds, heavy metals, poly-nuclear aromatic hydrocarbons. Specific assistance involved design of a soil vapor extraction (SVE) system to address VOC and SVOC source area impacts proximate to a residential neighborhood and development and implementation of a Community Air Monitoring Plan involving quantitative monitoring (Summa Canister and respirable particulate analysis) and qualitative monitoring (field instruments).

- Served as Project Manager for RI/FS and cleanup activities related to solvent releases from a former paint and specialty coatings manufacturing facility in Buffalo, NY. The work, carried out under NY State Superfund program, included insitu treatment of soils and groundwater impacted by chlorinated and non-chlorinated volatile organics and heavy metals.

- Assisted confidential client's legal counsel negotiate a consent decree with New Mexico Environment Department related to cleanup of chlorinated solvent releases to the fractured bedrock aquifer from a former manufacturing operation in Albuquerque, NM. Presently managing insitu groundwater cleanup and monitoring work.

- Currently serving as Project Manager for NY State Voluntary Cleanup efforts for chlorinated solvent cleanup at a former degreasing and electroplating facility in Rochester, NY. Designed and implemented interim remedial measures involving low-profile air stripping and insitu hydrogen infusion.

- Served as Project Manager for multiple EPA Pilot-Grant funded investigations for City of Buffalo Department of Strategic Planning.

- Project manager for remedial investigation, alternatives analysis, and remedial construction to facilitate redevelopment of over 450-acres of former steel manufacturing site property in Lackawanna, New York. Contaminants of concern primarily include petroleum organics and heavy metals.

- Managed design-build cleanup of former New 7th Street Brownfield Cleanup Program Site in Buffalo, New York. The project involved design-build removal of several hundred tons of petroleum-impacted soil and fill material and preparation of related engineering reports resulting in Certificate of Completion issuance.

- Led remedial efforts for petroleum releases at a Western New York refinery and major oil storage facility, achieving site inactivation within 3 months of the release.

- Managed spill site investigation and cleanup work including underground storage tank removal work at numerous petroleum and chemical spill sites in Western New York.

- Led design-build construction of a 5 MGD capacity cooling water pH adjustment system for PVS Chemical Corporation. The project included design of feed forward pH control system, adjustment tank and mixer construction, process and chemical feed piping modifications to neutralize sulfuric acid discharges. Successfully implemented startup and demonstration testing.

- Designed a 75 gpm groundwater treatment system and served as quality assurance officer for remedial efforts at the Steelfields site (former LTV Steel/Hanna Furnace Site), Buffalo, NY. The treatment system removes petroleum-based volatile organic and semi-volatile organic compounds prior to discharge to the Buffalo Sewer Authority.

June 1988 to June 1998 **Malcolm Pirnie, Inc.**

- Assisted the City of Buffalo Department of Community Development in implementing an emergency PCB-contaminated soil removal effort from a residential neighborhood in Buffalo, NY. Responsibilities included coordination of hazmat excavation contractor and secure landfill, preparation of an emergency excavation and confirmatory sampling plan, and oversight of community air monitoring during the removal work.

- Designed and successfully implemented an innovative groundwater treatment system for the Mercury Aircraft, Inc. Class 2 hazardous waste site in Dresden, New York. Responsibilities included preparation of design plans and specifications for an advanced oxidation process and low profile air stripper, construction oversight and treatment system start-up.

- Performed a Feasibility Study and prepared an Engineering Design Report for remediation of PCB-contaminated soils and sediments at the Columbus McKinnon Corporation, Tonawanda, New York. Responsibilities included detailed evaluation of several remedial processes, completion of design calculations and remedial cost estimates, and preparation of a final report for submission to NYSDEC.

- Assisted in performance of a Feasibility Study for the West Valley Nuclear Demonstration Site. The Feasibility Study evaluated alternatives for remediation of groundwater contaminated with radioactive isotopes from a former containment area release.

- Assisted in the design and performed start-up of a groundwater remediation system for Moog, Inc., an aerospace parts manufacturer. The project, performed on a design-build basis, involved preparation of design plans, securing contractor bids for construction, and start-up of the remediation system, which incorporates filtration and air stripping to remove chlorinated volatile organic contaminants from groundwater.

- Designed and implemented groundwater monitoring well decommissioning procedures for the Love Canal site, Niagara Falls NY. The project was performed on behalf of NYSDEC and included abandoning of monitoring wells no longer used in the Love Canal landfill or in adjoining neighborhoods.

- Prepared an environmental monitoring plan for remediation of PCB-contaminated sediments in the St. Lawrence River along the General Motors, Inc. Powertrain Division facility in Massena, New York.

- Assisted in the performance of a Feasibility Study for remediation of volatile organic, PCB and heavy metal-contaminated soils and ground water at the Rochester Fire Academy, Rochester, New York.

PUBLICATIONS/PRESENTATIONS

Forbes, Thomas H. and Frappa, Richard H. "Innovative Remedial Measures for the Mercury Aircraft Site" Proceedings of the Purdue University 50th Annual Industrial Waste Conference, May 1995.

Frappa, Richard H., Forbes, Thomas H. and McManus, Anne Marie "A Blast to Remediate" Industrial Wastewater, July/August 1996.

Forbes, Thomas H. and McManus, Anne Marie "Advanced Oxidation Technology and Application" Proceedings of the University at Buffalo 28th Mid-Atlantic Industrial and Hazardous Waste Conference, July 1996.

Forbes, Thomas H. et al - "Pay to Throw in Buffalo" Proceedings of 1997 Solid Waste Association of North America annual conference.

Forbes, T.H. & Werthman, P.H. "Development of Site-Specific Cleanup Levels for Commercial Redevelopment of a Large Former Steel Works," presented at the Brownfields 2000 Conference, Atlantic City NJ, October 2000.

Forbes, Thomas H. and Frappa, Richard H. "Innovative Remedial Measures Almost 10 Years Later at the Former Mercury Aircraft Site" Proceedings of the National Groundwater Association Northeast Conference, October 2002.

Forbes, Thomas H. "Ins and Outs of the New York State Brownfield Cleanup Program" Air & Waste Management Association, Niagara Frontier Section, Annual Environmental Seminar (presentation), April 2006.

Forbes, Thomas H. "Brownfield Redevelopment" Proceedings of Half Moon Seminar's "New York Environmental Compliance for Design Professionals" conference, September 2008.

Forbes, Thomas H. "New York State Brownfield Cleanup Program Update" Air & Waste Management Association Annual Environmental Seminar (presentation), April 2009.

MICHAEL LESAKOWSKI
SR. PROJECT MANAGER

EDUCATION

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

REGISTRATION

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

SUMMARY OF EXPERIENCE

Mr. Lesakowski has over 15 years experience in the environmental consulting field at numerous industrial, commercial and hazardous waste sites throughout the northeast United States. A summary of projects Mr. Lesakowski has been involved with include all aspects of New York Brownfield Cleanup Program projects, New York State Superfund Program projects, New York Petroleum Spills Department projects, over 1,000 Phase I Environmental Site Assessments and more than 200 Phase II Site Investigations associated with property acquisition and divestiture and numerous remediation projects ranging from simple underground storage tank (UST) removals to complex groundwater remediation programs. Mr. Lesakowski is proficient in vapor intrusion modeling of chlorinated solvent and petroleum volatile organic compound (VOC) impacted sites. Mr. Lesakowski also has project management and technical consulting experience on several multi-site portfolio environmental due diligence assignments, working with purchasers and lenders to facilitate multi-million dollar real estate transactions. Prior to joining Benchmark, Mr. Lesakowski was a principal in an environmental consulting firm with offices in New York, Pennsylvania, Ohio and Maryland. Mr. Lesakowski is currently managing ten New York Brownfield Cleanup Program sites and several New York Spill Sites. He has managed assessments, investigations and remediation projects on properties with a multitude of historic uses (e.g., petroleum storage terminals, gas stations, automobile dealerships, rail yards, foundries, drycleaners, steel manufacturing, metallurgical plants, metal plating operations, junk yards), media types (surface and subsurface soil, groundwater, sediments, soil vapor, indoor air, building materials) and contaminants (e.g, VOCs, semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), heavy metals).

NEW YORK BROWNFIELD CLEANUP PROGRAM EXPERIENCE

348 Langner Road Site, West Seneca, New York

- Recently completed a Remedial Investigation and Interim Remedial Measures (IRM) for a property that was formerly developed as a retail gasoline station since the 1940s. Contaminants of concern include petroleum VOCs in soil and groundwater. The IRM included removal of over 8,000-tons of petroleum-impacted soil and removal of eight underground storage tanks (USTs) and related infrastructure and piping. During the remedial work, certain soil that was not impacted was field-screened on-Site, characterized via analytical testing to show that it was not impacted with contaminants of concern, and transported off-Site to an approved destination site with permission from NYSDEC. This screening of on-site materials saved our client over 4,000 cubic yards of material that would have otherwise been sent to a landfill at significant additional cost.

285-295 Niagara Street Site, Buffalo, New York

- Recently completed a Remedial Work for a property that was formerly developed as a bicycle factory from the 1800s, and a car wash and gasoline station since the 1950s. Contaminants of concern include petroleum VOCs in soil and groundwater. The remedial work included removal of approximately 4,500-tons of petroleum-impacted soil and removal of two underground storage tanks (USTs) that were encountered during excavation. During the remedial work, certain soil that was not impacted was field-screened on-Site, characterized via analytical testing to show that it was not impacted with contaminants of concern, and re-used on-Site with permission from NYSDEC. This screening of on-site materials saved our client from disposing of clean material that would have otherwise been sent to a landfill at significant additional cost.

125 Main Street Site, Buffalo, New York

- Recently completed a Remedial Investigation for a property known as the Former Donovan building, located in the City of Buffalo, NY, which was formerly industrial and commercial site, which as filled with miscellaneous historic fill materials. Contaminants of concern include petroleum VOCs, SVOCs and metals in soil. The remedial work was started in 2012 and is expected to be completed in 2013.

301 Franklin Street Site, Olean, New York

- Recently received a certificate of completion (COC) for a NY Brownfield Program Site. As part of the project, Mr. Lesakowski managed a Remedial Investigation and Interim Remedial Measures for a property located within the ExxonMobil Legacy Site (EMSL) area, which was formerly developed as a petroleum refinery. Contaminants of concern include petroleum VOCs, SVOCs and metals in soil and VOCs and SVOCs and non-aqueous phase liquid (NAPL) in groundwater. The IRM included removal of approximately 3,000-tons of metals- and petroleum-impacted soil and removal of 5,800 linear feet of abandoned subsurface piping. Remedial work included soil excavation and disposal; removal of abandoned subsurface piping and infrastructure; installation of a soil vapor extraction system; installation of an active subslab depressurization (ASD) system in the building; and, construction of a soil cover system.

Homer Street Redevelopment Site, Olean, New York

- Recently completed Interim Remedial Measures that included removal of approximately 11,000 linear feet of abandoned subsurface piping and 48 drums of residual piping contents. A Remedial Investigation was previously completed for this property, which is located within the ExxonMobil Legacy Site (EMSL) Works #3 area, which was formerly developed as a petroleum refinery. Contaminants of concern include grossly contaminated soils impacted with tar-like material, petroleum VOCs, SVOCs and metals in soil and VOCs, SVOCS and light non-aqueous phase liquid (LNAPL) in groundwater. Remedial Investigation work completed 2011-2012 included test pit excavations, soil borings/monitoring wells, surface soil, subsurface soil, sediment, surface water and groundwater sampling and delineation of surficial petroleum contamination.

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

- Recently completed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for two former gasoline station and automotive repair facilities with significant soil and groundwater petroleum VOC impact. The remediation approach for both sites involves removal of abandoned underground storage tanks, product dispensers and piping, removal of in-ground hydraulic lifts, soil excavation, and extraction and treatment of impacted groundwater. Final Engineering Reports and Site Management Plans were approved by the NYSDEC in December 2009 and Certificates of Completion were also issued in December 2009.

3807 Highland Avenue Site, Niagara Falls, New York

- Completed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program sites at a historic metallurgical facility and steel factory in Niagara Falls, NY. The Remedial Investigation involved collecting over 100 surface and subsurface soil and sediment samples and installing and sampling groundwater monitoring wells on an approximate 25-acre parcel slated for future mixed used commercial and industrial development. IRMs include excavation of chromium-impacted, arsenic-impacted and SVOC-impacted soil in several areas of the Site, drum and tank removal, catch basin and sump cleaning, smoke stack deposits remediation, and chemical waste removal. A Certificate of Completion was issued in June 2010.

1501 College Avenue Site, Niagara Falls, New York

- A Certificate of Completion was issued in December 2012 for this BCP site. Mr. Lesakowski managed a Remedial Investigation (RI), Interim Remedial Measures (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program sites at a historic heavy industrial facility in Niagara Falls, NY. The Remedial Investigation involved collecting surface and subsurface soil and sediment samples and installing and sampling groundwater monitoring wells on an approximate 15-acre parcel. IRMs include excavation of petroleum-impacted, PCB-impacted and SVOC-impacted soil in several areas of the Site, removal of galbestos PCB-impacted building materials, abandoned/damaged drum removal, chemical waste removal and a soil cover system.

275 Franklin Street Site

- Currently managing a NYSDEC Brownfield Cleanup Program site formerly used as drycleaner in western New York with significant soil and groundwater chlorinated VOC impact. Soil was successfully remediated using soil vapor extraction (SVE) to unrestricted soil cleanup objectives (SCOs) and groundwater remediation involves in-situ treatment of impacted groundwater. An active sub-slab depressurization system design and installation is planned in the new building during construction.

330 Maple Road Site, Amherst, New York

- Managed a Remedial Investigation (RI) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program for a small-arms shooting range with significant lead and semi-volatile organic compound (SVOC) impact. The RI involved collecting over 1,000 soil samples on 26-acre parcel slated for future mixed-use commercial and residential development. Bench-scale testing was completed to select a substrate to treat the characteristic hazardous soil to below toxicity characteristic leaching procedure (TCLP) thresholds. A Remedial Action Work Plan, which called for in-situ stabilization of characteristic hazardous soil and off-site disposal was prepared and approved by the NYSDEC. The remediation, which achieved a Residential Cleanup, was completed from the summer of 2011 through winter 2012. A certificate of completion was issued in spring 2012.

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

- Managed Site Remediation at a former drycleaner, bus garage and asphalt plant under the NYSDEC Brownfield Cleanup Program with significant chlorinated volatile organic compound (cVOC) impact. The remediation approach involved underground tank removal, in-ground hydraulic lift removal, hazardous soil excavation and enhanced biodegradation of groundwater. The Site received its certificate of completion in December 2008. The Property is currently developed with an up-scale hotel. The project is highlighted on NYSDEC website as a Brownfield Success Story.

GLR Holdings Site, Niagara Falls, New York

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

2250 Factory Outlet Boulevard Site, Niagara Falls, New York

- Managed Remedial Investigation (RI), Interim Remedial Measure (IRM) and Remedial Alternatives Analysis under the NYSDEC Brownfield Cleanup Program at a former lumber yard with chromium impact in Niagara Falls, NY. The remediation approach involved excavation and off-Site disposal of hazardous and non-hazardous soil. The Site received its certificate of completion in December 2007.

New Seventh Street Site, Buffalo, New York

- Managed the investigation of a former gasoline station and adjacent manufactured gas plant (MGP) as part of one of the largest Brownfield redevelopment projects in western New York. The project involves site redevelopment from a historic MGP site and adjacent gasoline station to a multi-million dollar commercial office complex. Acting on behalf of the developer (Duke Realty) and future tenant (HealthNow New York); preliminary investigations were completed to evaluate the nature and location of contaminants. Subsequent site investigation and remediation was completed via a Remedial Investigation (RI) and Interim Remedial Measures (IRM) under the New York State Brownfield Cleanup Program, saving months and significant cost. As a concurrent assignment, acted as a technical consultant to the developer and future tenant on negotiations and advisement on development of an environmental liability transfer arrangement between the purchaser/tenant (client), seller and a national remediation contractor.

OTHER PERTINENT EXPERIENCE

- Managed a site assessment and site investigations for a portfolio of retail gasoline stations in western New York. Project tasks include a historical review to determine sites' histories, review of previous technical reports, soil and groundwater investigations and remediation cost estimating for site cleanups. This project also involves forensic analyses of soil and groundwater samples to estimate the relative time of historic spills to determine the liability and responsibility for remediation of historic petroleum spills on-site.

- Managed a Phase I/Phase II site investigations for the Buffalo Urban Development Corporation for two parcels in the City of Buffalo encompassing approximately 100-acres. The project involved Phase I ESAs to assess potential historic concerns in a historic heavy industrial area and subsequent soil and groundwater investigations to investigate subsurface environmental conditions. A portion of the property was subsequently developed with an industrial facility.

- Managed environmental due diligence, including Phase I/Phase II investigations of five active service stations in central and eastern upstate New York for a potential purchaser. Phase I ESAs indicated a history of gasoline stations on-site. In conjunction with the purchaser and seller, it was negotiated that a baseline assessment of soil and groundwater impact would be completed to establish responsibility for addressing contamination going forward. The purchaser was able to purchase the sites with no liability for historic petroleum spills on-site.

- Managed investigation and remediation of a former automobile dealership in Rochester, New York. Site investigations, competed with oversight of NYSDEC Spills division, indicated soil impact as a result of leaking gasoline, diesel and waste oil USTs and floor drain discharges. Remedial tasks included a removal of four USTs and associated pump dispensers, closing/sealing interior floor drains and excavation and off-site disposal of 1,500 cubic yards of impacted soil.

- Performed fieldwork at a 50-acre industrial park in western New York. Task included a soil boring and monitoring well installation program, development and sampling of monitoring wells and a hydraulic conductivity assessment. Subsequent remedial tasks included removal of six underground storage tanks and petroleum-impacted soil and a long-term groundwater monitoring plan.

- Performed fieldwork and reporting for RI/FS of NYSDEC superfund site in Long Island, NY. Investigation activities at this former metal plating facility included soil investigation, monitoring well installation and groundwater sampling, hydraulic conductivity testing, and floor drain/cess pool investigation. IRM activities included closure of interior floor drains and removal of heavy metals impacted soil.

ENVIRONMENTAL LIABILITY TRANSFER EXPERIENCE

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

- Managed environmental consulting and due diligence activities for a purchaser of 182 gasoline service stations in Maryland, Virginia and Washington, DC. Tasks included Phase I ESAs, remediation cost estimating for sites with known impacts and/or on-going remediation and interfacing with the client’s lenders to facilitate a $110 million dollar real estate transaction. An Environmental Liability Transfer arrangement funded by the seller facilitated the additional environmental investigation and remediation of impacted sites.

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

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

CHRISTOPHER Z. BORON
SENIOR PROJECT MANAGER

EDUCATION

Bachelors of Science (Geology) 1995; State University of New York, College at Fredonia

REGISTRATION AND AFFILIATIONS

Certified Professional Geologist #11624, American Institute of Professional Geologists, 2013
Hazardous Waste Safety Training (OSHA) – 1999
Annual Hazardous Waste Safety Refresher Training (OSHA) - 2000-Present

SUMMARY OF EXPERIENCE

Mr. Boron has 16 years of experience in the environmental field on a variety of projects involving environmental assessment, investigation and remediation, as well as geotechnical engineering within various regulatory programs. His experience includes Phase I and II Environmental Site Assessments (ESAs) for property transaction due diligence following ASTM 1597-13 and USEPA All Appropriate Inquiry (AAI); vapor intrusion investigations of industrial, commercial and residential structures following New York State Department of Health (NYSDOH) guidance for evaluating soil vapor intrusion into buildings; all aspects of remedial investigations, feasibility studies/alternatives analysis and site remediation under NYSDEC Inactive Hazardous Waste Site (Superfund) Program, Voluntary Cleanup Program, New York State Brownfield Cleanup Program and Environmental Restoration Program; all aspects of investigation and remediation involving petroleum spill sites regulated by the New York State Department of Environmental Conservation (NYSDEC) Petroleum Spills Division; solid waste facility construction management and construction quality assurance monitoring and testing following the NYSDEC Division of Solid Waste regulations.

REPRESENTATIVE PROJECT EXPERIENCE

July 2014 to Present: **TurnKey Environmental Restoration, LLC**

- **Brownfield Cleanup Program Project, Former Millard Fillmore Gates Hospital, City of Buffalo, New York.** A local development group has taken ownership of the former Millard Fillmore Gates Hospital for redevelopment. The Site was accepted in to the NYSDEC Brownfield Cleanup Program in February 2013 and a remedial investigation work plan has been prepared and accepted by NYSDEC. Remedial investigation activities are expected to begin in August 2014. My responsibilities will include oversight of the remedial investigation, implementation of remedial actions and preparation of the NYSDEC required reporting documents.

September 1998 to July 2014: **GZA GeoEnvironmental of New York**

- **Brownfield Cleanup Program Project, Central Park Plaza, City of Buffalo, New York**. A local developer obtained access to complete a Phase I and II ESA at the dilapidated Central Park Plaza, a vacant 27 acre commercial facility on the east side of the City of Buffalo. Contaminants identified during the investigation allowed the property to be accepted in to the BCP. Once in the BCP, a RI was complete under approved work plans which identified extensive backfilling of the former Buffalo Cement Co. Ltd. quarry which operated from 1877 to 1948. The Central Park Plaza was constructed in 1958 and in operation until 2011. The Remedial Investigation/Alternative Analysis report, along with the Remedial Action Work Plan (RAWP) were completed and submitted to NYSDEC for review in June 2014. As Project Manager, I was responsible for the oversight of the Phase I/II ESA, BCP application, preparation of the BCP work plans, oversight of the RI activities and preparation of the RI/AA Report and RAWP.

- **Environmental Restoration Project, Batavia Iron & Metal, City of Batavia, New York.** This project involved vacant industrial property previously used to reclaim iron, metal and wire materials. As Project Manager, responsibilities included negotiating the scope of work, developing the work plan, budget preparation, on-Site and off-Site soil and groundwater sampling, IRM implementation and data analysis. A Site Investigation and Remedial Alternatives Report (SI/RAR) was prepared and approved by NYSDEC in June 2012. Due to the significant volume of contaminated soil present (over 4,000 tons of PCB and metal impacted soil), the City of Batavia opted not to foreclose and take ownership. The Proposed Remedial Action Plan (PRAP) was released in February 2013. The Record of Decision (ROD) was in released in Summer 2013 and the site was transferred in the NYSDEC Superfund Program.

- **NYSDEC Superfund & Brownfield Cleanup Programs, Confidential Automotive Components Manufacturer, Lockport, New York.** Assisted an automotive parts manufacturing facility with various environmental issues at their facility for the over 15 years. Responsibilities have included:

    - Completing a Remedial Investigation and Feasibility Study (RI/FS) for a trichloroethylene (TCE) and tetrachloroethene (PCE) plume migrating in bedrock groundwater from a former AST spill. The RI/FS Reports were approved by NYSDEC, a Record of Decision (ROD) has been issued and the remedial alternative selected based on the FS is Monitored Natural Attenuation (MNA). The Record of Decision was issued by NYSDEC in March 2005 identifying monitored natural attenuation as the groundwater remedy. The MNA groundwater sampling has been conducted annually since 2005. The Site Management Plan (September 2011) and Final Engineering Report (March 2012) were approved by NYSDEC and the Certificate of Completion was issued in March 2012.

    - Application and acceptance of three individual sites of the 342 acre facility into the NYSDEC Brownfield Cleanup Program in February 2010. These sites have been investigated under NYSDEC approved work plans to assess contaminated media (soil, groundwater and indoor air) and develop remedial strategies to address the various impacted media. Based on the RI findings these three sites are currently being combined into one BCP Site. Chlorinated solvent groundwater contamination has been identified beneath and connecting the three sites.

    - Conducted a site-wide investigation of the storm sewer system to evaluate for chlorinated solvent groundwater contamination infiltration. The investigation involved: the review of existing plant drawings, collecting storm sewer structure measurements, completing video inspections and reviewing existing storm sewer videos, and storm water sampling during low-flow and high-flow events. Areas of contaminated groundwater infiltration were identified and recommendations were made to the NYSDEC for repair, with their concurrence.

  - Managed the assessment of former manufacturing and warehouse building being converted to use as vendor/supplier park. An environmental assessment identified chlorinated solvents (primarily PCE and TCE) in soil, groundwater and air samples that required remediation. After delineating the extent of soil contamination and completing a pilot-study, a soil vapor extraction and sub-slab depressurization systems (SVE/SSDS) was put into operation to remediate the soil within an approximate 14,000 square foot area and mitigate exposure to vapor intrusion from the impacted soil and groundwater. The building has been repurposed for use as a vendor/supplier park.

  - Completion and management of annual groundwater sampling and compliance reporting for their NYSDEC Major Oil Storage Facility permit.

  - Conducted a soil vapor intrusion assessment prior to the transmittal of a site building to another entity/tenant. The SVI work was completed to determine if the nearby TCE groundwater plume was impacting indoor air of the building for sale. The SVI assessment determined the nearby groundwater plume was not impacting indoor air or sub-slab vapors that required mitigation.

- **NYSDEC Brownfield Cleanup Program, Peters Dry Cleaners, Lockport, New York**. Peter's Dry Cleaning was located in a residential neighborhood in the City of Lockport. The property was contaminated from historic dry cleaning operations conducted at the site. A Phase II ESA was conducted on the property to determine the extent of contamination in the overburden soils and groundwater. An IRM was undertaken to remove an abandoned UST and associated petroleum contamination. Tetrachloroethene (PCE) contaminated soil was also encountered during the IRM, which changed the IRM waste profile. Peter's Dry Cleaning entered into the Brownfield Cleanup Program (BCP) in February 2007. NYSDEC Approved work plans were prepared that included the installation of bedrock groundwater monitoring wells, soil probes to delineation off-site soil and groundwater contamination and vapor intrusion sampling at the subject property and adjoining residential structures. The Site Investigation/Remedial Alternative Report was prepared and submitted to NYSDEC. The property owner opted to leave the BCP program and allow NYSDEC take on the responsibility of remediation, which will be completed under the NYS Superfund Program. My responsibilities as project manager included the oversight of the remedial investigation, remedial alternative evaluation/analysis and report preparation.

- **NYSDEC Order on Consent, Remedial Investigation & Feasibility Study, Confidential Client, Dunkirk, New York –** During a building expansion for the installation of a new rotoforge press, and under the guidance of the Site Management Plan, polychlorinated biphenyls (PCBs) were detected in soil and free product was encountered. Under an Order on Consent with the NYSDEC, an RI, IRM and FS were initiated. The IRM entailed the excavation and removal of approximately 6,000 tons of PCB-impacted soil at hazardous levels. The RI/IRM/FS Report has been approved by NYSDEC. A Site Management Plan was developed and approved to ensure institutional and engineering controls are monitored and maintained. My responsibilities as project manager included the oversight of the remedial investigation, preparation of the RI/FS report and SMP.

- **NYSDEC Spills Program, Contract to Closure, Remedial Activities, Commercial Facility, Rochester, New York.** Soil and groundwater at two adjacent properties have been contaminated with petroleum from former gasoline stations which occupied the properties as far back as the early 1950's.

The client wanted to develop the Site for commercial use as a credit union. Site activities included soil and groundwater sampling investigations, building demolition, preparation of NYSDEC approved work plan to remediate the soil and groundwater, removed soil impacted with free product, performed in-situ chemical oxidation injections to remediate Site groundwater to achieve NYSDEC inactive status. My responsibilities included performing the Site investigations, work plan and budget preparation, remedial implementation of the chemical injections, confirmatory sampling and closure report preparation. The Site received an "inactive" status from NYSDEC and a Credit Union facility had been constructed.

- **Voluntary Cleanup - Commercial Facility, Hamburg, New York**. Responsible for investigation at multi-unit commercial facility with identified chlorinated solvent contamination from a former dry cleaner in one of the units. Tetrachloroethene (PCE) was identified in soil and groundwater samples at the facility at concentrations exceeding NYSDEC regulatory standards. A source area, likely a former drum storage area, was identified outside the building in the shallow soil in the alleyway. Shallow and deep groundwater samples identified shallow groundwater contamination, but a clay confining layer appeared to limit the depth of the contamination. An IRM was completed which included soil removal and disposal and the installation of sub-slab vapor mitigation system to prevent contaminated vapor intrusion into the building.

- **NYSDEC Superfund Standby Contract, Remedial Investigation, Grove Cleaners, Hewlett, New York.** Groundwater at a former dry cleaners site was contaminated with chlorinated solvents. As part of a Remedial Investigation performed a comprehensive gas chromatograph field screening of subsurface soils and groundwater samples to delineate the source of contamination during the on-site characterization studies and collected groundwater samples during off-Site characterization. Responsible for conducting an existing monitoring well assessment, groundwater sampling and interpretation of the hydrogeologic and analytical data for the RI report preparation. This work was completed in accordance with NYSDEC approved site- specific work plans under the NYSDEC Superfund Program.

- **NYSDEC Superfund Standby Contract, Preliminary Site Assessment, Crusher Road Site, Bedford, New York**. Site groundwater was previously found to be contaminated with PCE from an unknown source. Responsible for field investigations which identified that the source of the PCE was unauthorized disposal at the former town dump, which is currently utilized as the town highway department. Field screening with a portable gas chromatograph of subsurface soil and groundwater samples helped delineate the source of contamination during the on and off-site characterization studies.

LORI E. RIKER, P.E.
PROJECT MANAGER

EDUCATION

BASc (Civil Engineering) 1992; University of Waterloo, Ontario, Canada
MASc (Environmental Engineering) 1994; University of Guelph, Ontario, Canada

REGISTRATION AND AFFILIATIONS

Professional Engineer, New York
Certified OSHA 40-Hour Hazardous Waste Site Training
Air and Waste Management Association, Member

SUMMARY OF EXPERIENCE

Ms. Riker has 20 years of environmental and civil engineering experience that has focused on industrial regulatory compliance assistance; Phase I environmental site assessments; hazardous waste site investigations and remedial evaluations; detailed design; and construction administration. Ms. Riker's regulatory compliance experience includes: petroleum bulk storage (PBS) and chemical bulk storage (CBS) auditing and the associated spill prevention reporting; Emergency Planning and Community Right-to-Know Act (EPCRA) Tier II and Toxic Release Inventory (Form R) reporting; Title V air permitting (Title V, State facility, minor facility registrations), compliance reporting, and emission statement preparation; Resource Conservation and Recovery Act (RCRA) hazardous waste reporting; storm water permitting and preparing discharge monitoring reports (DMRs), storm water pollution prevention plans (SWPPPs), and Best Management Practices (BMP) Plans; and hazardous waste annual reporting and reduction plans. Ms. Riker's site investigation and remediation experience has been under various New York State Department of Environmental Conservation (NYSDEC) remedial programs including the: Brownfield Cleanup Program (BCP); RCRA Corrective Action Program; and Voluntary Cleanup Program (VCP).

REPRESENTATIVE PROJECT EXPERIENCE

May 2003 to Present	**Benchmark Environmental Engineering & Science, PLLC**
Nov 1997 to May 2002	**Malcolm Pirnie, Inc.**
Feb 1995 to Oct 1997	**ENVIRON Corporation**

- Assisted in the RCRA Corrective Measures Study (CMS) for the Former Bethlehem Steel Coke Oven Division Site located in Lackawanna, NY. Duties included preparing work plans for Interim Corrective Measures (ICMs); reviewing analytical data obtained for the solid waste management units (SWMUs) and water courses; reviewing reports/assessments prepared by other consultants retained by NYSDEC and other agencies; and evaluating numerous slag/fill and groundwater remedial alternatives and recommending a final remedial approach in the CMS Report.
- Assisted former steel manufacturing facility with regulatory compliance during shutdown of operations in Lackawanna, NY. Current activities for former steel manufacturing company in Lackawanna, NY include: SPDES permitting; Industrial Water System compliance, including successfully obtaining a Water Withdrawal Permit for 50 MGD and implementing required upgrades to the water metering system; and preparing annual RCRA Hazardous Waste Reports.

- Assisted with environmental regulatory compliance audits at Gibraltar Steel's NY facilities, and coordinated audits at Gibraltar Steel's other facilities nationwide. The audits covered major existing environmental regulatory programs, as well as applicable local or state regulations and potential upcoming regulatory requirements.
- Assisted in preparing numerous successful NYSDEC BCP applications for former steel plant sites and industrial/commercial properties in western NY. Prepared Remedial Investigation (RI) Work Plans, RI Reports, Remedial Action Work Plans, Final Engineering Reports, and Site Management Plans. Contaminants of concern primarily include petroleum organics/solvents and heavy metals.
- Providing/managing on-going environmental compliance assistance to scrap metal recycling facilities in NY and PA including: permitting, sampling, inspection, and reporting requirements under the Multi-Sector General Permit (MSGP) for Storm Water Associated with Industrial Activity and NYSDEC State Pollutant Discharge Elimination System (SPDES) Permits; PBS inspections and preparing SPCC Plans; EPCRA Tier II reporting; preparing landfill disposal application; preparing Water Treatment Chemical notifications; hazardous waste annual reporting; and air permitting modifications, compliance reporting, and annual emission statement preparation.
- Providing/managing on-going environmental compliance assistance to industrial facilities including: air permit applications and modifications; storm water permitting, BMP Plan/SWPPP preparation, compliance monitoring, and DMR preparation; water withdrawal and sewer metering reports; PBS registration, SPCC Plan preparation, and tank inspection; and annual hazardous waste reporting.
- Providing environmental compliance assistance to NOCO Energy Corp. for its major petroleum distribution terminal and warehouse in Tonawanda, NY and multiple retail gasoline stations in NY and VT. Specific projects include: storm water permitting and preparation of a SWPPP; preparation of Spill Response, Control & Countermeasure (SPCC) Plans and a Spill Prevention Report (SPR); Title V air permitting assistance and emission statement preparation; EPCRA Form R reporting; review of and recommendations for updating the USCG Facility Response Plan; and permitting and conceptual design for upgrades to a PBS warehouse facility.
- Served as the environmental compliance manager for a porcelain insulator manufacturing facility and completed regulatory reporting requirements including TP550 forms, Form R reports, Tier II reports, hazardous waste reports, storm water permitting, and DMRs.
- Performed environmental compliance audits of multiple retail gasoline station and lube oil shops in western NY, focusing on the NYSDEC PBS regulations, and preparing SPCC Plans and an overall BMP Plan.
- Assisted in performing environmental regulatory compliance audits for numerous active industrial facilities. Responsibilities included researching and interpreting applicable environmental regulations, and preparing reports to summarize the findings and prioritize corrective measures.
- Prepared PBS and CBS applications for tank registration under NYSDEC's bulk storage programs and prepared the associated SPCC Plans and SPRs for industrial facilities.
- Assisted in preparing an SPCC Plan for General Electric Company's Tonawanda facility. Work included review of numerous federal and state regulations pertaining to PCB-contaminated oil and waste.

PUBLICATIONS/PRESENTATIONS

- Riker, L. E., McManus, A. C., "Energize Your Business," presented at the Fall Seminar of the New York Water Environment Association, Genesee Valley Chapter, Industrial Issues Committee, Webster NY, November 1, 2001.
- Riker, L. E., McManus, A. C., Sanders, L. A., "Life After Registration: Integrating Environmental Management Systems into Business and Operating Cultures," Proceedings, 94th Annual Conference and Exhibition of the Air & Waste Management Association, Orlando FL, June 26, 2001.
- Riker, L. E., McManus, K. R., Kreuz, D. E., Mistretta, M. V., "Trash to Treasure: Revitalization of Buffalo's Waterfront," presented at a Conference of the New York State Society of Professional Engineers, Erie/Niagara Chapter, Environmental Affairs Committee, Buffalo NY, January 10, 2001.
- Secker, L. E., Talley, J. W., "Bioremediating a Buffalo Brownfield: A Comparison of Bench-Scale Soil Biotreatability Results to Full-Scale Remediation," Proceedings, Thirtieth Mid-Atlantic Industrial & Hazardous Waste Conference, Villanova University, Philadelphia PA, July 12, 1998.

APPENDIX B

PREVIOUS INVESTIGATION

(PROVIDED ELECTRONICALLY)

TABLE 1

Soil/Fill Sample Analytical Results
Phase II Environmental Site Assessment
1111 Elmwood AvenueSite
Buffalo, NY

PARAMETER[1]	Unrestricted Use SCO's [2]	Restricted Residential Use SCO's [2]	Commercial Use SCO's [2]	Industrial Use SCO's [2]	SAMPLE LOCATION (DEPTH)															
					SB-1	SB-6	SB-7	SB-10	HA-1	HA-3	HA-4	HA-5	HA-5	HA-6	TP-2	TP-3	TP-4	TP-6	TP-7	TP-9
Volatile Organic Compounds (SVOCs) - mg/Kg [3]																				
Acetone	**0.05**	**100**	**500**	**1000**	--	--	--	--	--	--	--	--	--	--	--	--	0.084 J	--	--	--
Semi-Volatile Organic Compounds (SVOCs) - mg/Kg [3]																				
2-Methylnaphthalene	**--**	**--**	**--**	**--**	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.047 J	ND	ND	0.22 J	1.2	0.063 J	ND
Acenaphthene	**20**	**100**	**500**	**1000**	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.13 J	0.027 J	ND	0.82 J	ND	ND	ND
Acenaphthylene	**100**	**100**	**500**	**1000**	ND	0.22 J	ND	ND	ND	ND	ND	0.057 J	ND	0.037 J	ND	ND	ND	ND	0.034 J	ND
Anthracene	**100**	**100**	**500**	**1000**	ND	1.1	ND	ND	ND	ND	ND	0.052 J	ND	0.34	0.1 J	ND	2	0.28	0.062 J	ND
Benzo(a)anthracene	**1**	**1**	**5.6**	**11**	0.038 J	**5.4**	ND	ND	0.15	0.042 J	0.052 J	0.24	0.1 J	0.89	0.31	0.088 J	**4**	0.5	0.26	ND
Benzo(a)pyrene	**1**	**1**	**1**	**1.1**	0.036 J	**4.9**	ND	ND	0.18	0.083 J	0.096 J	0.3	0.18	0.66	0.3	0.083 J	**3.4**	0.8	0.26	ND
Benzo(b)fluoranthene	**1**	**1**	**5.6**	**11**	0.053 J	**5.3**	ND	ND	0.22	0.075 J	0.093 J	0.38	0.18	**1**	0.41	0.11 J	**4.6**	0.4	0.33	ND
Benzo(ghi)perylene	**100**	**100**	**500**	**1000**	0.028 J	3.2	44``	ND	0.094 J	0.027 J	0.034 J	0.23	0.085 J	0.52	0.18	0.054 J	1.9	1	0.14 J	ND
Benzo(k)fluoranthene	**0.8**	**3.9**	**56**	**110**	ND	**2.4**	ND	ND	0.09 J	ND	ND	0.16	0.056 J	0.42	0.12 J	0.042 J	**1.4**	0.057 J	0.1 J	ND
Biphenyl	**--**	**--**	**--**	**--**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.097 J	ND	ND
Bis(2-ethylhexyl) phthalate	**--**	**--**	**--**	**--**	0.082 J	ND	ND	ND	0.2 J	ND	0.17 J	0.93	0.2 J	0.16 J	0.59	0.073 J	ND	ND	ND	ND
Butyl benzyl phthalate	**--**	**--**	**--**	**--**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.29 J	ND	ND	ND
Carbazole	**--**	**--**	**--**	**--**	ND	0.12 J	ND	ND	0.029 J	ND	ND	0.037 J	ND	0.23	0.05 J	ND	1.2	ND	0.02 J	ND
Chrysene	**1**	**3.9**	**56**	**110**	0.047 J	**5**	ND	ND	0.15	0.039 J	0.054 J	0.27	0.097 J	0.86	0.31	0.082 J	**3.7**	0.77	0.23	ND
Dibenzofuran	**7**	**59**	**350**	**1000**	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11 J	ND	ND	0.63 J	0.24	0.022 J	ND
Dibenzo (a,h)anthracene	**0.33**	**0.33**	**0.56**	**1.1**	ND	ND	ND	ND	0.05 J	ND	ND	0.14	0.12 J	0.2	0.048 J	ND	**0.58 J**	0.27	0.038 J	ND
Fluoranthene	**100**	**100**	**500**	**1000**	0.091 J	11	ND	ND	0.31	0.08 J	0.1 J	0.6	0.23	2.3	0.73	0.16	9.8	0.15	0.55	0.16 J
Fluorene	**30**	**100**	**500**	**1000**	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.18 J	0.035 J	ND	1.2	ND	ND	ND
Indeno(1,2,3-cd)pyrene	**0.5**	**0.5**	**5.6**	**11**	ND	**2.5**	ND	ND	0.16	0.093 J	0.11 J	0.24	0.15 J	0.44	0.21	0.06 J	**2.3**	0.35	0.17	ND
Naphthalene	**12**	**100**	**500**	**1000**	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.067 J	ND	ND	0.5 J	0.72	0.038 J	ND
Phenanthrene	**100**	**100**	**500**	**1000**	0.059 J	3.2	ND	ND	0.15	0.04 J	0.055 J	0.19	0.091 J	1.4	0.41	0.089 J	8.4	1.5	0.23	ND
Pyrene	**100**	**100**	**500**	**1000**	0.076 J	11	ND	ND	0.25	0.065 J	0.082 J	0.47	0.18	1.8	0.59	0.14	7.4	1	0.46	0.14 J
Total Metals - mg/Kg																				
Arsenic	**13**	**16**	**16**	**16**	6.9	5.4	6.5	3.8	**20**	8.4	7.8	10	12	5.5	6.9	11	6.5	**20**	12	11
Barium	**350**	**400**	**400**	**10000**	120 F1	127	181	97.9	93	96	100	92	120	100	120	110	120	51	82	98
Cadmium	**2.5**	**4.3**	**9.3**	**60**	0.39	ND	ND	ND	ND	ND	ND	0.807	0.765	ND	3.5	0.83	0.91	0.22 J	0.2 J	**3.2**
Chromium	**30**	**180**	**1500**	**6800**	26.3	26.8	**40.3**	18.7	12	17	18	18	23	15	**500**	15	17	6.9	5.5	15
Lead	**63**	**400**	**1000**	**3900**	**732 F2**	18.7	15.8	19.7	**240**	52	**68**	**340**	**400**	**200**	**4200**	**520**	**470**	31	40	**200**
Mercury	**0.18**	**0.81**	**2.8**	**5.7**	0.048	0.037	ND	ND	**0.28**	0.11	**0.24**	**0.24**	**0.22**	**0.29**	0.14	**0.46**	**0.19**	0.05 J	0.04 J	**0.56**
Selenium	**30**	**180**	**1500**	**10000**	ND	ND	ND	ND	0.74 J	0.69 J	0.57 J	1.25	1.006	0.867 J	0.62 J	ND	ND	ND	ND	ND
Silver	**2**	**180**	**1500**	**6800**	ND	ND	ND	ND	ND	ND	ND	0.19 J	0.275 J	0.212 J	ND	ND	ND	ND	ND	ND

Notes:

1. Only those parameters detected at a minimum of one sample location are presented in this table; all other compounds were reported as non-detect.
2. Values per NYSDEC Part 375 Unrestricted and Restricted Soil Cleanup Objectives (SCOs) per Table 375-6.8(a) and (b).
3. Sample results were reported by the laboratory in ug/kg and converted to mg/kg for comparisons to SCOs

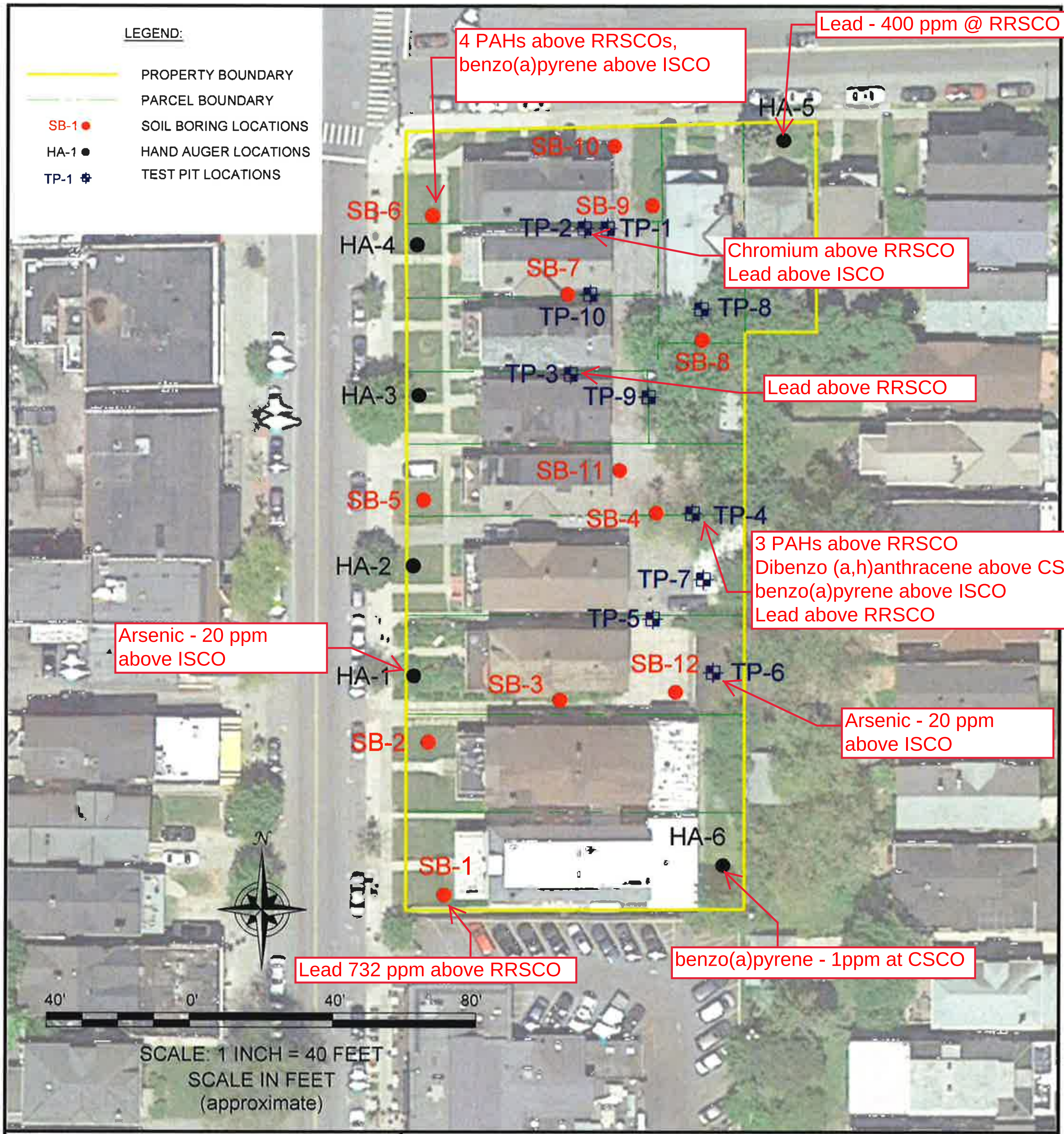
Definitions:

ND = Parameter not detected above laboratory detection limit.
"--" = No value available for the parameter, or the parameter was not analysed for.
F2 =MS/MSD RPD exceeds control limits
F1=MS and/or MSD Recovery is outside acceptance limits.
J = Estimated value; result is less than the sample quantitation limit but greater than zero.

🟩 **BOLD**	= Result exceeds Unrestricted Use SCO's.
🟦 **BOLD**	= Result exceeds Restricted Residential Use SCO's.
🟨 **BOLD**	= Result exceeds Commercial Use SCO's.
🟥 **BOLD**	= Result exceeds Industrial Use SCO's.

F:\CAD\TurnKey\Bond, Schoeneck & King PLLC\Figure\Figure 2; Site Plan and Sample Locations.dwg

FIGURE 2



TurnKey Environmental Restoration, LLC

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

PROJECT NO.: 0369-016-001

DATE: MARCH 2017

DRAFTED BY: RFL

SITE PLAN AND SAMPLE LOCATIONS

PHASE II ENVIRONMENTAL SITE ASSESSMENT

ELMWOOD AVENUE & FOREST AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES, LLC

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TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Buffalo
10 Hazelwood Drive
Amherst, NY 14228-2298
Tel: (716)691-2600

TestAmerica Job ID: 480-94559-1
Client Project/Site: Benchmark - Elmwood & Forest site

For:
Turnkey Environmental Restoration, LLC
2558 Hamburg Turnpike
Lackawanna, New York 14218

Attn: Mr. Christopher Z Boron

Joseph V. Giacomazza

Authorized for release by:
2/16/2016 9:45:35 AM
Joe Giacomazza, Project Management Assistant II
joe.giacomazza@testamericainc.com

Designee for

Brian Fischer, Manager of Project Management
(716)504-9835
brian.fischer@testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Definitions/Glossary

Qualifiers

GC/MS Semi VOA

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
F2	MS/MSD RPD exceeds control limits
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Job ID: 480-94559-1

Laboratory: TestAmerica Buffalo

Narrative

Job Narrative
480-94559-1

Receipt
The samples were received on 2/1/2016 11:45 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.4º C.

GC/MS Semi VOA
Method(s) 8270D: The following samples was diluted due to appearance and viscosity: SB-6 (0-4') (480-94559-2). Elevated reporting limits (RL) are provided.

Method(s) 8270D: The continuing calibration verification (CCV) analyzed in batch 480-285988 was outside the method criteria for the following analytes: bis (2-chloroisopropyl) ether and Benzaldehyde. A CCV standard at or below the reporting limit (RL) was analyzed with the affected samples and found to be acceptable. As indicated in the reference method, sample analysis may proceed; however, any detection for the affected analytes are considered estimated.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Detection Summary

Client: Turnkey Environmental Restoration, LLC
Project/Site: Benchmark - Elmwood & Forest site

TestAmerica Job ID: 480-94559-1

Client Sample ID: SB-1 (0-4')

Lab Sample ID: 480-94559-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Benzo(a)anthracene	38	J	200	20	ug/Kg	1	☼	8270D	Total/NA
Benzo(a)pyrene	36	J	200	29	ug/Kg	1	☼	8270D	Total/NA
Benzo(b)fluoranthene	53	J	200	32	ug/Kg	1	☼	8270D	Total/NA
Benzo(g,h,i)perylene	28	J	200	21	ug/Kg	1	☼	8270D	Total/NA
Bis(2-ethylhexyl) phthalate	82	J	200	68	ug/Kg	1	☼	8270D	Total/NA
Chrysene	47	J	200	45	ug/Kg	1	☼	8270D	Total/NA
Fluoranthene	91	J	200	21	ug/Kg	1	☼	8270D	Total/NA
Phenanthrene	59	J	200	29	ug/Kg	1	☼	8270D	Total/NA
Pyrene	76	J	200	23	ug/Kg	1	☼	8270D	Total/NA
Arsenic	6.9		2.3		mg/Kg	1	☼	6010C	Total/NA
Barium	120	F1	0.58		mg/Kg	1	☼	6010C	Total/NA
Cadmium	0.39		0.23		mg/Kg	1	☼	6010C	Total/NA
Chromium	26.3		0.58		mg/Kg	1	☼	6010C	Total/NA
Lead	732	F2	1.2		mg/Kg	1	☼	6010C	Total/NA
Mercury	0.048		0.022		mg/Kg	1	☼	7471B	Total/NA

Client Sample ID: SB-6 (0-4')

Lab Sample ID: 480-94559-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Acenaphthylene	220	J	990	130	ug/Kg	5	☼	8270D	Total/NA
Anthracene	1100		990	240	ug/Kg	5	☼	8270D	Total/NA
Benzo(a)anthracene	5400		990	99	ug/Kg	5	☼	8270D	Total/NA
Benzo(a)pyrene	4900		990	150	ug/Kg	5	☼	8270D	Total/NA
Benzo(b)fluoranthene	5300		990	160	ug/Kg	5	☼	8270D	Total/NA
Benzo(g,h,i)perylene	3200		990	100	ug/Kg	5	☼	8270D	Total/NA
Benzo(k)fluoranthene	2400		990	130	ug/Kg	5	☼	8270D	Total/NA
Carbazole	120	J	990	120	ug/Kg	5	☼	8270D	Total/NA
Chrysene	5000		990	220	ug/Kg	5	☼	8270D	Total/NA
Fluoranthene	11000		990	100	ug/Kg	5	☼	8270D	Total/NA
Indeno(1,2,3-cd)pyrene	2500		990	120	ug/Kg	5	☼	8270D	Total/NA
Phenanthrene	3200		990	150	ug/Kg	5	☼	8270D	Total/NA
Pyrene	11000		990	120	ug/Kg	5	☼	8270D	Total/NA
Arsenic	5.4		2.3		mg/Kg	1	☼	6010C	Total/NA
Barium	127		0.58		mg/Kg	1	☼	6010C	Total/NA
Chromium	26.8		0.58		mg/Kg	1	☼	6010C	Total/NA
Lead	18.7		1.2		mg/Kg	1	☼	6010C	Total/NA
Mercury	0.037		0.022		mg/Kg	1	☼	7471B	Total/NA

Client Sample ID: SB-7 (0-2')

Lab Sample ID: 480-94559-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	6.5		2.6		mg/Kg	1	☼	6010C	Total/NA
Barium	181		0.64		mg/Kg	1	☼	6010C	Total/NA
Chromium	40.3		0.64		mg/Kg	1	☼	6010C	Total/NA
Lead	15.8		1.3		mg/Kg	1	☼	6010C	Total/NA

Client Sample ID: SB-10 (1-4')

Lab Sample ID: 480-94559-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Arsenic	3.8		2.8		mg/Kg	1	☼	6010C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample ID: SB-10 (1-4') (Continued) Lab Sample ID: 480-94559-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Barium	97.9		0.71		mg/Kg	1	☼	6010C	Total/NA
Chromium	18.7		0.71		mg/Kg	1	☼	6010C	Total/NA
Lead	19.7		1.4		mg/Kg	1	☼	6010C	Total/NA

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Turnkey Environmental Restoration, LLC
Project/Site: Benchmark - Elmwood & Forest site

TestAmerica Job ID: 480-94559-1

Client Sample ID: SB-1 (0-4')

Date Collected: 01/29/16 09:00
Date Received: 02/01/16 11:45

Lab Sample ID: 480-94559-1
Matrix: Solid
Percent Solids: 84.4

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dinitrotoluene	ND		200	41	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
2,6-Dinitrotoluene	ND		200	23	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
2-Chloronaphthalene	ND		200	33	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
2-Methylnaphthalene	ND		200	40	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
2-Nitroaniline	ND		390	29	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
3,3'-Dichlorobenzidine	ND		390	230	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
3-Nitroaniline	ND		390	55	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
4-Bromophenyl phenyl ether	ND		200	28	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
4-Chloroaniline	ND		200	49	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
4-Chlorophenyl phenyl ether	ND		200	25	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
4-Nitroaniline	ND		390	100	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Acenaphthene	ND		200	29	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Acenaphthylene	ND		200	26	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Acetophenone	ND		200	27	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Anthracene	ND		200	49	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Atrazine	ND		200	69	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Benzaldehyde	ND		200	160	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Benzo(a)anthracene	**38**	**J**	200	20	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Benzo(a)pyrene	**36**	**J**	200	29	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Benzo(b)fluoranthene	**53**	**J**	200	32	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Benzo(g,h,i)perylene	**28**	**J**	200	21	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Benzo(k)fluoranthene	ND		200	26	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Biphenyl	ND		200	29	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
bis (2-chloroisopropyl) ether	ND		200	40	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Bis(2-chloroethoxy)methane	ND		200	42	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Bis(2-chloroethyl)ether	ND		200	26	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Bis(2-ethylhexyl) phthalate	**82**	**J**	200	68	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Butyl benzyl phthalate	ND		200	33	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Caprolactam	ND		200	60	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Carbazole	ND		200	23	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Chrysene	**47**	**J**	200	45	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Dibenz(a,h)anthracene	ND		200	35	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Dibenzofuran	ND		200	23	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Diethyl phthalate	ND		200	26	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Dimethyl phthalate	ND		200	23	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Di-n-butyl phthalate	ND		200	34	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Di-n-octyl phthalate	ND		200	23	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Fluoranthene	**91**	**J**	200	21	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Fluorene	ND		200	23	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Hexachlorobenzene	ND		200	27	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Hexachlorobutadiene	ND		200	29	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Hexachlorocyclopentadiene	ND		200	27	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Hexachloroethane	ND		200	26	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Indeno(1,2,3-cd)pyrene	ND		200	25	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Isophorone	ND		200	42	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Naphthalene	ND		200	26	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Nitrobenzene	ND		200	22	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
N-Nitrosodi-n-propylamine	ND		200	34	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
N-Nitrosodiphenylamine	ND		200	160	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1

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Client Sample ID: SB-1 (0-4')

Date Collected: 01/29/16 09:00
Date Received: 02/01/16 11:45

Lab Sample ID: 480-94559-1

Matrix: Solid
Percent Solids: 84.4

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenanthrene	**59**	**J**	200	29	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1
Pyrene	**76**	**J**	200	23	ug/Kg	☼	02/02/16 06:16	02/03/16 14:09	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*81*		*39 - 146*	*02/02/16 06:16*	*02/03/16 14:09*	*1*
2-Fluorobiphenyl	*69*		*37 - 120*	*02/02/16 06:16*	*02/03/16 14:09*	*1*
2-Fluorophenol	*72*		*18 - 120*	*02/02/16 06:16*	*02/03/16 14:09*	*1*
Nitrobenzene-d5	*73*		*34 - 132*	*02/02/16 06:16*	*02/03/16 14:09*	*1*
Phenol-d5	*72*		*11 - 120*	*02/02/16 06:16*	*02/03/16 14:09*	*1*
p-Terphenyl-d14	*67*		*65 - 153*	*02/02/16 06:16*	*02/03/16 14:09*	*1*

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**6.9**		2.3		mg/Kg	☼	02/02/16 13:30	02/03/16 09:12	1
Barium	**120**	**F1**	0.58		mg/Kg	☼	02/02/16 13:30	02/03/16 09:12	1
Cadmium	**0.39**		0.23		mg/Kg	☼	02/02/16 13:30	02/03/16 09:12	1
Chromium	**26.3**		0.58		mg/Kg	☼	02/02/16 13:30	02/03/16 09:12	1
Lead	**732**	**F2**	1.2		mg/Kg	☼	02/02/16 13:30	02/03/16 09:12	1
Selenium	ND		4.6		mg/Kg	☼	02/02/16 13:30	02/03/16 09:12	1
Silver	ND		0.70		mg/Kg	☼	02/02/16 13:30	02/03/16 09:12	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.048**		0.022		mg/Kg	☼	02/03/16 09:40	02/03/16 12:58	1

Client Sample Results

Client Sample ID: SB-6 (0-4')

Date Collected: 01/29/16 11:30
Date Received: 02/01/16 11:45

Lab Sample ID: 480-94559-2
Matrix: Solid
Percent Solids: 84.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dinitrotoluene	ND		990	200	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
2,6-Dinitrotoluene	ND		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
2-Chloronaphthalene	ND		990	160	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
2-Methylnaphthalene	ND		990	200	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
2-Nitroaniline	ND		1900	150	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
3,3'-Dichlorobenzidine	ND		1900	1200	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
3-Nitroaniline	ND		1900	270	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
4-Bromophenyl phenyl ether	ND		990	140	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
4-Chloroaniline	ND		990	240	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
4-Chlorophenyl phenyl ether	ND		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
4-Nitroaniline	ND		1900	520	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Acenaphthene	ND		990	150	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Acenaphthylene	**220**	**J**	990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Acetophenone	ND		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Anthracene	**1100**		990	240	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Atrazine	ND		990	340	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Benzaldehyde	ND		990	780	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Benzo(a)anthracene	**5400**		990	99	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Benzo(a)pyrene	**4900**		990	150	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Benzo(b)fluoranthene	**5300**		990	160	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Benzo(g,h,i)perylene	**3200**		990	100	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Benzo(k)fluoranthene	**2400**		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Biphenyl	ND		990	150	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
bis (2-chloroisopropyl) ether	ND		990	200	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Bis(2-chloroethoxy)methane	ND		990	210	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Bis(2-chloroethyl)ether	ND		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Bis(2-ethylhexyl) phthalate	ND		990	340	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Butyl benzyl phthalate	ND		990	160	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Caprolactam	ND		990	300	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Carbazole	**120**	**J**	990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Chrysene	**5000**		990	220	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Dibenz(a,h)anthracene	ND		990	170	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Dibenzofuran	ND		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Diethyl phthalate	ND		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Dimethyl phthalate	ND		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Di-n-butyl phthalate	ND		990	170	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Di-n-octyl phthalate	ND		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Fluoranthene	**11000**		990	100	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Fluorene	ND		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Hexachlorobenzene	ND		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Hexachlorobutadiene	ND		990	150	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Hexachlorocyclopentadiene	ND		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Hexachloroethane	ND		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Indeno(1,2,3-cd)pyrene	**2500**		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Isophorone	ND		990	210	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Naphthalene	ND		990	130	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Nitrobenzene	ND		990	110	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
N-Nitrosodi-n-propylamine	ND		990	170	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
N-Nitrosodiphenylamine	ND		990	800	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5

Client Sample Results

Client Sample ID: SB-6 (0-4')

Lab Sample ID: 480-94559-2

Date Collected: 01/29/16 11:30
Matrix: Solid
Date Received: 02/01/16 11:45
Percent Solids: 84.8

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenanthrene	**3200**		990	150	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5
Pyrene	**11000**		990	120	ug/Kg	☼	02/02/16 06:16	02/03/16 14:35	5

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*89*		*39 - 146*	*02/02/16 06:16*	*02/03/16 14:35*	*5*
2-Fluorobiphenyl	*80*		*37 - 120*	*02/02/16 06:16*	*02/03/16 14:35*	*5*
2-Fluorophenol	*80*		*18 - 120*	*02/02/16 06:16*	*02/03/16 14:35*	*5*
Nitrobenzene-d5	*71*		*34 - 132*	*02/02/16 06:16*	*02/03/16 14:35*	*5*
Phenol-d5	*77*		*11 - 120*	*02/02/16 06:16*	*02/03/16 14:35*	*5*
p-Terphenyl-d14	*74*		*65 - 153*	*02/02/16 06:16*	*02/03/16 14:35*	*5*

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**5.4**		2.3		mg/Kg	☼	02/02/16 13:30	02/03/16 09:38	1
Barium	**127**		0.58		mg/Kg	☼	02/02/16 13:30	02/03/16 09:38	1
Cadmium	ND		0.23		mg/Kg	☼	02/02/16 13:30	02/03/16 09:38	1
Chromium	**26.8**		0.58		mg/Kg	☼	02/02/16 13:30	02/03/16 09:38	1
Lead	**18.7**		1.2		mg/Kg	☼	02/02/16 13:30	02/03/16 09:38	1
Selenium	ND		4.7		mg/Kg	☼	02/02/16 13:30	02/03/16 09:38	1
Silver	ND		0.70		mg/Kg	☼	02/02/16 13:30	02/03/16 09:38	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	**0.037**		0.022		mg/Kg	☼	02/03/16 09:40	02/03/16 13:00	1

Client Sample Results

Client: Turnkey Environmental Restoration, LLC
Project/Site: Benchmark - Elmwood & Forest site

TestAmerica Job ID: 480-94559-1

Client Sample ID: SB-7 (0-2')

Date Collected: 01/29/16 12:00
Date Received: 02/01/16 11:45

Lab Sample ID: 480-94559-3
Matrix: Solid
Percent Solids: 78.0

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dinitrotoluene	ND		220	44	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
2,6-Dinitrotoluene	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
2-Chloronaphthalene	ND		220	35	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
2-Methylnaphthalene	ND		220	43	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
2-Nitroaniline	ND		420	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
3,3'-Dichlorobenzidine	ND		420	250	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
3-Nitroaniline	ND		420	59	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
4-Bromophenyl phenyl ether	ND		220	30	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
4-Chloroaniline	ND		220	53	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
4-Chlorophenyl phenyl ether	ND		220	27	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
4-Nitroaniline	ND		420	110	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Acenaphthene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Acenaphthylene	ND		220	28	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Acetophenone	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Anthracene	ND		220	53	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Atrazine	ND		220	75	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Benzaldehyde	ND		220	170	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Benzo(a)anthracene	ND		220	22	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Benzo(a)pyrene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Benzo(b)fluoranthene	ND		220	34	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Benzo(g,h,i)perylene	ND		220	23	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Benzo(k)fluoranthene	ND		220	28	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Biphenyl	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
bis (2-chloroisopropyl) ether	ND		220	43	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Bis(2-chloroethoxy)methane	ND		220	46	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Bis(2-chloroethyl)ether	ND		220	28	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Bis(2-ethylhexyl) phthalate	ND		220	73	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Butyl benzyl phthalate	ND		220	35	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Caprolactam	ND		220	65	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Carbazole	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Chrysene	ND		220	48	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Dibenz(a,h)anthracene	ND		220	38	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Dibenzofuran	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Diethyl phthalate	ND		220	28	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Dimethyl phthalate	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Di-n-butyl phthalate	ND		220	37	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Di-n-octyl phthalate	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Fluoranthene	ND		220	23	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Fluorene	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Hexachlorobenzene	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Hexachlorobutadiene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Hexachlorocyclopentadiene	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Hexachloroethane	ND		220	28	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Indeno(1,2,3-cd)pyrene	ND		220	27	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Isophorone	ND		220	46	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Naphthalene	ND		220	28	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Nitrobenzene	ND		220	24	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
N-Nitrosodi-n-propylamine	ND		220	37	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
N-Nitrosodiphenylamine	ND		220	170	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1

Client Sample Results

Client: Turnkey Environmental Restoration, LLC
TestAmerica Job ID: 480-94559-1
Project/Site: Benchmark - Elmwood & Forest site

Client Sample ID: SB-7 (0-2')
Lab Sample ID: 480-94559-3
Date Collected: 01/29/16 12:00
Matrix: Solid
Date Received: 02/01/16 11:45
Percent Solids: 78.0

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenanthrene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1
Pyrene	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*87*		*39 - 146*	*02/02/16 06:16*	*02/03/16 15:02*	*1*
2-Fluorobiphenyl	*75*		*37 - 120*	*02/02/16 06:16*	*02/03/16 15:02*	*1*
2-Fluorophenol	*76*		*18 - 120*	*02/02/16 06:16*	*02/03/16 15:02*	*1*
Nitrobenzene-d5	*72*		*34 - 132*	*02/02/16 06:16*	*02/03/16 15:02*	*1*
Phenol-d5	*75*		*11 - 120*	*02/02/16 06:16*	*02/03/16 15:02*	*1*
p-Terphenyl-d14	*72*		*65 - 153*	*02/02/16 06:16*	*02/03/16 15:02*	*1*

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**6.5**		2.6		mg/Kg	☼	02/02/16 13:30	02/03/16 09:41	1
Barium	**181**		0.64		mg/Kg	☼	02/02/16 13:30	02/03/16 09:41	1
Cadmium	ND		0.26		mg/Kg	☼	02/02/16 13:30	02/03/16 09:41	1
Chromium	**40.3**		0.64		mg/Kg	☼	02/02/16 13:30	02/03/16 09:41	1
Lead	**15.8**		1.3		mg/Kg	☼	02/02/16 13:30	02/03/16 09:41	1
Selenium	ND		5.2		mg/Kg	☼	02/02/16 13:30	02/03/16 09:41	1
Silver	ND		0.77		mg/Kg	☼	02/02/16 13:30	02/03/16 09:41	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.024		mg/Kg	☼	02/03/16 09:40	02/03/16 13:02	1

Client Sample ID: SB-10 (1-4') Lab Sample ID: 480-94559-4

Date Collected: 01/29/16 13:30 **Matrix: Solid**
Date Received: 02/01/16 11:45 **Percent Solids: 76.6**

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dinitrotoluene	ND		220	45	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
2,6-Dinitrotoluene	ND		220	26	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
2-Chloronaphthalene	ND		220	36	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
2-Methylnaphthalene	ND		220	44	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
2-Nitroaniline	ND		430	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
3,3'-Dichlorobenzidine	ND		430	260	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
3-Nitroaniline	ND		430	61	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
4-Bromophenyl phenyl ether	ND		220	31	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
4-Chloroaniline	ND		220	55	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
4-Chlorophenyl phenyl ether	ND		220	27	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
4-Nitroaniline	ND		430	120	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Acenaphthene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Acenaphthylene	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Acetophenone	ND		220	30	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Anthracene	ND		220	55	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Atrazine	ND		220	77	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Benzaldehyde	ND		220	180	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Benzo(a)anthracene	ND		220	22	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Benzo(a)pyrene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Benzo(b)fluoranthene	ND		220	35	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Benzo(g,h,i)perylene	ND		220	23	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Benzo(k)fluoranthene	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Biphenyl	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
bis (2-chloroisopropyl) ether	ND		220	44	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Bis(2-chloroethoxy)methane	ND		220	47	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Bis(2-chloroethyl)ether	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Bis(2-ethylhexyl) phthalate	ND		220	75	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Butyl benzyl phthalate	ND		220	36	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Caprolactam	ND		220	66	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Carbazole	ND		220	26	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Chrysene	ND		220	49	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Dibenz(a,h)anthracene	ND		220	39	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Dibenzofuran	ND		220	26	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Diethyl phthalate	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Dimethyl phthalate	ND		220	26	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Di-n-butyl phthalate	ND		220	38	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Di-n-octyl phthalate	ND		220	26	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Fluoranthene	ND		220	23	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Fluorene	ND		220	26	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Hexachlorobenzene	ND		220	30	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Hexachlorobutadiene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Hexachlorocyclopentadiene	ND		220	30	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Hexachloroethane	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Indeno(1,2,3-cd)pyrene	ND		220	27	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Isophorone	ND		220	47	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Naphthalene	ND		220	29	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Nitrobenzene	ND		220	25	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
N-Nitrosodi-n-propylamine	ND		220	38	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
N-Nitrosodiphenylamine	ND		220	180	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1

Client Sample ID: SB-10 (1-4')

Lab Sample ID: 480-94559-4

Date Collected: 01/29/16 13:30
Matrix: Solid
Date Received: 02/01/16 11:45
Percent Solids: 76.6

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenanthrene	ND		220	32	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1
Pyrene	ND		220	26	ug/Kg	☼	02/02/16 06:16	02/03/16 15:28	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*87*		*39 - 146*	*02/02/16 06:16*	*02/03/16 15:28*	*1*
2-Fluorobiphenyl	*82*		*37 - 120*	*02/02/16 06:16*	*02/03/16 15:28*	*1*
2-Fluorophenol	*79*		*18 - 120*	*02/02/16 06:16*	*02/03/16 15:28*	*1*
Nitrobenzene-d5	*77*		*34 - 132*	*02/02/16 06:16*	*02/03/16 15:28*	*1*
Phenol-d5	*79*		*11 - 120*	*02/02/16 06:16*	*02/03/16 15:28*	*1*
p-Terphenyl-d14	*75*		*65 - 153*	*02/02/16 06:16*	*02/03/16 15:28*	*1*

Method: 6010C - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	**3.8**		2.8		mg/Kg	☼	02/02/16 13:30	02/03/16 09:44	1
Barium	**97.9**		0.71		mg/Kg	☼	02/02/16 13:30	02/03/16 09:44	1
Cadmium	ND		0.28		mg/Kg	☼	02/02/16 13:30	02/03/16 09:44	1
Chromium	**18.7**		0.71		mg/Kg	☼	02/02/16 13:30	02/03/16 09:44	1
Lead	**19.7**		1.4		mg/Kg	☼	02/02/16 13:30	02/03/16 09:44	1
Selenium	ND		5.6		mg/Kg	☼	02/02/16 13:30	02/03/16 09:44	1
Silver	ND		0.85		mg/Kg	☼	02/02/16 13:30	02/03/16 09:44	1

Method: 7471B - Mercury (CVAA)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.026		mg/Kg	☼	02/03/16 09:40	02/03/16 13:04	1

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Matrix: Solid

Prep Type: Total/NA

		Percent Surrogate Recovery (Acceptance Limits)					
		TBP	FBP	2FP	NBZ	PHL	TPH
Lab Sample ID	**Client Sample ID**	(39-146)	(37-120)	(18-120)	(34-132)	(11-120)	(65-153)
480-94559-1	SB-1 (0-4')	81	69	72	73	72	67
480-94559-2	SB-6 (0-4')	89	80	80	71	77	74
480-94559-3	SB-7 (0-2')	87	75	76	72	75	72
480-94559-4	SB-10 (1-4')	87	82	79	77	79	75
480-94559-4 MS	SB-10 (1-4')	94	81	74	73	73	77
480-94559-4 MSD	SB-10 (1-4')	95	84	76	74	77	82
LCS 480-285765/2-A	Lab Control Sample	93	88	77	76	76	88
MB 480-285765/1-A	Method Blank	81	85	77	73	76	83

Surrogate Legend

TBP = 2,4,6-Tribromophenol
FBP = 2-Fluorobiphenyl
2FP = 2-Fluorophenol
NBZ = Nitrobenzene-d5
PHL = Phenol-d5
TPH = p-Terphenyl-d14

QC Sample Results

Client: Turnkey Environmental Restoration, LLC
Project/Site: Benchmark - Elmwood & Forest site

TestAmerica Job ID: 480-94559-1

Method: 8270D - Semivolatile Organic Compounds (GC/MS)

Lab Sample ID: MB 480-285765/1-A
Matrix: Solid
Analysis Batch: 285988

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 285765

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
2,4-Dinitrotoluene	ND		170	34	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
2,6-Dinitrotoluene	ND		170	20	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
2-Chloronaphthalene	ND		170	27	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
2-Methylnaphthalene	ND		170	33	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
2-Nitroaniline	ND		320	24	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
3,3'-Dichlorobenzidine	ND		320	200	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
3-Nitroaniline	ND		320	46	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
4-Bromophenyl phenyl ether	ND		170	23	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
4-Chloroaniline	ND		170	41	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
4-Chlorophenyl phenyl ether	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
4-Nitroaniline	ND		320	87	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Acenaphthene	ND		170	24	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Acenaphthylene	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Acetophenone	ND		170	22	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Anthracene	ND		170	41	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Atrazine	ND		170	58	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Benzaldehyde	ND		170	130	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Benzo(a)anthracene	ND		170	17	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Benzo(a)pyrene	ND		170	24	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Benzo(b)fluoranthene	ND		170	26	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Benzo(g,h,i)perylene	ND		170	18	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Benzo(k)fluoranthene	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Biphenyl	ND		170	24	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
bis (2-chloroisopropyl) ether	ND		170	33	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Bis(2-chloroethoxy)methane	ND		170	35	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Bis(2-chloroethyl)ether	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Bis(2-ethylhexyl) phthalate	ND		170	57	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Butyl benzyl phthalate	ND		170	27	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Caprolactam	ND		170	50	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Carbazole	ND		170	20	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Chrysene	ND		170	37	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Dibenz(a,h)anthracene	ND		170	29	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Dibenzofuran	ND		170	20	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Diethyl phthalate	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Dimethyl phthalate	ND		170	20	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Di-n-butyl phthalate	ND		170	28	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Di-n-octyl phthalate	ND		170	20	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Fluoranthene	ND		170	18	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Fluorene	ND		170	20	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Hexachlorobenzene	ND		170	22	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Hexachlorobutadiene	ND		170	24	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Hexachlorocyclopentadiene	ND		170	22	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Hexachloroethane	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Indeno(1,2,3-cd)pyrene	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Isophorone	ND		170	35	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Naphthalene	ND		170	21	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Nitrobenzene	ND		170	19	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
N-Nitrosodi-n-propylamine	ND		170	28	ug/Kg		02/02/16 06:16	02/03/16 12:24	1

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: MB 480-285765/1-A
Matrix: Solid
Analysis Batch: 285988

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 285765

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
N-Nitrosodiphenylamine	ND		170	130	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Phenanthrene	ND		170	24	ug/Kg		02/02/16 06:16	02/03/16 12:24	1
Pyrene	ND		170	20	ug/Kg		02/02/16 06:16	02/03/16 12:24	1

Surrogate	*MB %Recovery*	*MB Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
2,4,6-Tribromophenol	*81*		*39 - 146*	*02/02/16 06:16*	*02/03/16 12:24*	*1*
2-Fluorobiphenyl	*85*		*37 - 120*	*02/02/16 06:16*	*02/03/16 12:24*	*1*
2-Fluorophenol	*77*		*18 - 120*	*02/02/16 06:16*	*02/03/16 12:24*	*1*
Nitrobenzene-d5	*73*		*34 - 132*	*02/02/16 06:16*	*02/03/16 12:24*	*1*
Phenol-d5	*76*		*11 - 120*	*02/02/16 06:16*	*02/03/16 12:24*	*1*
p-Terphenyl-d14	*83*		*65 - 153*	*02/02/16 06:16*	*02/03/16 12:24*	*1*

Lab Sample ID: LCS 480-285765/2-A
Matrix: Solid
Analysis Batch: 285988

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 285765

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Acenaphthene	1650	1410		ug/Kg		86	53 - 120
Biphenyl	1650	1440		ug/Kg		87	71 - 120
bis (2-chloroisopropyl) ether	1650	1040		ug/Kg		63	44 - 120
Bis(2-chloroethoxy)methane	1650	1260		ug/Kg		76	61 - 133
Bis(2-chloroethyl)ether	1650	1180		ug/Kg		71	45 - 120
Bis(2-ethylhexyl) phthalate	1650	1440		ug/Kg		87	61 - 133
Butyl benzyl phthalate	1650	1470		ug/Kg		89	61 - 129
Caprolactam	3300	2620		ug/Kg		79	54 - 133
Carbazole	1650	1470		ug/Kg		89	59 - 129
Chrysene	1650	1470		ug/Kg		89	64 - 131
Dibenz(a,h)anthracene	1650	1590		ug/Kg		96	54 - 148
Dibenzofuran	1650	1440		ug/Kg		87	56 - 120
Diethyl phthalate	1650	1460		ug/Kg		88	66 - 126
Dimethyl phthalate	1650	1490		ug/Kg		90	65 - 124
Di-n-butyl phthalate	1650	1470		ug/Kg		89	58 - 130
Di-n-octyl phthalate	1650	1470		ug/Kg		89	62 - 133
Fluoranthene	1650	1460		ug/Kg		89	62 - 131
Fluorene	1650	1400		ug/Kg		85	63 - 126
Hexachlorobenzene	1650	1500		ug/Kg		91	60 - 132
Hexachlorobutadiene	1650	1370		ug/Kg		83	45 - 120
Hexachlorocyclopentadiene	1650	1310		ug/Kg		79	31 - 120
Hexachloroethane	1650	1130		ug/Kg		69	41 - 120
Indeno(1,2,3-cd)pyrene	1650	1570		ug/Kg		95	56 - 149
Isophorone	1650	1340		ug/Kg		81	56 - 120
Naphthalene	1650	1330		ug/Kg		80	46 - 120
Nitrobenzene	1650	1250		ug/Kg		75	49 - 120
N-Nitrosodi-n-propylamine	1650	1150		ug/Kg		70	46 - 120
N-Nitrosodiphenylamine	1650	1490		ug/Kg		90	20 - 119
Phenanthrene	1650	1440		ug/Kg		87	60 - 130
Pyrene	1650	1560		ug/Kg		94	51 - 133

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: LCS 480-285765/2-A
Matrix: Solid
Analysis Batch: 285988

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 285765

Surrogate	*LCS %Recovery*	*LCS Qualifier*	*Limits*
2,4,6-Tribromophenol	*93*		*39 - 146*
2-Fluorobiphenyl	*88*		*37 - 120*
2-Fluorophenol	*77*		*18 - 120*
Nitrobenzene-d5	*76*		*34 - 132*
Phenol-d5	*76*		*11 - 120*
p-Terphenyl-d14	*88*		*65 - 153*

Lab Sample ID: 480-94559-4 MS
Matrix: Solid
Analysis Batch: 285988

Client Sample ID: SB-10 (1-4')
Prep Type: Total/NA
Prep Batch: 285765

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Acenaphthene	ND		2140	1750		ug/Kg	☼	82	53 - 120
Biphenyl	ND		2140	1760		ug/Kg	☼	82	71 - 120
bis (2-chloroisopropyl) ether	ND		2140	1200		ug/Kg	☼	56	44 - 120
Bis(2-chloroethoxy)methane	ND		2140	1550		ug/Kg	☼	72	61 - 133
Bis(2-chloroethyl)ether	ND		2140	1410		ug/Kg	☼	66	45 - 120
Bis(2-ethylhexyl) phthalate	ND		2140	1770		ug/Kg	☼	83	61 - 133
Butyl benzyl phthalate	ND		2140	1770		ug/Kg	☼	83	61 - 129
Caprolactam	ND		4290	3370		ug/Kg	☼	79	54 - 133
Carbazole	ND		2140	1820		ug/Kg	☼	85	59 - 129
Chrysene	ND		2140	1800		ug/Kg	☼	84	64 - 131
Dibenz(a,h)anthracene	ND		2140	1840		ug/Kg	☼	86	54 - 148
Dibenzofuran	ND		2140	1790		ug/Kg	☼	84	56 - 120
Diethyl phthalate	ND		2140	1810		ug/Kg	☼	85	66 - 126
Dimethyl phthalate	ND		2140	1840		ug/Kg	☼	86	65 - 124
Di-n-butyl phthalate	ND		2140	1820		ug/Kg	☼	85	58 - 130
Di-n-octyl phthalate	ND		2140	1850		ug/Kg	☼	86	62 - 133
Fluoranthene	ND		2140	1850		ug/Kg	☼	86	62 - 131
Fluorene	ND		2140	1720		ug/Kg	☼	80	63 - 126
Hexachlorobenzene	ND		2140	1860		ug/Kg	☼	87	60 - 132
Hexachlorobutadiene	ND		2140	1660		ug/Kg	☼	77	45 - 120
Hexachlorocyclopentadiene	ND		2140	1580		ug/Kg	☼	74	31 - 120
Hexachloroethane	ND		2140	1290		ug/Kg	☼	60	41 - 120
Indeno(1,2,3-cd)pyrene	ND		2140	1840		ug/Kg	☼	86	56 - 149
Isophorone	ND		2140	1630		ug/Kg	☼	76	56 - 120
Naphthalene	ND		2140	1610		ug/Kg	☼	75	46 - 120
Nitrobenzene	ND		2140	1530		ug/Kg	☼	72	49 - 120
N-Nitrosodi-n-propylamine	ND		2140	1360		ug/Kg	☼	64	46 - 120
N-Nitrosodiphenylamine	ND		2140	1840		ug/Kg	☼	86	20 - 119
Phenanthrene	ND		2140	1830		ug/Kg	☼	85	60 - 130
Pyrene	ND		2140	1850		ug/Kg	☼	86	51 - 133

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
2,4,6-Tribromophenol	*94*		*39 - 146*
2-Fluorobiphenyl	*81*		*37 - 120*
2-Fluorophenol	*74*		*18 - 120*

Method: 8270D - Semivolatile Organic Compounds (GC/MS) (Continued)

Lab Sample ID: 480-94559-4 MS
Matrix: Solid
Analysis Batch: 285988

Client Sample ID: SB-10 (1-4')
Prep Type: Total/NA
Prep Batch: 285765

Surrogate	*MS %Recovery*	*MS Qualifier*	*Limits*
Nitrobenzene-d5	*73*		*34 - 132*
Phenol-d5	*73*		*11 - 120*
p-Terphenyl-d14	*77*		*65 - 153*

Lab Sample ID: 480-94559-4 MSD
Matrix: Solid
Analysis Batch: 285988

Client Sample ID: SB-10 (1-4')
Prep Type: Total/NA
Prep Batch: 285765

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Acenaphthene	ND		2160	1790		ug/Kg	☼	83	53 - 120	2	35
Biphenyl	ND		2160	1790		ug/Kg	☼	83	71 - 120	2	20
bis (2-chloroisopropyl) ether	ND		2160	1230		ug/Kg	☼	57	44 - 120	3	24
Bis(2-chloroethoxy)methane	ND		2160	1590		ug/Kg	☼	73	61 - 133	3	17
Bis(2-chloroethyl)ether	ND		2160	1470		ug/Kg	☼	68	45 - 120	4	21
Bis(2-ethylhexyl) phthalate	ND		2160	1830		ug/Kg	☼	85	61 - 133	3	15
Butyl benzyl phthalate	ND		2160	1850		ug/Kg	☼	86	61 - 129	5	16
Caprolactam	ND		4330	3560		ug/Kg	☼	82	54 - 133	5	20
Carbazole	ND		2160	1890		ug/Kg	☼	88	59 - 129	4	20
Chrysene	ND		2160	1860		ug/Kg	☼	86	64 - 131	3	15
Dibenz(a,h)anthracene	ND		2160	1930		ug/Kg	☼	89	54 - 148	5	15
Dibenzofuran	ND		2160	1820		ug/Kg	☼	84	56 - 120	2	15
Diethyl phthalate	ND		2160	1880		ug/Kg	☼	87	66 - 126	4	15
Dimethyl phthalate	ND		2160	1890		ug/Kg	☼	87	65 - 124	2	15
Di-n-butyl phthalate	ND		2160	1900		ug/Kg	☼	88	58 - 130	5	15
Di-n-octyl phthalate	ND		2160	1960		ug/Kg	☼	91	62 - 133	6	16
Fluoranthene	ND		2160	1940		ug/Kg	☼	90	62 - 131	5	15
Fluorene	ND		2160	1810		ug/Kg	☼	84	63 - 126	5	15
Hexachlorobenzene	ND		2160	1890		ug/Kg	☼	88	60 - 132	2	15
Hexachlorobutadiene	ND		2160	1660		ug/Kg	☼	77	45 - 120	0	44
Hexachlorocyclopentadiene	ND		2160	1510		ug/Kg	☼	70	31 - 120	4	49
Hexachloroethane	ND		2160	1290		ug/Kg	☼	59	41 - 120	0	46
Indeno(1,2,3-cd)pyrene	ND		2160	1920		ug/Kg	☼	89	56 - 149	4	15
Isophorone	ND		2160	1690		ug/Kg	☼	78	56 - 120	4	17
Naphthalene	ND		2160	1640		ug/Kg	☼	76	46 - 120	2	29
Nitrobenzene	ND		2160	1530		ug/Kg	☼	71	49 - 120	0	24
N-Nitrosodi-n-propylamine	ND		2160	1440		ug/Kg	☼	67	46 - 120	6	31
N-Nitrosodiphenylamine	ND		2160	1870		ug/Kg	☼	86	20 - 119	1	15
Phenanthrene	ND		2160	1890		ug/Kg	☼	87	60 - 130	3	15
Pyrene	ND		2160	1860		ug/Kg	☼	86	51 - 133	0	35

Surrogate	*MSD %Recovery*	*MSD Qualifier*	*Limits*
2,4,6-Tribromophenol	*95*		*39 - 146*
2-Fluorobiphenyl	*84*		*37 - 120*
2-Fluorophenol	*76*		*18 - 120*
Nitrobenzene-d5	*74*		*34 - 132*
Phenol-d5	*77*		*11 - 120*
p-Terphenyl-d14	*82*		*65 - 153*

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 480-285824/1-A
Matrix: Solid
Analysis Batch: 286112

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 285824

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		2.0		mg/Kg		02/02/16 13:30	02/03/16 09:06	1
Barium	ND		0.50		mg/Kg		02/02/16 13:30	02/03/16 09:06	1
Cadmium	ND		0.20		mg/Kg		02/02/16 13:30	02/03/16 09:06	1
Chromium	ND		0.50		mg/Kg		02/02/16 13:30	02/03/16 09:06	1
Lead	ND		1.0		mg/Kg		02/02/16 13:30	02/03/16 09:06	1
Selenium	ND		4.0		mg/Kg		02/02/16 13:30	02/03/16 09:06	1
Silver	ND		0.60		mg/Kg		02/02/16 13:30	02/03/16 09:06	1

Lab Sample ID: LCSSRM 480-285824/2-A
Matrix: Solid
Analysis Batch: 286112

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 285824

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	98.5	86.20		mg/Kg		87.5	69.3 - 145.2
Barium	308	281.7		mg/Kg		91.5	74.0 - 126.0
Cadmium	146	131.2		mg/Kg		89.8	73.3 - 126.7
Chromium	182	163.6		mg/Kg		89.9	70.9 - 129.7
Lead	130	127.8		mg/Kg		98.3	72.5 - 126.9
Selenium	154	134.2		mg/Kg		87.1	67.5 - 132.5
Silver	40.9	34.62		mg/Kg		84.7	66.0 - 133.7

Lab Sample ID: 480-94559-1 MS
Matrix: Solid
Analysis Batch: 286112

Client Sample ID: SB-1 (0-4')
Prep Type: Total/NA
Prep Batch: 285824

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	6.9		48.7	46.23		mg/Kg	☼	81	75 - 125
Barium	120	F1	48.7	172.8		mg/Kg	☼	108	75 - 125
Cadmium	0.39		48.7	40.92		mg/Kg	☼	83	75 - 125
Chromium	26.3		48.7	68.37		mg/Kg	☼	86	75 - 125
Lead	732	F2	48.7	626.7	4	mg/Kg	☼	-216	75 - 125
Selenium	ND		48.7	40.27		mg/Kg	☼	83	75 - 125
Silver	ND		12.2	10.35		mg/Kg	☼	85	75 - 125

Lab Sample ID: 480-94559-1 MSD
Matrix: Solid
Analysis Batch: 286112

Client Sample ID: SB-1 (0-4')
Prep Type: Total/NA
Prep Batch: 285824

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	6.9		46.6	46.27		mg/Kg	☼	85	75 - 125	0	20
Barium	120	F1	46.6	195.3	F1	mg/Kg	☼	161	75 - 125	12	20
Cadmium	0.39		46.6	41.80		mg/Kg	☼	89	75 - 125	2	20
Chromium	26.3		46.6	71.76		mg/Kg	☼	98	75 - 125	5	20

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: 480-94559-1 MSD
Matrix: Solid
Analysis Batch: 286112

Client Sample ID: SB-1 (0-4')
Prep Type: Total/NA
Prep Batch: 285824

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Lead	732	F2	46.6	236.7	4 F2	mg/Kg	☼	-1063	75 - 125	90	20
Selenium	ND		46.6	40.53		mg/Kg	☼	87	75 - 125	1	20
Silver	ND		11.6	10.58		mg/Kg	☼	91	75 - 125	2	20

Method: 7471B - Mercury (CVAA)

Lab Sample ID: MB 480-285886/1-A
Matrix: Solid
Analysis Batch: 286089

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 285886

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.020		mg/Kg		02/03/16 09:40	02/03/16 12:54	1

Lab Sample ID: LCSSRM 480-285886/2-A ^5
Matrix: Solid
Analysis Batch: 286089

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 285886

Analyte			Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury			7.10	7.51		mg/Kg		105.8	51.3 - 149.3		

GC/MS Semi VOA

Prep Batch: 285765

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-94559-1	SB-1 (0-4')	Total/NA	Solid	3550C	
480-94559-2	SB-6 (0-4')	Total/NA	Solid	3550C	
480-94559-3	SB-7 (0-2')	Total/NA	Solid	3550C	
480-94559-4	SB-10 (1-4')	Total/NA	Solid	3550C	
480-94559-4 MS	SB-10 (1-4')	Total/NA	Solid	3550C	
480-94559-4 MSD	SB-10 (1-4')	Total/NA	Solid	3550C	
LCS 480-285765/2-A	Lab Control Sample	Total/NA	Solid	3550C	
MB 480-285765/1-A	Method Blank	Total/NA	Solid	3550C	

Analysis Batch: 285988

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-94559-1	SB-1 (0-4')	Total/NA	Solid	8270D	285765
480-94559-2	SB-6 (0-4')	Total/NA	Solid	8270D	285765
480-94559-3	SB-7 (0-2')	Total/NA	Solid	8270D	285765
480-94559-4	SB-10 (1-4')	Total/NA	Solid	8270D	285765
480-94559-4 MS	SB-10 (1-4')	Total/NA	Solid	8270D	285765
480-94559-4 MSD	SB-10 (1-4')	Total/NA	Solid	8270D	285765
LCS 480-285765/2-A	Lab Control Sample	Total/NA	Solid	8270D	285765
MB 480-285765/1-A	Method Blank	Total/NA	Solid	8270D	285765

Metals

Prep Batch: 285824

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-94559-1	SB-1 (0-4')	Total/NA	Solid	3050B	
480-94559-1 MS	SB-1 (0-4')	Total/NA	Solid	3050B	
480-94559-1 MSD	SB-1 (0-4')	Total/NA	Solid	3050B	
480-94559-2	SB-6 (0-4')	Total/NA	Solid	3050B	
480-94559-3	SB-7 (0-2')	Total/NA	Solid	3050B	
480-94559-4	SB-10 (1-4')	Total/NA	Solid	3050B	
LCSSRM 480-285824/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 480-285824/1-A	Method Blank	Total/NA	Solid	3050B	

Prep Batch: 285886

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-94559-1	SB-1 (0-4')	Total/NA	Solid	7471B	
480-94559-2	SB-6 (0-4')	Total/NA	Solid	7471B	
480-94559-3	SB-7 (0-2')	Total/NA	Solid	7471B	
480-94559-4	SB-10 (1-4')	Total/NA	Solid	7471B	
LCSSRM 480-285886/2-A ^5	Lab Control Sample	Total/NA	Solid	7471B	
MB 480-285886/1-A	Method Blank	Total/NA	Solid	7471B	

Analysis Batch: 286089

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-94559-1	SB-1 (0-4')	Total/NA	Solid	7471B	285886
480-94559-2	SB-6 (0-4')	Total/NA	Solid	7471B	285886
480-94559-3	SB-7 (0-2')	Total/NA	Solid	7471B	285886
480-94559-4	SB-10 (1-4')	Total/NA	Solid	7471B	285886
LCSSRM 480-285886/2-A ^5	Lab Control Sample	Total/NA	Solid	7471B	285886
MB 480-285886/1-A	Method Blank	Total/NA	Solid	7471B	285886

Metals (Continued)

Analysis Batch: 286112

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-94559-1	SB-1 (0-4')	Total/NA	Solid	6010C	285824
480-94559-1 MS	SB-1 (0-4')	Total/NA	Solid	6010C	285824
480-94559-1 MSD	SB-1 (0-4')	Total/NA	Solid	6010C	285824
480-94559-2	SB-6 (0-4')	Total/NA	Solid	6010C	285824
480-94559-3	SB-7 (0-2')	Total/NA	Solid	6010C	285824
480-94559-4	SB-10 (1-4')	Total/NA	Solid	6010C	285824
LCSSRM 480-285824/2-A	Lab Control Sample	Total/NA	Solid	6010C	285824
MB 480-285824/1-A	Method Blank	Total/NA	Solid	6010C	285824

General Chemistry

Analysis Batch: 285960

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
480-94559-1	SB-1 (0-4')	Total/NA	Solid	Moisture	
480-94559-2	SB-6 (0-4')	Total/NA	Solid	Moisture	
480-94559-3	SB-7 (0-2')	Total/NA	Solid	Moisture	
480-94559-4	SB-10 (1-4')	Total/NA	Solid	Moisture	

Lab Chronicle

Client Sample ID: SB-1 (0-4')

Lab Sample ID: 480-94559-1

Date Collected: 01/29/16 09:00

Matrix: Solid

Date Received: 02/01/16 11:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	285960	02/03/16 03:34	CSW	TAL BUF

Client Sample ID: SB-1 (0-4')

Lab Sample ID: 480-94559-1

Date Collected: 01/29/16 09:00

Matrix: Solid

Date Received: 02/01/16 11:45

Percent Solids: 84.4

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			285765	02/02/16 06:16	RMZ	TAL BUF
Total/NA	Analysis	8270D		1	285988	02/03/16 14:09	LMW	TAL BUF
Total/NA	Prep	3050B			285824	02/02/16 13:30	CMM	TAL BUF
Total/NA	Analysis	6010C		1	286112	02/03/16 09:12	LMH	TAL BUF
Total/NA	Prep	7471B			285886	02/03/16 09:40	TAS	TAL BUF
Total/NA	Analysis	7471B		1	286089	02/03/16 12:58	TAS	TAL BUF

Client Sample ID: SB-6 (0-4')

Lab Sample ID: 480-94559-2

Date Collected: 01/29/16 11:30

Matrix: Solid

Date Received: 02/01/16 11:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	285960	02/03/16 03:34	CSW	TAL BUF

Client Sample ID: SB-6 (0-4')

Lab Sample ID: 480-94559-2

Date Collected: 01/29/16 11:30

Matrix: Solid

Date Received: 02/01/16 11:45

Percent Solids: 84.8

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			285765	02/02/16 06:16	RMZ	TAL BUF
Total/NA	Analysis	8270D		5	285988	02/03/16 14:35	LMW	TAL BUF
Total/NA	Prep	3050B			285824	02/02/16 13:30	CMM	TAL BUF
Total/NA	Analysis	6010C		1	286112	02/03/16 09:38	LMH	TAL BUF
Total/NA	Prep	7471B			285886	02/03/16 09:40	TAS	TAL BUF
Total/NA	Analysis	7471B		1	286089	02/03/16 13:00	TAS	TAL BUF

Client Sample ID: SB-7 (0-2')

Lab Sample ID: 480-94559-3

Date Collected: 01/29/16 12:00

Matrix: Solid

Date Received: 02/01/16 11:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	285960	02/03/16 03:34	CSW	TAL BUF

Client Sample ID: SB-7 (0-2')

Lab Sample ID: 480-94559-3

Date Collected: 01/29/16 12:00
Matrix: Solid
Date Received: 02/01/16 11:45
Percent Solids: 78.0

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			285765	02/02/16 06:16	RMZ	TAL BUF
Total/NA	Analysis	8270D		1	285988	02/03/16 15:02	LMW	TAL BUF
Total/NA	Prep	3050B			285824	02/02/16 13:30	CMM	TAL BUF
Total/NA	Analysis	6010C		1	286112	02/03/16 09:41	LMH	TAL BUF
Total/NA	Prep	7471B			285886	02/03/16 09:40	TAS	TAL BUF
Total/NA	Analysis	7471B		1	286089	02/03/16 13:02	TAS	TAL BUF

Client Sample ID: SB-10 (1-4')

Lab Sample ID: 480-94559-4

Date Collected: 01/29/16 13:30
Matrix: Solid
Date Received: 02/01/16 11:45

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1	285960	02/03/16 03:34	CSW	TAL BUF

Client Sample ID: SB-10 (1-4')

Lab Sample ID: 480-94559-4

Date Collected: 01/29/16 13:30
Matrix: Solid
Date Received: 02/01/16 11:45
Percent Solids: 76.6

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			285765	02/02/16 06:16	RMZ	TAL BUF
Total/NA	Analysis	8270D		1	285988	02/03/16 15:28	LMW	TAL BUF
Total/NA	Prep	3050B			285824	02/02/16 13:30	CMM	TAL BUF
Total/NA	Analysis	6010C		1	286112	02/03/16 09:44	LMH	TAL BUF
Total/NA	Prep	7471B			285886	02/03/16 09:40	TAS	TAL BUF
Total/NA	Analysis	7471B		1	286089	02/03/16 13:04	TAS	TAL BUF

Laboratory References:

TAL BUF = TestAmerica Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600

Certification Summary

Laboratory: TestAmerica Buffalo

Unless otherwise noted, all analytes for this laboratory were covered under each certification below.

Authority	Program	EPA Region	Certification ID	Expiration Date
New York	NELAP	2	10026	03-31-16 *

The following analytes are included in this report, but certification is not offered by the governing authority:

Analysis Method	Prep Method	Matrix	Analyte
Moisture		Solid	Percent Moisture
Moisture		Solid	Percent Solids

* Certification renewal pending - certification considered valid.

Method Summary

Method	Method Description	Protocol	Laboratory
8270D	Semivolatile Organic Compounds (GC/MS)	SW846	TAL BUF
6010C	Metals (ICP)	SW846	TAL BUF
7471B	Mercury (CVAA)	SW846	TAL BUF
Moisture	Percent Moisture	EPA	TAL BUF

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL BUF = TestAmerica Buffalo, 10 Hazelwood Drive, Amherst, NY 14228-2298, TEL (716)691-2600

Sample Summary

Client: Turnkey Environmental Restoration, LLC
Project/Site: Benchmark - Elmwood & Forest site

TestAmerica Job ID: 480-94559-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
480-94559-1	SB-1 (0-4')	Solid	01/29/16 09:00	02/01/16 11:45
480-94559-2	SB-6 (0-4')	Solid	01/29/16 11:30	02/01/16 11:45
480-94559-3	SB-7 (0-2')	Solid	01/29/16 12:00	02/01/16 11:45
480-94559-4	SB-10 (1-4')	Solid	01/29/16 13:30	02/01/16 11:45

Chain of Custody Record

TAL-4124 (1007)

Temperature on Receipt ______

Drinking Water? Yes ☐ No ☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Client: Turnkey Environmental Restoration
Project Manager: Chris Boron
Date: 01/29/2016
Chain of Custody Number: 190620
Address: 2558 Hamburg Turnpike
Telephone Number (Area Code)/Fax Number: 716-449-0882
Lab Number:
Page 1 of 1
City: Lackawanna
State: NY
Zip Code: 14218
Site Contact: Josh Robinson
Lab Contact:
Project Name and Location (State): 12 Parcel - Corner of Elmwood and Forest
Carrier/Waybill Number:
Contract/Purchase Order/Quote No.:

480-94559 Chain of Custody

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: SVOC (8270)	Metals (6010/7471)	Special Instructions/ Conditions of Receipt
SB-1 (0-4')	01/29/2016	0900				X	X						X	X	
SB-6 (0-4')	1/29/2016	1130				X	X						X	X	
SB-7 (0-2')	1/29/2016	1200				X	X						X	X	
SB-10 (1-4')	1/29/2016	1330				X	X						X	X	
SB-5 (4-8')	1/29/2016	1100				X	X						X	X	Hold Sample
SB-11 (4-8')	1/29/2016	1400				X	X						X	X	Hold Sample

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

Sample Disposal
☐ Return To Client ☐ Disposal By Lab ☐ Archive For ______ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☒ Other standard

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By	01/29/16	1700	1. Received By TA BUFFALO	2/1/16	1110
2. Relinquished By TA BUFFALO	2/1/16	1145	2. Received By	2/1/16	1145
3. Relinquished By			3. Received By		

Comments: SVOC Base Neutral, RCRA 8 Metals

2.4 #2

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Turnkey Environmental Restoration, LLC

Job Number: 480-94559-1

Login Number: 94559

List Source: TestAmerica Buffalo

List Number: 1

Creator: Janish, Carl M

Question	Answer	Comment
Radioactivity either was not measured or, if measured, is at or below background	True	
The cooler's custody seal, if present, is intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time (Excluding tests with immediate HTs)..	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	True	
If necessary, staff have been informed of any short hold time or quick TAT needs	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Sampling Company provided.	True	bmtk
Samples received within 48 hours of sampling.	False	
Samples requiring field filtration have been filtered in the field.	N/A	
Chlorine Residual checked.	N/A	

ANALYTICAL REPORT

Lab Number:	L1607809
Client:	Turnkey Environmental Restoration, LLC 2558 Hamburg Turnpike Suite 300 Buffalo, NY 14218
ATTN:	Chris Boron
Phone:	(716) 856-0599
Project Name:	ELMWOOD & FOREST AVENUE
Project Number:	T0369-016-001
Report Date:	03/24/16

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), VA (460195), MD (348), IL (200077), NC (666), TX (T104704476), DOD (L2217), USDA (Permit #P-330-11-00240).

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

Project Name: ELMWOOD & FOREST AVENUE
Project Number: T0369-016-001

Lab Number: L1607809
Report Date: 03/24/16

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1607809-01	HA-1 (2-6")	SOIL	BUFFALO, NY	03/17/16 09:45	03/17/16
L1607809-02	HA-2 (4-6")	SOIL	BUFFALO, NY	03/17/16 10:00	03/17/16
L1607809-03	HA-3 (4-8")	SOIL	BUFFALO, NY	03/17/16 10:15	03/17/16
L1607809-04	HA-4 (1-4")	SOIL	BUFFALO, NY	03/17/16 10:45	03/17/16
L1607809-05	HA-5 (1-4")	SOIL	BUFFALO, NY	03/17/16 11:30	03/17/16
L1607809-06	HA-5 (4-18")	SOIL	BUFFALO, NY	03/17/16 11:45	03/17/16
L1607809-07	HA-6 (4-8")	SOIL	BUFFALO, NY	03/17/16 12:30	03/17/16

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. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

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

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

HOLD POLICY

For samples submitted on hold, Alpha's policy is to hold samples (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 Client Service Representative 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 Client Services 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.

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

Authorized Signature: Michelle M. Morris Michelle M. Morris

Title: Technical Director/Representative

Date: 03/24/16

ORGANICS

SEMIVOLATILES

SAMPLE RESULTS

Lab ID:	L1607809-01	Date Collected:	03/17/16 09:45
Client ID:	HA-1 (2-6")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	03/22/16 07:09
Analytical Date:	03/24/16 01:31		
Analyst:	RC		
Percent Solids:	79%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	160	21.	1
1,2,4-Trichlorobenzene	ND		ug/kg	210	24.	1
Hexachlorobenzene	ND		ug/kg	120	23.	1
Bis(2-chloroethyl)ether	ND		ug/kg	190	28.	1
2-Chloronaphthalene	ND		ug/kg	210	20.	1
1,2-Dichlorobenzene	ND		ug/kg	210	37.	1
1,3-Dichlorobenzene	ND		ug/kg	210	36.	1
1,4-Dichlorobenzene	ND		ug/kg	210	36.	1
3,3'-Dichlorobenzidine	ND		ug/kg	210	55.	1
2,4-Dinitrotoluene	ND		ug/kg	210	41.	1
2,6-Dinitrotoluene	ND		ug/kg	210	36.	1
Fluoranthene	310		ug/kg	120	24.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	210	22.	1
4-Bromophenyl phenyl ether	ND		ug/kg	210	32.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	250	35.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	220	21.	1
Hexachlorobutadiene	ND		ug/kg	210	30.	1
Hexachlorocyclopentadiene	ND		ug/kg	590	190	1
Hexachloroethane	ND		ug/kg	160	33.	1
Isophorone	ND		ug/kg	190	27.	1
Naphthalene	ND		ug/kg	210	25.	1
Nitrobenzene	ND		ug/kg	190	31.	1
NDPA/DPA	ND		ug/kg	160	24.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	210	32.	1
Bis(2-ethylhexyl)phthalate	200	J	ug/kg	210	72.	1
Butyl benzyl phthalate	ND		ug/kg	210	52.	1
Di-n-butylphthalate	ND		ug/kg	210	39.	1
Di-n-octylphthalate	ND		ug/kg	210	70.	1
Diethyl phthalate	ND		ug/kg	210	19.	1
Dimethyl phthalate	ND		ug/kg	210	43.	1

SAMPLE RESULTS

Lab ID:	L1607809-01	Date Collected:	03/17/16 09:45
Client ID:	HA-1 (2-6")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified

Semivolatile Organics by GC/MS - Westborough Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Benzo(a)anthracene	150		ug/kg	120	23.	1
Benzo(a)pyrene	180		ug/kg	160	50.	1
Benzo(b)fluoranthene	220		ug/kg	120	35.	1
Benzo(k)fluoranthene	90	J	ug/kg	120	33.	1
Chrysene	150		ug/kg	120	22.	1
Acenaphthylene	ND		ug/kg	160	32.	1
Anthracene	ND		ug/kg	120	40.	1
Benzo(ghi)perylene	94	J	ug/kg	160	24.	1
Fluorene	ND		ug/kg	210	20.	1
Phenanthrene	150		ug/kg	120	25.	1
Dibenzo(a,h)anthracene	50	J	ug/kg	120	24.	1
Indeno(1,2,3-cd)pyrene	160		ug/kg	160	29.	1
Pyrene	250		ug/kg	120	20.	1
Biphenyl	ND		ug/kg	470	48.	1
4-Chloroaniline	ND		ug/kg	210	38.	1
2-Nitroaniline	ND		ug/kg	210	40.	1
3-Nitroaniline	ND		ug/kg	210	39.	1
4-Nitroaniline	ND		ug/kg	210	86.	1
Dibenzofuran	ND		ug/kg	210	20.	1
2-Methylnaphthalene	ND		ug/kg	250	25.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	210	22.	1
Acetophenone	ND		ug/kg	210	26.	1
Benzyl Alcohol	ND		ug/kg	210	63.	1
Carbazole	29	J	ug/kg	210	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	89		23-120
2-Fluorobiphenyl	93		30-120
4-Terphenyl-d14	102		18-120

SAMPLE RESULTS

Lab ID: L1607809-03
Client ID: HA-3 (4-8")
Sample Location: BUFFALO, NY
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 03/24/16 01:57
Analyst: RC
Percent Solids: 78%

Date Collected: 03/17/16 10:15
Date Received: 03/17/16
Field Prep: Not Specified
Extraction Method:EPA 3546
Extraction Date: 03/22/16 07:09

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	170	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	210	24.	1
Hexachlorobenzene	ND		ug/kg	120	23.	1
Bis(2-chloroethyl)ether	ND		ug/kg	190	28.	1
2-Chloronaphthalene	ND		ug/kg	210	21.	1
1,2-Dichlorobenzene	ND		ug/kg	210	38.	1
1,3-Dichlorobenzene	ND		ug/kg	210	36.	1
1,4-Dichlorobenzene	ND		ug/kg	210	36.	1
3,3'-Dichlorobenzidine	ND		ug/kg	210	56.	1
2,4-Dinitrotoluene	ND		ug/kg	210	42.	1
2,6-Dinitrotoluene	ND		ug/kg	210	36.	1
Fluoranthene	80	J	ug/kg	120	24.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	210	22.	1
4-Bromophenyl phenyl ether	ND		ug/kg	210	32.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	250	36.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	230	21.	1
Hexachlorobutadiene	ND		ug/kg	210	31.	1
Hexachlorocyclopentadiene	ND		ug/kg	600	190	1
Hexachloroethane	ND		ug/kg	170	34.	1
Isophorone	ND		ug/kg	190	27.	1
Naphthalene	ND		ug/kg	210	26.	1
Nitrobenzene	ND		ug/kg	190	31.	1
NDPA/DPA	ND		ug/kg	170	24.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	210	32.	1
Bis(2-ethylhexyl)phthalate	ND		ug/kg	210	72.	1
Butyl benzyl phthalate	ND		ug/kg	210	53.	1
Di-n-butylphthalate	ND		ug/kg	210	40.	1
Di-n-octylphthalate	ND		ug/kg	210	71.	1
Diethyl phthalate	ND		ug/kg	210	19.	1
Dimethyl phthalate	ND		ug/kg	210	44.	1

SAMPLE RESULTS

Lab ID:	L1607809-03	Date Collected:	03/17/16 10:15
Client ID:	HA-3 (4-8")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified

Semivolatile Organics by GC/MS - Westborough Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Benzo(a)anthracene	42	J	ug/kg	120	24.	1
Benzo(a)pyrene	83	J	ug/kg	170	51.	1
Benzo(b)fluoranthene	75	J	ug/kg	120	35.	1
Benzo(k)fluoranthene	ND		ug/kg	120	34.	1
Chrysene	39	J	ug/kg	120	22.	1
Acenaphthylene	ND		ug/kg	170	32.	1
Anthracene	ND		ug/kg	120	41.	1
Benzo(ghi)perylene	27	J	ug/kg	170	25.	1
Fluorene	ND		ug/kg	210	20.	1
Phenanthrene	40	J	ug/kg	120	25.	1
Dibenzo(a,h)anthracene	ND		ug/kg	120	24.	1
Indeno(1,2,3-cd)pyrene	93	J	ug/kg	170	29.	1
Pyrene	65	J	ug/kg	120	21.	1
Biphenyl	ND		ug/kg	480	49.	1
4-Chloroaniline	ND		ug/kg	210	38.	1
2-Nitroaniline	ND		ug/kg	210	40.	1
3-Nitroaniline	ND		ug/kg	210	40.	1
4-Nitroaniline	ND		ug/kg	210	87.	1
Dibenzofuran	ND		ug/kg	210	20.	1
2-Methylnaphthalene	ND		ug/kg	250	25.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	210	22.	1
Acetophenone	ND		ug/kg	210	26.	1
Benzyl Alcohol	ND		ug/kg	210	64.	1
Carbazole	ND		ug/kg	210	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	66		23-120
2-Fluorobiphenyl	79		30-120
4-Terphenyl-d14	104		18-120

SAMPLE RESULTS

Lab ID:	L1607809-04	Date Collected:	03/17/16 10:45
Client ID:	HA-4 (1-4")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	03/22/16 07:09
Analytical Date:	03/24/16 02:22		
Analyst:	RC		
Percent Solids:	74%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	180	23.	1
1,2,4-Trichlorobenzene	ND		ug/kg	220	26.	1
Hexachlorobenzene	ND		ug/kg	130	25.	1
Bis(2-chloroethyl)ether	ND		ug/kg	200	30.	1
2-Chloronaphthalene	ND		ug/kg	220	22.	1
1,2-Dichlorobenzene	ND		ug/kg	220	40.	1
1,3-Dichlorobenzene	ND		ug/kg	220	38.	1
1,4-Dichlorobenzene	ND		ug/kg	220	39.	1
3,3'-Dichlorobenzidine	ND		ug/kg	220	59.	1
2,4-Dinitrotoluene	ND		ug/kg	220	45.	1
2,6-Dinitrotoluene	ND		ug/kg	220	38.	1
Fluoranthene	100	J	ug/kg	130	26.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	220	24.	1
4-Bromophenyl phenyl ether	ND		ug/kg	220	34.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	270	38.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	240	22.	1
Hexachlorobutadiene	ND		ug/kg	220	33.	1
Hexachlorocyclopentadiene	ND		ug/kg	640	200	1
Hexachloroethane	ND		ug/kg	180	36.	1
Isophorone	ND		ug/kg	200	29.	1
Naphthalene	ND		ug/kg	220	27.	1
Nitrobenzene	ND		ug/kg	200	33.	1
NDPA/DPA	ND		ug/kg	180	25.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	220	34.	1
Bis(2-ethylhexyl)phthalate	170	J	ug/kg	220	77.	1
Butyl benzyl phthalate	ND		ug/kg	220	56.	1
Di-n-butylphthalate	ND		ug/kg	220	42.	1
Di-n-octylphthalate	ND		ug/kg	220	76.	1
Diethyl phthalate	ND		ug/kg	220	21.	1
Dimethyl phthalate	ND		ug/kg	220	47.	1

SAMPLE RESULTS

Lab ID:	L1607809-04		Date Collected:	03/17/16 10:45
Client ID:	HA-4 (1-4")		Date Received:	03/17/16
Sample Location:	BUFFALO, NY		Field Prep:	Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	52	J	ug/kg	130	25.	1
Benzo(a)pyrene	96	J	ug/kg	180	54.	1
Benzo(b)fluoranthene	93	J	ug/kg	130	38.	1
Benzo(k)fluoranthene	ND		ug/kg	130	36.	1
Chrysene	54	J	ug/kg	130	23.	1
Acenaphthylene	ND		ug/kg	180	34.	1
Anthracene	ND		ug/kg	130	44.	1
Benzo(ghi)perylene	34	J	ug/kg	180	26.	1
Fluorene	ND		ug/kg	220	22.	1
Phenanthrene	55	J	ug/kg	130	27.	1
Dibenzo(a,h)anthracene	ND		ug/kg	130	26.	1
Indeno(1,2,3-cd)pyrene	110	J	ug/kg	180	31.	1
Pyrene	82	J	ug/kg	130	22.	1
Biphenyl	ND		ug/kg	510	52.	1
4-Chloroaniline	ND		ug/kg	220	41.	1
2-Nitroaniline	ND		ug/kg	220	43.	1
3-Nitroaniline	ND		ug/kg	220	42.	1
4-Nitroaniline	ND		ug/kg	220	92.	1
Dibenzofuran	ND		ug/kg	220	21.	1
2-Methylnaphthalene	ND		ug/kg	270	27.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	220	23.	1
Acetophenone	ND		ug/kg	220	28.	1
Benzyl Alcohol	ND		ug/kg	220	68.	1
Carbazole	ND		ug/kg	220	22.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	95		23-120
2-Fluorobiphenyl	101		30-120
4-Terphenyl-d14	101		18-120

SAMPLE RESULTS

Lab ID: L1607809-05
Client ID: HA-5 (1-4")
Sample Location: BUFFALO, NY
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 03/24/16 01:39
Analyst: RC
Percent Solids: 70%

Date Collected: 03/17/16 11:30
Date Received: 03/17/16
Field Prep: Not Specified
Extraction Method:EPA 3546
Extraction Date: 03/22/16 07:09

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	190	24.	1
1,2,4-Trichlorobenzene	ND		ug/kg	240	27.	1
Hexachlorobenzene	ND		ug/kg	140	26.	1
Bis(2-chloroethyl)ether	ND		ug/kg	210	32.	1
2-Chloronaphthalene	ND		ug/kg	240	23.	1
1,2-Dichlorobenzene	ND		ug/kg	240	42.	1
1,3-Dichlorobenzene	ND		ug/kg	240	41.	1
1,4-Dichlorobenzene	ND		ug/kg	240	41.	1
3,3'-Dichlorobenzidine	ND		ug/kg	240	63.	1
2,4-Dinitrotoluene	ND		ug/kg	240	47.	1
2,6-Dinitrotoluene	ND		ug/kg	240	40.	1
Fluoranthene	600		ug/kg	140	27.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	240	25.	1
4-Bromophenyl phenyl ether	ND		ug/kg	240	36.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	280	40.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	260	24.	1
Hexachlorobutadiene	ND		ug/kg	240	35.	1
Hexachlorocyclopentadiene	ND		ug/kg	680	210	1
Hexachloroethane	ND		ug/kg	190	38.	1
Isophorone	ND		ug/kg	210	31.	1
Naphthalene	ND		ug/kg	240	29.	1
Nitrobenzene	ND		ug/kg	210	35.	1
NDPA/DPA	ND		ug/kg	190	27.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	240	36.	1
Bis(2-ethylhexyl)phthalate	930		ug/kg	240	82.	1
Butyl benzyl phthalate	ND		ug/kg	240	60.	1
Di-n-butylphthalate	ND		ug/kg	240	45.	1
Di-n-octylphthalate	ND		ug/kg	240	80.	1
Diethyl phthalate	ND		ug/kg	240	22.	1
Dimethyl phthalate	ND		ug/kg	240	50.	1

SAMPLE RESULTS

Lab ID:	L1607809-05	Date Collected:	03/17/16 11:30
Client ID:	HA-5 (1-4")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	240		ug/kg	140	27.	1
Benzo(a)pyrene	300		ug/kg	190	58.	1
Benzo(b)fluoranthene	380		ug/kg	140	40.	1
Benzo(k)fluoranthene	160		ug/kg	140	38.	1
Chrysene	270		ug/kg	140	24.	1
Acenaphthylene	57	J	ug/kg	190	36.	1
Anthracene	52	J	ug/kg	140	46.	1
Benzo(ghi)perylene	230		ug/kg	190	28.	1
Fluorene	ND		ug/kg	240	23.	1
Phenanthrene	190		ug/kg	140	29.	1
Dibenzo(a,h)anthracene	140		ug/kg	140	27.	1
Indeno(1,2,3-cd)pyrene	240		ug/kg	190	33.	1
Pyrene	470		ug/kg	140	23.	1
Biphenyl	ND		ug/kg	540	55.	1
4-Chloroaniline	ND		ug/kg	240	43.	1
2-Nitroaniline	ND		ug/kg	240	46.	1
3-Nitroaniline	ND		ug/kg	240	44.	1
4-Nitroaniline	ND		ug/kg	240	98.	1
Dibenzofuran	ND		ug/kg	240	22.	1
2-Methylnaphthalene	ND		ug/kg	280	28.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	240	25.	1
Acetophenone	ND		ug/kg	240	29.	1
Benzyl Alcohol	ND		ug/kg	240	72.	1
Carbazole	37	J	ug/kg	240	23.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	77		23-120
2-Fluorobiphenyl	100		30-120
4-Terphenyl-d14	115		18-120

SAMPLE RESULTS

Lab ID: L1607809-06
Client ID: HA-5 (4-18")
Sample Location: BUFFALO, NY
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 03/24/16 02:05
Analyst: RC
Percent Solids: 78%

Date Collected: 03/17/16 11:45
Date Received: 03/17/16
Field Prep: Not Specified
Extraction Method:EPA 3546
Extraction Date: 03/22/16 07:09

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	170	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	210	24.	1
Hexachlorobenzene	ND		ug/kg	130	24.	1
Bis(2-chloroethyl)ether	ND		ug/kg	190	29.	1
2-Chloronaphthalene	ND		ug/kg	210	21.	1
1,2-Dichlorobenzene	ND		ug/kg	210	38.	1
1,3-Dichlorobenzene	ND		ug/kg	210	37.	1
1,4-Dichlorobenzene	ND		ug/kg	210	37.	1
3,3'-Dichlorobenzidine	ND		ug/kg	210	57.	1
2,4-Dinitrotoluene	ND		ug/kg	210	43.	1
2,6-Dinitrotoluene	ND		ug/kg	210	37.	1
Fluoranthene	230		ug/kg	130	24.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	210	23.	1
4-Bromophenyl phenyl ether	ND		ug/kg	210	32.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	260	36.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	230	21.	1
Hexachlorobutadiene	ND		ug/kg	210	31.	1
Hexachlorocyclopentadiene	ND		ug/kg	610	190	1
Hexachloroethane	ND		ug/kg	170	34.	1
Isophorone	ND		ug/kg	190	28.	1
Naphthalene	ND		ug/kg	210	26.	1
Nitrobenzene	ND		ug/kg	190	32.	1
NDPA/DPA	ND		ug/kg	170	24.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	210	33.	1
Bis(2-ethylhexyl)phthalate	200	J	ug/kg	210	74.	1
Butyl benzyl phthalate	ND		ug/kg	210	54.	1
Di-n-butylphthalate	ND		ug/kg	210	40.	1
Di-n-octylphthalate	ND		ug/kg	210	72.	1
Diethyl phthalate	ND		ug/kg	210	20.	1
Dimethyl phthalate	ND		ug/kg	210	45.	1

SAMPLE RESULTS

Lab ID: L1607809-06
Client ID: HA-5 (4-18")
Sample Location: BUFFALO, NY
Date Collected: 03/17/16 11:45
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	100	J	ug/kg	130	24.	1
Benzo(a)pyrene	180		ug/kg	170	52.	1
Benzo(b)fluoranthene	180		ug/kg	130	36.	1
Benzo(k)fluoranthene	56	J	ug/kg	130	34.	1
Chrysene	97	J	ug/kg	130	22.	1
Acenaphthylene	ND		ug/kg	170	33.	1
Anthracene	ND		ug/kg	130	42.	1
Benzo(ghi)perylene	85	J	ug/kg	170	25.	1
Fluorene	ND		ug/kg	210	21.	1
Phenanthrene	91	J	ug/kg	130	26.	1
Dibenzo(a,h)anthracene	120	J	ug/kg	130	25.	1
Indeno(1,2,3-cd)pyrene	150	J	ug/kg	170	30.	1
Pyrene	180		ug/kg	130	21.	1
Biphenyl	ND		ug/kg	490	50.	1
4-Chloroaniline	ND		ug/kg	210	39.	1
2-Nitroaniline	ND		ug/kg	210	41.	1
3-Nitroaniline	ND		ug/kg	210	40.	1
4-Nitroaniline	ND		ug/kg	210	88.	1
Dibenzofuran	ND		ug/kg	210	20.	1
2-Methylnaphthalene	ND		ug/kg	260	26.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	210	22.	1
Acetophenone	ND		ug/kg	210	26.	1
Benzyl Alcohol	ND		ug/kg	210	65.	1
Carbazole	ND		ug/kg	210	21.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	89		23-120
2-Fluorobiphenyl	106		30-120
4-Terphenyl-d14	**121**	Q	18-120

SAMPLE RESULTS

Lab ID:	L1607809-07	Date Collected:	03/17/16 12:30
Client ID:	HA-6 (4-8")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	03/22/16 07:09
Analytical Date:	03/24/16 02:31		
Analyst:	RC		
Percent Solids:	77%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	130	J	ug/kg	170	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	210	24.	1
Hexachlorobenzene	ND		ug/kg	120	23.	1
Bis(2-chloroethyl)ether	ND		ug/kg	190	28.	1
2-Chloronaphthalene	ND		ug/kg	210	21.	1
1,2-Dichlorobenzene	ND		ug/kg	210	38.	1
1,3-Dichlorobenzene	ND		ug/kg	210	36.	1
1,4-Dichlorobenzene	ND		ug/kg	210	37.	1
3,3'-Dichlorobenzidine	ND		ug/kg	210	56.	1
2,4-Dinitrotoluene	ND		ug/kg	210	42.	1
2,6-Dinitrotoluene	ND		ug/kg	210	36.	1
Fluoranthene	2300		ug/kg	120	24.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	210	22.	1
4-Bromophenyl phenyl ether	ND		ug/kg	210	32.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	250	36.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	230	21.	1
Hexachlorobutadiene	ND		ug/kg	210	31.	1
Hexachlorocyclopentadiene	ND		ug/kg	600	190	1
Hexachloroethane	ND		ug/kg	170	34.	1
Isophorone	ND		ug/kg	190	27.	1
Naphthalene	67	J	ug/kg	210	26.	1
Nitrobenzene	ND		ug/kg	190	31.	1
NDPA/DPA	ND		ug/kg	170	24.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	210	32.	1
Bis(2-ethylhexyl)phthalate	160	J	ug/kg	210	72.	1
Butyl benzyl phthalate	ND		ug/kg	210	53.	1
Di-n-butylphthalate	ND		ug/kg	210	40.	1
Di-n-octylphthalate	ND		ug/kg	210	71.	1
Diethyl phthalate	ND		ug/kg	210	19.	1
Dimethyl phthalate	ND		ug/kg	210	44.	1

SAMPLE RESULTS

Lab ID: L1607809-07
Client ID: HA-6 (4-8")
Sample Location: BUFFALO, NY
Date Collected: 03/17/16 12:30
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	890		ug/kg	120	24.	1
Benzo(a)pyrene	660		ug/kg	170	51.	1
Benzo(b)fluoranthene	1000		ug/kg	120	35.	1
Benzo(k)fluoranthene	420		ug/kg	120	34.	1
Chrysene	860		ug/kg	120	22.	1
Acenaphthylene	37	J	ug/kg	170	32.	1
Anthracene	340		ug/kg	120	41.	1
Benzo(ghi)perylene	520		ug/kg	170	25.	1
Fluorene	180	J	ug/kg	210	20.	1
Phenanthrene	1400		ug/kg	120	25.	1
Dibenzo(a,h)anthracene	200		ug/kg	120	24.	1
Indeno(1,2,3-cd)pyrene	440		ug/kg	170	29.	1
Pyrene	1800		ug/kg	120	21.	1
Biphenyl	ND		ug/kg	480	49.	1
4-Chloroaniline	ND		ug/kg	210	38.	1
2-Nitroaniline	ND		ug/kg	210	40.	1
3-Nitroaniline	ND		ug/kg	210	40.	1
4-Nitroaniline	ND		ug/kg	210	87.	1
Dibenzofuran	110	J	ug/kg	210	20.	1
2-Methylnaphthalene	47	J	ug/kg	250	25.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	210	22.	1
Acetophenone	ND		ug/kg	210	26.	1
Benzyl Alcohol	ND		ug/kg	210	64.	1
Carbazole	230		ug/kg	210	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Nitrobenzene-d5	85		23-120
2-Fluorobiphenyl	108		30-120
4-Terphenyl-d14	**125**	Q	18-120

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 03/23/16 19:06
Analyst: RC

Extraction Method: EPA 3546
Extraction Date: 03/22/16 07:09

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01,03-07 Batch: WG876071-1					
Acenaphthene	ND		ug/kg	130	17.
1,2,4-Trichlorobenzene	ND		ug/kg	160	18.
Hexachlorobenzene	ND		ug/kg	97	18.
Bis(2-chloroethyl)ether	ND		ug/kg	140	22.
2-Chloronaphthalene	ND		ug/kg	160	16.
1,2-Dichlorobenzene	ND		ug/kg	160	29.
1,3-Dichlorobenzene	ND		ug/kg	160	28.
1,4-Dichlorobenzene	ND		ug/kg	160	28.
3,3'-Dichlorobenzidine	ND		ug/kg	160	43.
2,4-Dinitrotoluene	ND		ug/kg	160	32.
2,6-Dinitrotoluene	ND		ug/kg	160	28.
Fluoranthene	ND		ug/kg	97	19.
4-Chlorophenyl phenyl ether	ND		ug/kg	160	17.
4-Bromophenyl phenyl ether	ND		ug/kg	160	25.
Bis(2-chloroisopropyl)ether	ND		ug/kg	190	28.
Bis(2-chloroethoxy)methane	ND		ug/kg	180	16.
Hexachlorobutadiene	ND		ug/kg	160	24.
Hexachlorocyclopentadiene	ND		ug/kg	460	150
Hexachloroethane	ND		ug/kg	130	26.
Isophorone	ND		ug/kg	140	21.
Naphthalene	ND		ug/kg	160	20.
Nitrobenzene	ND		ug/kg	140	24.
NDPA/DPA	ND		ug/kg	130	18.
n-Nitrosodi-n-propylamine	ND		ug/kg	160	25.
Bis(2-ethylhexyl)phthalate	ND		ug/kg	160	56.
Butyl benzyl phthalate	ND		ug/kg	160	41.
Di-n-butylphthalate	ND		ug/kg	160	31.
Di-n-octylphthalate	ND		ug/kg	160	55.
Diethyl phthalate	ND		ug/kg	160	15.

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 03/23/16 19:06
Analyst: RC

Extraction Method: EPA 3546
Extraction Date: 03/22/16 07:09

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01,03-07 Batch: WG876071-1					
Dimethyl phthalate	ND		ug/kg	160	34.
Benzo(a)anthracene	ND		ug/kg	97	18.
Benzo(a)pyrene	ND		ug/kg	130	40.
Benzo(b)fluoranthene	ND		ug/kg	97	27.
Benzo(k)fluoranthene	ND		ug/kg	97	26.
Chrysene	ND		ug/kg	97	17.
Acenaphthylene	ND		ug/kg	130	25.
Anthracene	ND		ug/kg	97	32.
Benzo(ghi)perylene	ND		ug/kg	130	19.
Fluorene	ND		ug/kg	160	16.
Phenanthrene	ND		ug/kg	97	20.
Dibenzo(a,h)anthracene	ND		ug/kg	97	19.
Indeno(1,2,3-cd)pyrene	ND		ug/kg	130	23.
Pyrene	ND		ug/kg	97	16.
Biphenyl	ND		ug/kg	370	38.
4-Chloroaniline	ND		ug/kg	160	30.
2-Nitroaniline	ND		ug/kg	160	31.
3-Nitroaniline	ND		ug/kg	160	30.
4-Nitroaniline	ND		ug/kg	160	67.
Dibenzofuran	ND		ug/kg	160	15.
2-Methylnaphthalene	ND		ug/kg	190	20.
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	160	17.
Acetophenone	ND		ug/kg	160	20.
Benzyl Alcohol	ND		ug/kg	160	50.
Carbazole	ND		ug/kg	160	16.

Method Blank Analysis
Batch Quality Control

Analytical Method:	1,8270D	Extraction Method:	EPA 3546
Analytical Date:	03/23/16 19:06	Extraction Date:	03/22/16 07:09
Analyst:	RC		

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 01,03-07 Batch: WG876071-1					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	81		25-120
Phenol-d6	91		10-120
Nitrobenzene-d5	77		23-120
2-Fluorobiphenyl	88		30-120
2,4,6-Tribromophenol	91		10-136
4-Terphenyl-d14	117		18-120

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): 01,03-07 Batch: WG876071-2 WG876071-3								
Acenaphthene	93		94		31-137	1		50
Benzidine	58		62		10-66	7		50
n-Nitrosodimethylamine	90		90		22-100	0		50
1,2,4-Trichlorobenzene	91		92		38-107	1		50
Hexachlorobenzene	105		110		40-140	5		50
Bis(2-chloroethyl)ether	92		90		40-140	2		50
2-Chloronaphthalene	100		101		40-140	1		50
1,2-Dichlorobenzene	88		86		40-140	2		50
1,3-Dichlorobenzene	86		83		40-140	4		50
1,4-Dichlorobenzene	86		84		28-104	2		50
3,3'-Dichlorobenzidine	68		70		40-140	3		50
2,4-Dinitrotoluene	**122**	Q	**126**	Q	28-89	3		50
2,6-Dinitrotoluene	118		122		40-140	3		50
Fluoranthene	112		116		40-140	4		50
4-Chlorophenyl phenyl ether	98		101		40-140	3		50
4-Bromophenyl phenyl ether	109		114		40-140	4		50
Azobenzene	107		109		40-140	2		50
Bis(2-chloroisopropyl)ether	86		86		40-140	0		50
Bis(2-chloroethoxy)methane	104		104		40-117	0		50
Hexachlorobutadiene	90		89		40-140	1		50
Hexachlorocyclopentadiene	115		114		40-140	1		50

Lab Control Sample Analysis
Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE
Lab Number: L1607809
Project Number: T0369-016-001
Report Date: 03/24/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,03-07 Batch: WG876071-2 WG876071-3								
Hexachloroethane	92		90		40-140	2		50
Isophorone	120		119		40-140	1		50
Naphthalene	91		91		40-140	0		50
Nitrobenzene	102		103		40-140	1		50
NitrosoDiPhenylAmine(NDPA)/DPA	114		117		36-157	3		50
n-Nitrosodi-n-propylamine	121		120		32-121	1		50
Bis(2-Ethylhexyl)phthalate	102		103		40-140	1		50
Butyl benzyl phthalate	122		124		40-140	2		50
Di-n-butylphthalate	113		115		40-140	2		50
Di-n-octylphthalate	109		110		40-140	1		50
Diethyl phthalate	116		121		40-140	4		50
Dimethyl phthalate	111		114		40-140	3		50
Benzo(a)anthracene	110		112		40-140	2		50
Benzo(a)pyrene	105		108		40-140	3		50
Benzo(b)fluoranthene	98		101		40-140	3		50
Benzo(k)fluoranthene	104		110		40-140	6		50
Chrysene	91		94		40-140	3		50
Acenaphthylene	114		115		40-140	1		50
Anthracene	107		109		40-140	2		50
Benzo(ghi)perylene	105		107		40-140	2		50
Fluorene	103		106		40-140	3		50

Lab Control Sample Analysis

Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE

Project Number: T0369-016-001

Lab Number: L1607809

Report Date: 03/24/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,03-07 Batch: WG876071-2 WG876071-3								
Phenanthrene	95		97		40-140	2		50
Dibenzo(a,h)anthracene	99		101		40-140	2		50
Indeno(1,2,3-cd)Pyrene	114		116		40-140	2		50
Pyrene	108		111		35-142	3		50
Biphenyl	87		88		54-104	1		50
Aniline	54		58		40-140	7		50
4-Chloroaniline	82		81		40-140	1		50
2-Nitroaniline	120		126		47-134	5		50
3-Nitroaniline	90		94		26-129	4		50
4-Nitroaniline	108		114		41-125	5		50
Dibenzofuran	96		98		40-140	2		50
2-Methylnaphthalene	99		98		40-140	1		50
1,2,4,5-Tetrachlorobenzene	85		86		40-117	1		50
Acetophenone	109		109		14-144	0		50
2,4,6-Trichlorophenol	115		117		30-130	2		50
P-Chloro-M-Cresol	**121**	Q	**124**	Q	26-103	2		50
2-Chlorophenol	**108**	Q	**107**	Q	25-102	1		50
2,4-Dichlorophenol	117		117		30-130	0		50
2,4-Dimethylphenol	126		125		30-130	1		50
2-Nitrophenol	120		118		30-130	2		50
4-Nitrophenol	**115**	Q	**121**	Q	11-114	5		50

Lab Control Sample Analysis

Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE

Project Number: T0369-016-001

Lab Number: L1607809

Report Date: 03/24/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,03-07 Batch: WG876071-2 WG876071-3								
2,4-Dinitrophenol	108		129		4-130	18		50
4,6-Dinitro-o-cresol	123		**134**	Q	10-130	9		50
Pentachlorophenol	**113**	Q	**114**	Q	17-109	1		50
Phenol	**104**	Q	**103**	Q	26-90	1		50
2-Methylphenol	110		109		30-130.	1		50
3-Methylphenol/4-Methylphenol	114		114		30-130	0		50
2,4,5-Trichlorophenol	118		122		30-130	3		50
Benzoic Acid	66		**74**	Q	10-66	11		50
Benzyl Alcohol	114		114		40-140	0		50
Carbazole	110		112		54-128	2		50
Benzaldehyde	96		94		40-140	2		50
Caprolactam	116		120		15-130	3		50
Atrazine	116		120		40-140	3		50
2,3,4,6-Tetrachlorophenol	122		128		40-140	5		50
Pyridine	75		73		10-93	3		50
Parathion, ethyl	**161**	Q	**167**	Q	40-140	4		50
1-Methylnaphthalene	98		96		26-130	2		50

Lab Control Sample Analysis

Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE

Lab Number: L1607809

Project Number: T0369-016-001

Report Date: 03/24/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits

Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 01,03-07 Batch: WG876071-2 WG876071-3

Surrogate	*LCS %Recovery*	*Qual*	*LCSD %Recovery*	*Qual*	*Acceptance Criteria*
2-Fluorophenol	100		99		25-120
Phenol-d6	105		106		10-120
Nitrobenzene-d5	99		99		23-120
2-Fluorobiphenyl	102		102		30-120
2,4,6-Tribromophenol	107		110		10-136
4-Terphenyl-d14	110		114		18-120

METALS

Project Name: ELMWOOD & FOREST AVENUE
Lab Number: L1607809
Project Number: T0369-016-001
Report Date: 03/24/16

SAMPLE RESULTS

Lab ID:	L1607809-01	Date Collected:	03/17/16 09:45
Client ID:	HA-1 (2-6")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	79%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	20		mg/kg	0.48	0.10	1	03/19/16 11:03	03/24/16 09:28	EPA 3050B	1,6010C	FB
Barium, Total	93		mg/kg	0.48	0.14	1	03/19/16 11:03	03/24/16 09:28	EPA 3050B	1,6010C	FB
Cadmium, Total	ND		mg/kg	0.48	0.03	1	03/19/16 11:03	03/24/16 09:28	EPA 3050B	1,6010C	FB
Chromium, Total	12		mg/kg	0.48	0.10	1	03/19/16 11:03	03/24/16 09:28	EPA 3050B	1,6010C	FB
Lead, Total	240		mg/kg	2.4	0.10	1	03/19/16 11:03	03/24/16 09:28	EPA 3050B	1,6010C	FB
Mercury, Total	0.28		mg/kg	0.08	0.02	1	03/19/16 12:00	03/23/16 10:45	EPA 7471B	1,7471B	JH
Selenium, Total	0.74	J	mg/kg	0.97	0.14	1	03/19/16 11:03	03/24/16 09:28	EPA 3050B	1,6010C	FB
Silver, Total	ND		mg/kg	0.48	0.10	1	03/19/16 11:03	03/24/16 09:28	EPA 3050B	1,6010C	FB

Project Name: ELMWOOD & FOREST AVENUE | **Lab Number:** L1607809
Project Number: T0369-016-001 | **Report Date:** 03/24/16

SAMPLE RESULTS

Lab ID: L1607809-03
Client ID: HA-3 (4-8")
Sample Location: BUFFALO, NY
Matrix: Soil
Percent Solids: 78%

Date Collected: 03/17/16 10:15
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	8.4		mg/kg	0.51	0.10	1	03/19/16 11:03	03/24/16 09:33	EPA 3050B	1,6010C	FB
Barium, Total	96		mg/kg	0.51	0.15	1	03/19/16 11:03	03/24/16 09:33	EPA 3050B	1,6010C	FB
Cadmium, Total	ND		mg/kg	0.51	0.04	1	03/19/16 11:03	03/24/16 09:33	EPA 3050B	1,6010C	FB
Chromium, Total	17		mg/kg	0.51	0.10	1	03/19/16 11:03	03/24/16 09:33	EPA 3050B	1,6010C	FB
Lead, Total	52		mg/kg	2.6	0.10	1	03/19/16 11:03	03/24/16 09:33	EPA 3050B	1,6010C	FB
Mercury, Total	0.11		mg/kg	0.09	0.02	1	03/19/16 12:00	03/23/16 10:47	EPA 7471B	1,7471B	JH
Selenium, Total	0.69	J	mg/kg	1.0	0.15	1	03/19/16 11:03	03/24/16 09:33	EPA 3050B	1,6010C	FB
Silver, Total	ND		mg/kg	0.51	0.10	1	03/19/16 11:03	03/24/16 09:33	EPA 3050B	1,6010C	FB

Project Name: ELMWOOD & FOREST AVENUE
Lab Number: L1607809
Project Number: T0369-016-001
Report Date: 03/24/16

SAMPLE RESULTS

Lab ID: L1607809-04
Date Collected: 03/17/16 10:45
Client ID: HA-4 (1-4")
Date Received: 03/17/16
Sample Location: BUFFALO, NY
Field Prep: Not Specified
Matrix: Soil
Percent Solids: 74%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	7.8		mg/kg	0.52	0.10	1	03/19/16 11:03	03/24/16 09:38	EPA 3050B	1,6010C	FB
Barium, Total	100		mg/kg	0.52	0.16	1	03/19/16 11:03	03/24/16 09:38	EPA 3050B	1,6010C	FB
Cadmium, Total	ND		mg/kg	0.52	0.04	1	03/19/16 11:03	03/24/16 09:38	EPA 3050B	1,6010C	FB
Chromium, Total	18		mg/kg	0.52	0.10	1	03/19/16 11:03	03/24/16 09:38	EPA 3050B	1,6010C	FB
Lead, Total	68		mg/kg	2.6	0.10	1	03/19/16 11:03	03/24/16 09:38	EPA 3050B	1,6010C	FB
Mercury, Total	0.24		mg/kg	0.09	0.02	1	03/19/16 12:00	03/23/16 10:48	EPA 7471B	1,7471B	JH
Selenium, Total	0.57	J	mg/kg	1.0	0.16	1	03/19/16 11:03	03/24/16 09:38	EPA 3050B	1,6010C	FB
Silver, Total	ND		mg/kg	0.52	0.10	1	03/19/16 11:03	03/24/16 09:38	EPA 3050B	1,6010C	FB

Project Name:	ELMWOOD & FOREST AVENUE	**Lab Number:**	L1607809
Project Number:	T0369-016-001	**Report Date:**	03/24/16

SAMPLE RESULTS

Lab ID:	L1607809-05	Date Collected:	03/17/16 11:30
Client ID:	HA-5 (1-4")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	70%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	10		mg/kg	0.55	0.11	1	03/19/16 11:03	03/24/16 09:43	EPA 3050B	1,6010C	FB
Barium, Total	92		mg/kg	0.55	0.16	1	03/19/16 11:03	03/24/16 09:43	EPA 3050B	1,6010C	FB
Cadmium, Total	0.807		mg/kg	0.552	0.039	1	03/19/16 11:03	03/24/16 09:43	EPA 3050B	1,6010C	FB
Chromium, Total	18		mg/kg	0.55	0.11	1	03/19/16 11:03	03/24/16 09:43	EPA 3050B	1,6010C	FB
Lead, Total	340		mg/kg	2.8	0.11	1	03/19/16 11:03	03/24/16 09:43	EPA 3050B	1,6010C	FB
Mercury, Total	0.24		mg/kg	0.10	0.02	1	03/19/16 12:00	03/23/16 10:50	EPA 7471B	1,7471B	JH
Selenium, Total	1.25		mg/kg	1.10	0.166	1	03/19/16 11:03	03/24/16 09:43	EPA 3050B	1,6010C	FB
Silver, Total	0.19	J	mg/kg	0.55	0.11	1	03/19/16 11:03	03/24/16 09:43	EPA 3050B	1,6010C	FB

Project Name:	ELMWOOD & FOREST AVENUE	**Lab Number:**	L1607809
Project Number:	T0369-016-001	**Report Date:**	03/24/16

SAMPLE RESULTS

Lab ID:	L1607809-06	Date Collected:	03/17/16 11:45
Client ID:	HA-5 (4-18")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	78%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	12		mg/kg	0.50	0.10	1	03/19/16 11:03	03/24/16 09:48	EPA 3050B	1,6010C	FB
Barium, Total	120		mg/kg	0.50	0.15	1	03/19/16 11:03	03/24/16 09:48	EPA 3050B	1,6010C	FB
Cadmium, Total	0.765		mg/kg	0.500	0.035	1	03/19/16 11:03	03/24/16 09:48	EPA 3050B	1,6010C	FB
Chromium, Total	23		mg/kg	0.50	0.10	1	03/19/16 11:03	03/24/16 09:48	EPA 3050B	1,6010C	FB
Lead, Total	400		mg/kg	2.5	0.10	1	03/19/16 11:03	03/24/16 09:48	EPA 3050B	1,6010C	FB
Mercury, Total	0.22		mg/kg	0.08	0.02	1	03/19/16 12:00	03/23/16 10:52	EPA 7471B	1,7471B	JH
Selenium, Total	1.006		mg/kg	1.000	0.1501	1	03/19/16 11:03	03/24/16 09:48	EPA 3050B	1,6010C	FB
Silver, Total	0.275	J	mg/kg	0.500	0.100	1	03/19/16 11:03	03/24/16 09:48	EPA 3050B	1,6010C	FB

Project Name:	ELMWOOD & FOREST AVENUE	**Lab Number:**	L1607809
Project Number:	T0369-016-001	**Report Date:**	03/24/16

SAMPLE RESULTS

Lab ID:	L1607809-07	Date Collected:	03/17/16 12:30
Client ID:	HA-6 (4-8")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	77%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Westborough Lab											
Arsenic, Total	5.5		mg/kg	0.50	0.10	1	03/19/16 11:03	03/24/16 09:53	EPA 3050B	1,6010C	FB
Barium, Total	100		mg/kg	0.50	0.15	1	03/19/16 11:03	03/24/16 09:53	EPA 3050B	1,6010C	FB
Cadmium, Total	ND		mg/kg	0.50	0.04	1	03/19/16 11:03	03/24/16 09:53	EPA 3050B	1,6010C	FB
Chromium, Total	15		mg/kg	0.50	0.10	1	03/19/16 11:03	03/24/16 09:53	EPA 3050B	1,6010C	FB
Lead, Total	200		mg/kg	2.5	0.10	1	03/19/16 11:03	03/24/16 09:53	EPA 3050B	1,6010C	FB
Mercury, Total	0.29		mg/kg	0.09	0.02	1	03/19/16 12:00	03/23/16 10:54	EPA 7471B	1,7471B	JH
Selenium, Total	0.867	J	mg/kg	1.01	0.151	1	03/19/16 11:03	03/24/16 09:53	EPA 3050B	1,6010C	FB
Silver, Total	0.212	J	mg/kg	0.504	0.101	1	03/19/16 11:03	03/24/16 09:53	EPA 3050B	1,6010C	FB

Method Blank Analysis
Batch Quality Control

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Westborough Lab for sample(s): 01,03-07 Batch: WG875428-1										
Mercury, Total	ND		mg/kg	0.08	0.02	1	03/19/16 12:00	03/23/16 10:28	1,7471B	JH

Prep Information

Digestion Method: EPA 7471B

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Westborough Lab for sample(s): 01,03-07 Batch: WG875465-1										
Arsenic, Total	ND		mg/kg	0.40	0.08	1	03/19/16 11:03	03/21/16 13:42	1,6010C	PS
Barium, Total	ND		mg/kg	0.40	0.12	1	03/19/16 11:03	03/21/16 13:42	1,6010C	PS
Cadmium, Total	ND		mg/kg	0.40	0.03	1	03/19/16 11:03	03/21/16 13:42	1,6010C	PS
Chromium, Total	ND		mg/kg	0.40	0.08	1	03/19/16 11:03	03/21/16 13:42	1,6010C	PS
Lead, Total	ND		mg/kg	2.0	0.08	1	03/19/16 11:03	03/21/16 13:42	1,6010C	PS
Selenium, Total	ND		mg/kg	0.80	0.12	1	03/19/16 11:03	03/21/16 13:42	1,6010C	PS
Silver, Total	ND		mg/kg	0.40	0.08	1	03/19/16 11:03	03/21/16 13:42	1,6010C	PS

Prep Information

Digestion Method: EPA 3050B

Lab Control Sample Analysis

Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE

Lab Number: L1607809

Project Number: T0369-016-001

Report Date: 03/24/16

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Westborough Lab Associated sample(s): 01,03-07 Batch: WG875428-2 SRM Lot Number: D088-540								
Mercury, Total	107		-		72-128	-		
Total Metals - Westborough Lab Associated sample(s): 01,03-07 Batch: WG875465-2 SRM Lot Number: D088-540								
Arsenic, Total	105		-		79-121	-		
Barium, Total	105		-		83-117	-		
Cadmium, Total	102		-		83-117	-		
Chromium, Total	110		-		80-120	-		
Lead, Total	98		-		81-117	-		
Selenium, Total	108		-		78-122	-		
Silver, Total	105		-		75-124	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE
Project Number: T0369-016-001

Lab Number: L1607809
Report Date: 03/24/16

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Westborough Lab Associated sample(s): 01,03-07 QC Batch ID: WG875428-4 QC Sample: L1607827-01 Client ID: MS Sample												
Mercury, Total	0.82	0.207	2.5	**813**	Q	-	-		80-120	-		20
Total Metals - Westborough Lab Associated sample(s): 01,03-07 QC Batch ID: WG875465-4 QC Sample: L1608021-03 Client ID: MS Sample												
Arsenic, Total	2.3	10.6	12	91		-	-		75-125	-		20
Barium, Total	77.	177	260	103		-	-		75-125	-		20
Cadmium, Total	ND	4.52	3.2	**71**	Q	-	-		75-125	-		20
Chromium, Total	20.	17.7	41	118		-	-		75-125	-		20
Lead, Total	35.	45.2	79	97		-	-		75-125	-		20
Selenium, Total	ND	10.6	10	94		-	-		75-125	-		20
Silver, Total	ND	26.6	24	90		-	-		75-125	-		20

Lab Duplicate Analysis

Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE

Project Number: T0369-016-001

Lab Number: L1607809

Report Date: 03/24/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Westborough Lab Associated sample(s): 01,03-07 QC Batch ID: WG875428-3 QC Sample: L1607827-01 Client ID: DUP Sample						
Mercury, Total	0.82	0.98	mg/kg	18		20
Total Metals - Westborough Lab Associated sample(s): 01,03-07 QC Batch ID: WG875465-3 QC Sample: L1608021-03 Client ID: DUP Sample						
Arsenic, Total	2.3	2.2	mg/kg	4		20
Barium, Total	77.	85	mg/kg	10		20
Cadmium, Total	ND	ND	mg/kg	NC		20
Chromium, Total	20.	22	mg/kg	10		20
Lead, Total	35.	37	mg/kg	6		20
Selenium, Total	ND	ND	mg/kg	NC		20
Silver, Total	ND	ND	mg/kg	NC		20

INORGANICS
&
MISCELLANEOUS

SAMPLE RESULTS

Lab ID: L1607809-01
Client ID: HA-1 (2-6")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 03/17/16 09:45
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	79.3		%	0.100	NA	1	-	03/19/16 01:09	30,2540G	RT

SAMPLE RESULTS

Lab ID: L1607809-03
Client ID: HA-3 (4-8")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 03/17/16 10:15
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	77.6		%	0.100	NA	1	-	03/19/16 01:09	30,2540G	RT

Project Name: ELMWOOD & FOREST AVENUE **Lab Number:** L1607809
Project Number: T0369-016-001 **Report Date:** 03/24/16

SAMPLE RESULTS

Lab ID: L1607809-04
Client ID: HA-4 (1-4")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 03/17/16 10:45
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	74.4		%	0.100	NA	1	-	03/19/16 01:09	30,2540G	RT

SAMPLE RESULTS

Lab ID:	L1607809-05	Date Collected:	03/17/16 11:30
Client ID:	HA-5 (1-4")	Date Received:	03/17/16
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	69.5		%	0.100	NA	1	-	03/19/16 01:09	30,2540G	RT

SAMPLE RESULTS

Lab ID: L1607809-06
Client ID: HA-5 (4-18")
Sample Location: BUFFALO, NY
Matrix: Soil
Date Collected: 03/17/16 11:45
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	77.6		%	0.100	NA	1	-	03/19/16 01:09	30,2540G	RT

SAMPLE RESULTS

Lab ID: L1607809-07
Client ID: HA-6 (4-8")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 03/17/16 12:30
Date Received: 03/17/16
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	77.1		%	0.100	NA	1	-	03/19/16 01:09	30,2540G	RT

Lab Duplicate Analysis
Batch Quality Control

Project Name: ELMWOOD & FOREST AVENUE
Project Number: T0369-016-001

Lab Number: L1607809
Report Date: 03/24/16

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 01,03-07 QC Batch ID: WG875389-1 QC Sample: L1607806-01 Client ID: DUP Sample						
Solids, Total	90.8	91.0	%	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**	**pH**	**Temp deg C**	**Pres**	**Seal**	**Analysis(*)**
L1607809-01A	Glass 250ml/8oz unpreserved	A	N/A	4.4	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1607809-02A	Glass 250ml/8oz unpreserved	A	N/A	4.4	Y	Absent	HOLD-WETCHEM(),HOLD-8270(14),HOLD-METAL(180)
L1607809-03A	Glass 250ml/8oz unpreserved	A	N/A	4.4	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1607809-04A	Glass 250ml/8oz unpreserved	A	N/A	4.4	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1607809-05A	Glass 250ml/8oz unpreserved	A	N/A	4.4	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1607809-06A	Glass 250ml/8oz unpreserved	A	N/A	4.4	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)
L1607809-07A	Glass 250ml/8oz unpreserved	A	N/A	4.4	Y	Absent	NYTCL-8270(14),AS-TI(180),BA-TI(180),AG-TI(180),CR-TI(180),TS(7),PB-TI(180),SE-TI(180),HG-T(28),CD-TI(180)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

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

EPA - Environmental Protection Agency.

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

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

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

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

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

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

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

NI - Not Ignitable.

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

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.

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

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.

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

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

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

Report Format: DU Report with 'J' Qualifiers

Data Qualifiers

C	- Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
D	- Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
E	- Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
G	- The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.
H	- The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
I	- The lower value for the two columns has been reported due to obvious interference.
M	- Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
NJ	- Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
P	- The RPD between the results for the two columns exceeds the method-specified criteria.
Q	- The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
R	- Analytical results are from sample re-analysis.
RE	- Analytical results are from sample re-extraction.
S	- Analytical results are from modified screening analysis.
J	- Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
ND	- Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

REFERENCES

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

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

LIMITATION OF LIABILITIES

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

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

Alpha Analytical, Inc. ID No.:**17873**
Facility: **Company-wide** Revision 6
Department: **Quality Assurance** Published Date: 2/3/2016 10:23:10 AM
Title: **Certificate/Approval Program Summary** Page 1 of 1

Certification Information

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

Westborough Facility
EPA 524.2: 1,2-Dibromo-3-chloropropane, 1,2-Dibromoethane, m/p-xylene, o-xylene
EPA 624: 2-Butanone (MEK), 1,4-Dioxane, tert-Amylmethyl Ether, tert-Butyl Alcohol, m/p-xylene, o-xylene
EPA 625: Aniline, Benzoic Acid, Benzyl Alcohol, 4-Chloroaniline, 3-Methylphenol, 4-Methylphenol.
EPA 1010A: NPW: Ignitability
EPA 6010C: NPW: Strontium; SCM: Strontium
EPA 8151A: NPW: 2,4-DB, Dicamba, Dichloroprop, MCPA, MCPP; SCM: 2,4-DB, Dichloroprop, MCPA, MCPP
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene, Isopropanol; SCM: Iodomethane (methyl iodide), Methyl methacrylate (soil); 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Pentachloronitrobenzene, 1-Methylnaphthalene, Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 9010: NPW: Amenable Cyanide Distillation, Total Cyanide Distillation
EPA 9038: NPW: Sulfate
EPA 9050A: NPW: Specific Conductance
EPA 9056: NPW: Chloride, Nitrate, Sulfate
EPA 9065: NPW: Phenols
EPA 9251: NPW: Chloride
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
EPA 8270D: NPW: Biphenyl; SCM: Biphenyl, Caprolactam
EPA 8270D-SIM Isotope Dilution: SCM: 1,4-Dioxane
SM 2540D: TSS
SM2540G: SCM: Percent Solids
EPA 1631E: SCM: Mercury
EPA 7474: SCM: Mercury
EPA 8081B: NPW and SCM: Mirex, Hexachlorobenzene.
EPA 8082A: NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
EPA 8270-SIM: NPW and SCM: Alkylated PAHs.
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, n-Butylbenzene, n-Propylbenzene, sec-Butylbenzene, tert-Butylbenzene.
Biological Tissue Matrix: ***8270D-SIM; 3050B; 3051A; 7471B; 8081B; 8082A; 6020A:*** Lead***; 8270D:*** bis(2-ethylhexyl)phthalate, Butylbenzylphthalate, Diethyl phthalate, Dimethyl phthalate, Di-n-butyl phthalate, Di-n-octyl phthalate, Fluoranthene, Pentachlorophenol.

The following analytes are included in our Massachusetts DEP Scope of Accreditation, Westborough Facility:

Drinking Water
EPA 200.8: Sb,As,Ba,Be,Cd,Cr,Cu,Pb,Ni,Se,Tl; **EPA 200.7**: Ba,Be,Ca,Cd,Cr,Cu,Na; **EPA 245.1:** Mercury;
EPA 300.0: 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**
EPA 332: Perchlorate.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, Enterolert-QT.**

Non-Potable Water
EPA 200.8: Al,Sb,As,Be,Cd,Cr,Cu,Pb,Mn,Ni,Se,Ag,Tl,Zn;
EPA 200.7: Al,Sb,As,Be,Cd,Ca,Cr,Co,Cu,Fe,Pb,Mg,Mn,Mo,Ni,K,Se,Ag,Na,Sr,Ti,Tl,V,Zn;
EPA 245.1, SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2340B, SM2320B, SM4500CL-E, SM4500F-BC, SM426C, SM4500NH3-BH, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F,**
EPA 353.2: Nitrate-N**, SM4500NH3-BC-NES, EPA 351.1, SM4500P-E, SM4500P-B, E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, SM14 510AC, EPA 420.1, SM4500-CN-CE, SM2540D.**
EPA 624: Volatile Halocarbons & Aromatics,
EPA 608: 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: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9222D-MF**.

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

Serial_No:03241616:31

CHAIN OF COUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 3/18/16

ALPHA Job #: L1607809

ALPHA ANALYTICAL

WESTBORO, MA
TEL: 508-898-9220
FAX: 508-898-9193

MANSFIELD, MA
TEL: 508-822-9300
FAX: 508-822-3288

Project Information

Project Name: Elmwood & Forest Acave
Project Location: Buffalo, NY
Project #: T0369-016-001
Project Manager: Chris Boron
ALPHA Quote #:

Report Information - Data Deliverables

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

Billing Information

☐ Same as Client info PO #:

Client Information

Client: TurnKey Environmental
Address: 2558 Hamburg TPKE
Lackawanna, NY 14218
Phone: 716-856-0635
Fax:
Email: jrobinson@turnkeyllc.com

☐ These samples have been previously analyzed by Alpha

Turn-Around Time

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

Date Due: Time:

Regulatory Requirements/Report Limits

State /Fed Program
Criteria

Other Project Specific Requirements/Comments/Detection Limits:

SAMPLE HANDLING

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

ALPHA Lab ID (Lab Use Only)	Sample ID	Collection Date	Collection Time	Sample Matrix	Sampler's Initials	ANALYSIS: 8270 SVOCs Base Neutrals	RCRA 8 metals 6010/7471	Sample Specific Comments	TOTAL # BOTTLES
07809-01	HA-1 (2-6")	03/17/16	0945	S	JJR	X	X		
02	HA-2 (4-6")	↓	1000	S	JJR	X	X	Hold	
03	HA-3 (4-8")	↓	1015	S	JJR	X	X		
04	HA-4 (1-4")	↓	1045	S	JJR	X	X		
05	HA-5 (1-4")	↓	1130	S	JJR	X	X		
06	HA-5 (4-18")	↓	1145	S	JJR	X	X		
07	HA-6 (4-8")	↓	1230	S	JJR	X	X		
	Container Type					A	A		
	Preservative					A	A		

Relinquished By:	Date/Time	Received By:	Date/Time
	3/17/16 1425	Linda Henry AAL	3/17/16 16:40
Linda Henry	3/17/16		3/18/16 0105

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

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

ANALYTICAL REPORT

Lab Number:	L1705569
Client:	Turnkey Environmental Restoration, LLC 2558 Hamburg Turnpike Suite 300 Buffalo, NY 14218
ATTN:	Chris Boron
Phone:	(716) 856-0599
Project Name:	REDEV PROJ ELMWOOD& FOREST AVE
Project Number:	T0369-016-001-006
Report Date:	03/01/17

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), NJ NELAP (MA935), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-14-00197).

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

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Project Number: T0369-016-001-006

Lab Number: L1705569
Report Date: 03/01/17

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L1705569-01	TP-1 (0-4")	SOIL	BUFFALO, NY	02/21/17 08:41	02/22/17
L1705569-02	TP-2 (0-4")	SOIL	BUFFALO, NY	02/21/17 09:10	02/22/17
L1705569-03	TP-2 (4"-1')	SOIL	BUFFALO, NY	02/21/17 09:17	02/22/17
L1705569-04	TP-3 (0-4")	SOIL	BUFFALO, NY	02/21/17 09:42	02/22/17
L1705569-05	TP-4 (0-6")	SOIL	BUFFALO, NY	02/21/17 10:10	02/22/17
L1705569-06	TP-5 (0-1')	SOIL	BUFFALO, NY	02/21/17 11:10	02/22/17
L1705569-07	TP-6 (0-4")	SOIL	BUFFALO, NY	02/21/17 12:12	02/22/17
L1705569-08	TP-6 (4"-8")	SOIL	BUFFALO, NY	02/21/17 12:15	02/22/17
L1705569-09	TP-7 (0-6")	SOIL	BUFFALO, NY	02/21/17 13:00	02/22/17
L1705569-10	TP-8 (0-6")	SOIL	BUFFALO, NY	02/21/17 13:25	02/22/17
L1705569-11	TP-9 (2-6")	SOIL	BUFFALO, NY	02/21/17 13:57	02/22/17

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. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

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

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

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (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 Client Service Representative 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 Client Services 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.

L1705569-05: The sample has elevated detection limits due to the dilution required by the elevated concentrations of non-target compounds in the sample.

Semivolatile Organics

L1705569-05 and -11: The sample has elevated detection limits due to the dilution required by the sample matrix.

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: Melissa Cripps Melissa Cripps

Title: Technical Director/Representative Date: 03/01/17

ORGANICS

VOLATILES

SAMPLE RESULTS

Lab ID:	L1705569-05	Date Collected:	02/21/17 10:10
Client ID:	TP-4 (0-6")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		
Analytical Method:	1,8260C		
Analytical Date:	02/28/17 02:57		
Analyst:	TE		
Percent Solids:	75%		

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Volatile Organics by GC/MS - Westborough Lab						
Methylene chloride	ND		ug/kg	610	67.	1
1,1-Dichloroethane	ND		ug/kg	91	5.2	1
Chloroform	ND		ug/kg	91	22.	1
Carbon tetrachloride	ND		ug/kg	61	13.	1
1,2-Dichloropropane	ND		ug/kg	210	14.	1
Dibromochloromethane	ND		ug/kg	61	9.3	1
1,1,2-Trichloroethane	ND		ug/kg	91	18.	1
Tetrachloroethene	ND		ug/kg	61	8.5	1
Chlorobenzene	ND		ug/kg	61	21.	1
Trichlorofluoromethane	ND		ug/kg	300	24.	1
1,2-Dichloroethane	ND		ug/kg	61	6.9	1
1,1,1-Trichloroethane	ND		ug/kg	61	6.7	1
Bromodichloromethane	ND		ug/kg	61	10.	1
trans-1,3-Dichloropropene	ND		ug/kg	61	7.3	1
cis-1,3-Dichloropropene	ND		ug/kg	61	7.1	1
Bromoform	ND		ug/kg	240	14.	1
1,1,2,2-Tetrachloroethane	ND		ug/kg	61	6.1	1
Benzene	ND		ug/kg	61	7.2	1
Toluene	ND		ug/kg	91	12.	1
Ethylbenzene	ND		ug/kg	61	7.7	1
Chloromethane	ND		ug/kg	300	18.	1
Bromomethane	ND		ug/kg	120	20.	1
Vinyl chloride	ND		ug/kg	120	7.1	1
Chloroethane	ND		ug/kg	120	19.	1
1,1-Dichloroethene	ND		ug/kg	61	16.	1
trans-1,2-Dichloroethene	ND		ug/kg	91	13.	1
Trichloroethene	ND		ug/kg	61	7.6	1
1,2-Dichlorobenzene	ND		ug/kg	300	9.3	1
1,3-Dichlorobenzene	ND		ug/kg	300	8.2	1
1,4-Dichlorobenzene	ND		ug/kg	300	8.4	1

SAMPLE RESULTS

Lab ID: L1705569-05 Date Collected: 02/21/17 10:10

Client ID: TP-4 (0-6") Date Received: 02/22/17

Sample Location: BUFFALO, NY Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Volatile Organics by GC/MS - Westborough Lab						
Methyl tert butyl ether	ND		ug/kg	120	5.1	1
p/m-Xylene	ND		ug/kg	120	21.	1
o-Xylene	ND		ug/kg	120	20.	1
cis-1,2-Dichloroethene	ND		ug/kg	61	8.7	1
Styrene	ND		ug/kg	120	24.	1
Dichlorodifluoromethane	ND		ug/kg	610	12.	1
Acetone	84	J	ug/kg	610	63.	1
Carbon disulfide	ND		ug/kg	610	67.	1
2-Butanone	ND		ug/kg	610	16.	1
4-Methyl-2-pentanone	ND		ug/kg	610	15.	1
2-Hexanone	ND		ug/kg	610	40.	1
Bromochloromethane	ND		ug/kg	300	17.	1
1,2-Dibromoethane	ND		ug/kg	240	10.	1
1,2-Dibromo-3-chloropropane	ND		ug/kg	300	24.	1
Isopropylbenzene	ND		ug/kg	61	6.3	1
1,2,3-Trichlorobenzene	ND		ug/kg	300	9.0	1
1,2,4-Trichlorobenzene	ND		ug/kg	300	11.	1
Methyl Acetate	ND		ug/kg	1200	16.	1
Cyclohexane	ND		ug/kg	1200	8.8	1
1,4-Dioxane	ND		ug/kg	2400	870	1
Freon-113	ND		ug/kg	1200	17.	1
Methyl cyclohexane	ND		ug/kg	240	9.4	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	106		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	100		70-130
Dibromofluoromethane	101		70-130

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 02/27/17 20:22
Analyst: KD

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 05 Batch: WG981598-5					
Methylene chloride	ND		ug/kg	500	55.
1,1-Dichloroethane	ND		ug/kg	75	4.3
Chloroform	ND		ug/kg	75	18.
Carbon tetrachloride	ND		ug/kg	50	10.
1,2-Dichloropropane	ND		ug/kg	180	11.
Dibromochloromethane	ND		ug/kg	50	7.7
1,1,2-Trichloroethane	ND		ug/kg	75	15.
Tetrachloroethene	ND		ug/kg	50	7.0
Chlorobenzene	ND		ug/kg	50	17.
Trichlorofluoromethane	ND		ug/kg	250	19.
1,2-Dichloroethane	ND		ug/kg	50	5.7
1,1,1-Trichloroethane	ND		ug/kg	50	5.5
Bromodichloromethane	ND		ug/kg	50	8.7
trans-1,3-Dichloropropene	ND		ug/kg	50	6.0
cis-1,3-Dichloropropene	ND		ug/kg	50	5.9
Bromoform	ND		ug/kg	200	12.
1,1,2,2-Tetrachloroethane	ND		ug/kg	50	5.0
Benzene	ND		ug/kg	50	5.9
Toluene	ND		ug/kg	75	9.7
Ethylbenzene	ND		ug/kg	50	6.4
Chloromethane	ND		ug/kg	250	15.
Bromomethane	25	J	ug/kg	100	17.
Vinyl chloride	ND		ug/kg	100	5.9
Chloroethane	ND		ug/kg	100	16.
1,1-Dichloroethene	ND		ug/kg	50	13.
trans-1,2-Dichloroethene	ND		ug/kg	75	11.
Trichloroethene	ND		ug/kg	50	6.2
1,2-Dichlorobenzene	ND		ug/kg	250	7.7
1,3-Dichlorobenzene	ND		ug/kg	250	6.8

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 02/27/17 20:22
Analyst: KD

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**
Volatile Organics by GC/MS - Westborough Lab for sample(s): 05 Batch: WG981598-5					
1,4-Dichlorobenzene	ND		ug/kg	250	6.9
Methyl tert butyl ether	ND		ug/kg	100	4.2
p/m-Xylene	ND		ug/kg	100	18.
o-Xylene	ND		ug/kg	100	17.
cis-1,2-Dichloroethene	ND		ug/kg	50	7.1
Styrene	ND		ug/kg	100	20.
Dichlorodifluoromethane	ND		ug/kg	500	9.5
Acetone	ND		ug/kg	500	52.
Carbon disulfide	ND		ug/kg	500	55.
2-Butanone	ND		ug/kg	500	14.
4-Methyl-2-pentanone	ND		ug/kg	500	12.
2-Hexanone	ND		ug/kg	500	33.
Bromochloromethane	ND		ug/kg	250	14.
1,2-Dibromoethane	ND		ug/kg	200	8.7
1,2-Dibromo-3-chloropropane	ND		ug/kg	250	20.
Isopropylbenzene	ND		ug/kg	50	5.2
1,2,3-Trichlorobenzene	ND		ug/kg	250	7.4
1,2,4-Trichlorobenzene	ND		ug/kg	250	9.1
Methyl Acetate	ND		ug/kg	1000	14.
Cyclohexane	ND		ug/kg	1000	7.3
1,4-Dioxane	ND		ug/kg	2000	720
Freon-113	ND		ug/kg	1000	14.
Methyl cyclohexane	ND		ug/kg	200	7.7

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8260C
Analytical Date: 02/27/17 20:22
Analyst: KD

Parameter	Result	Qualifier	Units	RL	MDL
Volatile Organics by GC/MS - Westborough Lab for sample(s): 05 Batch: WG981598-5					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
1,2-Dichloroethane-d4	102		70-130
Toluene-d8	98		70-130
4-Bromofluorobenzene	103		70-130
Dibromofluoromethane	100		70-130

Lab Control Sample Analysis

Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE

Project Number: T0369-016-001-006

Lab Number: L1705569

Report Date: 03/01/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 05 Batch: WG981598-3 WG981598-4								
Methylene chloride	95		100		70-130	5		30
1,1-Dichloroethane	98		95		70-130	3		30
Chloroform	101		99		70-130	2		30
Carbon tetrachloride	98		95		70-130	3		30
1,2-Dichloropropane	96		95		70-130	1		30
Dibromochloromethane	104		99		70-130	5		30
1,1,2-Trichloroethane	100		96		70-130	4		30
Tetrachloroethene	101		96		70-130	5		30
Chlorobenzene	99		95		70-130	4		30
Trichlorofluoromethane	102		95		70-139	7		30
1,2-Dichloroethane	100		98		70-130	2		30
1,1,1-Trichloroethane	104		101		70-130	3		30
Bromodichloromethane	101		101		70-130	0		30
trans-1,3-Dichloropropene	105		102		70-130	3		30
cis-1,3-Dichloropropene	105		103		70-130	2		30
Bromoform	92		90		70-130	2		30
1,1,2,2-Tetrachloroethane	100		97		70-130	3		30
Benzene	97		95		70-130	2		30
Toluene	96		93		70-130	3		30
Ethylbenzene	97		94		70-130	3		30
Chloromethane	97		93		52-130	4		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE

Project Number: T0369-016-001-006

Lab Number: L1705569

Report Date: 03/01/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 05 Batch: WG981598-3 WG981598-4								
Bromomethane	101		97		57-147	4		30
Vinyl chloride	102		94		67-130	8		30
Chloroethane	96		90		50-151	6		30
1,1-Dichloroethene	101		97		65-135	4		30
trans-1,2-Dichloroethene	100		98		70-130	2		30
Trichloroethene	100		97		70-130	3		30
1,2-Dichlorobenzene	100		97		70-130	3		30
1,3-Dichlorobenzene	99		96		70-130	3		30
1,4-Dichlorobenzene	99		96		70-130	3		30
Methyl tert butyl ether	108		103		66-130	5		30
p/m-Xylene	98		94		70-130	4		30
o-Xylene	98		95		70-130	3		30
cis-1,2-Dichloroethene	99		96		70-130	3		30
Styrene	97		94		70-130	3		30
Dichlorodifluoromethane	103		98		30-146	5		30
Acetone	106		94		54-140	12		30
Carbon disulfide	78		75		59-130	4		30
2-Butanone	99		95		70-130	4		30
4-Methyl-2-pentanone	99		93		70-130	6		30
2-Hexanone	96		91		70-130	5		30
Bromochloromethane	104		101		70-130	3		30

Lab Control Sample Analysis
Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Lab Number: L1705569
Project Number: T0369-016-001-006
Report Date: 03/01/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics by GC/MS - Westborough Lab Associated sample(s): 05 Batch: WG981598-3 WG981598-4								
1,2-Dibromoethane	104		100		70-130	4		30
1,2-Dibromo-3-chloropropane	98		95		68-130	3		30
Isopropylbenzene	99		95		70-130	4		30
1,2,3-Trichlorobenzene	102		100		70-130	2		30
1,2,4-Trichlorobenzene	102		99		70-130	3		30
Methyl Acetate	100		97		51-146	3		30
Cyclohexane	96		94		59-142	2		30
1,4-Dioxane	104		98		65-136	6		30
Freon-113	104		100		50-139	4		30
Methyl cyclohexane	101		98		70-130	3		30

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
1,2-Dichloroethane-d4	102		102		70-130
Toluene-d8	97		98		70-130
4-Bromofluorobenzene	102		103		70-130
Dibromofluoromethane	104		102		70-130

SEMIVOLATILES

SAMPLE RESULTS

Lab ID: L1705569-02
Client ID: TP-2 (0-4")
Sample Location: BUFFALO, NY
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 02/27/17 00:50
Analyst: RC
Percent Solids: 76%

Date Collected: 02/21/17 09:10
Date Received: 02/22/17
Field Prep: Not Specified
Extraction Method:EPA 3546
Extraction Date: 02/25/17 23:50

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	27	J	ug/kg	170	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	220	25.	1
Hexachlorobenzene	ND		ug/kg	130	24.	1
Bis(2-chloroethyl)ether	ND		ug/kg	190	29.	1
2-Chloronaphthalene	ND		ug/kg	220	21.	1
1,2-Dichlorobenzene	ND		ug/kg	220	39.	1
1,3-Dichlorobenzene	ND		ug/kg	220	37.	1
1,4-Dichlorobenzene	ND		ug/kg	220	38.	1
3,3'-Dichlorobenzidine	ND		ug/kg	220	58.	1
2,4-Dinitrotoluene	ND		ug/kg	220	43.	1
2,6-Dinitrotoluene	ND		ug/kg	220	37.	1
Fluoranthene	730		ug/kg	130	25.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	220	23.	1
4-Bromophenyl phenyl ether	ND		ug/kg	220	33.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	260	37.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	230	22.	1
Hexachlorobutadiene	ND		ug/kg	220	32.	1
Hexachlorocyclopentadiene	ND		ug/kg	620	200	1
Hexachloroethane	ND		ug/kg	170	35.	1
Isophorone	ND		ug/kg	190	28.	1
Naphthalene	ND		ug/kg	220	26.	1
Nitrobenzene	ND		ug/kg	190	32.	1
NDPA/DPA	ND		ug/kg	170	25.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	220	33.	1
Bis(2-ethylhexyl)phthalate	590		ug/kg	220	75.	1
Butyl benzyl phthalate	ND		ug/kg	220	54.	1
Di-n-butylphthalate	ND		ug/kg	220	41.	1
Di-n-octylphthalate	ND		ug/kg	220	74.	1
Diethyl phthalate	ND		ug/kg	220	20.	1
Dimethyl phthalate	ND		ug/kg	220	45.	1

SAMPLE RESULTS

Lab ID:	L1705569-02	Date Collected:	02/21/17 09:10
Client ID:	TP-2 (0-4")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified

Semivolatile Organics by GC/MS - Westborough Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Benzo(a)anthracene	310		ug/kg	130	24.	1
Benzo(a)pyrene	300		ug/kg	170	53.	1
Benzo(b)fluoranthene	410		ug/kg	130	36.	1
Benzo(k)fluoranthene	120	J	ug/kg	130	35.	1
Chrysene	310		ug/kg	130	22.	1
Acenaphthylene	ND		ug/kg	170	33.	1
Anthracene	100	J	ug/kg	130	42.	1
Benzo(ghi)perylene	180		ug/kg	170	25.	1
Fluorene	35	J	ug/kg	220	21.	1
Phenanthrene	410		ug/kg	130	26.	1
Dibenzo(a,h)anthracene	48	J	ug/kg	130	25.	1
Indeno(1,2,3-cd)pyrene	210		ug/kg	170	30.	1
Pyrene	590		ug/kg	130	21.	1
Biphenyl	ND		ug/kg	490	50.	1
4-Chloroaniline	ND		ug/kg	220	39.	1
2-Nitroaniline	ND		ug/kg	220	42.	1
3-Nitroaniline	ND		ug/kg	220	41.	1
4-Nitroaniline	ND		ug/kg	220	90.	1
Dibenzofuran	ND		ug/kg	220	20.	1
2-Methylnaphthalene	ND		ug/kg	260	26.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	220	22.	1
Acetophenone	ND		ug/kg	220	27.	1
Benzyl Alcohol	ND		ug/kg	220	66.	1
Carbazole	50	J	ug/kg	220	21.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	73		25-120
Phenol-d6	74		10-120
Nitrobenzene-d5	85		23-120
2-Fluorobiphenyl	82		30-120
2,4,6-Tribromophenol	90		10-136
4-Terphenyl-d14	71		18-120

SAMPLE RESULTS

Lab ID:	L1705569-04	Date Collected:	02/21/17 09:42
Client ID:	TP-3 (0-4")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	02/25/17 23:50
Analytical Date:	02/27/17 01:15		
Analyst:	RC		
Percent Solids:	78%		

Semivolatile Organics by GC/MS - Westborough Lab

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Acenaphthene	ND		ug/kg	170	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	210	24.	1
Hexachlorobenzene	ND		ug/kg	130	24.	1
Bis(2-chloroethyl)ether	ND		ug/kg	190	28.	1
2-Chloronaphthalene	ND		ug/kg	210	21.	1
1,2-Dichlorobenzene	ND		ug/kg	210	38.	1
1,3-Dichlorobenzene	ND		ug/kg	210	36.	1
1,4-Dichlorobenzene	ND		ug/kg	210	37.	1
3,3'-Dichlorobenzidine	ND		ug/kg	210	56.	1
2,4-Dinitrotoluene	ND		ug/kg	210	42.	1
2,6-Dinitrotoluene	ND		ug/kg	210	36.	1
Fluoranthene	160		ug/kg	130	24.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	210	22.	1
4-Bromophenyl phenyl ether	ND		ug/kg	210	32.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	250	36.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	230	21.	1
Hexachlorobutadiene	ND		ug/kg	210	31.	1
Hexachlorocyclopentadiene	ND		ug/kg	600	190	1
Hexachloroethane	ND		ug/kg	170	34.	1
Isophorone	ND		ug/kg	190	27.	1
Naphthalene	ND		ug/kg	210	26.	1
Nitrobenzene	ND		ug/kg	190	31.	1
NDPA/DPA	ND		ug/kg	170	24.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	210	32.	1
Bis(2-ethylhexyl)phthalate	73	J	ug/kg	210	73.	1
Butyl benzyl phthalate	ND		ug/kg	210	53.	1
Di-n-butylphthalate	ND		ug/kg	210	40.	1
Di-n-octylphthalate	ND		ug/kg	210	71.	1
Diethyl phthalate	ND		ug/kg	210	19.	1
Dimethyl phthalate	ND		ug/kg	210	44.	1

SAMPLE RESULTS

Lab ID: L1705569-04
Client ID: TP-3 (0-4")
Sample Location: BUFFALO, NY
Date Collected: 02/21/17 09:42
Date Received: 02/22/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	88	J	ug/kg	130	24.	1
Benzo(a)pyrene	83	J	ug/kg	170	51.	1
Benzo(b)fluoranthene	110	J	ug/kg	130	35.	1
Benzo(k)fluoranthene	42	J	ug/kg	130	34.	1
Chrysene	82	J	ug/kg	130	22.	1
Acenaphthylene	ND		ug/kg	170	32.	1
Anthracene	ND		ug/kg	130	41.	1
Benzo(ghi)perylene	54	J	ug/kg	170	25.	1
Fluorene	ND		ug/kg	210	20.	1
Phenanthrene	89	J	ug/kg	130	26.	1
Dibenzo(a,h)anthracene	ND		ug/kg	130	24.	1
Indeno(1,2,3-cd)pyrene	60	J	ug/kg	170	29.	1
Pyrene	140		ug/kg	130	21.	1
Biphenyl	ND		ug/kg	480	49.	1
4-Chloroaniline	ND		ug/kg	210	38.	1
2-Nitroaniline	ND		ug/kg	210	40.	1
3-Nitroaniline	ND		ug/kg	210	40.	1
4-Nitroaniline	ND		ug/kg	210	87.	1
Dibenzofuran	ND		ug/kg	210	20.	1
2-Methylnaphthalene	ND		ug/kg	250	25.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	210	22.	1
Acetophenone	ND		ug/kg	210	26.	1
Benzyl Alcohol	ND		ug/kg	210	64.	1
Carbazole	ND		ug/kg	210	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	64		25-120
Phenol-d6	64		10-120
Nitrobenzene-d5	85		23-120
2-Fluorobiphenyl	87		30-120
2,4,6-Tribromophenol	85		10-136
4-Terphenyl-d14	78		18-120

SAMPLE RESULTS

Lab ID: L1705569-05 D
Client ID: TP-4 (0-6")
Sample Location: BUFFALO, NY
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 02/27/17 05:09
Analyst: RC
Percent Solids: 75%

Date Collected: 02/21/17 10:10
Date Received: 02/22/17
Field Prep: Not Specified
Extraction Method:EPA 3546
Extraction Date: 02/25/17 23:50

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	820	J	ug/kg	870	110	5
1,2,4-Trichlorobenzene	ND		ug/kg	1100	120	5
Hexachlorobenzene	ND		ug/kg	650	120	5
Bis(2-chloroethyl)ether	ND		ug/kg	980	150	5
2-Chloronaphthalene	ND		ug/kg	1100	110	5
1,2-Dichlorobenzene	ND		ug/kg	1100	190	5
1,3-Dichlorobenzene	ND		ug/kg	1100	190	5
1,4-Dichlorobenzene	ND		ug/kg	1100	190	5
3,3'-Dichlorobenzidine	ND		ug/kg	1100	290	5
2,4-Dinitrotoluene	ND		ug/kg	1100	220	5
2,6-Dinitrotoluene	ND		ug/kg	1100	190	5
Fluoranthene	9800		ug/kg	650	120	5
4-Chlorophenyl phenyl ether	ND		ug/kg	1100	120	5
4-Bromophenyl phenyl ether	ND		ug/kg	1100	160	5
Bis(2-chloroisopropyl)ether	ND		ug/kg	1300	180	5
Bis(2-chloroethoxy)methane	ND		ug/kg	1200	110	5
Hexachlorobutadiene	ND		ug/kg	1100	160	5
Hexachlorocyclopentadiene	ND		ug/kg	3100	980	5
Hexachloroethane	ND		ug/kg	870	180	5
Isophorone	ND		ug/kg	980	140	5
Naphthalene	500	J	ug/kg	1100	130	5
Nitrobenzene	ND		ug/kg	980	160	5
NDPA/DPA	ND		ug/kg	870	120	5
n-Nitrosodi-n-propylamine	ND		ug/kg	1100	170	5
Bis(2-ethylhexyl)phthalate	ND		ug/kg	1100	380	5
Butyl benzyl phthalate	290	J	ug/kg	1100	270	5
Di-n-butylphthalate	ND		ug/kg	1100	200	5
Di-n-octylphthalate	ND		ug/kg	1100	370	5
Diethyl phthalate	ND		ug/kg	1100	100	5
Dimethyl phthalate	ND		ug/kg	1100	230	5

SAMPLE RESULTS

Lab ID:	L1705569-05	D	Date Collected:	02/21/17 10:10
Client ID:	TP-4 (0-6")		Date Received:	02/22/17
Sample Location:	BUFFALO, NY		Field Prep:	Not Specified

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	4000		ug/kg	650	120	5
Benzo(a)pyrene	3400		ug/kg	870	260	5
Benzo(b)fluoranthene	4600		ug/kg	650	180	5
Benzo(k)fluoranthene	1400		ug/kg	650	170	5
Chrysene	3700		ug/kg	650	110	5
Acenaphthylene	ND		ug/kg	870	170	5
Anthracene	2000		ug/kg	650	210	5
Benzo(ghi)perylene	1900		ug/kg	870	130	5
Fluorene	1200		ug/kg	1100	100	5
Phenanthrene	8400		ug/kg	650	130	5
Dibenzo(a,h)anthracene	580	J	ug/kg	650	120	5
Indeno(1,2,3-cd)pyrene	2300		ug/kg	870	150	5
Pyrene	7400		ug/kg	650	110	5
Biphenyl	ND		ug/kg	2500	250	5
4-Chloroaniline	ND		ug/kg	1100	200	5
2-Nitroaniline	ND		ug/kg	1100	210	5
3-Nitroaniline	ND		ug/kg	1100	200	5
4-Nitroaniline	ND		ug/kg	1100	450	5
Dibenzofuran	630	J	ug/kg	1100	100	5
2-Methylnaphthalene	220	J	ug/kg	1300	130	5
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	1100	110	5
Acetophenone	ND		ug/kg	1100	130	5
Benzyl Alcohol	ND		ug/kg	1100	330	5
Carbazole	1200		ug/kg	1100	100	5

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
2-Fluorophenol	46		25-120
Phenol-d6	49		10-120
Nitrobenzene-d5	71		23-120
2-Fluorobiphenyl	61		30-120
2,4,6-Tribromophenol	62		10-136
4-Terphenyl-d14	50		18-120

SAMPLE RESULTS

Lab ID: L1705569-07
Client ID: TP-6 (0-4")
Sample Location: BUFFALO, NY
Matrix: Soil
Analytical Method: 1,8270D
Analytical Date: 02/27/17 01:41
Analyst: RC
Percent Solids: 78%

Date Collected: 02/21/17 12:12
Date Received: 02/22/17
Field Prep: Not Specified
Extraction Method:EPA 3546
Extraction Date: 02/25/17 23:50

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	170	22.	1
1,2,4-Trichlorobenzene	ND		ug/kg	210	24.	1
Hexachlorobenzene	ND		ug/kg	130	24.	1
Bis(2-chloroethyl)ether	ND		ug/kg	190	29.	1
2-Chloronaphthalene	ND		ug/kg	210	21.	1
1,2-Dichlorobenzene	ND		ug/kg	210	38.	1
1,3-Dichlorobenzene	ND		ug/kg	210	37.	1
1,4-Dichlorobenzene	ND		ug/kg	210	37.	1
3,3'-Dichlorobenzidine	ND		ug/kg	210	57.	1
2,4-Dinitrotoluene	ND		ug/kg	210	43.	1
2,6-Dinitrotoluene	ND		ug/kg	210	37.	1
Fluoranthene	150		ug/kg	130	24.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	210	23.	1
4-Bromophenyl phenyl ether	ND		ug/kg	210	32.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	260	36.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	230	21.	1
Hexachlorobutadiene	ND		ug/kg	210	31.	1
Hexachlorocyclopentadiene	ND		ug/kg	610	190	1
Hexachloroethane	ND		ug/kg	170	34.	1
Isophorone	ND		ug/kg	190	28.	1
Naphthalene	720		ug/kg	210	26.	1
Nitrobenzene	ND		ug/kg	190	32.	1
NDPA/DPA	ND		ug/kg	170	24.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	210	33.	1
Bis(2-ethylhexyl)phthalate	ND		ug/kg	210	74.	1
Butyl benzyl phthalate	ND		ug/kg	210	54.	1
Di-n-butylphthalate	ND		ug/kg	210	40.	1
Di-n-octylphthalate	ND		ug/kg	210	72.	1
Diethyl phthalate	ND		ug/kg	210	20.	1
Dimethyl phthalate	ND		ug/kg	210	45.	1

SAMPLE RESULTS

Lab ID:	L1705569-07	Date Collected:	02/21/17 12:12
Client ID:	TP-6 (0-4")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	500		ug/kg	130	24.	1
Benzo(a)pyrene	800		ug/kg	170	52.	1
Benzo(b)fluoranthene	400		ug/kg	130	36.	1
Benzo(k)fluoranthene	57	J	ug/kg	130	34.	1
Chrysene	770		ug/kg	130	22.	1
Acenaphthylene	ND		ug/kg	170	33.	1
Anthracene	280		ug/kg	130	42.	1
Benzo(ghi)perylene	1000		ug/kg	170	25.	1
Fluorene	ND		ug/kg	210	21.	1
Phenanthrene	1500		ug/kg	130	26.	1
Dibenzo(a,h)anthracene	270		ug/kg	130	25.	1
Indeno(1,2,3-cd)pyrene	350		ug/kg	170	30.	1
Pyrene	1000		ug/kg	130	21.	1
Biphenyl	97	J	ug/kg	490	50.	1
4-Chloroaniline	ND		ug/kg	210	39.	1
2-Nitroaniline	ND		ug/kg	210	41.	1
3-Nitroaniline	ND		ug/kg	210	40.	1
4-Nitroaniline	ND		ug/kg	210	88.	1
Dibenzofuran	240		ug/kg	210	20.	1
2-Methylnaphthalene	1200		ug/kg	260	26.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	210	22.	1
Acetophenone	ND		ug/kg	210	26.	1
Benzyl Alcohol	ND		ug/kg	210	65.	1
Carbazole	ND		ug/kg	210	21.	1

Surrogate	**% Recovery**	**Qualifier**	**Acceptance Criteria**
2-Fluorophenol	45		25-120
Phenol-d6	45		10-120
Nitrobenzene-d5	79		23-120
2-Fluorobiphenyl	83		30-120
2,4,6-Tribromophenol	79		10-136
4-Terphenyl-d14	81		18-120

SAMPLE RESULTS

Lab ID:	L1705569-09	Date Collected:	02/21/17 13:00
Client ID:	TP-7 (0-6")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil	Extraction Method:	EPA 3546
Analytical Method:	1,8270D	Extraction Date:	02/25/17 23:50
Analytical Date:	02/27/17 02:06		
Analyst:	RC		
Percent Solids:	82%		

Parameter	**Result**	**Qualifier**	**Units**	**RL**	**MDL**	**Dilution Factor**
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	160	21.	1
1,2,4-Trichlorobenzene	ND		ug/kg	200	23.	1
Hexachlorobenzene	ND		ug/kg	120	23.	1
Bis(2-chloroethyl)ether	ND		ug/kg	180	28.	1
2-Chloronaphthalene	ND		ug/kg	200	20.	1
1,2-Dichlorobenzene	ND		ug/kg	200	36.	1
1,3-Dichlorobenzene	ND		ug/kg	200	35.	1
1,4-Dichlorobenzene	ND		ug/kg	200	35.	1
3,3'-Dichlorobenzidine	ND		ug/kg	200	54.	1
2,4-Dinitrotoluene	ND		ug/kg	200	41.	1
2,6-Dinitrotoluene	ND		ug/kg	200	35.	1
Fluoranthene	550		ug/kg	120	23.	1
4-Chlorophenyl phenyl ether	ND		ug/kg	200	22.	1
4-Bromophenyl phenyl ether	ND		ug/kg	200	31.	1
Bis(2-chloroisopropyl)ether	ND		ug/kg	240	35.	1
Bis(2-chloroethoxy)methane	ND		ug/kg	220	20.	1
Hexachlorobutadiene	ND		ug/kg	200	30.	1
Hexachlorocyclopentadiene	ND		ug/kg	580	180	1
Hexachloroethane	ND		ug/kg	160	33.	1
Isophorone	ND		ug/kg	180	26.	1
Naphthalene	38	J	ug/kg	200	25.	1
Nitrobenzene	ND		ug/kg	180	30.	1
NDPA/DPA	ND		ug/kg	160	23.	1
n-Nitrosodi-n-propylamine	ND		ug/kg	200	31.	1
Bis(2-ethylhexyl)phthalate	ND		ug/kg	200	70.	1
Butyl benzyl phthalate	ND		ug/kg	200	51.	1
Di-n-butylphthalate	ND		ug/kg	200	38.	1
Di-n-octylphthalate	ND		ug/kg	200	69.	1
Diethyl phthalate	ND		ug/kg	200	19.	1
Dimethyl phthalate	ND		ug/kg	200	43.	1

SAMPLE RESULTS

Lab ID:	L1705569-09	Date Collected:	02/21/17 13:00
Client ID:	TP-7 (0-6")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	260		ug/kg	120	23.	1
Benzo(a)pyrene	260		ug/kg	160	50.	1
Benzo(b)fluoranthene	330		ug/kg	120	34.	1
Benzo(k)fluoranthene	100	J	ug/kg	120	32.	1
Chrysene	230		ug/kg	120	21.	1
Acenaphthylene	34	J	ug/kg	160	31.	1
Anthracene	62	J	ug/kg	120	40.	1
Benzo(ghi)perylene	140	J	ug/kg	160	24.	1
Fluorene	ND		ug/kg	200	20.	1
Phenanthrene	230		ug/kg	120	25.	1
Dibenzo(a,h)anthracene	38	J	ug/kg	120	23.	1
Indeno(1,2,3-cd)pyrene	170		ug/kg	160	28.	1
Pyrene	460		ug/kg	120	20.	1
Biphenyl	ND		ug/kg	460	47.	1
4-Chloroaniline	ND		ug/kg	200	37.	1
2-Nitroaniline	ND		ug/kg	200	39.	1
3-Nitroaniline	ND		ug/kg	200	38.	1
4-Nitroaniline	ND		ug/kg	200	84.	1
Dibenzofuran	22	J	ug/kg	200	19.	1
2-Methylnaphthalene	63	J	ug/kg	240	24.	1
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	200	21.	1
Acetophenone	ND		ug/kg	200	25.	1
Benzyl Alcohol	ND		ug/kg	200	62.	1
Carbazole	20	J	ug/kg	200	20.	1

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	49		25-120
Phenol-d6	49		10-120
Nitrobenzene-d5	86		23-120
2-Fluorobiphenyl	89		30-120
2,4,6-Tribromophenol	81		10-136
4-Terphenyl-d14	77		18-120

SAMPLE RESULTS

Lab ID:	L1705569-11	D	Date Collected:	02/21/17 13:57
Client ID:	TP-9 (2-6")		Date Received:	02/22/17
Sample Location:	BUFFALO, NY		Field Prep:	Not Specified
Matrix:	Soil		Extraction Method:	EPA 3546
Analytical Method:	1,8270D		Extraction Date:	02/25/17 23:50
Analytical Date:	02/27/17 05:36			
Analyst:	RC			
Percent Solids:	77%			

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Acenaphthene	ND		ug/kg	860	110	5
1,2,4-Trichlorobenzene	ND		ug/kg	1100	120	5
Hexachlorobenzene	ND		ug/kg	640	120	5
Bis(2-chloroethyl)ether	ND		ug/kg	960	140	5
2-Chloronaphthalene	ND		ug/kg	1100	110	5
1,2-Dichlorobenzene	ND		ug/kg	1100	190	5
1,3-Dichlorobenzene	ND		ug/kg	1100	180	5
1,4-Dichlorobenzene	ND		ug/kg	1100	190	5
3,3'-Dichlorobenzidine	ND		ug/kg	1100	280	5
2,4-Dinitrotoluene	ND		ug/kg	1100	210	5
2,6-Dinitrotoluene	ND		ug/kg	1100	180	5
Fluoranthene	160	J	ug/kg	640	120	5
4-Chlorophenyl phenyl ether	ND		ug/kg	1100	110	5
4-Bromophenyl phenyl ether	ND		ug/kg	1100	160	5
Bis(2-chloroisopropyl)ether	ND		ug/kg	1300	180	5
Bis(2-chloroethoxy)methane	ND		ug/kg	1200	110	5
Hexachlorobutadiene	ND		ug/kg	1100	160	5
Hexachlorocyclopentadiene	ND		ug/kg	3100	970	5
Hexachloroethane	ND		ug/kg	860	170	5
Isophorone	ND		ug/kg	960	140	5
Naphthalene	ND		ug/kg	1100	130	5
Nitrobenzene	ND		ug/kg	960	160	5
NDPA/DPA	ND		ug/kg	860	120	5
n-Nitrosodi-n-propylamine	ND		ug/kg	1100	160	5
Bis(2-ethylhexyl)phthalate	ND		ug/kg	1100	370	5
Butyl benzyl phthalate	ND		ug/kg	1100	270	5
Di-n-butylphthalate	ND		ug/kg	1100	200	5
Di-n-octylphthalate	ND		ug/kg	1100	360	5
Diethyl phthalate	ND		ug/kg	1100	99.	5
Dimethyl phthalate	ND		ug/kg	1100	220	5

SAMPLE RESULTS

Lab ID: L1705569-11 D

Client ID: TP-9 (2-6")

Sample Location: BUFFALO, NY

Date Collected: 02/21/17 13:57

Date Received: 02/22/17

Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Semivolatile Organics by GC/MS - Westborough Lab						
Benzo(a)anthracene	ND		ug/kg	640	120	5
Benzo(a)pyrene	ND		ug/kg	860	260	5
Benzo(b)fluoranthene	ND		ug/kg	640	180	5
Benzo(k)fluoranthene	ND		ug/kg	640	170	5
Chrysene	ND		ug/kg	640	110	5
Acenaphthylene	ND		ug/kg	860	160	5
Anthracene	ND		ug/kg	640	210	5
Benzo(ghi)perylene	ND		ug/kg	860	130	5
Fluorene	ND		ug/kg	1100	100	5
Phenanthrene	ND		ug/kg	640	130	5
Dibenzo(a,h)anthracene	ND		ug/kg	640	120	5
Indeno(1,2,3-cd)pyrene	ND		ug/kg	860	150	5
Pyrene	140	J	ug/kg	640	110	5
Biphenyl	ND		ug/kg	2400	250	5
4-Chloroaniline	ND		ug/kg	1100	200	5
2-Nitroaniline	ND		ug/kg	1100	210	5
3-Nitroaniline	ND		ug/kg	1100	200	5
4-Nitroaniline	ND		ug/kg	1100	440	5
Dibenzofuran	ND		ug/kg	1100	100	5
2-Methylnaphthalene	ND		ug/kg	1300	130	5
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	1100	110	5
Acetophenone	ND		ug/kg	1100	130	5
Benzyl Alcohol	ND		ug/kg	1100	330	5
Carbazole	ND		ug/kg	1100	100	5

Surrogate	% Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	60		25-120
Phenol-d6	63		10-120
Nitrobenzene-d5	70		23-120
2-Fluorobiphenyl	68		30-120
2,4,6-Tribromophenol	70		10-136
4-Terphenyl-d14	52		18-120

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 02/26/17 20:10
Analyst: RC

Extraction Method: EPA 3546
Extraction Date: 02/25/17 23:50

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 02,04-05,07,09,11 Batch: WG981077-1					
Acenaphthene	ND		ug/kg	130	17.
1,2,4-Trichlorobenzene	ND		ug/kg	160	18.
Hexachlorobenzene	ND		ug/kg	97	18.
Bis(2-chloroethyl)ether	ND		ug/kg	140	22.
2-Chloronaphthalene	ND		ug/kg	160	16.
1,2-Dichlorobenzene	ND		ug/kg	160	29.
1,3-Dichlorobenzene	ND		ug/kg	160	28.
1,4-Dichlorobenzene	ND		ug/kg	160	28.
3,3'-Dichlorobenzidine	ND		ug/kg	160	43.
2,4-Dinitrotoluene	ND		ug/kg	160	32.
2,6-Dinitrotoluene	ND		ug/kg	160	28.
Fluoranthene	ND		ug/kg	97	18.
4-Chlorophenyl phenyl ether	ND		ug/kg	160	17.
4-Bromophenyl phenyl ether	ND		ug/kg	160	25.
Bis(2-chloroisopropyl)ether	ND		ug/kg	190	28.
Bis(2-chloroethoxy)methane	ND		ug/kg	170	16.
Hexachlorobutadiene	ND		ug/kg	160	24.
Hexachlorocyclopentadiene	ND		ug/kg	460	150
Hexachloroethane	ND		ug/kg	130	26.
Isophorone	ND		ug/kg	140	21.
Naphthalene	ND		ug/kg	160	20.
Nitrobenzene	ND		ug/kg	140	24.
NDPA/DPA	ND		ug/kg	130	18.
n-Nitrosodi-n-propylamine	ND		ug/kg	160	25.
Bis(2-ethylhexyl)phthalate	ND		ug/kg	160	56.
Butyl benzyl phthalate	ND		ug/kg	160	41.
Di-n-butylphthalate	ND		ug/kg	160	31.
Di-n-octylphthalate	ND		ug/kg	160	55.
Diethyl phthalate	ND		ug/kg	160	15.

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 02/26/17 20:10
Analyst: RC

Extraction Method: EPA 3546
Extraction Date: 02/25/17 23:50

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 02,04-05,07,09,11 Batch: WG981077-1					
Dimethyl phthalate	ND		ug/kg	160	34.
Benzo(a)anthracene	ND		ug/kg	97	18.
Benzo(a)pyrene	ND		ug/kg	130	39.
Benzo(b)fluoranthene	ND		ug/kg	97	27.
Benzo(k)fluoranthene	ND		ug/kg	97	26.
Chrysene	ND		ug/kg	97	17.
Acenaphthylene	ND		ug/kg	130	25.
Anthracene	ND		ug/kg	97	32.
Benzo(ghi)perylene	ND		ug/kg	130	19.
Fluorene	ND		ug/kg	160	16.
Phenanthrene	ND		ug/kg	97	20.
Dibenzo(a,h)anthracene	ND		ug/kg	97	19.
Indeno(1,2,3-cd)pyrene	ND		ug/kg	130	22.
Pyrene	ND		ug/kg	97	16.
Biphenyl	ND		ug/kg	370	38.
4-Chloroaniline	ND		ug/kg	160	29.
2-Nitroaniline	ND		ug/kg	160	31.
3-Nitroaniline	ND		ug/kg	160	30.
4-Nitroaniline	ND		ug/kg	160	67.
Dibenzofuran	ND		ug/kg	160	15.
2-Methylnaphthalene	ND		ug/kg	190	20.
1,2,4,5-Tetrachlorobenzene	ND		ug/kg	160	17.
Acetophenone	ND		ug/kg	160	20.
Benzyl Alcohol	ND		ug/kg	160	49.
Carbazole	ND		ug/kg	160	16.

Method Blank Analysis
Batch Quality Control

Analytical Method: 1,8270D
Analytical Date: 02/26/17 20:10
Analyst: RC

Extraction Method: EPA 3546
Extraction Date: 02/25/17 23:50

Parameter	Result	Qualifier	Units	RL	MDL
Semivolatile Organics by GC/MS - Westborough Lab for sample(s): 02,04-05,07,09,11 Batch: WG981077-1					
Tentatively Identified Compounds					
Total TIC Compounds	154	J	ug/kg		
Unknown Organic Acid	154	J	ug/kg		

Surrogate	%Recovery	Qualifier	Acceptance Criteria
2-Fluorophenol	62		25-120
Phenol-d6	64		10-120
Nitrobenzene-d5	62		23-120
2-Fluorobiphenyl	74		30-120
2,4,6-Tribromophenol	73		10-136
4-Terphenyl-d14	90		18-120

Lab Control Sample Analysis
Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Lab Number: L1705569
Project Number: T0369-016-001-006
Report Date: 03/01/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 02,04-05,07,09,11 Batch: WG981077-2 WG981077-3								
Acenaphthene	87		84		31-137	4		50
1,2,4-Trichlorobenzene	86		84		38-107	2		50
Hexachlorobenzene	92		90		40-140	2		50
Bis(2-chloroethyl)ether	73		70		40-140	4		50
2-Chloronaphthalene	93		91		40-140	2		50
1,2-Dichlorobenzene	80		79		40-140	1		50
1,3-Dichlorobenzene	80		77		40-140	4		50
1,4-Dichlorobenzene	78		77		28-104	1		50
3,3'-Dichlorobenzidine	60		69		40-140	14		50
2,4-Dinitrotoluene	104		101		40-132	3		50
2,6-Dinitrotoluene	109		104		40-140	5		50
Fluoranthene	94		96		40-140	2		50
4-Chlorophenyl phenyl ether	94		90		40-140	4		50
4-Bromophenyl phenyl ether	97		92		40-140	5		50
Bis(2-chloroisopropyl)ether	70		67		40-140	4		50
Bis(2-chloroethoxy)methane	81		79		40-117	3		50
Hexachlorobutadiene	89		88		40-140	1		50
Hexachlorocyclopentadiene	96		94		40-140	2		50
Hexachloroethane	79		78		40-140	1		50
Isophorone	86		85		40-140	1		50
Naphthalene	84		80		40-140	5		50

Lab Control Sample Analysis
Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE

Project Number: T0369-016-001-006

Lab Number: L1705569

Report Date: 03/01/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 02,04-05,07,09,11 Batch: WG981077-2 WG981077-3								
Nitrobenzene	85		82		40-140	4		50
NDPA/DPA	93		89		36-157	4		50
n-Nitrosodi-n-propylamine	85		83		32-121	2		50
Bis(2-ethylhexyl)phthalate	104		100		40-140	4		50
Butyl benzyl phthalate	102		98		40-140	4		50
Di-n-butylphthalate	104		101		40-140	3		50
Di-n-octylphthalate	109		104		40-140	5		50
Diethyl phthalate	97		94		40-140	3		50
Dimethyl phthalate	103		101		40-140	2		50
Benzo(a)anthracene	92		89		40-140	3		50
Benzo(a)pyrene	102		98		40-140	4		50
Benzo(b)fluoranthene	99		94		40-140	5		50
Benzo(k)fluoranthene	95		92		40-140	3		50
Chrysene	88		85		40-140	3		50
Acenaphthylene	100		96		40-140	4		50
Anthracene	94		91		40-140	3		50
Benzo(ghi)perylene	86		82		40-140	5		50
Fluorene	94		90		40-140	4		50
Phenanthrene	88		85		40-140	3		50
Dibenzo(a,h)anthracene	92		89		40-140	3		50
Indeno(1,2,3-cd)pyrene	92		88		40-140	4		50

Lab Control Sample Analysis
Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Lab Number: L1705569
Project Number: T0369-016-001-006
Report Date: 03/01/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Semivolatile Organics by GC/MS - Westborough Lab Associated sample(s): 02,04-05,07,09,11 Batch: WG981077-2 WG981077-3								
Pyrene	92		89		35-142	3		50
Biphenyl	96		93		54-104	3		50
4-Chloroaniline	46		51		40-140	10		50
2-Nitroaniline	102		99		47-134	3		50
3-Nitroaniline	71		76		26-129	7		50
4-Nitroaniline	97		91		41-125	6		50
Dibenzofuran	89		87		40-140	2		50
2-Methylnaphthalene	91		88		40-140	3		50
1,2,4,5-Tetrachlorobenzene	92		87		40-117	6		50
Acetophenone	89		86		14-144	3		50
Benzyl Alcohol	93		90		40-140	3		50
Carbazole	93		89		54-128	4		50

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
2-Fluorophenol	81		77		25-120
Phenol-d6	80		77		10-120
Nitrobenzene-d5	82		78		23-120
2-Fluorobiphenyl	92		87		30-120
2,4,6-Tribromophenol	89		86		10-136
4-Terphenyl-d14	89		85		18-120

METALS

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Lab Number: L1705569
Project Number: T0369-016-001-006
Report Date: 03/01/17

SAMPLE RESULTS

Lab ID: L1705569-02
Date Collected: 02/21/17 09:10
Client ID: TP-2 (0-4")
Date Received: 02/22/17
Sample Location: BUFFALO, NY
Field Prep: Not Specified
Matrix: Soil
Percent Solids: 76%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	6.9		mg/kg	0.52	0.11	1	02/24/17 18:45	02/27/17 11:25	EPA 3050B	1,6010C	JH
Barium, Total	120		mg/kg	0.52	0.09	1	02/24/17 18:45	02/27/17 11:25	EPA 3050B	1,6010C	JH
Cadmium, Total	3.5		mg/kg	0.52	0.05	1	02/24/17 18:45	02/27/17 11:25	EPA 3050B	1,6010C	JH
Chromium, Total	500		mg/kg	0.52	0.05	1	02/24/17 18:45	02/27/17 11:25	EPA 3050B	1,6010C	JH
Lead, Total	4200		mg/kg	2.6	0.14	1	02/24/17 18:45	02/27/17 11:25	EPA 3050B	1,6010C	JH
Mercury, Total	0.14		mg/kg	0.08	0.02	1	02/24/17 09:15	02/28/17 12:59	EPA 7471B	1,7471B	BV
Selenium, Total	0.62	J	mg/kg	1.0	0.13	1	02/24/17 18:45	02/27/17 11:25	EPA 3050B	1,6010C	JH
Silver, Total	ND		mg/kg	0.52	0.15	1	02/24/17 18:45	02/27/17 11:25	EPA 3050B	1,6010C	JH

Project Name:	REDEV PROJ ELMWOOD& FOREST AVE	**Lab Number:**	L1705569
Project Number:	T0369-016-001-006	**Report Date:**	03/01/17

SAMPLE RESULTS

Lab ID:	L1705569-04	Date Collected:	02/21/17 09:42
Client ID:	TP-3 (0-4")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	78%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	11		mg/kg	0.50	0.10	1	02/24/17 18:45	02/27/17 11:29	EPA 3050B	1,6010C	JH
Barium, Total	110		mg/kg	0.50	0.09	1	02/24/17 18:45	02/27/17 11:29	EPA 3050B	1,6010C	JH
Cadmium, Total	0.83		mg/kg	0.50	0.05	1	02/24/17 18:45	02/27/17 11:29	EPA 3050B	1,6010C	JH
Chromium, Total	15		mg/kg	0.50	0.05	1	02/24/17 18:45	02/27/17 11:29	EPA 3050B	1,6010C	JH
Lead, Total	520		mg/kg	2.5	0.13	1	02/24/17 18:45	02/27/17 11:29	EPA 3050B	1,6010C	JH
Mercury, Total	0.46		mg/kg	0.08	0.02	1	02/24/17 09:15	02/28/17 13:10	EPA 7471B	1,7471B	BV
Selenium, Total	ND		mg/kg	1.0	0.13	1	02/24/17 18:45	02/27/17 11:29	EPA 3050B	1,6010C	JH
Silver, Total	ND		mg/kg	0.50	0.14	1	02/24/17 18:45	02/27/17 11:29	EPA 3050B	1,6010C	JH

Project Name:	REDEV PROJ ELMWOOD& FOREST AVE	**Lab Number:**	L1705569
Project Number:	T0369-016-001-006	**Report Date:**	03/01/17

SAMPLE RESULTS

Lab ID:	L1705569-05	Date Collected:	02/21/17 10:10
Client ID:	TP-4 (0-6")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
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	6.5		mg/kg	0.52	0.11	1	02/24/17 18:45	02/27/17 11:34	EPA 3050B	1,6010C	JH
Barium, Total	120		mg/kg	0.52	0.09	1	02/24/17 18:45	02/27/17 11:34	EPA 3050B	1,6010C	JH
Cadmium, Total	0.91		mg/kg	0.52	0.05	1	02/24/17 18:45	02/27/17 11:34	EPA 3050B	1,6010C	JH
Chromium, Total	17		mg/kg	0.52	0.05	1	02/24/17 18:45	02/27/17 11:34	EPA 3050B	1,6010C	JH
Lead, Total	470		mg/kg	2.6	0.14	1	02/24/17 18:45	02/27/17 11:34	EPA 3050B	1,6010C	JH
Mercury, Total	0.19		mg/kg	0.08	0.02	1	02/24/17 09:15	02/28/17 13:11	EPA 7471B	1,7471B	BV
Selenium, Total	ND		mg/kg	1.0	0.13	1	02/24/17 18:45	02/27/17 11:34	EPA 3050B	1,6010C	JH
Silver, Total	ND		mg/kg	0.52	0.15	1	02/24/17 18:45	02/27/17 11:34	EPA 3050B	1,6010C	JH

Project Name:	REDEV PROJ ELMWOOD& FOREST AVE	**Lab Number:**	L1705569
Project Number:	T0369-016-001-006	**Report Date:**	03/01/17

SAMPLE RESULTS

Lab ID:	L1705569-07	Date Collected:	02/21/17 12:12
Client ID:	TP-6 (0-4")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		
Percent Solids:	78%		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	20		mg/kg	0.50	0.10	1	02/24/17 18:45	02/27/17 11:38	EPA 3050B	1,6010C	JH
Barium, Total	51		mg/kg	0.50	0.09	1	02/24/17 18:45	02/27/17 11:38	EPA 3050B	1,6010C	JH
Cadmium, Total	0.22	J	mg/kg	0.50	0.05	1	02/24/17 18:45	02/27/17 11:38	EPA 3050B	1,6010C	JH
Chromium, Total	6.9		mg/kg	0.50	0.05	1	02/24/17 18:45	02/27/17 11:38	EPA 3050B	1,6010C	JH
Lead, Total	31		mg/kg	2.5	0.13	1	02/24/17 18:45	02/27/17 11:38	EPA 3050B	1,6010C	JH
Mercury, Total	0.05	J	mg/kg	0.08	0.02	1	02/24/17 09:15	02/28/17 13:13	EPA 7471B	1,7471B	BV
Selenium, Total	ND		mg/kg	1.0	0.13	1	02/24/17 18:45	02/27/17 11:38	EPA 3050B	1,6010C	JH
Silver, Total	ND		mg/kg	0.50	0.14	1	02/24/17 18:45	02/27/17 11:38	EPA 3050B	1,6010C	JH

Project Name: REDEV PROJ ELMWOOD& FOREST AVE **Lab Number:** L1705569

Project Number: T0369-016-001-006 **Report Date:** 03/01/17

SAMPLE RESULTS

Lab ID: L1705569-09 Date Collected: 02/21/17 13:00

Client ID: TP-7 (0-6") Date Received: 02/22/17

Sample Location: BUFFALO, NY Field Prep: Not Specified

Matrix: Soil

Percent Solids: 82%

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Prep Method	Analytical Method	Analyst
Total Metals - Mansfield Lab											
Arsenic, Total	12		mg/kg	0.48	0.10	1	02/24/17 18:45	02/27/17 11:42	EPA 3050B	1,6010C	JH
Barium, Total	82		mg/kg	0.48	0.08	1	02/24/17 18:45	02/27/17 11:42	EPA 3050B	1,6010C	JH
Cadmium, Total	0.20	J	mg/kg	0.48	0.05	1	02/24/17 18:45	02/27/17 11:42	EPA 3050B	1,6010C	JH
Chromium, Total	5.5		mg/kg	0.48	0.05	1	02/24/17 18:45	02/27/17 11:42	EPA 3050B	1,6010C	JH
Lead, Total	40		mg/kg	2.4	0.13	1	02/24/17 18:45	02/27/17 11:42	EPA 3050B	1,6010C	JH
Mercury, Total	0.04	J	mg/kg	0.08	0.02	1	02/24/17 09:15	02/28/17 13:15	EPA 7471B	1,7471B	BV
Selenium, Total	ND		mg/kg	0.95	0.12	1	02/24/17 18:45	02/27/17 11:42	EPA 3050B	1,6010C	JH
Silver, Total	ND		mg/kg	0.48	0.13	1	02/24/17 18:45	02/27/17 11:42	EPA 3050B	1,6010C	JH

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Lab Number: L1705569
Project Number: T0369-016-001-006
Report Date: 03/01/17

SAMPLE RESULTS

Lab ID: L1705569-11
Date Collected: 02/21/17 13:57
Client ID: TP-9 (2-6")
Date Received: 02/22/17
Sample Location: BUFFALO, NY
Field Prep: Not Specified
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	11		mg/kg	0.51	0.10	1	02/24/17 18:45	02/27/17 11:47	EPA 3050B	1,6010C	JH
Barium, Total	98		mg/kg	0.51	0.09	1	02/24/17 18:45	02/27/17 11:47	EPA 3050B	1,6010C	JH
Cadmium, Total	3.2		mg/kg	0.51	0.05	1	02/24/17 18:45	02/27/17 11:47	EPA 3050B	1,6010C	JH
Chromium, Total	15		mg/kg	0.51	0.05	1	02/24/17 18:45	02/27/17 11:47	EPA 3050B	1,6010C	JH
Lead, Total	200		mg/kg	2.5	0.14	1	02/24/17 18:45	02/27/17 11:47	EPA 3050B	1,6010C	JH
Mercury, Total	0.56		mg/kg	0.09	0.02	1	02/24/17 09:15	02/28/17 13:17	EPA 7471B	1,7471B	BV
Selenium, Total	ND		mg/kg	1.0	0.13	1	02/24/17 18:45	02/27/17 11:47	EPA 3050B	1,6010C	JH
Silver, Total	ND		mg/kg	0.51	0.14	1	02/24/17 18:45	02/27/17 11:47	EPA 3050B	1,6010C	JH

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): 02,04-05,07,09,11 Batch: WG980599-1										
Mercury, Total	ND		mg/kg	0.08	0.02	1	02/24/17 09:15	02/28/17 12:55	1,7471B	BV

Prep Information

Digestion Method: EPA 7471B

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
Total Metals - Mansfield Lab for sample(s): 02,04-05,07,09,11 Batch: WG980868-1										
Arsenic, Total	ND		mg/kg	0.40	0.08	1	02/24/17 18:45	02/27/17 10:47	1,6010C	JH
Barium, Total	ND		mg/kg	0.40	0.07	1	02/24/17 18:45	02/27/17 10:47	1,6010C	JH
Cadmium, Total	ND		mg/kg	0.40	0.04	1	02/24/17 18:45	02/27/17 10:47	1,6010C	JH
Chromium, Total	ND		mg/kg	0.40	0.04	1	02/24/17 18:45	02/27/17 10:47	1,6010C	JH
Lead, Total	ND		mg/kg	2.0	0.11	1	02/24/17 18:45	02/27/17 10:47	1,6010C	JH
Selenium, Total	ND		mg/kg	0.80	0.10	1	02/24/17 18:45	02/27/17 10:47	1,6010C	JH
Silver, Total	ND		mg/kg	0.40	0.11	1	02/24/17 18:45	02/27/17 10:47	1,6010C	JH

Prep Information

Digestion Method: EPA 3050B

Lab Control Sample Analysis

Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Project Number: T0369-016-001-006

Lab Number: L1705569
Report Date: 03/01/17

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 02,04-05,07,09,11 Batch: WG980599-2 SRM Lot Number: D091-540								
Mercury, Total	89		-		72-128	-		
Total Metals - Mansfield Lab Associated sample(s): 02,04-05,07,09,11 Batch: WG980868-2 SRM Lot Number: D091-540								
Arsenic, Total	117		-		80-121	-		
Barium, Total	115		-		84-117	-		
Cadmium, Total	107		-		83-117	-		
Chromium, Total	105		-		80-119	-		
Lead, Total	110		-		82-118	-		
Selenium, Total	107		-		79-121	-		
Silver, Total	115		-		75-124	-		

Matrix Spike Analysis
Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE
Lab Number: L1705569
Project Number: T0369-016-001-006
Report Date: 03/01/17

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): 02,04-05,07,09,11 QC Batch ID: WG980599-3 QC Sample: L1705569-02 Client ID: TP-2 (0-4")												
Mercury, Total	0.14	0.173	0.34	116		-	-		80-120	-		20
Total Metals - Mansfield Lab Associated sample(s): 02,04-05,07,09,11 QC Batch ID: WG980868-3 QC Sample: L1705775-03 Client ID: MS Sample												
Arsenic, Total	7.9	10.5	17	87		-	-		75-125	-		20
Barium, Total	33.	175	190	90		-	-		75-125	-		20
Cadmium, Total	ND	4.45	4.0	90		-	-		75-125	-		20
Chromium, Total	36.	17.5	54	103		-	-		75-125	-		20
Lead, Total	5.0	44.5	46	92		-	-		75-125	-		20
Selenium, Total	ND	10.5	8.4	80		-	-		75-125	-		20
Silver, Total	ND	26.2	24	92		-	-		75-125	-		20

Lab Duplicate Analysis
Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE

Project Number: T0369-016-001-00

Lab Number: L1705569

Report Date: 03/01/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Total Metals - Mansfield Lab Associated sample(s): 02,04-05,07,09,11 QC Batch ID: WG980599-4 QC Sample: L1705569-02 Client ID: TP-2 (0-4")						
Mercury, Total	0.14	0.17	mg/kg	19		20
Total Metals - Mansfield Lab Associated sample(s): 02,04-05,07,09,11 QC Batch ID: WG980868-4 QC Sample: L1705775-03 Client ID: DUP Sample						
Arsenic, Total	7.9	8.6	mg/kg	8		20
Barium, Total	33.	29	mg/kg	13		20
Cadmium, Total	ND	ND	mg/kg	NC		20
Chromium, Total	36.	41	mg/kg	13		20
Lead, Total	5.0	7.8	mg/kg	**44**	Q	20
Selenium, Total	ND	ND	mg/kg	NC		20
Silver, Total	ND	ND	mg/kg	NC		20

INORGANICS
&
MISCELLANEOUS

SAMPLE RESULTS

Lab ID:	L1705569-02	Date Collected:	02/21/17 09:10
Client ID:	TP-2 (0-4")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	75.8		%	0.100	NA	1	-	02/23/17 16:00	121,2540G	RI

SAMPLE RESULTS

Lab ID: L1705569-04
Client ID: TP-3 (0-4")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 02/21/17 09:42
Date Received: 02/22/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	78.1		%	0.100	NA	1	-	02/23/17 16:00	121,2540G	RI

SAMPLE RESULTS

Lab ID: L1705569-05
Client ID: TP-4 (0-6")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 02/21/17 10:10
Date Received: 02/22/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	75.3		%	0.100	NA	1	-	02/23/17 16:00	121,2540G	RI

SAMPLE RESULTS

Lab ID:	L1705569-07	Date Collected:	02/21/17 12:12
Client ID:	TP-6 (0-4")	Date Received:	02/22/17
Sample Location:	BUFFALO, NY	Field Prep:	Not Specified
Matrix:	Soil		

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	77.5		%	0.100	NA	1	-	02/23/17 16:00	121,2540G	RI

SAMPLE RESULTS

Lab ID: L1705569-09
Client ID: TP-7 (0-6")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 02/21/17 13:00
Date Received: 02/22/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	81.8		%	0.100	NA	1	-	02/23/17 16:00	121,2540G	RI

SAMPLE RESULTS

Lab ID: L1705569-11
Client ID: TP-9 (2-6")
Sample Location: BUFFALO, NY
Matrix: Soil

Date Collected: 02/21/17 13:57
Date Received: 02/22/17
Field Prep: Not Specified

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Westborough Lab										
Solids, Total	77.0		%	0.100	NA	1	-	02/23/17 16:00	121,2540G	RI

Lab Duplicate Analysis

Batch Quality Control

Project Name: REDEV PROJ ELMWOOD& FOREST AVE

Project Number: T0369-016-001-00

Lab Number: L1705569

Report Date: 03/01/17

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
General Chemistry - Westborough Lab Associated sample(s): 02,04-05,07,09,11 QC Batch ID: WG980488-1 QC Sample: L1704561-08 Client ID: DUP Sample						
Solids, Total	77.7	79.0	%	2		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	pH	Temp deg C	Pres	Seal	Analysis(*)
L1705569-01A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	HOLD-8270(14),HOLD-METAL(180)
L1705569-02A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	NYTCL-8270(14),TS(7)
L1705569-02B	Glass 60ml unpreserved split	A	N/A	2.4	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)
L1705569-03A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	HOLD-8270(14),HOLD-METAL(180)
L1705569-04A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	NYTCL-8270(14),TS(7)
L1705569-04B	Metals Only - Glass 60mL/2oz unp	A	N/A	2.4	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)
L1705569-05A	Vial Large Septa unpreserved (4o	A	N/A	2.4	Y	Absent	NYTCL-8260(14)
L1705569-05B	Metals Only - Glass 60mL/2oz unp	A	N/A	2.4	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)
L1705569-05C	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	NYTCL-8270(14),TS(7)
L1705569-05X	Vial MeOH preserved split	A	N/A	2.4	Y	Absent	NYTCL-8260(14)
L1705569-05Y	Vial Water preserved split	A	N/A	2.4	Y	Absent	NYTCL-8260(14)
L1705569-05Z	Vial Water preserved split	A	N/A	2.4	Y	Absent	NYTCL-8260(14)
L1705569-06A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	HOLD-8270(14),HOLD-METAL(180)
L1705569-07A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	NYTCL-8270(14),TS(7)
L1705569-07B	Glass 60ml unpreserved split	A	N/A	2.4	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)
L1705569-08A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	HOLD-8270(14),HOLD-METAL(180)
L1705569-09A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	NYTCL-8270(14),TS(7)
L1705569-09B	Glass 60ml unpreserved split	A	N/A	2.4	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)
L1705569-10A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	HOLD-8270(14),HOLD-METAL(180)
L1705569-11A	Glass 250ml/8oz unpreserved	A	N/A	2.4	Y	Absent	NYTCL-8270(14),TS(7)

*Values in parentheses indicate holding time in days

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1705569-11B	Glass 60ml unpreserved split	A	N/A	2.4	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)

*Values in parentheses indicate holding time in days

GLOSSARY

Acronyms

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

EPA - Environmental Protection Agency.

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

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

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

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

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

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

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

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

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

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.

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

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.

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

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

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

Data Qualifiers

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.

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.

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

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

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

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

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

S - Analytical results are from modified screening analysis.

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

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

REFERENCES

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

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

LIMITATION OF LIABILITIES

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Facility: **Company-wide** Revision 10
Department: **Quality Assurance** Published Date: 1/16/2017 11:00:05 AM
Title: **Certificate/Approval Program Summary** Page 1 of 1

Certification Information

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

Westborough Facility
EPA 624: m/p-xylene, o-xylene
EPA 8260C: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270D: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
EPA 300: DW: Bromide
EPA 6860: NPW and SCM: Perchlorate
EPA 9010: NPW and SCM: Amenable Cyanide Distillation
EPA 9012B: NPW: Total Cyanide
EPA 9050A: NPW: Specific Conductance
SM3500: NPW: Ferrous Iron
SM4500: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.
SM5310C: DW: Dissolved Organic Carbon

Mansfield Facility
SM 2540D: TSS
EPA 3005A NPW
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: 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**
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, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, 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 624: Volatile Halocarbons & Aromatics,
EPA 608: 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: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E.**

Mansfield Facility:

Drinking Water
EPA 200.7: Ba, Be, Cd, Cr, Cu, Ni, Na, Ca. **EPA 200.8:** Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Ni, Se, TL. **EPA 245.1** Hg.

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, Pb, Mn, Ni, Se, Ag, TL, Zn.
EPA 245.1 Hg.
SM2340B

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

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 2

Date Rec'd in Lab 2/23/17

ALPHA Job # L1705569

Project Information

Project Name: Redevelopment Project - Corner of Elmwood and Forest Avenue
Project Location: Buffalo, NY
Project # TO 369-016-001-006
(Use Project name as Project #) ☐
Project Manager: Chris Boron
ALPHAQuote #:

Client Information

Client: Turnkey Environmental
Address: 2558 Hamburg TPKE
Lackawanna, NY 14218
Phone: 716-856-0635
Fax: 716-856-0583
Email: jrobinson@turnkeyllc.com

Turn-Around Time

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

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:

Base Neutrals for SVOCs via EPA Method 8270

Please specify Metals or TAL.

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	8270 SVOCs Base Neutrals	RCRA metals 6010/7471	TCL VOCs 8260	Sample Specific Comments	Total Bottles
05569-01	TP-1 (0-4")	2/21/17	0841	Soil	JJR	X	X		Hold All	
-02	TP-2 (0-4")		0910	Soil	JJR	X	X			
-03	TP-2 (4"-1')		0917	Soil	JJR	X	X		Hold All	
-04	TP-3 (0-4")		0942	Soil	JJR	X	X			
-05	TP-4 (0-6")		1010	Soil	JJR	X	X	X		
-06	TP-5 (0-1')		1110	Soil	JJR	X	X		Hold ALL	
-07	TP-6 (0-4")		1212	Soil	JJR	X	X			
-08	TP-6 (4-8")		1215	Soil	JJR	X	X		Hold ALL	
-09	TP-7 (0-6")		1300	Soil	JJR	X	X			
-10	TP-8 (0-6")		1325	Soil	JJR	X	X		Hold ALL	

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
	2/21/17 1530	JMA AAL	2/22/17 14:10
			2/23/17 0040

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)

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

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

Page 2 of 2

Date Rec'd in Lab 2/23/17.

ALPHA Job # L1705569

Project Information

Project Name: Redevelopment Project- Corner of Elmwood + Forest Ave
Project Location: Buffalo, New York
Project # T0369-016-001-006
(Use Project name as Project #) ☐
Project Manager: Chris Boron
ALPHAQuote #:

Client Information

Client: Turnkey Environmental
Address: 2558 Hamburg TPKE
Lackawanna, NY 14218
Phone: 716-856-0635
Fax: 716-856-0583
Email: jrobinson@turnkeyllc.com

Turn-Around Time

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

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:

Base Neutrals for SVOCs Via EPA Method 8270

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	8270 SVOCs Base Neutrals	RCRA Metals 6010/7471	TCL VOCs 8260						Sample Specific Comments	Total Bottle
05569-11	TP-9 (2-6")	2/21/17	1357	Soil	JJR	X	X							~~Hold All~~	

Preservative Code:	Container Code
A = None	P = Plastic
B = HCl	A = Amber Glass
C = HNO_3	V = Vial
D = H_2SO_4	G = Glass
E = NaOH	B = Bacteria Cup
F = MeOH	C = Cube
G = $NaHSO_4$	O = Other
H = $Na_2S_2O_3$	E = Encore
K/E = Zn Ac/NaOH	D = BOD Bottle
O = Other	

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

Container Type	A	A	A					
Preservative	A	A	A					

Relinquished By:	Date/Time	Received By:	Date/Time
	2/21/17 1530	JM AL AAL	2/22/17 14:10
JM AL AAL	2/22/17 15:45		2/23/17 0040

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)

APPENDIX C

PROJECT DOCUMENTATION FORMS

INSPECTOR’S DAILY REPORT

CONTRACTOR			
CLIENT		DATE:	

LOCATION				DAY		JOB NO.	
WEATHER		TEMP	° F	START		END	

WORK PERFORMED:

CONTRACTOR ACTIVITIES:

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

TURNKEY ACTIVITIES:

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

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

TurnKey
Environmental
Restoration, LLC

INSPECTOR'S DAILY REPORT

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

TurnKey
Environmental
Restoration, LLC

INSPECTOR'S DAILY REPORT

MEETINGS HELD & RESULTS:

CONTRACTOR'S WORK FORCE AND EQUIPMENT

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

REMARKS:

REFERENCES TO OTHER FORMS:

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

DAILY LOG	DATE			
	REPORT NO.			
	PAGE	OF		

PROBLEM IDENTIFICATION 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:

Problem Description:

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

Problem Causes:

Suggested Corrective Measures or Variances:

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

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

DAILY LOG	DATE			
	REPORT NO.			
	PAGE	OF		

CORRECTIVE MEASURES REPORT

Date:

Project:

Job No:

Location:

CQA Monitor(s):

Client:

Contractor:

Contractor's Supervisor:

WEATHER CONDITIONS:

Ambient Air Temp. - A.M.:

Ambient Air Temp. - P.M.:

Wind Direction:

Wind Speed:

Precipitation:

Corrective Measures Undertaken (reference Problem Identification Report No.)

Retesing Location:

Suggested Method of Minimizing Re-Occurrence:

Approvals (initial):

CQA Engineer:

Project Manager:

Signed:

CQA Representative

APPENDIX D

SITE-SPECIFIC HEALTH AND SAFETY PLAN

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

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

May 2017 0369-016-001

Prepared for:

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

1111 ELMWOOD AVENUE SITE
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES

ACKNOWLEDGEMENT

Plan Reviewed by (initial):

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

Project Manager: Christopher Boron

Designated Site Safety and Health Officer: Christopher Boron

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

1111 ELMWOOD AVENUE SITE
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES

TABLE OF CONTENTS

1111 ELMWOOD AVENUE SITE
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES

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1111 ELMWOOD AVENUE SITE
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES

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1.0 INTRODUCTION

1.1 General

In accordance with OSHA requirements contained in 29 CFR 1910.120, this Health and Safety Plan (HASP) describes the specific health and safety practices and procedures to be employed by and Benchmark Environmental Engineering & Science, PLLC and TurnKey Environmental Restoration, LLC employees (referred to jointly hereafter as "Benchmark-TurnKey") during Remedial Investigation (RI) and Interim Remedial Measures (IRM) activities at the 1111 Elmwood Avenue Site (Site) located in the City of Buffalo, Erie County, New York. This HASP presents procedures for Benchmark-TurnKey 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. Benchmark-TurnKey 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 is currently improved with twelve (12), 3 story commercial and/or residential buildings which will be demolished prior to implementation of the RI/IRM. The remaining portion of the Site consist of vegetative, asphalt and concrete surface cover.

The Site has a long history of being utilized for various residential and commercial uses since the early 1900s.

Previous environmental investigations completed at the Site have identified elevated levels of semi-volatile organic compounds (SVOCs) and metals at concentrations exceeding regulatory guidelines. Details of the previous investigations are presented in Section 2.8 below.

1.3 Known and Suspected Environmental Conditions

TurnKey Environmental Restoration completed a Phase II Environmental Investigation on the Site in March 2017. Findings of the Phase II investigation are detailed below:

- The Site, located at the southeast corner of Elmwood and Forest Avenues, is in a mixed-use area in the Elmwood Village in the City of Buffalo.
- SVOCs were detected at or above their respective Part 375 Restricted-Residential Use Soil Cleanup Objectives (RRSCOs) (i.e., the applicable SCOs for the intended Site reuse) at three (3) investigation locations, SB-6, HA-6 and TP-4. Benzo(a)pyrene was also detected at two (2) locations (SB-6 and TP-4) in exceedance of its Industrial SCO (ISCO). Table 1 is a summary of the soil/fill analytical results.
- Metal analytes were detected above their respective RRSCOs at seven (7) investigation locations, SB-1, HA-1, HA-5, TP-2, TP-3, TP-4, and TP-6.
  - Arsenic exceeded its ISCO at two (2) locations (HA-1 and TP-6).
  - Chromium exceeded its Commercial SCO (CSCO) at one (1) location, TP-2.
  - Lead exceeded its CSCO at four (4) locations ((SB-1, HA-5, TP-3 and TP-4) and the ISCO at one (1) locations (TP-2).

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

1.4 Parameters of Interest

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

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

- **Semi-Volatile Organic Compounds (SVOCs) –** SVOCs present at elevated concentrations may include polycyclic aromatic hydrocarbons (PAHs), which are byproducts of incomplete combustion and impurities in petroleum products.

1.5 Overview of RI/IRM Activities

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

Remedial Investigation Activities

1. **Subsurface Soil Sampling:** Benchmark-TurnKey will advance test pits and collect subsurface soil samples for the purpose of determining the nature and extent of potential COPC impacts in the subsurface soil/fill.

2. **Monitoring Well Installation/Development and Sampling:** Benchmark-TurnKey will observe the installation of three (3) groundwater monitoring wells, develop the wells, and collect groundwater samples for the purpose of determining the nature and extent of potential COPC impacts.

Potential IRM Activities

1. **Soil Excavation:** The remediation contractor would perform soil excavation activities.

2. **Verification Sampling:** The remediation contractor, in association with Benchmark-TurnKey, will collect soil samples from the sidewalls and bottom of the excavations using a backhoe to verify that cleanup objectives have been met.

3. **Backfilling:** The remediation contractor would coordinate and perform backfilling activities.

4. **Groundwater and Surface Management:** The remediation contractor will direct groundwater/surface water collection during soil excavation activities and coordinate disposal/treatment of the collected water, in association with Benchmark-TurnKey.

2.0 ORGANIZATIONAL STRUCTURE

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

2.1 Roles and Responsibilities

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

2.1.2 Project Manager

The Project Manager for this Site is ***Mr. Christopher Boron.*** The Project Manager has the responsibility and authority to direct all Benchmark-TurnKey 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 Benchmark-TurnKey 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. Christopher Boron***. 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 Benchmark-TurnKey personnel on the Site.
- Serving as the point of contact for safety and health matters.
- Ensuring that Benchmark-TurnKey field personnel working on the Site have received proper training (per 29 CFR Part 1910.120(e)), that they have obtained medical clearance to wear respiratory protection (per 29 CFR Part 1910.134), and that they are properly trained in the selection, use and maintenance of personal protective equipment, including qualitative respirator fit testing.
- Performing or overseeing Site monitoring as required by the HASP.
- Assisting in the preparation and review of the HASP.
- Maintaining site-specific safety and health records as described in this HASP.

- Coordinating with the Project Manager, Site Workers, and Contractor's SSHO as necessary for safety and health efforts.

2.1.4 Site Workers

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

2.1.5 Other Site Personnel

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

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

3.0 HAZARD EVALUATION

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

3.1 Chemical Hazards

As discussed in Section 1.3, SVOC and inorganic impacts have been identified in the fill material present 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.

- **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.

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

- **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.

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 the 1111 Elmwood Avenue Site may present the following physical hazards:

- The potential for physical injury during heavy construction equipment use, such as backhoes, excavators and drilling equipment.

- The potential for heat/cold stress to employees during the summer/winter months (see Section 10.0).

- The potential for slip and fall injuries due to rough, uneven terrain and/or open excavations.

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

4.0 TRAINING

4.1 Site Workers

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

4.1.1 Initial and Refresher Training

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

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

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

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

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

4.1.2 Site Training

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

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

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

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

4.2 Supervisor Training

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

4.3 Emergency Response Training

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

4.4 Site Visitors

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

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

5.0 MEDICAL MONITORING

Medical monitoring examinations are provided to Benchmark-TurnKey employees as stipulated under 29 CFR Part 1910.120(f). These exams include initial employment, annual and employment termination physicals for all Benchmark-TurnKey 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 Benchmark-TurnKey. 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 Benchmark-TurnKey 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, Benchmark-TurnKey will maintain and preserve medical records for a period of 30 years following termination of employment. Employees are provided a copy of the physician's post-exam report, and have access to their medical records and analyses.

6.0 SAFE WORK PRACTICES

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

7.0 PERSONAL PROTECTIVE EQUIPMENT

7.1 Equipment Selection

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

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

- **Level A:** Should be selected when the highest level of respiratory, skin and eye protection is needed.

- **Level B:** Should be selected when the highest level of respiratory protection is needed, but a lesser level of skin protection is required. Level B protection is the minimum level recommended on initial Site entries until the hazards have been further defined by on-site studies. Level B (or Level A) is also necessary for oxygen-deficient atmospheres.

- **Level C:** Should be selected when the types of airborne substances are known, the concentrations have been measured and the criteria for using air-purifying respirators are met. In atmospheres where no airborne contaminants are present, Level C provides dermal protection only.

- **Level D:** Should not be worn on any Site with elevated respiratory or skin hazards. This is generally a work uniform providing minimal protection.

OSHA requires the use of certain PPE under conditions where an immediate danger to life and health (IDLH) may be present. Specifically, OSHA 29 CFR 1910.120(g)(3)(iii) requires use of a positive pressure self-contained breathing apparatus, or positive pressure air-line respirator equipped with an escape air supply when chemical exposure levels present a substantial possibility of immediate serious injury, illness or death, or impair the ability to escape. Similarly, OSHA 29 CFR 1910.120(g)(3)(iv) requires donning totally-encapsulating chemical protective suits (with a protection level equivalent to Level A protection) in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate serious illness, injury or death, or impair the ability to escape.

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

7.2 Protection Ensembles

7.2.1 Level A/B Protection Ensemble

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

The recommended PPE for level A/B is:

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

7.2.2 Level C Protection Ensemble

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

Recommended PPE for Level C conditions includes:

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

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

7.2.3 Level D Protection Ensemble

As indicated above, Level D protection is primarily a work uniform. It can be worn in areas where only boots can be contaminated, where there are no inhalable toxic substances and where the atmospheric contains at least 19.5% oxygen.

Recommended PPE for Level D includes:

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

7.2.4 Recommended Level of Protection for Site Tasks

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

8.0 EXPOSURE MONITORING

8.1 General

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

8.1.1 On-Site Work Zone Monitoring

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

8.1.2 Off-Site Community Air Monitoring

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

Ground intrusive activities are defined in the Generic Community Air Monitoring Plan and attached as Appendix C. Ground intrusive activities include soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells. Non-intrusive activities include the collection of soil and sediment samples or the collection of groundwater samples from existing wells. Continuous monitoring is required for ground intrusive activities and periodic monitoring is required for non-intrusive activities. Periodic monitoring consists of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring while bailing a well, and taking a reading prior to leaving a sampling location. This may be upgraded to continuous if the sampling location is in close proximity to individuals not involved in the Site activity (i.e., on a curb of a busy street). The action levels below will be used during periodic monitoring.

8.2 Monitoring Action Levels

8.2.1 On-Site Work Zone Action Levels

The PID, or other appropriate instrument(s), will be used by Benchmark-TurnKey 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 Benchmark-TurnKey personnel:

- Total atmospheric concentrations of unidentified vapors or gases ranging from 0 to 1 ppm above background on the PID) - Continue operations under Level D (see Appendix A).

- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings from >1 ppm to 5 ppm above background on the PID (vapors not suspected of containing high levels of chemicals toxic to the skin) - Continue operations under Level C (see Appendix A).

- Total atmospheric concentrations of unidentified vapors or gases yielding sustained readings of >5 ppm to 50 ppm above background on the PID - Continue operations under Level B (see Attachment 1), re-evaluate and alter (if possible) construction methods to achieve lower vapor concentrations.

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

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

- Less than 50 mg/m^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 Benchmark-TurnKey personnel on-site, the following criteria shall also be adhered to for the protection of downwind receptors consistent with NYSDOH requirements (Appendix C):

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

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

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

o **ORGANIC VAPOR CONTINGENCY MONITORING PLAN:**

- If the sustained organic vapor level is greater than 5 ppm over background 200 feet downwind from the work area or half the distance to the nearest off-site residential or commercial property, whichever is less, all work activities must be halted.

- If, following the cessation of the work activities or as the result of an emergency, sustained organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest off-site residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest off-site residential or commercial structure (20-foot zone).

- If efforts to abate the emission source are unsuccessful and if sustained organic vapor levels approach or exceed 5 ppm above background within the 20-foot zone for more than 30 minutes, or are sustained at levels greater than 10 ppm above background for longer than one minute, then the ***Major Vapor Emission Response Plan*** (see below) will automatically be placed into effect.

o **MAJOR VAPOR EMISSION RESPONSE PLAN:**

Upon activation, the following activities will be undertaken:

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

2. The local police authorities will immediately be contacted by the Site Health and Safety Officer and advised of the situation.

3. Frequent air monitoring will be conducted at 30-minute intervals within the 20-foot zone. If two sustained successive readings below action levels are measured, air monitoring may be halted or modified by the Site Health and Safety Officer.

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

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

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

- **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 (Appendix A).

9.0 SPILL RELEASE/RESPONSE

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

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

9.1 Potential Spills and Available Controls

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

- CERCLA Hazardous Substances as identified in 40 CFR Part 302, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).

- Extremely Hazardous Substances as identified in 40 CFR Part 355, Appendix A, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).

- Hazardous Chemicals as defined under Section 311(e) of the Emergency Planning and Community Right-To-Know Act of 1986, where such chemicals are present or will be stored in excess of 10,000 lbs.

- Toxic Chemicals as defined in 40 CFR Part 372, where such chemicals are present or will be stored in excess of 10,000 lbs.

- Chemicals regulated under 6NYCRR Part 597, where such materials pose the potential for release in excess of their corresponding Reportable Quantity (RQ).

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

- The potential for a "harmful quantity" of oil (including petroleum and non-petroleum-based fuels and lubricants) to reach navigable waters of the U.S. exists (40 CFR Part 112.4). Harmful quantities are considered by USEPA to be volumes that could form a visible sheen on the water or violate applicable water quality standards.

- The potential for any amount of petroleum to reach any waters of NY State, including groundwater, exists. Petroleum, as defined by NY State in 6NYCRR Part 612, is a petroleum-based heat source, energy source, or engine lubricant/maintenance fluid.

- The potential for any release, to soil or water, of petroleum from a bulk storage facility regulated under 6NYCRR Part 612. A regulated petroleum storage facility is defined by NY State as a site having stationary tank(s) and intra-facility piping, fixtures and related equipment with an aggregate storage volume of 1,100 gallons or greater.

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

9.2 Initial Spill Notification and Evaluation

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

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

9.3 Spill Response

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

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

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

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

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

9.4 Post-Spill Evaluation

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

10.0 HEAT/COLD STRESS MONITORING

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

11.0 WORK ZONES AND SITE CONTROL

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

- Exclusion Zone ("Hot Zone") - The area where contaminated materials may be exposed, excavated or handled and all areas where contaminated equipment or personnel may travel. Flagging tape will delineate the zone. All personnel entering the Exclusion Zone must wear the prescribed level of personal protective equipment identified in Section 7.

- Contamination Reduction Zone - The zone where decontamination of personnel and equipment takes place. Any potentially contaminated clothing, equipment and samples must remain in the Contamination Reduction Zone until decontaminated.

- Support Zone - The part of the site that is considered non-contaminated or "clean." Support equipment will be located in this zone, and personnel may wear normal work clothes within this zone.

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

- Exclusion Zone: 50 foot radius from the outer limit of the sampling/construction activity.

- Contaminant Reduction Zone: 100 foot radius from the outer limit of the sampling/construction activity.

- Support Zone: Areas outside the Contaminant Reduction Zone.

Access of non-essential personnel to the Exclusion and Contamination Reduction Zones will be strictly controlled by the SSHO. Only personnel who are essential to the completion of the task will be allowed access to these areas and only if they are wearing the prescribed level of protection. Entrance of all personnel must be approved by the SSHO.

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

12.0 DECONTAMINATION

12.1 Decontamination for Benchmark-TurnKey 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 Benchmark-TurnKey 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.

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

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

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

13.0 CONFINED SPACE ENTRY

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

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

14.0 FIRE PREVENTION AND PROTECTION

14.1 General Approach

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

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

14.2 Equipment and Requirements

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

14.3 Flammable and Combustible Substances

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

14.4 Hot Work

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

15.0 EMERGENCY INFORMATION

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

16.0 REFERENCES

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

TABLES

TABLE 1

TOXICITY DATA FOR CONSTITUENTS OF POTENTIAL CONCERN

1111 ELMWOOD AVENUE SITE

Buffalo, New York

Parameter	Synonyms	CAS No.	Code	Concentration Limits [1]		
				PEL	**TLV**	**IDLH**
Semi-volatile Organic Compounds (SVOCs) [2] : ppm						
Anthracene	*none*	120-12-7	*none*	--	--	--
Benzo(a)anthracene	*none*	56-55-3	*none*	--	--	--
Benzo(a)pyrene	*none*	50-32-8	*none*	--	--	--
Benzo(b)fluoranthene	*none*	205-99-2	*none*	--	--	--
Benzo(k)fluoranthene	*none*	207-08-9	*none*	--	--	--
Chrysene	*none*	218 01 9	*none*	--	--	--
Dibenzo(a,h)anthracene	*none*	53-70-3	*none*	--	--	--
Fluoranthene	*none*	206-44-0	*none*	--	--	--
Fluorene	*none*	86-73-7	*none*	--	--	--
Indeno(1,2,3-cd)pyrene	*none*	193-39-5	*none*	--	--	--
Naphthalene	Naphthalin, Tar camphor, White tar	91-20-3	*none*	10	10	250
Phenanthrene	*none*	85-01-8	*none*	--	--	--
Pyrene	*none*	129-00-0	*none*	--	--	--
Inorganic Compounds: mg/m [2]						
Arsenic	*none*	7440-38-2	*Ca*	0.01	0.01	5
Chromium	*none*	7440-47-3	*none*	1	0.5	250
Lead	*none*	7439-92-1	*none*	0.05	0.15	100

Notes:

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

Explanation:

Ca = NIOSH considers constituent to be a potential occupational carcinogen.
C-## = Ceiling Level equals the maximum exposure concentration allowable during the work day.
IDLH = Immediately Dangerous to Life or Health.
ND indicates that an IDLH has not as yet been determined.
TLV = Threshold Limit Value, established by American Conference of Industrial Hygienists (ACGIH), equals the maximum exposure concentration allowable for 8 hours/day @ 40 ho
TLVs are the amounts of chemicals in the air that almost all healthy adult workers are predicted to be able to tolerate without adverse effects. There are three types.
TLV-TWA (TLV-Time-Weighted Average) which is averaged over the normal eight-hour day/forty-hour work week. (Most TLVs.)
TLV-C or Ceiling limits are the concentration that should not be exceeded during any part of the working exposure.
Unless the initials "STEL" or "C" appear in the Code column, the TLV value should be considered to be the eight-hour TLV-TWA.
PEL = Permissible Exposure Limit, established by OSHA, equals the 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

1111 Elmwood Avenue Site
Buffalo, New York

Activity [1]	Direct Contact with Soil/Fill	Inhalation of Vapors or Dust	Direct Contact with Groundwater
Remedial Investigation Tasks			
1. Subsurface Soil Sampling	x	x	
2. Monitoring Well Installation/Development and Sampling	x	x	x
Interim Remedial Measures Tasks			
1. Soil Excavation	x	x	
2. Backfilling	x	x	
3. Verification Sampling	x	x	
4. 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 RI/IRM TASKS

1111 Elmwood Avenue Site
Buffalo, 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. Monitoring Well Installation/Development and Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	SGSS
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. Backfilling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
3. Verification Sampling	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS
4. Groundwater and Surface Water Management	Level D (upgrade to Level C if necessary)	Work Uniform or Tyvek	L/N	outer: L inner: STSS	HH SGSS

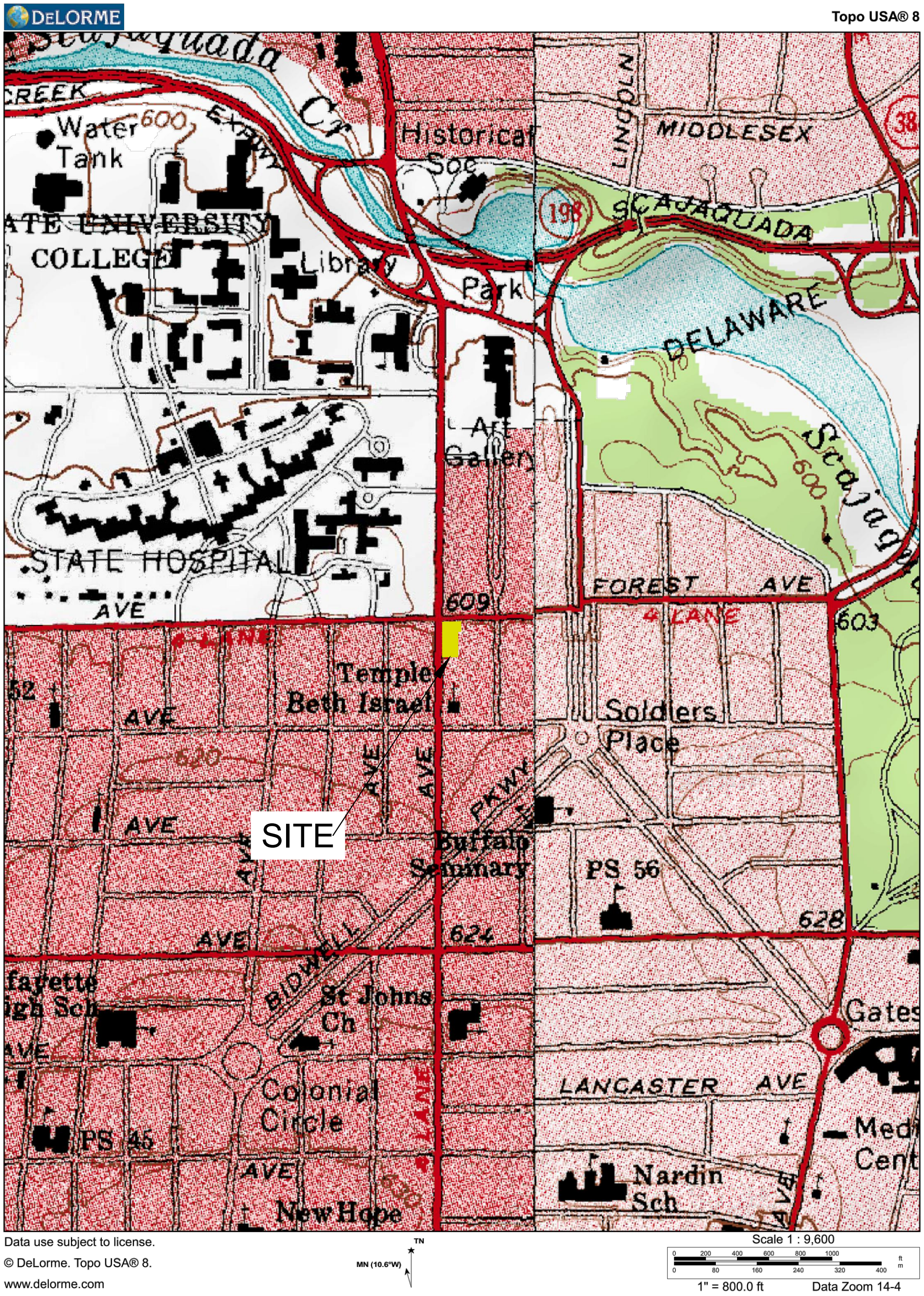
Notes:

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

FIGURES

F:\CAD\TurnKey\Affinity Elmwood Gateway Properties, LLC\RI_IRM WORK PLAN\Figure 1; Site Location and Vicinity Map.dwg

FIGURE 1



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BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

TURNKEY ENVIRONMENTAL RESTORATION, LLC

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

PROJECT NO.: 0369-016-001

DATE: APRIL 2017

DRAFTED BY: KRR-CMC

SITE LOCATION AND VICINITY MAP

HEALTH & SAFETY PLAN

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

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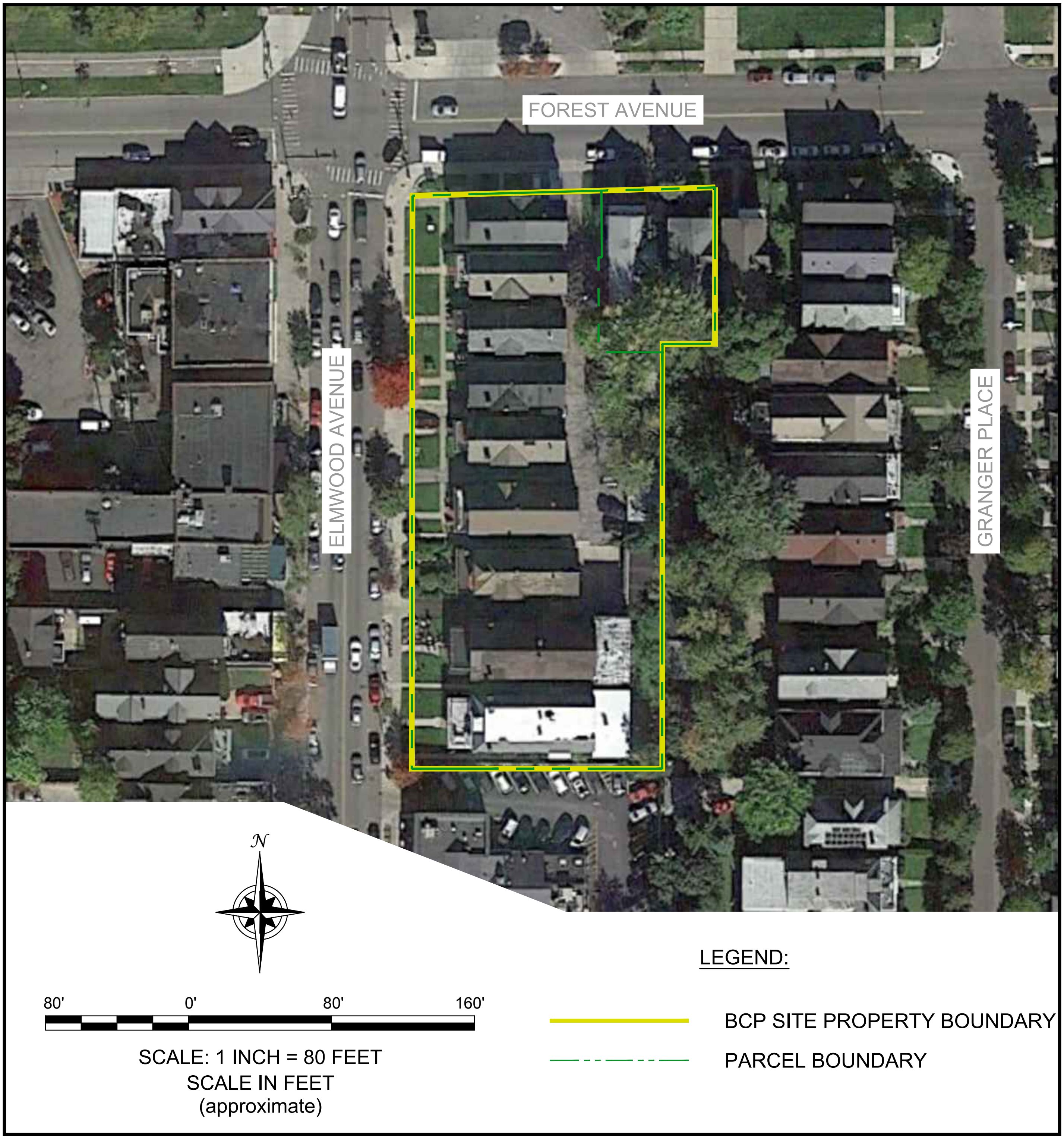
F:\CAD\TurnKey\Affinity Elmwood Gateway Properties, LLC\RI_IRM WORK PLAN\Figure 2; Site Plan.dwg

FIGURE 2



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

PROJECT NO.: 0369-016-001

DATE: APRIL 2017

DRAFTED BY: CMC

SITE PLAN

HEALTH & SAFETY PLAN

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

ATTACHMENT A

EMERGENCY RESPONSE PLAN

EMERGENCY RESPONSE PLAN
for
BROWNFIELD CLEANUP PROGRAM
RI/IRM ACTIVITIES

1111 ELMWOOD AVENUE SITE
BUFFALO, NEW YORK

May 2017 0369-016-001

Prepared for:

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

1111 ELMWOOD AVENUE SITE
HEALTH AND SAFETY PLAN FOR RI/IRM ACTIVITIES

APPENDIX A: EMERGENCY RESPONSE PLAN

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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) and Interim Remedial Measures (IRM) activities at the 1111 Elmwood Avenue Street Site in Buffalo, New York. This appendix of the HASP describes potential emergencies that may occur at the Site; procedures for responding to those emergencies; roles and responsibilities during emergency response; and training all workers must receive in order to follow emergency procedures. This ERP also describes the provisions this Site has made to coordinate its emergency response planning with other contractors on-site and with off-site emergency response organizations.

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

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

2.0 PRE-EMERGENCY PLANNING

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

Type of Emergency:

1. Medical, due to physical injury

Source of Emergency:

1. Slip/trip/fall

Location of Source:

1. Non-specific

3.0 ON-SITE EMERGENCY RESPONSE EQUIPMENT

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

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

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

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

4.0 EMERGENCY PLANNING MAPS

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

5.0 EMERGENCY CONTACTS

The following identifies the emergency contacts for this ERP.

Emergency Telephone Numbers:

Project Manager: ***Christopher Boron***
Work: (716) 856-0635
Mobile: (716) 864-2726

Corporate Health and Safety Director: ***Thomas H. Forbes***
Work: (716) 856-0599
Mobile: (716) 864-1730

Site Safety and Health Officer (SSHO): ***Christopher Boron***
Work: (716) 856-0635
Mobile: (716) 864-2726

Alternate SSHO: ***Nathan Munley***
Work: (716) 856-0635
Mobile: (716) 289-1072

BUFFALO GENERAL HOSPITAL (ER):	(716) 748-2100
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:

1111 Elmwood Avenue
Buffalo, New York 14222
Site Phone Number: TurnKey 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 Benchmark-TurnKey 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 Buffalo General Hospital (see Figure 1):

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

- Travel east on Forest Avenue toward Chapin Parkway
- Turn right (south) onto Chapin Parkway
- At the traffic circle, continue south on Chapin Parkway
- At the next traffic circle, continue south on Delaware Avenue
- Turn left (east) onto West Ferry Street
- Turn right (south) onto Michigan Avenue
- Turn right (west) onto High Street
- Hospital on the right (100 High Street)
  (2.7 miles)

9.0 EMERGENCY RESPONSE CRITIQUE & RECORD KEEPING

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

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

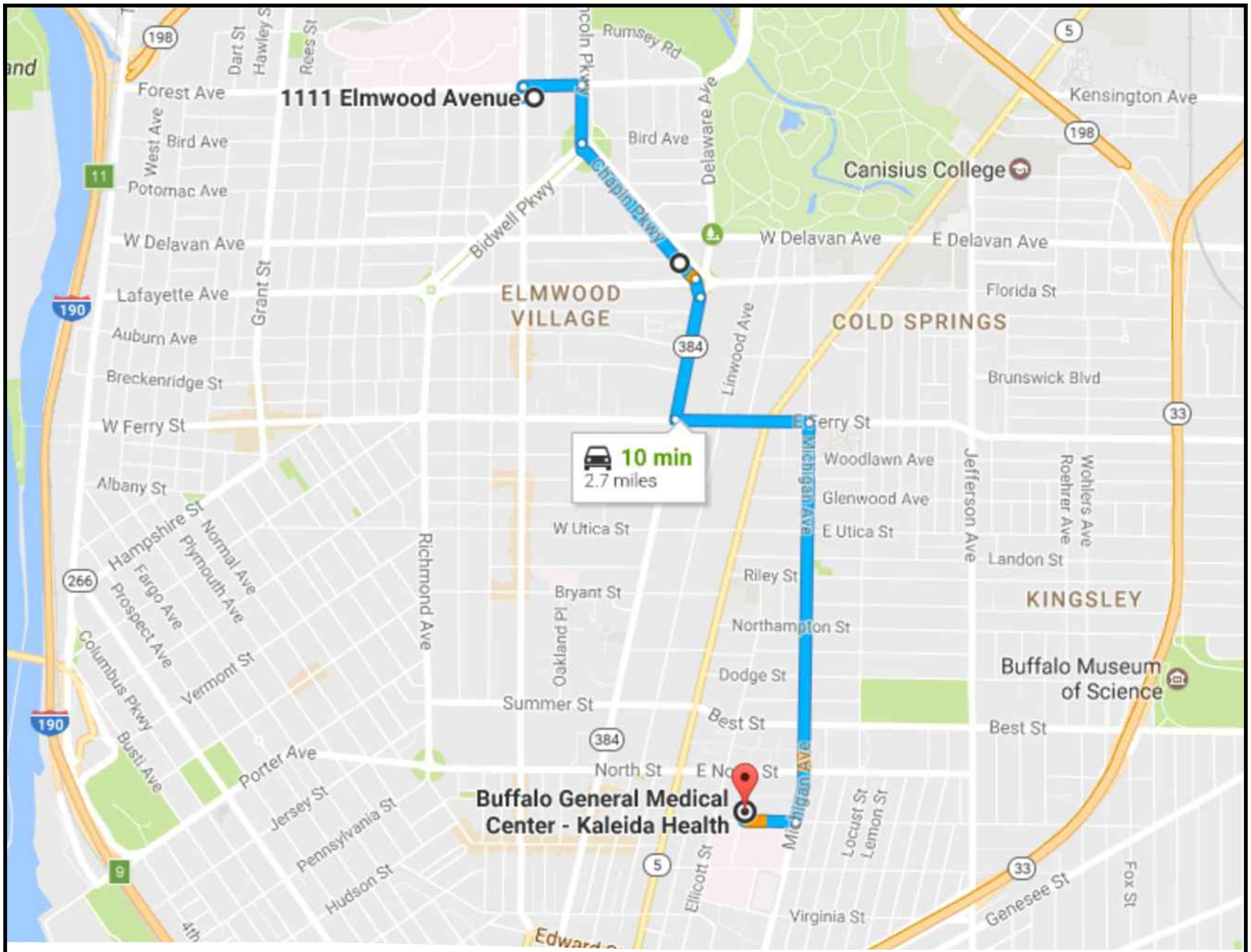
10.0 EMERGENCY RESPONSE TRAINING

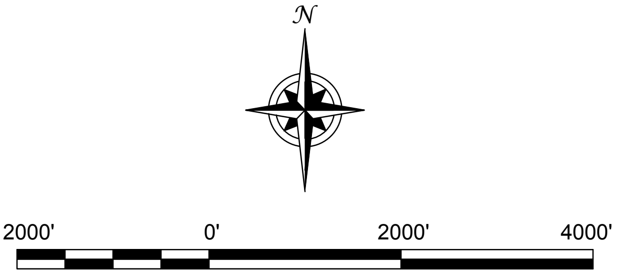
All persons who enter the worksite, including visitors, shall receive a site-specific briefing about anticipated emergency situations and the emergency procedures by the SSHO. Where this site relies on off-site organizations for emergency response, the training of personnel in those off-site organizations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

FIGURES

F:\CAD\TurnKey\Affinity Elmwood Gateway Properties, LLC\RI_IRM WORK PLAN\ERP\Figure 1; Hospital Route Map.dwg

FIGURE 1





SCALE: 1 INCH = 2000 FEET
SCALE IN FEET
(approximate)

- TRAVEL EAST ON FOREST AVENUE TOWARD CHAPIN PARKWAY
- TURN RIGHT (SOUTH) ONTO CHAPIN PARKWAY
- AT THE TRAFFIC CIRCLE, CONTINUE SOUTH ON CHAPIN PARKWAY
- AT THE NEXT TRAFFIC CIRCLE, CONTINUE SOUTH ON DELAWARE AVENUE
- TURN LEFT (EAST) ONTO WEST FERRY STREET
- TURN RIGHT (SOUTH) ONTO WEST FERRY STREET
- TURN RIGHT (SOUTH) ONTO MICHIGAN AVENUE
- TURN RIGHT (WEST) ONTO HIGH STREET
- HOSPITAL ON THE RIGHT (100 HIGH STREET) (2.7 MILES)

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

TURNKEY ENVIRONMENTAL RESTORATION, LLC

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

PROJECT NO.: 0369-016-001

DATE: APRIL 2017

DRAFTED BY: CMC

HOSPITAL ROUTE MAP

EMERGENCY RESPONSE PLAN

1111 ELMWOOD AVENUE SITE

BUFFALO, NEW YORK

PREPARED FOR

AFFINITY ELMWOOD GATEWAY PROPERTIES LLC

ATTACHMENT B

HOT WORK PERMIT FORM

TurnKey Environmental Restoration, LLC

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:

ATTACHMENT C

NYSDOH GENERIC COMMUNITY AIR MONITORING PLAN

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

Overview

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

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

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

Community Air Monitoring Plan

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

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

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

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

December 2009

Appendix C2
Fugitive Dust and Particulate Monitoring

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

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX E

FIELD OPERATING PROCEDURES

(PROVIDED ELECTRONICALLY)

BENCHMARK
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FIELD OPERATING PROCEDURES

Abandonment of Borehole Procedures

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.

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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:

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FIELD OPERATING PROCEDURES

Abandonment of Monitoring Wells Procedure

FOP 002.0

ABANDONMENT OF MONITORING WELLS PROCEDURE

PURPOSE

This guideline presents a method for the abandonment and decommissioning of wells that are no longer reliable as competent monitors of formation groundwater. Well abandonment and decommissioning is required in order to remove a potential pathway for the vertical migration of impacted groundwater and/or surface water.

PROCEDURE

1. Examine the existing well to be abandoned/decommissioned and review well construction detail information (if applicable) to determine well depth,, screened interval, diameter, material of composition and other construction details. Establish appropriate equipment requirements for removal of the well.

2. Determine the most suitable seal materials as discussed in the next section.

3. Attempt to remove the well using a drilling rig, by using the following procedures:
    - Attaching the winch line to the well to see if it can be removed by pulling;
    - Using the rig's hydraulics to advance casing incrementally;
    - If a cable tool rig is available, bump back the casing using the cathead and drive block.

3. Upon removal of the well, ream the borehole by advancing the augers approximately one foot beyond the total depth of the well. Rotate the augers at a speed sufficient to remove the construction materials (i.e., filter pack, bentonite seal, etc.) from the borehole annulus (if possible). Backfill the resulting borehole with cement/bentonite grout, by tremie method, to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

4. If the well cannot be removed from the borehole over-drill the borehole and well to approximately two (2) feet below the well depth. Upon reaching the desired depth, remove the well from within the augers and go back to Step 3.

5. If the borehole cannot be reamed out using conventional drilling techniques (i.e., over-drilled), remove or puncture the base plate of the well screen using the drill rig and associated equipment by pounding with the drill rods. Upon filling the well with grout by tremie method, slowly pull the well from the ground surface to allow the grout to evacuate through the bottom of the well to fill the void space created by removal of the well casing. Continue adding grout mix to the well casing, as necessary, to fill the void space to approximately one foot below ground surface. Fill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary). Go to Step 10.

   If the driller is unsuccessful at removing or puncturing the base plate of the well due, in part, to well construction materials (i.e., stainless steel or black iron), go to Step 6.

6. Insert a tremie pipe down the well to the bottom and pump a cement/bentonite grout mixture to a depth one to two feet above the top of the screen.

7. Perform a hydraulic pressure test on the portion of the well casing above the grouted screen section. Allow the grout to set up for a period not less than 72 hours before pressure testing of the grouted interval. Place a pneumatic packer a maximum of 4.5 feet above the top of the slotted screen section of the well. The infiltration pressure applied to the packer shall not exceed the pressure rating of the well casing material. If the interval between the top of the grout and the bottom of the packer is not saturated, potable water will be used to fill the interval. A gauge pressure of 5 psig at the well head shall be applied to the interval for a period of 5 minutes to allow for temperature stabilization. After 5 minutes, the pressure will be maintained at 5 psig for 30 minutes. The grout seal shall be considered acceptable if the total loss of water to the seal does not exceed 0.5 gallons over a 30-minute period.

8. If the grout seal is determined to be unacceptable, tremie grout an additional 5 feet of well riser above the failing interval and retest as specified above (see Step 7).

9. If the grout seal is determined to be acceptable, tremie grout the remainder of the well until grout displaces all formation water and a grout return is visible in the well at the surface. Cut off well casing at a depth of five feet or greater below ground surface and backfill the remaining borehole to match the existing grade elevation and material of construction (i.e., clean native soil, concrete or asphalt, as necessary).

10. Record all well construction details and abandonment procedures on the **Well Abandonment/Decommissioning Log** (sample attached).

CEMENT/BENTONITE GROUT MIXTURE

The cement/bentonite grout mixture identified below is generally considered the most suitable seal material for monitoring well advancement and abandonment. 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

MISCELLANEOUS

All removed well materials (PVC, stainless steel, steel pipe) should be decontaminated (if necessary) as per the project specific **Drilling and Excavation Equipment Decontamination FOP** and removed from the site. The project manager will determine the destination of final disposal for all well materials. All drill cuttings (depending on site protocol) should be placed in DOT-approved 55-gallon drums, labeled and sampled in accordance with Benchmark's field operating procedure **Management of Investigation-Derived Waste** in order to determine proper removal and disposal procedures. The drilling subcontractor will provide any potable water utilized during this field activity from a known and reliable source (see Notes section).

ATTACHMENTS

Well Abandonment/Decommissioning Log (sample)

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.

Benchmark FOPs:
018 Drilling/Excavation Equipment Decontamination Protocols
032 Management of Investigation-Derived Waste

NOTES

Tap water may be used from any municipal water treatment system. The use of an untreated potable water supply is not an acceptable substitute.

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

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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)

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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/m³					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:** ______________________

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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
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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		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:**

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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:**

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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 total 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: ____________________ 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	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]	[illegible]		open air zero _____ ppm Iso. Gas		MIBK response factor = 1.0
☐ 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:** ____________________

Technical Note TN-106

Revised 08/2010

Correction Factors, Ionization Energies*, And Calibration Characteristics

Correction Factors and Ionization Energies

RAE Systems PIDs can be used for the detection of a wide variety of gases that exhibit different responses. In general, any compound with ionization energy (IE) lower than that of the lamp photons can be measured.* 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. In our PIDs, correction factors can be used in one of three ways:

1) Calibrate the monitor with isobutylene in the usual fashion to read in isobutylene equivalents. Manually multiply the reading by the correction factor (CF) to obtain the concentration of the gas being measured.

2) Calibrate the unit with isobutylene in the usual fashion to read in isobutylene equivalents. Call up the correction factor from the instrument memory or download it from a personal computer and then call it up. The monitor will then read directly in units of the gas of interest.

3) Calibrate the unit with isobutylene, but input an equivalent, "corrected" span gas concentration when prompted for this value. The unit will then read directly in units of the gas of interest.

* *The term "ionization energy" is more scientifically correct and replaces the old term "ionization potential." High-boiling ("heavy") compounds may not vaporize enough to give a response even when their ionization energies are below the lamp photon energy. Some inorganic compounds like H_2O_2 and NO_2 give weak response even when their ionization energies are well below the lamp photon energy.*

Example 1:

With the unit calibrated to read isobutylene equivalents, the reading is 10 ppm with a 10.6 eV lamp. The gas being measured is butyl acetate, which has a correction factor of 2.6. Multiplying 10 by 2.6 gives an adjusted butyl acetate value of 26 ppm. Similarly, if the gas being measured were trichloroethylene (CF = 0.54), the adjusted value with a 10 ppm reading would be 5.4 ppm.

Example 2:

With the unit calibrated to read isobutylene equivalents, the reading is 100 ppm with a 10.6 eV lamp. The gas measured is m-xylene (CF = 0.43). After downloading this factor, the unit should read about 43 ppm when exposed to the same gas, and thus read directly in m-xylene values.

Example 3:

The desired gas to measure is ethylene dichloride (EDC). The CF is 0.6 with an 11.7 eV lamp. During calibration with 100 ppm isobutylene, insert 0.6 times 100, or 60 at the prompt for the calibration gas concentration. The unit then reads directly in EDC values.

Conversion to mg/m^3

To convert from ppm to mg/m^3, use the following formula:

$$\text{Conc. (mg/m}^3) = \frac{[\text{Conc.(ppmv) x mol. wt. (g/mole)}]}{\text{molar gas volume (L)}}$$

For air at 25 °C (77 °F), the molar gas volume is 24.4 L/mole and the formula reduces to:

$$\text{Conc.(mg/m}^3) = \text{Conc.(ppmv) x mol. wt. (g/mole) x 0.041}$$

For example, if the instrument is calibrated with a gas standard in ppmv, such as 100 ppm isobutylene, and the user wants the display to read in mg/m^3 of hexane, whose m.w. is 86 and CF is 4.3, the overall correction factor would be 4.3 x 86 x 0.041 equals 15.2.

Correction Factors for Mixtures

The correction factor for a mixture is calculated from the sum of the mole fractions Xi of each component divided by their respective correction factors CFi:

$$\text{CFmix} = 1 / (X_1/CF_1 + X_2/CF_2 + X_3/CF_3 + ... Xi/CFi)$$

Thus, for example, a vapor phase mixture of 5% benzene and 95% n-hexane would have a CFmix of CFmix = 1 / (0.05/0.53 + 0.95/4.3) = 3.2. A reading of 100 would then correspond to 320 ppm of the total mixture, comprised of 16 ppm benzene and 304 ppm hexane.

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For a spreadsheet to compute the correction factor and TLV of a mixture see the appendix at the end of the CF table.

TLVs and Alarm Limits for Mixtures

The correction factor for mixtures can be used to set alarm limits for mixtures. To do this one first needs to calculate the exposure limit for the mixture. The Threshold Limit Value (TLV) often defines exposure limits. The TLV for the mixture is calculated in a manner similar to the CF calculation:

$$\text{TLV mix} = 1 / (X_1/\text{TLV}_1 + X_2/\text{TLV}_2 + X_3/\text{TLV}_3 + ... X_i/\text{TLV}_i)$$

In the above example, the 8-h TLV for benzene is 0.5 ppm and for n-hexane 50 ppm. Therefore the TLV of the mixture is TLVmix = 1 / (0.05/0.5 + 0.95/50) = 8.4 ppm, corresponding to 8.0 ppm hexane and 0.4 ppm benzene. For an instrument calibrated on isobutylene, the reading corrsponding to the TLV is:

$$\text{Alarm Reading} = \text{TLVmix} / \text{CFmix} = 8.4 / 3.2 = 2.6 \text{ ppm}$$

A common practice is to set the lower alarm limit to half the TLV, and the higher limit to the TLV. Thus, one would set the alarms to 1.3 and 2.6 ppm, respectively.

Calibration Characteristics

a) Flow Configuration. PID response is essentially independent of gas flow rate as long as it is sufficient to satisfy the pump demand. Four main flow configurations are used for calibrating a PID:

1) **Pressurized gas cylinder (Fixed-flow regulator):** The flow rate of the regulator should match the flow demand of the instrument pump or be slightly higher.
2) **Pressurized gas cylinder (Demand-flow regulator):** A demand-flow regulator better matches pump speed differences, but results in a slight vacuum during calibration and thus slightly high readings.
3) **Collapsible gas bag:** The instrument will draw the calibration gas from the bag at its normal flow rate, as long as the bag valve is large enough. The bag should be filled with enough gas to allow at least one minute of flow (~ 0.6 L for a MiniRAE, ~0.3 L for MultiRAE).
4) **T (or open tube) method:** The T method uses a T-junction with gas flow higher than the pump draw. The gas supply is connected to one end of the T, the instrument inlet is connected to a second end of the T, and excess gas flow escapes through the third, open end of the T. To prevent ambient air mixing, a long tube should be connected to the open end, or a high excess rate should be used. Alternatively, the instrument probe can be inserted into an open tube slightly wider than the probe. Excess gas flows out around the probe.

The first two cylinder methods are the most efficient in terms of gas usage, while the bag and T methods give slightly more accurate results because they match the pump flow better.

b) Pressure. Pressures deviating from atmospheric pressure affect the readings by altering gas concentration and pump characteristics. It is best to calibrate with the instrument and calibration gas at the same pressure as each other and the sample gas. (Note that the cylinder pressure is not relevant because the regulator reduces the pressure to ambient.) If the instrument is calibrated at atmospheric pressure in one of the flow configurations described above, then 1) pressures slightly above ambient are acceptable but high pressures can damage the pump and 2) samples under vacuum may give low readings if air leaks into the sample train.

c) Temperature. Because temperature effects gas density and concentration, the temperature of the calibration gas and instrument should be as close as possible to the ambient temperature where the unit will be used. We recommend that the temperature of the calibration gas be within the instrument's temperature specification (typically 14° to 113° F or -10° to 45° C). Also, during actual measurements, the instrument should be kept at the same or higher temperature than the sample temperature to avoid condensation in the unit.

d) Matrix. The matrix gas of the calibration compound and VOC sample is significant. Some common matrix components, such as methane and water vapor can affect the VOC signal. PIDs are most commonly used for monitoring VOCs in air, in which case the preferred calibration gas matrix is air. For a MiniRAE, methane, methanol, and water vapor reduce the response by about 20% when their concentration is 15,000 ppm and by about 40% at 30,000 ppm. Despite earlier reports of oxygen effects, RAE PID responses with 10.6 eV lamps are independent of oxygen concentration, and calibration gases in a pure nitrogen matrix can be used. H_2 and CO_2 up to 5 volume % also have no effect.

e) Concentration. Although RAE Systems PIDs have electronically linearized output, it is best to calibrate in a concentration range close to the actual measurement range. For example, 100 ppm standard gas for anticipated vapors of 0 to 250 ppm, and 500 ppm standard for expected concentrations of 250 to 1000 ppm. The correction factors in this table were typically measured at 50 to 100 ppm and apply from the ppb range up to about 1000 ppm. Above 1000 ppm the CF may vary and it is best to calibrate with the gas of interest near the concentration of interest.

f) Filters. Filters affect flow and pressure conditions and therefore all filters to be used during sampling should also be in place during calibration. Using a water trap (hydrophobic filter) greatly reduces the chances of drawing water aerosols or dirt particles into the instrument. Regular filter replacements are recommended because dirty filters can adsorb VOCs and cause slower response time and shifts in calibration.

g) Instrument Design. High-boiling ("heavy") or very reactive compounds can be lost by reaction or adsorption onto materials in the gas sample train, such as filters, pumps and other sensors. Multi-gas meters, including EntryRAE, MultiRAE and AreaRAE have the pump and other sensors upstream of the PID and are prone to these losses. Compounds possibly affected by such losses are shown in green in the table, and may give slow response, or in extreme cases, no response at all. In many cases the multi-gas meters can still give a rough indication of the relative concentration, without giving an accurate, quantitative reading. The ppbRAE and MiniRAE series instruments have inert sample trains and therefore do not exhibit significant loss; nevertheless, response may be slow for the very heavy compounds and additional sampling time up to a minute or more should be allowed to get a stable reading.

Table Abbreviations:

CF = Correction Factor (multiply by reading to get corrected value for the compound when calibrated to isobutylene)
NR= No Response
IE = Ionization Energy (values in parentheses are not well established)
C = Confirmed Value indicated by "+" in this column; all others are preliminary or estimated values and are subject to change
ne = Not Established ACGIH 8-hr. TWA
C## = Ceiling value, given where 8-hr.TWA is not available

Disclaimer:

Actual readings may vary with age and cleanliness of lamp, relative humidity, and other factors. For accurate work, the instrument should be calibrated regularly under the operating conditions used. The factors in this table were measured in dry air at room temperature, typically at 50-100 ppm. CF values may vary above about 1000 ppm.

Updates:

The values in this table are subject to change as more or better data become available. Watch for updates of this table on the Internet at **http://www.raesystems.com**

IE data are taken from the CRC Handbook of Chemistry and Physics, 73rd Edition, D.R. Lide (Ed.), CRC Press (1993) and NIST Standard Ref. Database 19A, NIST Positive Ion Energetics, Vers. 2.0, Lias, et.al., U.S. Dept. Commerce (1993). Exposure limits (8-h TWA and Ceiling Values) are from the 2005 ACGIH Guide to Occupational Exposure Values, ACGIH, Cincinnati, OH 2005. Equations for exposure limits for mixtures of chemicals were taken from the 1997 TLVs and BEIs handbook published by the ACGIH (1997).

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Acetaldehyde		75-07-0	C_2H_4O	NR	+	6	+	3.3	+	10.23	C25
Acetic acid	Ethanoic Acid	64-19-7	$C_2H_4O_2$	NR	+	22	+	2.6	+	10.66	10
Acetic anhydride	Ethanoic Acid Anhydride	108-24-7	$C_4H_6O_3$	NR	+	6.1	+	2.0	+	10.14	5
Acetone	2-Propanone	67-64-1	C_3H_6O	1.2	+	1.1	+	1.4	+	9.71	500
Acetone cyanohydrin	2-Hydroxyisobutyronitrile	75-86-5	C_4H_7NO					4	+	11.1	C5
Acetonitrile	Methyl cyanide, Cyanomethane	75-05-8	C_2H_3N					100		12.19	40
Acetylene	Ethyne	74-86-2	C_2H_2					2.1	+	11.40	ne
Acrolein	Propenal	107-02-8	C_3H_4O	42	+	3.9	+	1.4	+	10.10	0.1
Acrylic acid	Propenoic Acid	79-10-7	$C_3H_4O_2$			12	+	2.0	+	10.60	2
Acrylonitrile	Propenenitrile	107-13-1	C_3H_3N			NR	+	1.2	+	10.91	2
Allyl alcohol		107-18-6	C_3H_6O	4.5	+	2.4	+	1.6	+	9.67	2
Allyl chloride	3-Chloropropene	107-05-1	C_3H_5Cl			4.3		0.7		9.9	1
Ammonia		7664-41-7	H_3N	NR	+	9.7	+	5.7	+	10.16	25
Amyl acetate	mix of n-Pentyl acetate & 2-Methylbutyl acetate	628-63-7	$C_7H_{14}O_2$	11	+	2.3	+	0.95	+	<9.9	100
Amyl alcohol	1-Pentanol	75-85-4	$C_5H_{12}O$			5		1.6		10.00	ne
Aniline	Aminobenzene	62-53-3	C_7H_7N	0.50	+	0.48	+	0.47	+	7.72	2
Anisole	Methoxybenzene	100-66-3	C_7H_8O	0.89	+	0.58	+	0.56	+	8.21	ne
Arsine	Arsenic trihydride	7784-42-1	AsH_3			1.9	+			9.89	0.05
Benzaldehyde		100-52-7	C_7H_6O					1		9.49	ne
Benzenamine, N-methyl-	N-Methylphenylamine	100-61-8	C_7H_9N			0.7				7.53	
Benzene		71-43-2	C_6H_6	0.55	+	0.53	+	0.6	+	9.25	0.5
Benzonitrile	Cyanobenzene	100-47-0	C_7H_5N			1.6				9.62	ne
Benzyl alcohol	α-Hydroxytoluene, Hydroxymethylbenzene, Benzenemethanol	100-51-6	C_7H_8O	1.4	+	1.1	+	0.9	+	8.26	ne
Benzyl chloride	α-Chlorotoluene, Chloromethylbenzene	100-44-7	C_7H_7Cl	0.7	+	0.6	+	0.5	+	9.14	1
Benzyl formate	Formic acid benzyl ester	104-57-4	$C_8H_8O_2$	0.9	+	0.73	+	0.66	+		ne
Boron trifluoride		7637-07-2	BF_3	NR		NR		NR		15.5	C1
Bromine		7726-95-6	Br_2	NR	+	1.30	+	0.74	+	10.51	0.1
Bromobenzene		108-86-1	C_6H_5Br			0.6		0.5		8.98	ne
2-Bromoethyl methyl ether		6482-24-2	C_3H_7OBr			0.84	+			~10	ne
Bromoform	Tribromomethane	75-25-2	$CHBr_3$	NR	+	2.5	+	0.5	+	10.48	0.5
Bromopropane,1-	n-Propyl bromide	106-94-5	C_3H_7Br	150	+	1.5	+	0.6	+	10.18	ne
Butadiene	1,3-Butadiene, Vinyl ethylene	106-99-0	C_4H_6	0.8		0.85	+	1.1		9.07	2
Butadiene diepoxide, 1,3-	1,2,3,4-Diepoxybutane	298-18-0	$C_4H_6O_2$	25	+	3.5	+	1.2		~10	ne
Butanal	1-Butanal	123-72-8	C_4H_8O			1.8				9.84	
Butane		106-97-8	C_4H_{10}			67	+	1.2		10.53	800
Butanol, 1-	Butyl alcohol, n-Butanol	71-36-3	$C_4H_{10}O$	70	+	4.7	+	1.4	+	9.99	20
Butanol, t-	tert-Butanol, t-Butyl alcohol	75-65-0	$C_4H_{10}O$	6.9	+	2.9	+			9.90	100
Butene, 1-	1-Butylene	106-98-9	C_4H_8			0.9				9.58	ne
Butoxyethanol, 2-	Butyl Cellosolve, Ethylene glycol monobutyl ether	111-76-2	$C_6H_{14}O_2$	1.8	+	1.2	+	0.6	+	<10	25
Butoxyethanol acetate	Ethanol, 2-(2-butoxyethoxy)-, acetate	124-17-4	$C_{10}H_{20}O_4$			5.6				≤10.6	
Butoxyethoxyethanol	2-(2-Butoxyethoxy)ethanol	112-34-5	$C_8H_{18}O_3$			4.6				≤10.6	
Butyl acetate, n-		123-86-4	$C_6H_{12}O_2$			2.6	+			10	150
Butyl acrylate, n-	Butyl 2-propenoate, Acrylic acid butyl ester	141-32-2	$C_7H_{12}O_2$			1.6	+	0.6	+		10
Butylamine, n-		109-73-9	$C_4H_{11}N$	1.1	+	1.1	+	0.7	+	8.71	C5
Butyl cellosolve	see 2-Butoxyethanol	111-76-2									
Butyl hydroperoxide, t-		75-91-2	$C_4H_{10}O_2$	2.0	+	1.6	+			<10	1
Butyl mercaptan	1-Butanethiol	109-79-5	$C_4H_{10}S$	0.55	+	0.52	+			9.14	0.5
Carbon disulfide		75-15-0	CS_2	4	+	1.2	+	0.44		10.07	10
Carbon tetrachloride	Tetrachloromethane	56-23-5	CCl_4	NR	+	NR	+	1.7	+	11.47	5
Carbonyl sulfide	Carbon oxysulfide	463-58-1	COS							11.18	
Cellosolve see 2-Ethoxyethanol											
CFC-14 see Tetrafluoromethane											
CFC-113 see 1,1,2-Trichloro-1,2,2-trifluoroethane											

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Chlorine		7782-50-5	Cl_2					1.0	+	11.48	0.5
Chlorine dioxide		10049-04-4	ClO_2	NR	+	NR	+	NR	+	10.57	0.1
Chlorobenzene	Monochlorobenzene	108-90-7	C_6H_5Cl	0.44	+	0.40	+	0.39	+	9.06	10
Chlorobenzotrifluoride, 4-	PCBTF, OXSOL 100 p-Chlorobenzotrifluoride	98-56-6	$C_7H_4ClF_3$	0.74	+	0.63	+	0.55	+	<9.6	25
Chloro-1,3-butadiene, 2-	Chloroprene	126-99-8	C_4H_5Cl			3					10
Chloro-1,1-difluoroethane, 1-	HCFC-142B, R-142B	75-68-3	$C_2H_3ClF_2$	NR		NR		NR		12.0	ne
Chlorodifluoromethane	HCFC-22, R-22	75-45-6	$CHClF_2$	NR		NR		NR		12.2	1000
Chloroethane	Ethyl chloride	75-00-3	C_2H_5Cl	NR	+	NR	+	1.1	+	10.97	100
Chloroethanol	Ethylene chlrohydrin	107-07-3	C_2H_5ClO					2.9		10.52	C1
Chloroethyl ether, 2-	bis(2-chloroethyl) ether	111-44-4	$C_4H_8Cl_2O$	8.6	+	3.0	+				5
Chloroethyl methyl ether, 2-	Methyl 2-chloroethyl ether	627-42-9	C_3H_7ClO			3					ne
Chloroform	Trichloromethane	67-66-3	$CHCl_3$	NR	+	NR	+	3.5	+	11.37	10
Chloro-2-methylpropene, 3-	Methallyl chloride, Isobutenyl chloride	563-47-3	C_4H_7Cl	1.4	+	1.2	+	0.63	+	9.76	ne
Chloropicrin		76-06-2	CCl_3NO_2	NR	+	~400	+	7	+	?	0.1
Chlorotoluene, o-	o-Chloromethylbenzene	95-49-8	C_7H_7Cl			0.5		0.6		8.83	50
Chlorotoluene, p-	p-Chloromethylbenzene	106-43-4	C_7H_7Cl					0.6		8.69	ne
Chlorotrifluoroethene	CTFE, Chlorotrifluoroethylene Genetron 1113	79-38-9	C_2ClF_3	6.7	+	3.9	+	1.2	+	9.76	5
Chlorotrimethylsilane		75-77-4	C_3H_9ClSi	NR		NR		0.82	+	10.83	ne
Cresol, m-	m-Hydroxytoluene	108-39-4	C_7H_8O	0.57	+	0.50	+	0.57	+	8.29	5
Cresol, o-	o-Hydroxytoluene	95-48-7	C_7H_8O			1.0				8.50	
Cresol, p-	p-Hydroxytoluene	106-44-5	C_7H_8O			1.4				8.35	
Crotonaldehyde	*trans*-2-Butenal	123-73-9 4170-30-3	C_4H_6O	1.5	+	1.1	+	1.0	+	9.73	2
Cumene	Isopropylbenzene	98-82-8	C_9H_{12}	0.58	+	0.54	+	0.4	+	8.73	50
Cyanogen bromide		506-68-3	$CNBr$	NR		NR		NR		11.84	ne
Cyanogen chloride		506-77-4	$CNCl$	NR		NR		NR		12.34	C0.3
Cyclohexane		110-82-7	C_6H_{12}	3.3	+	1.4	+	0.64	+	9.86	300
Cyclohexanol	Cyclohexyl alcohol	108-93-0	$C_6H_{12}O$	1.5	+	0.9	+	1.1	+	9.75	50
Cyclohexanone		108-94-1	$C_6H_{10}O$	1.0	+	0.9	+	0.7	+	9.14	25
Cyclohexene		110-83-8	C_6H_{10}			0.8	+			8.95	300
Cyclohexylamine		108-91-8	$C_6H_{13}N$			1.2				8.62	10
Cyclopentane 85% 2,2-dimethylbutane 15%		287-92-3	C_5H_{10}	NR	+	15	+	1.1		10.33	600
Cyclopropylamine	Aminocyclpropane	765-30-0	C_3H_7N	1.1	+	0.9	+	0.9	+		ne
Decamethylcyclopentasiloxane		541-02-6	$C_{10}H_{30}O_5Si_5$	0.16	+	0.13	+	0.12	+		ne
Decamethyltetrasiloxane		141-62-8	$C_{10}H_{30}O_3Si_4$	0.17	+	0.13	+	0.12	+	<10.2	ne
Decane		124-18-5	$C_{10}H_{22}$	4.0	+	1.4	+	0.35	+	9.65	ne
Diacetone alcohol	4-Methyl-4-hydroxy-2-pentanone	123-42-2	$C_6H_{12}O_2$			0.7					50
Dibromochloromethane	Chlorodibromomethane	124-48-1	$CHBr_2Cl$	NR	+	5.3	+	0.7	+	10.59	ne
Dibromo-3-chloropropane, 1,2-	DBCP	96-12-8	$C_3H_5Br_2Cl$	NR	+	1.7	+	0.43	+		0.001
Dibromoethane, 1,2-	EDB, Ethylene dibromide, Ethylene bromide	106-93-4	$C_2H_4Br_2$	NR	+	1.7	+	0.6	+	10.37	ne
Dichlorobenzene, o-	1,2-Dichlorobenzene	95-50-1	$C_6H_4Cl_2$	0.54	+	0.47	+	0.38	+	9.08	25
Dichlorodifluoromethane	CFC-12	75-71-8	CCl_2F_2			NR	+	NR	+	11.75	1000
Dichlorodimethylsilane		75-78-5	$C_2H_6Cl_2Si$	NR		NR		1.1	+	>10.7	ne
Dichloroethane, 1,2-	EDC, 1,2-DCA, Ethylene dichloride	107-06-2	$C_2H_4Cl_2$			NR	+	0.6	+	11.04	10
Dichloroethene, 1,1-	1,1-DCE, Vinylidene chloride	75-35-4	$C_2H_2Cl_2$			0.82	+	0.8	+	9.79	5
Dichloroethene, c-1,2-	*c*-1,2-DCE, *cis*-Dichloroethylene	156-59-2	$C_2H_2Cl_2$			0.8				9.66	200
Dichloroethene, t-1,2-	*t*-1,2-DCE, *trans*-Dichloroethylene	156-60-5	$C_2H_2Cl_2$			0.45	+	0.34	+	9.65	200
Dichloro-1-fluoroethane, 1,1-	R-141B	1717-00-6	$C_2H_3Cl_2F$	NR	+	NR	+	2.0	+		ne
Dichloromethane	see Methylene chloride										

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Dichloropentafluoropropane	AK-225, mix of ~45% 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca) & ~55% 1,3-Dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb)	442-56-0 507-55-1	$C_3HCl_2F_5$	NR	+	NR	+	25	+		ne
Dichloropropane, 1,2-		78-87-5	$C_3H_6Cl_2$					0.7		10.87	75
Dichloro-1-propene, 1,3-		542-75-6	$C_3H_4C_{12}$	1.3	+	0.96	+			<10	1
Dichloro-1-propene, 2,3-		78-88-6	$C_3H_4Cl_2$	1.9	+	1.3	+	0.7	+	<10	ne
Dichloro-1,1,1-trifluoroethane, 2,2-	R-123	306-83-2	$C_2HCl_2F_3$	NR	+	NR	+	10.1	+	11.5	ne
Dichloro-2,4,6-trifluoropyridine, 3,5-	DCTFP	1737-93-5	$C_5Cl_2F_3N$	1.1	+	0.9	+	0.8	+		ne
Dichlorvos *	Vapona; O,O-dimethyl O-dichlorovinyl phosphate	62-73-7	$C_4H_7Cl_2O_4P$			0.9	+			<9.4	0.1
Dicyclopentadiene	DCPD, Cyclopentadiene dimer	77-73-6	$C_{10}H_{12}$	0.57	+	0.48	+	0.43	+	8.8	5
Diesel Fuel		68334-30-5	m.w. 226			0.9	+				11
Diesel Fuel #2 (Automotive)		68334-30-5	m.w. 216	1.3		0.7	+	0.4	+		11
Diethylamine		109-89-7	$C_4H_{11}N$			1	+			8.01	5
Diethylaminopropylamine, 3-		104-78-9	$C_7H_{18}N_2$			1.3					ne
Diethylbenzene	See Dowtherm J										
Diethylmaleate		141-05-9	$C_8H_{12}O_4$			4					ne
Diethyl sulfide	see Ethyl sulfide										
Diglyme	See Methoxyethyl ether	111-96-6	$C_6H_{14}O_3$								
Diisobutyl ketone	DIBK, 2,2-dimethyl-4-heptanone	108-83-8	$C_9H_{18}O$	0.71	+	0.61	+	0.35	+	9.04	25
Diisopropylamine		108-18-9	$C_6H_{15}N$	0.84	+	0.74	+	0.5	+	7.73	5
Diketene	Ketene dimer	674-82-8	$C_4H_4O_2$	2.6	+	2.0	+	1.4	+	9.6	0.5
Dimethylacetamide, N,N-	DMA	127-19-5	C_4H_9NO	0.87	+	0.8	+	0.8	+	8.81	10
Dimethylamine		124-40-3	C_2H_7N			1.5				8.23	5
Dimethyl carbonate	Carbonic acid dimethyl ester	616-38-6	$C_3H_6O_3$	NR	+	~70	+	1.7	+	~10.5	ne
Dimethyl disulfide	DMDS	624-92-0	$C_2H_6S_2$	0.2	+	0.20	+	0.21	+	7.4	ne
Dimethyl ether	see Methyl ether										
Dimethylethylamine	DMEA	598-56-1	$C_4H_{11}N$	1.1	+	1.0	+	0.9	+	7.74	~3
Dimethylformamide, N,N-	DMF	68-12-2	C_3H_7NO	0.7	+	0.7	+	0.8	+	9.13	10
Dimethylhydrazine, 1,1-	UDMH	57-14-7	$C_2H_8N_2$			0.8	+	0.8	+	7.28	0.01
Dimethyl methylphosphonate	DMMP, methyl phosphonic acid dimethyl ester	756-79-6	$C_3H_9O_3P$	NR	+	4.3	+	0.74	+	10.0	ne
Dimethyl sulfate		77-78-1	$C_2H_6O_4S$	~23		~20	+	2.3	+		0.1
Dimethyl sulfide	see Methyl sulfide										
Dimethyl sulfoxide	DMSO, Methyl sulfoxide	67-68-5	C_2H_6OS			1.4	+			9.10	ne
Dioxane, 1,4-		123-91-1	$C_4H_8O_2$			1.3				9.19	25
Dioxolane, 1,3-	Ethylene glycol formal	646-06-0	$C_3H_6O_2$	4.0	+	2.3	+	1.6	+	9.9	20
Dowtherm A see Therminol® *											
Dowtherm J (97% Diethylbenzene) *		25340-17-4	$C_{10}H_{14}$			0.5					
DS-108F Wipe Solvent	Ethyl lactate/Isopar H/ Propoxypropanol ~7:2:1	97-64-3 64742-48-9 1569-01-3	m.w. 118	3.3	+	1.6	+	0.7	+		ne
Epichlorohydrin	ECH Chloromethyloxirane, 1-chloro2,3-epoxypropane	106-89-8	C_2H_5ClO	~200	+	8.5	+	1.4	+	10.2	0.5
Ethane		74-84-0	C_2H_6			NR	+	15	+	11.52	ne
Ethanol	Ethyl alcohol	64-17-5	C_2H_6O			10	+	3.1	+	10.47	1000
Ethanolamine *	MEA, Monoethanolamine	141-43-5	C_2H_7NO	5.6	+	1.6	+			8.96	3
Ethene	Ethylene	74-85-1	C_2H_4			9	+	4.5	+	10.51	ne
Ethoxyethanol, 2-	Ethyl cellosolve	110-80-5	$C_4H_{10}O_2$			1.3				9.6	5
Ethyl acetate		141-78-6	$C_4H_8O_2$			4.6	+	3.5		10.01	400
Ethyl acetoacetate		141-97-9	$C_6H_{10}O_3$	1.4	+	1.2	+	1.0	+	<10	ne
Ethyl acrylate		140-88-5	$C_5H_8O_2$			2.4	+	1.0	+	<10.3	5
Ethylamine		75-04-7	C_2H_7N			0.8				8.86	5

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (Ev)	TWA
Ethylbenzene		100-41-4	C_8H_{10}	0.52	+	0.52	+	0.51	+	8.77	100
Ethyl caprylate	Ethyl octanoate	106-32-1	$C_{10}H_{20}O_2$		+	0.52	+	0.51	+		
Ethylenediamine	1,2-Ethanediamine; 1,2-Diaminoethane	107-15-3	$C_2H_8N_2$	0.9	+	0.8	+	1.0	+	8.6	10
Ethylene glycol *	1,2-Ethanediol	107-21-1	$C_2H_6O_2$			16	+	6	+	10.16	C100
Ethylene glycol, Acrylate	2-hydroxyethyl Acrylate	818-61-1	$C_5H_8O_3$			8.2				≤10.6	
Ethylene glycol dimethyl ether	1,2-Dimethoxyethane, Monoglyme	110-71-4	$C_4H_{10}O_2$	1.1		0.86		0.7		9.2	ne
Ethylene glycol monobutyl ether acetate	2-Butoxyethyl acetate	112-07-2	$C_8H_{16}O_3$			1.3				≤10.6	
Ethylene glycol, monothio	mercapto-2-ethanol	60-24-2	C_2H_6OS			1.5				9.65	
Ethylene oxide	Oxirane, Epoxyethane	75-21-8	C_2H_4O			13	+	3.5	+	10.57	1
Ethyl ether	Diethyl ether	60-29-7	$C_4H_{10}O$			1.1	+	1.7		9.51	400
Ethyl 3-ethoxypropionate	EEP	763-69-9	$C_7H_{14}O_3$	1.2	+	0.75	+				ne
Ethyl formate		109-94-4	$C_3H_6O_2$					1.9		10.61	100
Ethylhexyl □acrylate, 2-	Acrylic acid 2-ethylhexyl ester	103-11-7	$C_{11}H_{20}O_2$			1.1	+	0.5	+		ne
Ethylhexanol	2-Ethyl-1-hexanol	104-76-7	$C8H_{18}O$			1.9				≤10.6	
Ethylidenenorbornene	5-Ethylidene bicyclo(2,2,1)hept-2-ene	16219-75-3	C_9H_{12}	0.4	+	0.39	+	0.34	+	≤8.8	ne
Ethyl (S)-(-)-lactate see also DS-108F	Ethyl lactate, Ethyl (S)-(-)-hydroxypropionate	687-47-8 97-64-3	$C_5H_{10}O_3$	13	+	3.2	+	1.6	+	~10	ne
Ethyl mercaptan	Ethanethiol	75-08-1	C_2H_6S	0.60	+	0.56	+			9.29	0.5
Ethyl sulfide	Diethyl sulfide	352-93-2	$C_4H_{10}S$			0.5	+			8.43	ne
Formaldehyde	Formalin	50-00-0	CH_2O	NR	+	NR	+	1.6	+	10.87	C0.3
Formamide		75-12-7	CH_3NO			6.9	+	4		10.16	10
Formic acid		64-18-6	CH_2O_2	NR	+	NR	+	9	+	11.33	5
Furfural	2-Furaldehyde	98-01-1	$C_5H_4O_2$			0.92	+	0.8	+	9.21	2
Furfuryl alcohol		98-00-0	$C_5H_6O_2$			0.80	+			<9.5	10
Gasoline #1		8006-61-9	m.w. 72			0.9	+				300
Gasoline #2, 92 octane		8006-61-9	m.w. 93	1.3	+	1.0	+	0.5	+		300
Glutaraldehyde	1,5-Pentanedial, Glutaric dialdehyde	111-30-8	$C_5H_8O_2$	1.1	+	0.8	+	0.6	+		C0.05
Glycidyl methacrylate	2,3-Epoxypropyl methacrylate	106-91-2	$C_7H_{10}O_3$	2.6	+	1.2	+	0.9	+		0.5
Halothane	2-Bromo-2-chloro-1,1,1-trifluoroethane	151-67-7	$C_2HBrClF_3$					0.6		11.0	50
HCFC-22 see Chlorodifluoromethane											
HCFC-123 see 2,2-Dichloro-1,1,1-trifluoroethane											
HCFC-141B see 1,1-Dichloro-1-fluoroethane											
HCFC-142B see 1-Chloro-1,1-difluoroethane											
HCFC-134A see 1,1,1,2-Tetrafluoroethane											
HCFC-225 see Dichloropentafluoropropane											
Heptane, n-		142-82-5	C_7H_{16}	45	+	2.8	+	0.60	+	9.92	400
Heptanol, 4-	Dipropylcarbinol	589-55-9	$C_7H_{16}O$	1.8	+	1.3	+	0.5	+	9.61	ne
Hexamethyldisilazane, 1,1,1,3,3,3- *	HMDS	999-97-3	$C_6H_{19}NSi_2$			0.2	+	0.2	+	~8.6	ne
Hexamethyldisiloxane	HMDSx	107-46-0	$C_6H_{18}OSi_2$	0.33	+	0.27	+	0.25	+	9.64	ne
Hexane, n-		110-54-3	C_6H_{14}	350	+	4.3	+	0.54	+	10.13	50
Hexanol, 1-	Hexyl alcohol	111-27-3	$C_6H_{14}O$	9	+	2.5	+	0.55	+	9.89	ne
Hexene, 1-		592-41-6	C_6H_{12}			0.8				9.44	30
HFE-7100 see Methyl nonafluorobutyl ether											
Histoclear (Histo-Clear)	Limonene/corn oil reagent		m.w. ~136	0.5	+	0.4	+	0.3	+		ne
Hydrazine *		302-01-2	H_4N_2	>8	+	2.6	+	2.1	+	8.1	0.01
Hydrazoic acid	Hydrogen azide		HN_3							10.7	
Hydrogen	Synthesis gas	1333-74-0	H_2	NR	+	NR	+	NR	+	15.43	ne
Hydrogen cyanide	Hydrocyanic acid	74-90-8	HCN	NR	+	NR	+	NR	+	13.6	C4.7
Hydrogen iodide *	Hydriodic acid	10034-85-2	HI			~0.6*				10.39	
Hydrogen peroxide		7722-84-1	H_2O_2	NR	+	NR	+	NR	+	10.54	1
Hydrogen sulfide		7783-06-4	H_2S	NR	+	3.3	+	1.5	+	10.45	10
Hydroxypropyl methacrylate		27813-02-1 923-26-2	$C_7H_{12}O_3$	9.9	+	2.3	+	1.1	+		ne
Iodine *		7553-56-2	I_2	0.1	+	0.1	+	0.1	+	9.40	C0.1

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Iodomethane	Methyl iodide	74-88-4	CH_3I	0.21	+	0.22	+	0.26	+	9.54	2
Isoamyl acetate	Isopentyl acetate	123-92-2	$C_7H_{14}O_2$	10.1		2.1		1.0		<10	100
Isobutane	2-Methylpropane	75-28-5	C_4H_{10}			100	+	1.2	+	10.57	ne
Isobutanol	2-Methyl-1-propanol	78-83-1	$C_4H_{10}O$	19	+	3.8	+	1.5		10.02	50
Isobutene	Isobutylene, Methyl butene	115-11-7	C_4H_8	1.00	+	1.00	+	1.00	+	9.24	Ne
Isobutyl acrylate	Isobutyl 2-propenoate	106-63-8	$C_7H_{12}O_2$			1.5	+	0.60	+		Ne
Isoflurane	1-Chloro-2,2,2-trifluoroethyl difluoromethyl ether, forane	26675-46-7	$C_3H_2ClF_5O$	NR	+	NR	+	48	+	~11.7	Ne
Isooctane	2,2,4-Trimethylpentane	540-84-1	C8H18			1.2				9.86	ne
Isopar E Solvent	Isoparaffinic hydrocarbons	64741-66-8	m.w. 121	1.7	+	0.8	+				Ne
Isopar G Solvent	Photocopier diluent	64742-48-9	m.w. 148			0.8	+				Ne
Isopar K Solvent	Isoparaffinic hydrocarbons	64742-48-9	m.w. 156	0.9	+	0.5	+	0.27	+		Ne
Isopar L Solvent	Isoparaffinic hydrocarbons	64742-48-9	m.w. 163	0.9	+	0.5	+	0.28	+		Ne
Isopar M Solvent	Isoparaffinic hydrocarbons	64742-47-8	m.w. 191			0.7	+	0.4	+		Ne
Isopentane	2-Methylbutane	78-78-4	C_5H_{12}			8.2					Ne
Isophorone		78-59-1	$C_9H_{14}O$					3		9.07	C5
Isoprene	2-Methyl-1,3-butadiene	78-79-5	C_5H_8	0.69	+	0.63	+	0.60	+	8.85	Ne
Isopropanol	Isopropyl alcohol, 2-propanol, IPA	67-63-0	C_3H_8O	500	+	6.0	+	2.7		10.12	200
Isopropyl acetate		108-21-4	$C_5H_{10}O_2$			2.6				9.99	100
Isopropyl ether	Diisopropyl ether	108-20-3	$C_6H_{14}O$			0.8				9.20	250
Jet fuel JP-4	Jet B, Turbo B, F-40 Wide cut type aviation fuel	8008-20-6 + 64741-42-0	m.w. 115			1.0	+	0.4	+		Ne
Jet fuel JP-5	Jet 5, F-44, Kerosene type aviation fuel	8008-20-6 + 64747-77-1	m.w. 167			0.6	+	0.5	+		29
Jet fuel JP-8	Jet A-1, F-34, Kerosene type aviation fuel	8008-20-6 + 64741-77-1	m.w. 165			0.6	+	0.3	+		30
Jet fuel A-1 (JP-8)	F-34, Kerosene type aviation fuel	8008-20-6 + 64741-77-1	m.w. 145			0.67					34
Jet Fuel TS	Thermally Stable Jet Fuel, Hydrotreated kerosene fuel	8008-20-6 + 64742-47-8	m.w. 165	0.9	+	0.6	+	0.3	+		30
Limonene, D-	(R)-(+)-Limonene	5989-27-5	$C_{10}H_{16}$			0.33	+			~8.2	Ne
Kerosene C10-C16 petro.distillate – see Jet Fuels		8008-20-6									
MDI – see 4,4'-Methylenebis(phenylisocyanate)											
Maleic anhydride	2,5-Furandione	108-31-6	$C_4H_2O_3$							~10.8	0.1
Mesitylene	1,3,5-Trimethylbenzene	108-67-8	C_9H_{12}	0.36	+	0.35	+	0.3	+	8.41	25
Methallyl chloride – see 3-Chloro-2-methylpropene											
Methane	Natural gas	74-82-8	CH_4	NR	+	NR	+	NR	+	12.61	Ne
Methanol	Methyl alcohol, carbinol	67-56-1	CH_4O	NR	+	NR	+	2.5	+	10.85	200
Methoxyethanol, 2-	Methyl cellosolve, Ethylene glycol monomethyl ether	109-86-4	$C_3H_8O_2$	4.8	+	2.4	+	1.4	+	10.1	5
Methoxyethoxyethanol, 2-	2-(2-Methoxyethoxy)ethanol Diethylene glycol monomethyl ether	111-77-3	$C_7H_{16}O$	2.3	+	1.2	+	0.9	+	<10	Ne
Methoxyethyl ether, 2-	bis(2-Methoxyethyl) ether, Diethylene glycol dimethyl ether, Diglyme	111-96-6	$C_6H_{14}O_3$	0.64	+	0.54	+	0.44	+	<9.8	Ne
Methyl acetate		79-20-9	$C_3H_6O_2$	NR	+	6.6	+	1.4	+	10.27	200
Methyl acrylate	Methyl 2-propenoate, Acrylic acid methyl ester	96-33-3	$C_4H_6O_2$			3.7	+	1.2	+	(9.9)	2
Methylamine	Aminomethane	74-89-5	CH_5N			1.2				8.97	5
Methyl amyl ketone	MAK, 2-Heptanone, Methyl pentyl ketone	110-43-0	$C_7H_{14}O$	0.9	+	0.85	+	0.5	+	9.30	50
Methyl bromide	Bromomethane	74-83-9	CH_3Br	110	+	1.7	+	1.3	+	10.54	1
Methyl t-butyl ether	MTBE, *tert*-Butyl methyl ether	1634-04-4	$C_5H_{12}O$			0.9	+			9.24	40
Methyl cellosolve	see 2-Methoxyethanol										
Methyl chloride	Chloromethane	74-87-3	CH_3Cl	NR	+	NR	+	0.74	+	11.22	50
Methylcyclohexane		107-87-2	C_7H_{14}	1.6	+	0.97	+	0.53	+	9.64	400
Methylene bis(phenyl-isocyanate), 4,4'- *	MDI, Mondur M		$C_{15}H_{10}N_2O_2$	Very slow ppb level response							0.005

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Methylene chloride	Dichloromethane	75-09-2	CH_2Cl_2	NR	+	NR	+	0.89	+	11.32	25
Methyl ether	Dimethyl ether	115-10-6	C_2H_6O	4.8	+	3.1	+	2.5	+	10.03	Ne
Methyl ethyl ketone	MEK, 2-Butanone	78-93-3	C_4H_8O	0.86	+	0.9	+	1.1	+	9.51	200
Methylhydrazine	Monomethylhydrazine, Hydrazomethane	60-34-4	$C_2H_6N_2$	1.4	+	1.2	+	1.3	+	7.7	0.01
Methyl isoamyl ketone	MIAK, 5-Methyl-2-hexanone	110-12-3	$C_7H_{14}O$	0.8	+	0.76	+	0.5	+	9.28	50
Methyl isobutyl ketone	MIBK, 4-Methyl-2-pentanone	108-10-1	$C_6H_{12}O$	0.9	+	0.8	+	0.6	+	9.30	50
Methyl isocyanate	CH3NCO	624-83-9	C_2H_3NO	NR	+	4.6	+	1.5		10.67	0.02
Methyl isothiocyanate	CH3NCS	551-61-6	C_2H_3NS	0.5	+	0.45	+	0.4	+	9.25	ne
Methyl mercaptan	Methanethiol	74-93-1	CH_4S	0.65		0.54		0.66		9.44	0.5
Methyl methacrylate		80-62-6	$C_5H_8O_2$	2.7	+	1.5	+	1.2	+	9.7	100
Methyl nonafluorobutyl ether	HFE-7100DL	163702-08-7, 163702-07-6	$C_5H_3F_9O$			NR	+	~35	+		ne
Methyl-1,5-pentanediamine, 2- (coats lamp) *	Dytek-A amine, 2-Methyl pentamethylenediamine	15520-10-2	C6H16N2			~0.6	+			<9.0	ne
Methyl propyl ketone	MPK, 2-Pentanone	107-87-9	$C_5H_{12}O$			0.93	+	0.79	+	9.38	200
Methyl-2-pyrrolidinone, N-	NMP, N-Methylpyrrolidone, 1-Methyl-2-pyrrolidinone, 1-Methyl-2-pyrrolidone	872-50-4	C_5H_9NO	1.0	+	0.8	+	0.9	+	*9.17*	ne
Methyl salicylate	Methyl 2-hydroxybenzoate	119-36-8	C_8H_8O3	1.3	+	0.9	+	0.9	+	~9	ne
Methylstyrene, α-	2-Propenylbenzene	98-83-9	C_9H_{10}			0.5				8.18	50
Methyl sulfide	DMS, Dimethyl sulfide	75-18-3	C_2H_6S	0.49	+	0.44	+	0.46	+	8.69	ne
Mineral spirits	Stoddard Solvent, Varsol 1, White Spirits	8020-83-5 8052-41-3 68551-17-7	m.w. 144	1.0		0.69	+	0.38	+		100
Mineral Spirits - Viscor 120B Calibration Fluid, b.p. 156-207°C		8052-41-3	m.w. 142	1.0	+	0.7	+	0.3	+		100
Monoethanolamine - see Ethanolamine											
Mustard *	HD, Bis(2-chloroethyl) sulfide	505-60-2 39472-40-7 68157-62-0	$C_4H_8Cl_2S$			0.6					0.0005
Naphtha - see VM & P Naptha											
Naphthalene	Mothballs	91-20-3	$C_{10}H_8$	0.45	+	0.42	+	0.40	+	8.13	10
Nickel carbonyl (in CO)	Nickel tetracarbonyl	13463-39-3	C_4NiO_4			0.18				<8.8	0.001
Nicotine		54-11-5	$C_{10}H_{14}N_2$			2.0				≤10.6	
Nitric oxide		10102-43-9	NO	~6		5.2	+	2.8	+	9.26	25
Nitrobenzene		98-95-3	$C_6H_5NO_2$	2.6	+	1.9	+	1.6	+	9.81	1
Nitroethane		79-24-3	$C_2H_5NO_2$					3		10.88	100
Nitrogen dioxide		10102-44-0	NO_2	23	+	16	+	6	+	9.75	3
Nitrogen trifluoride		7783-54-2	NF_3	NR		NR		NR		13.0	10
Nitromethane		75-52-5	CH_3NO_2					4		11.02	20
Nitropropane, 2-		79-46-9	$C_3H_7NO_2$					2.6		10.71	10
Nonane		111-84-2	C_9H_{20}			1.4				9.72	200
Norpar 12	n-Paraffins, mostly C_{10}-C_{13}	64771-72-8	m.w. 161	3.2	+	1.1	+	0.28	+		ne
Norpar 13	n-Paraffins, mostly C_{13}-C_{14}	64771-72-8	m.w. 189	2.7	+	1.0	+	0.3	+		ne
Octamethylcyclotetrasiloxane		556-67-2	$C_8H_{24}O_4Si_4$	0.21	+	0.17	+	0.14	+		ne
Octamethyltrisiloxane		107-51-7	$C_8H_{24}O_2Si_3$	0.23	+	0.18	+	0.17	+	<10.0	ne
Octane, n-		111-65-9	C_8H_{18}	13	+	1.8	+			9.82	300
Octene, 1-		111-66-0	C_8H_{16}	0.9	+	0.75	+	0.4	+	9.43	75
Pentane		109-66-0	C_5H_{12}	80	+	8.4	+	0.7	+	10.35	600
Peracetic acid *	Peroxyacetic acid, Acetyl hydroperoxide	79-21-0	$C_2H_4O_3$	NR	+	NR	+	2.3	+		ne
Peracetic/Acetic acid mix *	Peroxyacetic acid, Acetyl hydroperoxide	79-21-0	$C_2H_4O_3$			50	+	2.5	+		ne
Perchloroethene	PCE, Perchloroethylene, Tetrachloroethylene	127-18-4	C_2Cl_4	0.69	+	0.57	+	0.31	+	9.32	25
PGME	Propylene glycol methyl ether, 1-Methoxy-2-propanol	107-98-2	$C_6H_{12}O_3$	2.4	+	1.5	+	1.1	+		100

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
PGMEA	Propylene glycol methyl ether acetate, 1-Methoxy-2-acetoxypropane, 1-Methoxy-2-propanol acetate	108-65-6	$C_6H_{12}O_3$	1.65	+	1.0	+	0.8	+		ne
Phenol	Hydroxybenzene	108-95-2	C_6H_6O	1.0	+	1.0	+	0.9	+	8.51	5
Phosgene	Dichlorocarbonyl	75-44-5	CCl_2O	NR	+	NR	+	8.5	+	11.2	0.1
Phosgene in Nitrogen	Dichlorocarbonyl	75-44-5	CCl_2O	NR	+	NR	+	6.8	+	11.2	0.1
Phosphine (coats lamp)		7803-51-2	PH_3	28		3.9	+	1.1	+	9.87	0.3
Photocopier Toner	Isoparaffin mix					0.5	+	0.3	+		ne
Picoline, 3-	3-Methylpyridine	108-99-6	C_6H_7N			0.9				9.04	ne
Pinene, α-		2437-95-8	$C_{10}H_{16}$			0.31	+	0.47		8.07	ne
Pinene, β-		18172-67-3	$C_{10}H_{16}$	0.38	+	0.37	+	0.37	+	~8	100
Piperylene, isomer mix	1,3-Pentadiene	504-60-9	C_5H_8	0.76	+	0.69	+	0.64	+	8.6	100
Propane		74-98-6	C_3H_8			NR	+	1.8	+	10.95	2500
Propanol, n-	Propyl alcohol	71-23-8	C_3H_8O			5		1.7		10.22	200
Propene	Propylene	115-07-1	C_3H_6	1.5	+	1.4	+	1.6	+	9.73	ne
Propionaldehyde	Propanal	123-38-6	C_3H_6O			1.9				9.95	ne
Propyl acetate, n-		109-60-4	$C_5H_{10}O_2$			3.5		2.3		10.04	200
Propylamine, n-	1-Propylamine, 1-Aminopropane	107-10-8	C_3H_9N	1.1	+	1.1	+	0.9	+	8.78	ne
Propylene carbonate *		108-32-7	$C_4H_6O_3$			62	+	1	+	10.5	ne
Propylene glycol	1,2-Propanediol	57-55-6	$C_3H_8O_2$	18		5.5	+	1.6	+	<10.2	ne
Propylene glycol propyl ether	1-Propoxy-2-propanol	1569-01-3	$C_6H_{14}O_2$	1.3	+	1.0	+	1.6	+		ne
Propylene oxide	Methyloxirane	75-56-9 16088-62-3 15448-47-2	C_3H_6O	~240		6.6	+	2.9	+	10.22	20
Propyleneimine	2-Methylaziridine	75-55-8	C_3H_7N	1.5	+	1.3	+	1.0	+	9.0	2
Propyl mercaptan, 2-	2-Propanethiol, Isopropyl mercaptan	75-33-2	C_3H_8S	0.64	+	0.66	+			9.15	ne
Pyridine		110-86-1	C_5H_5N	0.78	+	0.7	+	0.7	+	9.25	5
Pyrrolidine (coats lamp)	Azacyclohexane	123-75-1	C_4H_9N	2.1	+	1.3	+	1.6	+	~8.0	ne
RR7300 (PGME/PGMEA)	70:30 PGME:PGMEA (1-Methoxy-2-propanol:1-Methoxy-2-acetoxypropane)	107-98-2	$C_4H_{10}O_2$ / $C_6H_{12}O_3$			1.4	+	1.0	+		ne
Sarin	GB, Isopropyl methylphosphonofluoridate	107-44-8 50642-23-4	$C_4H_{10}FO_2P$			~3					
Stoddard Solvent - see Mineral Spirits		8020-83-5									
Styrene		100-42-5	C_8H_8	0.45	+	0.40	+	0.4	+	8.43	20
Sulfur dioxide		7446-09-5	SO_2	NR		NR	+	NR	+	12.32	2
Sulfur hexafluoride		2551-62-4	SF_6	NR		NR		NR		15.3	1000
Sulfuryl fluoride	Vikane	2699-79-8	SO_2F_2	NR		NR		NR		13.0	5
Tabun *	Ethyl N, N-dimethylphosphoramidocyanidate	77-81-6	$C_5H_{11}N_2O_2P$			0.8					15ppt
Tetrachloroethane, 1,1,1,2-		630-20-6	$C_2H_2Cl_4$					1.3		~11.1	ne
Tetrachloroethane, 1,1,2,2-		79-34-5	$C_2H_2Cl_4$	NR	+	NR	+	0.60	+	~11.1	1
Tetrachlorosilane		10023-04-7	$SiCl_4$	NR		NR		15	+	11.79	ne
Tetraethyl lead	TEL	78-00-2	$C_8H_{20}Pb$	0.4		0.3		0.2		~11.1	0.008
Tetraethyl orthosilicate	Ethyl silicate, TEOS	78-10-4	$C_8H_{20}O_4Si$			0.7	+	0.2	+	~9.8	10
Tetrafluoroethane, 1,1,1,2-	HFC-134A	811-97-2	$C_2H_2F_4$			NR		NR			ne
Tetrafluoroethene	TFE, Tetrafluoroethylene, Perfluoroethylene	116-14-3	C_2F_4			~15				10.12	ne
Tetrafluoromethane	CFC-14, Carbon tetrafluoride	75-73-0	CF_4			NR	+	NR	+	>15.3	ne
Tetrahydrofuran	THF	109-99-9	C_4H_8O	1.9	+	1.7	+	1.0	+	9.41	200
Tetramethyl orthosilicate	Methyl silicate, TMOS	681-84-5	$C_4H_{12}O_4Si$	10	+	1.9	+			~10	1
Therminol® D-12 *	Hydrotreated heavy naphtha	64742-48-9	m.w. 160	0.8	+	0.51	+	0.33	+		ne
Therminol® VP-1 *	Dowtherm A, 3:1 Diphenyl oxide: Biphenyl	101-84-8 92-52-4	$C_{12}H_{10}O$ $C_{12}H_{10}$			0.4	+				1
Toluene	Methylbenzene	108-88-3	C_7H_8	0.54	+	0.50	+	0.51	+	8.82	50

Compound Name	Synonym/Abbreviation	CAS No.	Formula	9.8	C	10.6	C	11.7	C	IE (eV)	TWA
Tolylene-2,4-diisocyanate	TDI, 4-Methyl-1,3-phenylene-2,4-diisocyanate	584-84-9	$C_9H_6N_2O_2$	1.4	+	1.4	+	2.0	+		0.002
Trichlorobenzene, 1,2,4-	1,2,4-TCB	120-82-1	$C_6H_3Cl_3$	0.7	+	0.46	+			9.04	C5
Trichloroethane, 1,1,1-	1,1,1-TCA, Methyl chloroform	71-55-6	$C_2H_3Cl_3$			NR	+	1	+	11	350
Trichloroethane, 1,1,2-	1,1,2-TCA	79-00-5	$C_2H_3Cl_3$	NR	+	NR	+	0.9	+	11.0	10
Trichloroethene	TCE, Trichoroethylene	79-01-6	C_2HCl_3	0.62	+	0.54	+	0.43	+	9.47	50
Trichloromethylsilane	Methyltrichlorosilane	75-79-6	CH_3Cl_3Si	NR		NR		1.8	+	11.36	ne
Trichlorotrifluoroethane, 1,1,2-	CFC-113	76-13-1	$C_2Cl_3F_3$			NR		NR		11.99	1000
Triethylamine	TEA	121-44-8	$C_6H_{15}N$	0.95	+	0.9	+	0.65	+	7.3	1
Triethyl borate	TEB; Boric acid triethyl ester	150-46-9	$C_6H_{15}O_3B$			2.2	+	1.1	+	~10	ne
Triethyl phosphate	Ethyl phosphate	78-40-0	$C_6H_{15}O_4P$	~50	+	3.1	+	0.60	+	9.79	ne
Trifluoroethane, 1,1,2-		430-66-0	$C_2H_3F_3$					34		*12.9*	ne
Trimethylamine		75-50-3	C_3H_9N			0.9				7.82	5
Trimethylbenzene, 1,3,5- - see Mesitylene		108-67-8									25
Trimethyl borate	TMB; Boric acid trimethyl ester, Boron methoxide	121-43-7	$C_3H_9O_3B$			5.1	+	1.2	+	10.1	ne
Trimethyl phosphate	Methyl phosphate	512-56-1	$C_3H_9O_4P$			8.0	+	1.3	+	9.99	ne
Trimethyl phosphite	Methyl phosphite	121-45-9	$C_3H_9O_3P$			1.1	+		+	*8.5*	2
Turpentine	Pinenes (85%) + other diisoprenes	8006-64-2	$C_{10}H_{16}$	0.37	+	0.30	+	0.29	+	~8	20
Undecane		1120-21-4	$C_{11}H_{24}$			2				9.56	ne
Varsol – see Mineral Spirits											
Vinyl actetate		108-05-4	$C_4H_6O_2$	1.5	+	1.2	+	1.0	+	9.19	10
Vinyl bromide	Bromoethylene	593-60-2	C_2H_3Br			0.4				9.80	5
Vinyl chloride	Chloroethylene, VCM	75-01-4	C_2H_3Cl			2.0	+	0.6	+	9.99	5
Vinyl-1-cyclohexene, 4-	Butadiene dimer, 4-Ethenylcyclohexene	100-40-3	C_8H_{12}	0.6	+	0.56	+			9.83	0.1
Vinylidene chloride - see 1,1-Dichloroethene											
Vinyl-2-pyrrolidinone, 1-	NVP, N-vinylpyrrolidone, 1-ethenyl-2-pyrrolidinone	88-12-0	C_6H_9NO	1.0	+	0.8	+	0.9	+		ne
Viscor 120B - see Mineral Spirits - Viscor 120B Calibration Fluid											
V. M. & P. Naphtha	Ligroin; Solvent naphtha; Varnish maker's & painter's naptha	64742-89-8	m.w. 111 (C_8-C_9)	1.7	+	0.97	+				300
Xylene, m-	1,3-Dimethylbenzene	108-38-3	C_8H_{10}	0.50	+	0.44	+	0.40	+	8.56	100
Xylene, o-	1,2-Dimethylbenzene	95-47-6	C_8H_{10}	0.56	+	0.46	+	0.43		8.56	100
Xylene, p-	1,4-Dimethylbenzene	106-42-3	C_8H_{10}	0.48	+	0.39	+	0.38	+	8.44	100
None				1		1		1			
Undetectable				1E+6		1E+6		1E+6			

* Compounds indicated in green can be detected using a MiniRAE 2000 or ppbRAE/+ with slow response, but may be lost by adsorption on a MultiRAE or EntryRAE. Response on multi-gas meters can give an indication of relative concentrations, but may not be quantitative and for some chemicals no response is observed.

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Appendix I:
Example of Automatic Calculation of Correction Factors, TLVs and Alarm Limits for Mixtures
(Calculations performed using Excel version of this database, available on request)

Compound	**CF 9.8 eV**	**CF 10.6 eV**	**CF 11.7eV**	**Mol. Frac**	**Conc ppm**	**TLV ppm**	**STEL Ppm**
Benzene	0.55	0.53	0.6	0.01	1	0.5	2.5
Toluene	0.54	0.5	0.51	0.06	10	50	150
Hexane, n-	300	4.3	0.54	0.06	10	50	150
Heptane, n-	45	2.8	0.6	0.28	50	400	500
Styrene	0.45	0.4	0.42	0.06	10	20	40
Acetone	1.2	1.1	1.4	0.28	50	750	1000
Isopropanol	500	6	2.7	0.28	50	400	500
None	1	1	1	0.00	0	1	
Mixture Value:	2.1	1.5	0.89	1.00	181 ppm	56 ppm	172 ppm
TLV Alarm Setpoint when Calibrated to Isobutylene:	26 ppm	37 ppm	62 ppm				
STEL Alarm Setpoint, same Calibration	86 ppm	115 ppm	193 ppm				

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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)

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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		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:**

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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 Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination procedures.

7. Prepare samples in accordance with Benchmark'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

Benchmark FOPs:

040	*Non-disposable and Non-dedicated Sampling Equipment Decontamination*
046	*Sample Labeling, Storage and Shipment*

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SOIL/SEDIME
SAMPLE COLLECTION SUMMARY L

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

Equipment Rinsate Blanks *- Pour clean deionized water [illegible] d sa[illegible] uipment into sample containers. Collect at a frequency of 1 per sampling method per day. Analyze for all those parameters analyzed for in the samples coll the same day. HSL Metals can be substituted by only the Metals an[illegible] exa[illegible] romium which needs a separate container). Match equipment used for constituents of concern to rinsate analyte. Note deionzied water lot # or distilay. manufacturers info & date.*

MS/MSD/MSB *- Collect at a frequency of 1 per 20 samples of each matri[illegible] or 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' sectio*

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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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. Benchmark 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 Benchmark 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 Benchmark 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 Benchmark 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.

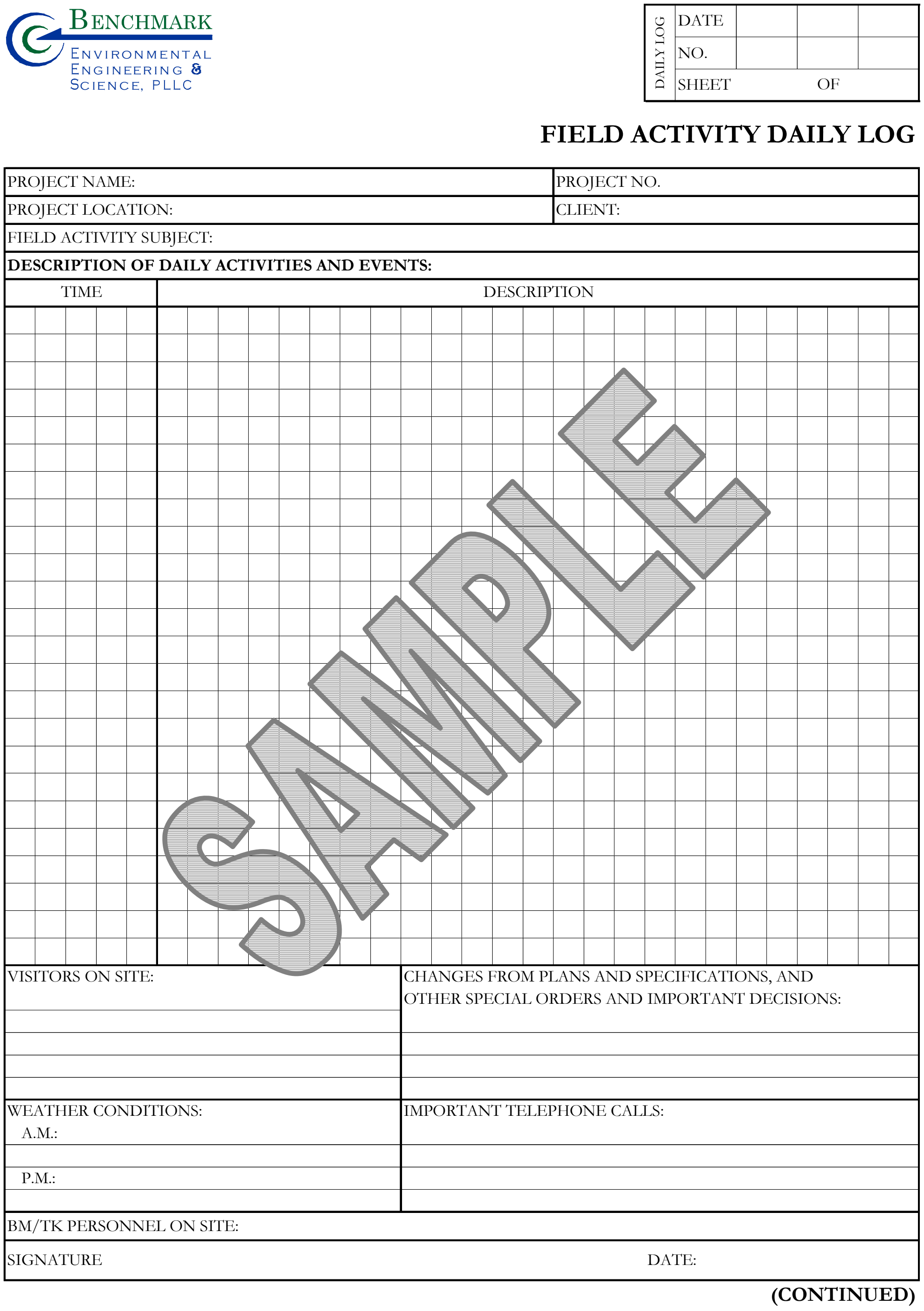
The form should be signed daily by both the Benchmark field supervisor and the driller's representative, and provided to the Benchmark Field Team Leader.

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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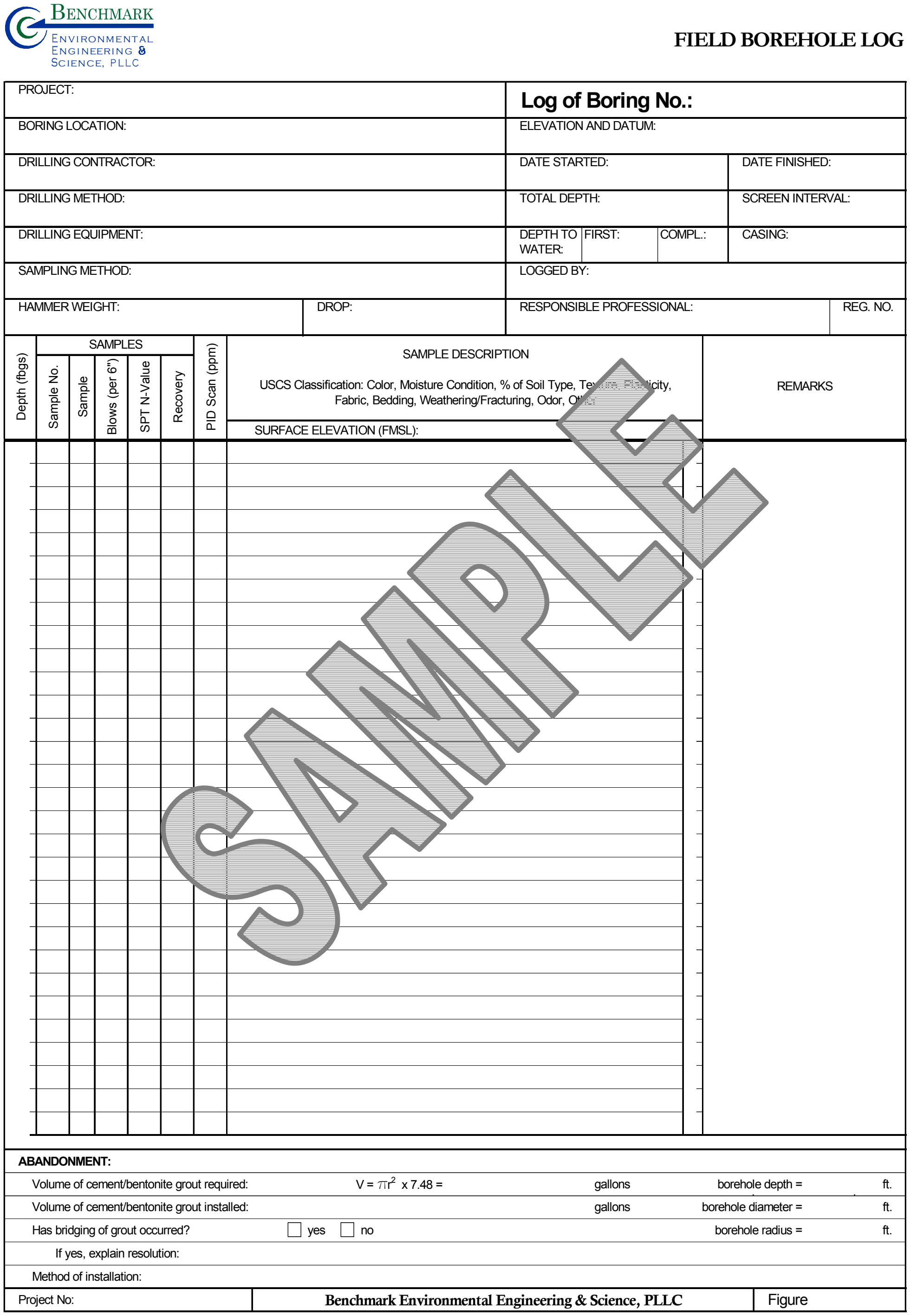
DAILY LOG				
	DATE			
	NO.			
	SHEET OF			

FIELD ACTIVITY DAILY LOG

PROJECT NAME:	PROJECT NO.
PROJECT LOCATION:	CLIENT:
FIELD ACTIVITY SUBJECT:	
DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:	
TIME	DESCRIPTION
VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS:
WEATHER CONDITIONS: A.M.: P.M.:	IMPORTANT TELEPHONE CALLS:
BM/TK PERSONNEL ON SITE:	
SIGNATURE	DATE:

(CONTINUED)



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: $V = \pi r^2 \times 7.48 =$ 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

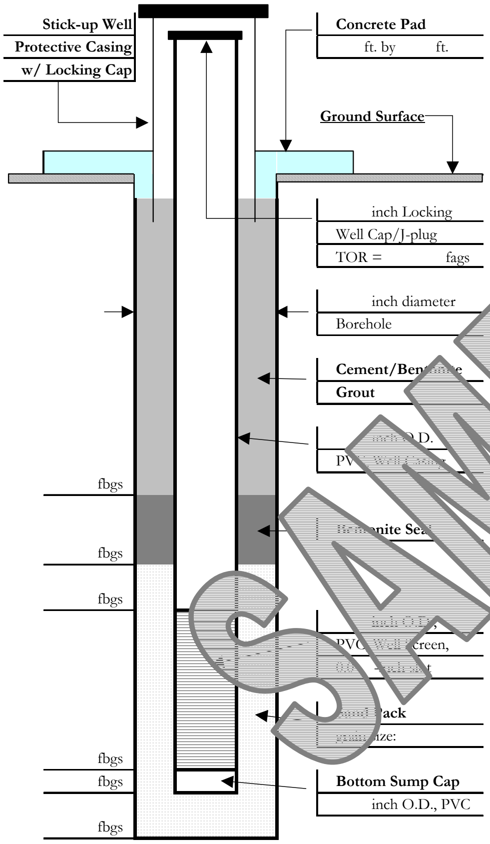
PROJECT:		**Log of Well No.:**		
BORING LOCATION:		ELEVATION AND DATUM:		
DRILLING CONTRACTOR:		DATE STARTED:		DATE FINISHED:
DRILLING METHOD:		TOTAL DEPTH:		SCREEN INTERVAL:
DRILLING EQUIPMENT:		DEPTH TO WATER:	FIRST:	COMPL.:	CASING:
SAMPLING METHOD:		LOGGED BY:		
HAMMER WEIGHT:	DROP:	RESPONSIBLE PROFESSIONAL: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

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

Project No:	**Benchmark Environmental Engineering & Science, PLLC**	Figure

STICK-UP 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:

PREPARED BY: DATE:

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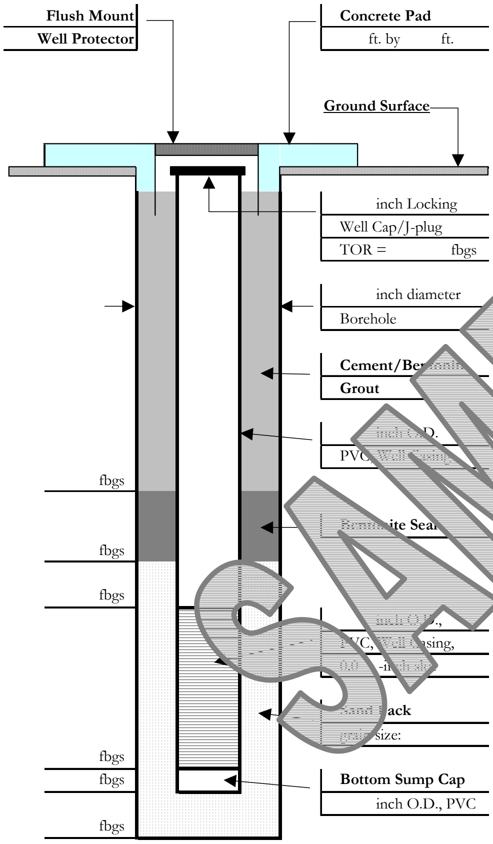
FLUSHMOUNT WELL/PIEZOMETER COMPLETION DETAIL

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:

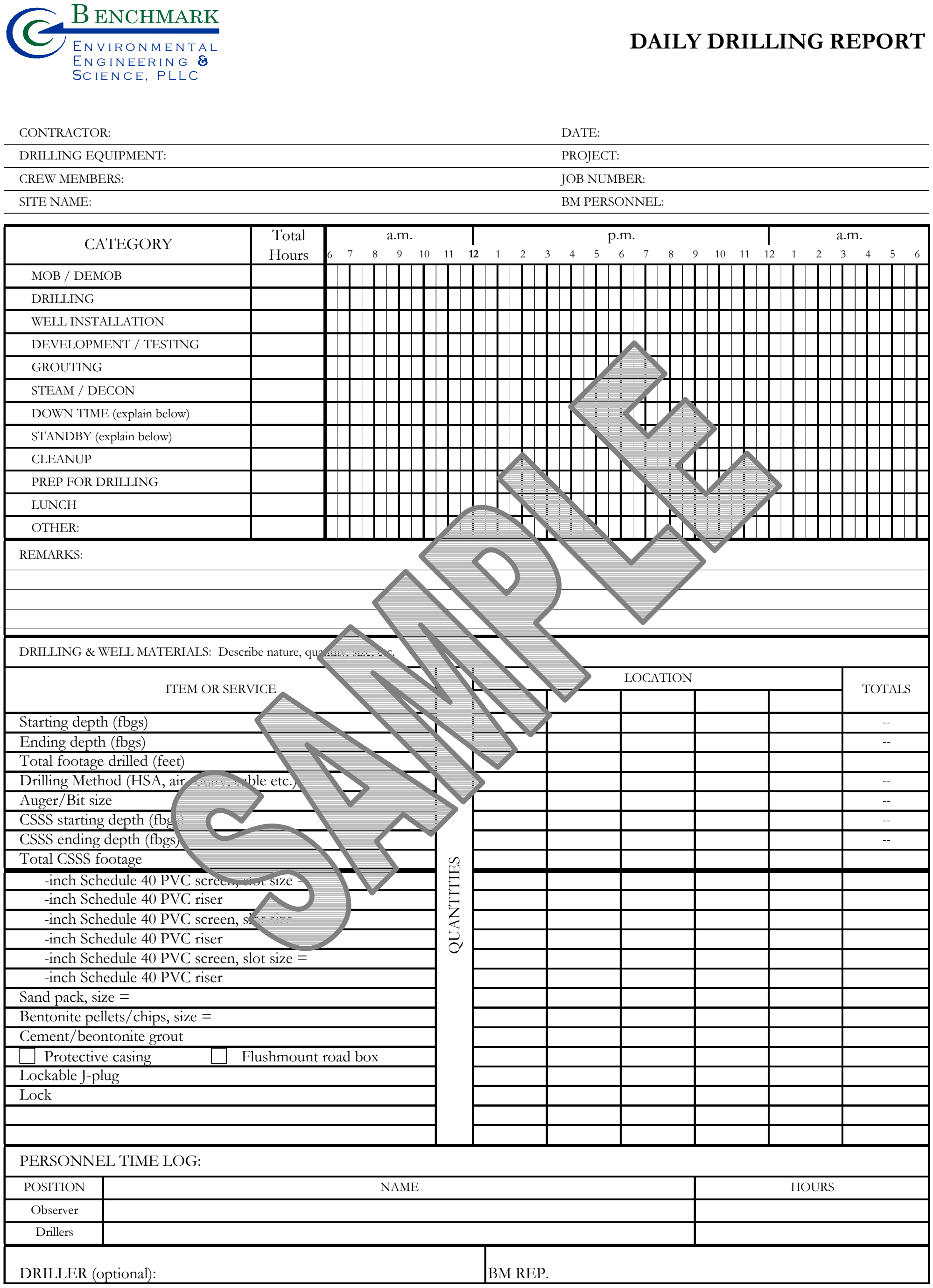
Purge Duration: minutes

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. 6	7	8	9	10	11	p.m. 12	1	2	3	4	5	6	7	8	9	10	11	a.m. 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.

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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

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FIELD OPERATING PROCEDURES

Drilling and Excavation Equipment Decontamination Procedures

FOP 018.0

DRILLING AND EXCAVATION EQUIPMENT DECONTAMINATION PROCEDURES

PURPOSE

This procedure is to be used for the decontamination of drilling and excavation equipment (i.e., drill rigs, backhoes, augers, drill bits, drill rods, buckets, and associated equipment) used during a subsurface investigation. The purpose of this procedure is to remove chemical constituents associated with a particular drilling or excavation location from this equipment. This prevents these constituents from being transferred between drilling or excavation locations, or being transported out of controlled areas.

PROCEDURE

The following procedure will be utilized prior to the use of drilling or excavation equipment at each location, and prior to the demobilization of such equipment from the site:

1. Remove all loose soil and other particulate materials from the equipment at the survey site.

2. Wrap augers, tools, plywood, and other reusable items with a plastic cover prior to transport from the site of use to the decontamination facility.

3. Transport equipment to the decontamination facility. All equipment must be decontaminated at an established decontamination facility. This facility will be placed within a controlled area, and will be equipped with necessary features to contain and collect wash water and entrained materials.

4. Wash equipment thoroughly with pressurized low-volume water or steam, supplied by a pressure washer or steam cleaner.

5. If necessary, use a brush or scraper to remove visible soils adhering to the equipment, and a non-phosphate detergent to remove any oils, grease, and/or hydraulic fluids adhering to the equipment. Continue pressure washing until all visible contaminants are removed.

6. Allow equipment to air dry.

7. Store equipment in a clean area or wrap the equipment in new plastic sheeting as necessary to ensure cleanliness until ready for use.

8. Manage all wash waters and entrained solids as described in the Benchmark Field Operating Procedure for Management of Investigation-Derived Waste.

ATTACHMENTS

none

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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 Benchmark Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

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

<u>Benchmark FOPs:</u>
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:

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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 Benchmark Field Operating Procedure for Groundwater Level Measurement and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark Field Operating Procedure for Non-disposable and Non-dedicated Sampling Equipment Decontamination. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

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 Benchmark 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 Benchmark 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:

    - Bailer – 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.

    - Well Wizard Purge Pump (or similar) – 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 Benchmark 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 Benchmark 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

Benchmark FOPs:

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

PREPARED BY:

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GROUNDWATER WELL INSPECTION FORM

Project:
Client:
Job No.:
Date:
Time:

WELL I.D.:

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:

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FIELD OPERATING PROCEDURES

Groundwater Sample Collection Procedures

FOP 024.1

GROUNDWATER SAMPLE COLLECTION PROCEDURES

PURPOSE

This procedure describes the methods for collecting groundwater samples from monitoring wells and domestic supply wells following purging and sufficient recovery. This procedure also includes the preferred collection order in which water samples are collected based on the volatilization sensitivity or suite of analytical parameters required.

PROCEDURE

Allow approximately 3 to 10 days following well development before performing purge and sample activities at any well location. Conversely, perform sampling as soon as practical after sample purging at any time after the well has recovered sufficiently to sample, or within 24 hours after evacuation, if the well recharges slowly. If the well does not yield sufficient volume for all required laboratory analytical testing (including quality control), a decision should be made to prioritize analyses based on contaminants of concern at the site. If the well takes longer than 24 hours to recharge, the Project Manager should be consulted. The following two procedures outline sample collection activities for monitoring and domestic type wells.

Monitoring Wells

1. Purge the monitoring well in accordance with the Benchmark FOPs for Groundwater Purging Procedures Prior to Sample Collection or Low Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedures. Perform sampling as soon as practical after purging at any time after the well has recovered sufficiently to sample, or within 24 hours after evacuation, if the well recharges slowly. If the well does not yield sufficient volume for all required laboratory analytical testing (including quality control), a decision should be made to prioritize analyses based on contaminants of concern at the site. Analyses will be prioritized in the order of the parameters volatilization sensitivity. After volatile organics have been collected, field parameters

must be measured from the next sample collected. If a well takes longer than 24 hours to recharge, the Project Manager should be consulted.

2. Sampling equipment that is not disposable or dedicated to the well will be decontaminated in accordance with the Benchmark Field Operating Procedure for Non-Disposable and Non-Dedicated Sampling Equipment Decontamination.

3. Calibrate all field meters (i.e., pH/Eh, turbidity, specific conductance, dissolved oxygen, PID etc.) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of the specific field meter.

4. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Benchmark Field Operating Procedure for Groundwater Level Measurement and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark Field Operating Procedure for Non-disposable and Non-dedicated Sampling Equipment Decontamination. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

5. Inspect the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Field Form (sample attached). Specifically, inspect the integrity of the following: concrete surface seal, lock, protective casing and well cover, well casing and J-plug/cap. Report any irregular findings to the Project Manager.

6. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.

7. Calibrate the photoionization detector (PID) in accordance with the Benchmark Field Operating Procedure for Calibration and Maintenance of Portable Photoionization Detector.

8. Monitor the well for organic vapors using a PID, as per the Work Plan. If a reading of greater than 5 ppm is recorded, the well should be allowed to vent until levels drop below 5 ppm before proceeding with purging. Record PID measurements on a well-specific Groundwater Field Form (sample attached).

9. Lower the e-line probe slowly into the monitoring well and record the measurement on a well-specific Groundwater Field Form (sample attached).

10. Groundwater samples will be collected directly from the sampling valve on the flow through cell (low-flow), discharge port of a standard pump assembly (peristaltic, pneumatic, submersible, or Waterra™ pump) or bailer (stainless steel, PVC or polyethylene) into appropriate laboratory provided containers. In low-yielding wells at which the flow through cell is not used, the samples may be collected using a disposable bailer.

11. If disposable polyethylene bailers are used, the bailer should be lowered *slowly* below the surface of the water to minimize agitation and volatilization. For wells that are known to produce turbid samples (values greater than 50 NTU), the bailer should be lowered and retrieved at a rate that limits surging of the well.

12. Sampling data will be recorded on a Groundwater Field Form (sample attached).

13. Pre-label all sample bottles in the field using a waterproof permanent marker in accordance with the Benchmark Sample Labeling, Storage, and Shipment FOP. The following information, at a minimum, should be included on the label:

    - Project Number;
    - Sample identification code (as per project specifications);
    - Date of sample collection (mm, dd, yy);
    - Time of sample collection (military time only) (hh:mm);
    - Specify "grab" or "composite" sample type;
    - Sampler initials;
    - Preservative(s) (if applicable); and
    - Analytes for analysis (if practicable).

14. Collect a separate sample of approximately 200 ml into an appropriate container prior to collecting the first and following the last groundwater sample collected to measure the following field parameters:

Parameter	**Units**
Dissolved Oxygen	parts per million (ppm)

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

Record all field measurements on a Groundwater Field Form (sample attached).

15. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated in the **Sample Collection Order** section below.

16. Lower the e-line probe slowly into the monitoring well and record the measurement on a well-specific Groundwater Field Form (sample attached).

17. The samples will be labeled, stored, and shipped in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage, and Shipment Procedures.

Domestic Supply Wells

1. Calculate or estimate the volume of water in the well. It is desirable to purge at least one casing volume before sampling. This is controlled, to some extent, by the depth of the well, well yield and the rate of the existing pump. If the volume of water in the well cannot be calculated, the well should be purged continuously for no less than 15 minutes.

2. Connect a sampling tap to an accessible fitting between the well and the pressure tank where practicable. A hose will be connected to the device and the hose discharge located 25 to 50 feet away. The well will be allowed to pump until the lines and one well volume is removed. Flow rate will be measured with a container of known volume and a stopwatch.

3. Place a clean piece of polyethylene or Teflon™ tubing on the sampling port and collect the samples in the order designated below and in the sample containers supplied by the laboratory for the specified analytes. ***DO NOT*** use standard garden hose to collect samples.

4. Sampling results and measurements will be recorded on a Groundwater Field Form (sample attached) as described in the previous section.

5. Collect samples into pre-cleaned bottles provided by the analytical laboratory with the appropriate preservative(s) added based on the volatilization sensitivity or suite of analytical parameters required, as designated in the **Sample Collection Order** section below.

6. The samples will be labeled, stored, and shipped in accordance with the Benchmark Field Operating Procedure for Sample Labeling, Storage, and Shipment Procedures.

SAMPLE COLLECTION ORDER

All groundwater samples, from monitoring wells and domestic supply wells, will be collected in accordance with the following.

1. Samples will be collected preferentially in recognition of volatilization sensitivity. The preferred order of sampling if no free product is present is:

    - Field parameters
    - Volatile Organic Compounds (VOCs)
    - Purgeable organic carbons (POC)
    - Purgeable organic halogens (POH)
    - Total Organic Halogens (TOX)
    - Total Organic Carbon (TOC)
    - Extractable Organic Compounds (i.e., BNAs, SVOCs, etc.)
    - Total petroleum hydrocarbons (TPH) and oil and grease
    - PCBs and pesticides
    - Total metals (Dissolved Metals)
    - Total Phenolic Compounds

- Cyanide
- Sulfate and Chloride
- Turbidity
- Nitrate (as Nitrogen) and Ammonia
- Preserved inorganics
- Radionuclides
- Unpreserved inorganics
- Bacteria
- Field parameters

2. Document the sampling procedures and related information in the Project Field Book and on a Groundwater Field Form (sample attached).

DOCUMENTATION

The three words used to ensure adequate documentation for groundwater sampling are accountability, controllability, and traceability. Accountability is undertaken in the sampling plan and answers the questions who, what, where, when, and why to assure that the sampling effort meets its goals. Controllability refers to checks (including QA/QC) used to ensure that the procedures used are those specified in the sampling plan. Traceability is documentation of what was done, when it was done, how it was done, and by whom it was done, and is found in the field forms, Project Field Book, and chain-of-custody forms. At a minimum, adequate documentation of the sampling conducted in the field consists of an entry in the Project Field Book (with sewn binding), field data sheets for each well, and a chain-of-custody form.

As a general rule, if one is not sure whether the information is necessary, it should nevertheless be recorded, as it is impossible to over-document one's fieldwork. Years may go by before the documentation comes under close scrutiny, so the documentation must be capable of defending the sampling effort without the assistance or translation of the sampling crew.

The minimum information to be recorded daily with an indelible pen in the Project Field Book and/or field data sheets includes date and time(s), name of the facility, name(s) of the sampling crew, site conditions, the wells sampled, a description of how the sample shipment was handled, and a QA/QC summary. After the last entry for the day in the Project Field Book, the Field Team Leader should sign the bottom of the page under the last entry and then draw a line across the page directly under the signature.

PRECAUTIONS/RECOMMENDATIONS

The following precautions should be adhered to prior to and during sample collection activities:

- Field vehicles should be parked downwind (to avoid potential sample contamination concerns) at a minimum of 15 feet from the well and the engine turned off prior to PID vapor analysis and VOC sample collection.

- Ambient odors, vehicle exhaust, precipitation, or windy/dusty conditions can potentially interfere with obtaining representative samples. These conditions should be minimized and should be recorded in the field notes. Shield sample bottles from strong winds, rain, and dust when being filled.

- The outlet from the sampling device should discharge below the top of the sample's air/water interface, when possible. The sampling plan should specify how the samples will be transferred from the sample collection device to the sample container to minimize sample alterations.

- The order of sampling should be from the least contaminated to the most contaminated well to reduce the potential for cross contamination of sampling equipment (see the Sampling Plan or Work Plan).

- Samples should not be transferred from one sampling container to another.

- Sampling equipment must not be placed on the ground, because the ground may be contaminated and soil contains trace metals. Equipment and supplies should be removed from the field vehicle only when needed.

- Smoking and eating should not be allowed until the well is sampled and hands are washed with soap and water, due to safety and possibly sample contamination concerns. These activities should be conducted beyond a 15-foot radius of the well.

- No heat-producing or electrical instruments should be within 15 feet of the well, unless they are intrinsically safe, prior to PID vapor analysis.

- Minimize the amount of time that the sample containers remain open.

- Do not touch the inside of sample bottles or the groundwater sample as it enters the bottle. Disposable gloves may be a source of phthalates, which could be introduced into groundwater samples if the gloves contact the sample.

- Sampling personnel should use a new pair of disposable gloves for each well sampled to reduce the potential for exposure of the sampling personnel to contaminants and to reduce sample cross contamination. In addition, sampling personnel should change disposable gloves between purging and sampling operations at the same well.

- Sampling personnel should not use perfume, insect repellent, hand lotion, etc., when taking groundwater samples. If insect repellent must be used, then sampling personnel should not allow samples or sampling equipment to contact the repellent, and it should be noted in the documentation that insect repellent was used.

- Complete the documentation of the well. A completed assemblage of paperwork for a sampling event includes the completed field forms, entries in the Project Field Book (with a sewn binding), transportation documentation (if required), and possibly chain-of-custody forms.

ATTACHMENTS

Groundwater Field Form (sample)

REFERENCES

1. Wilson, Neal. *Soil Water and Ground Water Sampling*, 1995

Benchmark FOPs:

007	*Calibration and Maintenance of Portable Dissolved Oxygen Meter*
008	*Calibration and Maintenance of Portable Field pH/Eh Meter*
009	*Calibration and Maintenance of Portable Field Turbidity Meter*
011	*Calibration and Maintenance of Portable Photoionization Detector*
012	*Calibration and Maintenance of Portable Specific Conductance Meter*
022	*Groundwater Level Measurement*
023	*Groundwater Purging Procedures Prior to Sample Collection (optional)*
031	*Low Flow (Minimal Drawdown) Groundwater Purging & Sampling Procedures (optional)*
040	*Non-Disposable and Non-Dedicated Sampling Equipment Decontamination*
046	*Sample Labeling, Storage and Shipment Procedures*

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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:

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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 Benchmark's Field Operating Procedure for Drill Site Selection Procedure prior to implementing any drilling activity.
2. Perform drill rig safety checks with the driller by completing the Drilling Safety Checklist form (sample attached).
3. Conduct tailgate health and safety meeting with project team and drillers by completing the Tailgate Safety Meeting Form.
4. Calibrate air-monitoring equipment in accordance with the appropriate Benchmark's Field Operating Procedures (i.e., PID, FID, combustible gas meter) or manufacturer's recommendations for calibration of field meters (i.e., DataRAM 4 Particulate Meter).
5. Ensure all drilling equipment (i.e., augers, rods, split-spoons) appear clean and free of soil prior to initiating any subsurface intrusion. Decontamination of drilling equipment should be in accordance with Benchmark'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 Benchmark field supervisor.

10. Collect soil samples via split spoon sampler in accordance with Benchmark's Field Operating Procedure for Split Spoon Sampling.

11. Check augers periodically during drilling to ensure the boring is plumb. Adjust rig position as necessary to maintain plumb.

12. Continue drilling until reaching the assigned total depth, or until auger refusal occurs. Auger refusal is when the drilling penetration drops below 0.1 feet per 10 minutes, with the full weight of the rig on the auger bit, and a center <u>bit</u> (not center plug) in place.

13. Plug and abandon boreholes not used for well installation in accordance with Benchmark'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 Benchmark 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 Benchmark Project Manager and/or NYSDEC Project Manager. Upon approval, the potable water source and quantity used will be documented in the Project Field Book and subsequent report submittal.

ATTACHMENTS

Drilling Safety Checklist (sample)
Tailgate Safety Meeting Form (sample)

REFERENCES

<u>Benchmark FOPs:</u>

001	*Abandonment of Borehole Procedures*
010	*Calibration and Maintenance of Portable Flame Ionization Detector*
011	*Calibration and Maintenance of Portable Photoionization Detector*
017	*Drill Site Selection Procedure*
018	*Drilling and Excavation Equipment Decontamination Procedures*
058	*Split Spoon Sampling Procedures*

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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

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:

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:

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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 Benchmark's Groundwater Purging Procedures Prior to Sample Collection FOP.

1. Water samples should not be taken immediately following well development. Sufficient time should be allowed to stabilize the groundwater flow regime in

the vicinity of the monitoring well. This lag time will depend on site conditions and methods of installation but may exceed one week.

2. Prepare the electronic water level indicator (e-line) in accordance with the procedures referenced in the Benchmark's Groundwater Level Measurement FOP and decontaminate the e-line probe and a lower portion of cable following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP. Store the e-line in a protected area until use. This may include wrapping the e-line in clean plastic until the time of use.

3. Calibrate all sampling devices and monitoring equipment in accordance with manufacturer's recommendations, the site Quality Assurance Project Plan (QAPP) and/or Field Sampling Plan (FSP). Calibration of field instrumentation should be followed as specified in Benchmark's Calibration and Maintenance FOP for each individual meter.

4. Inspect the well/piezometer for signs of vandalism or damage and record condition on the Groundwater Field Form (sample attached). Specifically, inspect the integrity of the following: concrete surface seal, lock, protective casing and well cover, well casing and J-plug/cap. Report any irregular findings to the Project Manager.

5. Unlock and remove the well protective cap or cover and place on clean plastic to avoid introducing foreign material into the well.

6. Monitor the well for organic vapors using a PID, as per the Work Plan. If a reading of greater than 5 ppm is recorded, the well should be allowed to vent until levels drop below 5 ppm before proceeding with purging.

7. Lower the e-line probe slowly into the monitoring well and record the initial water level in accordance with the procedures referenced in Benchmark's Groundwater Level Measurement FOP. Refer to the construction diagram for the well to identify the screened depth.

8. Decontaminate all non-dedicated pump and tubing equipment following the procedures referenced in the Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination FOP.

9. Lower the purge pump or tubing (i.e., low-flow electrical submersible, peristaltic, etc.) 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. Record measurements for field indicator parameters (including water levels) at regular intervals during purging. The stability of these parameters with time can be used to guide the decision to discontinue purging. Proper adjustments must be made to stabilize the flow rate as soon as possible.

14. Record well purging and sampling data in the Project Field Book or on the Groundwater Field Form (sample attached). Measurements should be taken approximately every three to five minutes, or as merited given the rapidity of change.

15. Purging is complete when field indicator parameters stabilize. Stabilization is achieved after all field parameters have stabilized for three successive readings. Three successive readings should be within ± 0.1 units for pH, ± 3% for specific conductance, ± 10 mV for Eh, and ± 10% for turbidity and dissolved oxygen. These stabilization guidelines are provided for rough estimates only, actual site-specific knowledge may be used to adjust these requirements higher or lower.

    An in-line water quality measurement device (e.g., flow-through cell) should be used to establish the stabilization time for several field parameters on a well-specific basis. Data on pumping rate, drawdown, and volume required for parameter stabilization can be used as a guide for conducting subsequent sampling activities.

16. Collect all project-required samples from the discharge tubing at the flow rate established during purging in accordance with Benchmark's Groundwater Sample Collection Procedures FOP. **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.*

Benchmark FOPs:

007 Calibration and Maintenance of Portable Dissolved Oxygen Meter
008 Calibration and Maintenance of Portable Field pH/Eh Meter
009 Calibration and Maintenance of Portable Field Turbidity Meter
011 Calibration and Maintenance of Portable Photoionization Detector
012 Calibration and Maintenance of Portable Specific Conductance Meter
022 Groundwater Level Measurement
024 Groundwater Sample Collection Procedures
040 Non-Disposable and Non-Dedicated Sampling Equipment Decontamination
046 Sample Labeling, Storage and Shipment Procedures

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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:

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FIELD OPERATING PROCEDURES

Management of Investigative-Derived Waste (IDW)

FOP 032.1

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 Benchmark 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 Benchmark's IDW container label (sample attached). Use indelible ink for all labeling.

7. Complete the Investigative Derived Waste Container Log (sample attached) as waste containers are labeled in order to track and inventory project waste. Leave a copy of the log with the site manager or fax copy to the owner/operator as necessary.

8. Collect samples for waste characterization purposes, or use boring/well sample analytical data for characterization.

9. For wastes determined to be hazardous in character, **be aware of accumulation time limitations**. Coordinate the disposal of these wastes with the plant manager/owner/operator, if applicable.

10. Upon Property Owner, Project Manager, and/or NYSDEC Project Manager approval, dispose of investigation-derived wastes as follows:

- Soil, water, and other environmental media for which analysis does not detect organic constituents, and for which inorganic constituents are at levels that meet the Site's cleanup objectives, may be spread on the Property or otherwise treated as a non-waste material. Disposal quantity and on-site location will be documented on Project Field Books and in the project report submittal.

- Soil, water, and other environmental media in which organic compounds are detected or metals are present above the Site's cleanup objectives will be disposed off-site in accordance with applicable state and federal regulations. Disposal quantity and off-site location will be documented on Project Field Books and in the project report submittal.

- Personal protective equipment, disposable bailers, and similar equipment may be disposed as municipal waste, unless waste characterization results mandate otherwise.

WASTE STORAGE MANAGEMENT

Hazardous materials generated on site should be temporarily stored in a secure location that is under the control of the owner/operator or does not allow for vandalism (i.e., within a locked building structure or within a locked fenced in area). A waste-staging area should be designated on-site by the Project Manager in conjunction with the owner/operator.

ATTACHMENTS

Investigation Derived Waste Container Log (sample)
Investigation Derived Waste Container Label (sample)

REFERENCES

None

INVESTIGATION DERIVED WASTE CO

Project Name:

Location:

Project Number:

Personnel:

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

Prepared By:

Signed:

IDW Container Label (sample):

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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:

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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 Benchmark'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 Benchmark'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 Benchmark Field Operating Procedure for Monitoring Well Development.

18. Manage all waste materials generated during well installation and development as described in the Benchmark Field Operating Procedure for Management of Investigation Derived Waste.

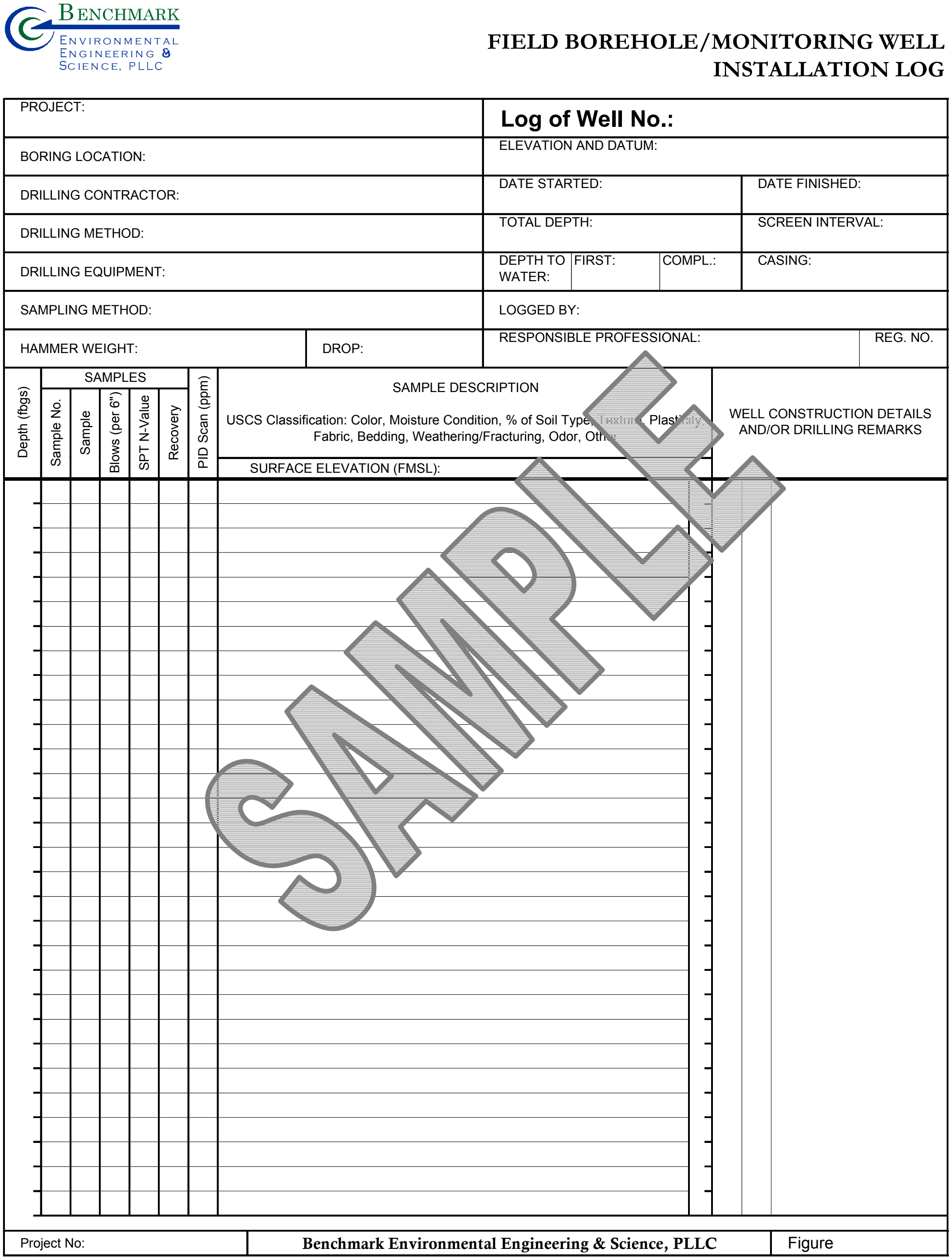
ATTACHMENTS

Field Borehole/Monitoring Well Installation Log (sample)
Typical Monitoring Well Detail (Figure 1)

REFERENCES

Benchmark 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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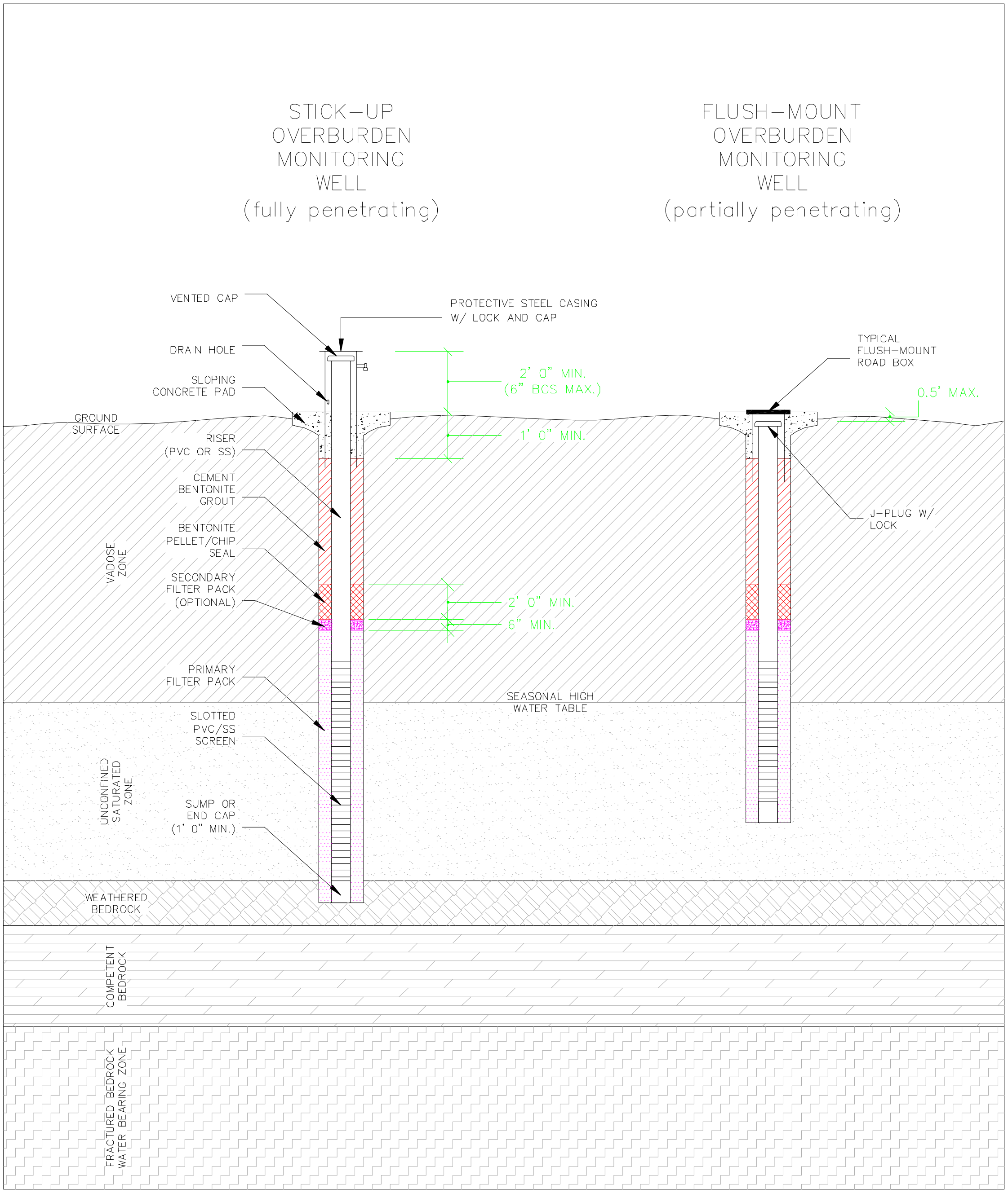
FIELD BOREHOLE/MONITORING WELL INSTALLATION LOG

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					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
	Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery			

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

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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 Benchmark 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 Benchmark 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 Benchmark Groundwater Well Development Log (sample attached).

ATTACHMENTS

Groundwater Well Development Log (sample)

REFERENCES

<u>Benchmark 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): $V = 0.0408 [(B)^2 \times \{ (A) - (C) \}]$	

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

Field Personnel:

Volume Calculation

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

Stabilization Criteria

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

EVACUATION STABILIZATION TEST DATA:

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

REMARKS:

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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 Benchmark 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 Benchmark'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 Benchmark 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 Benchmark 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 Benchmark 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 Benchmark 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

Benchmark FOPs:

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): $V = 0.0408 [(B)^2 \; x \; \{ (A) - (C) \}]$	

* 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 ($\mu S/cm$)	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:

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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 Benchmark 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

Benchmark FOPs:

032 Management of Investigation-Derived Waste

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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)

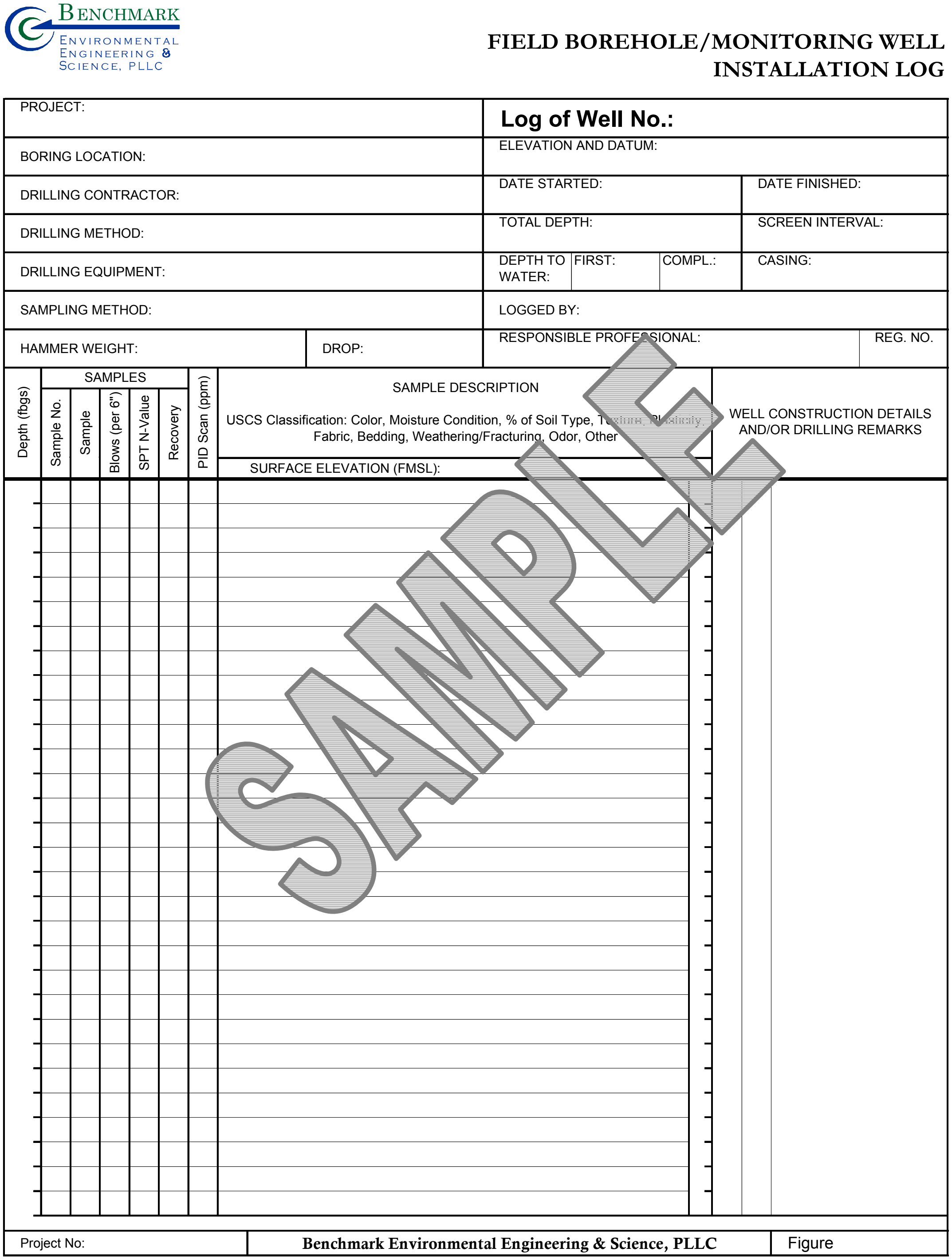
Table 1 – Range of Values of Hydraulic Conductivity and Permeability

REFERENCES

Freeze, R.A. and J.A. Cherry. 1979. *Groundwater*. Prentice-Hall, Inc., Englewood, New Jersey, 604 p.

Benchmark 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					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
	Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery			

Project No:

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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.)

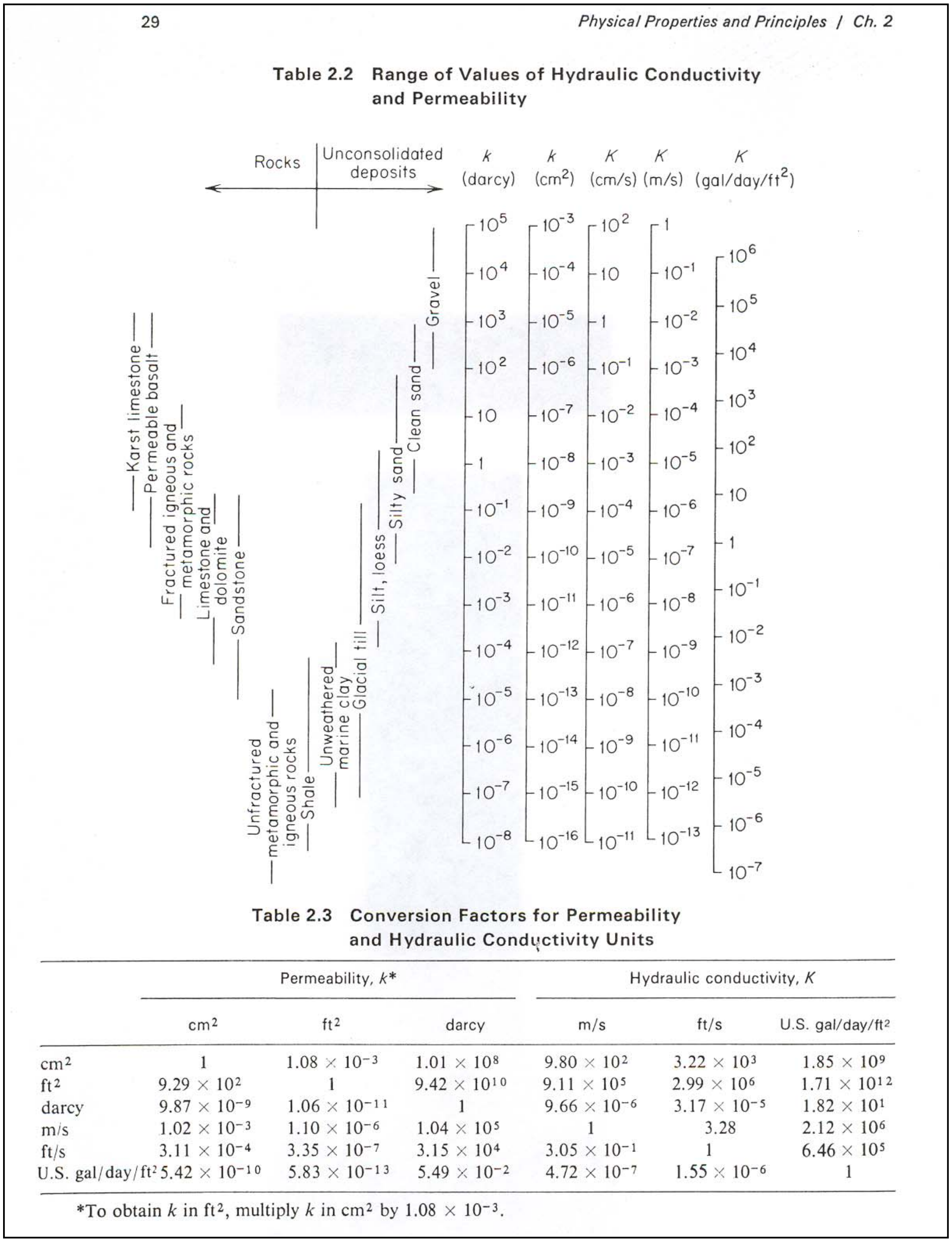

Table 2.2 Range of Values of Hydraulic Conductivity and Permeability

Table 2.3 Conversion Factors for Permeability and Hydraulic Conductivity Units

	Permeability, *k**			Hydraulic conductivity, *K*		
	cm^2	ft^2	darcy	m/s	ft/s	U.S. gal/day/ft^2
cm^2	1	1.08×10^{-3}	1.01×10^{8}	9.80×10^{2}	3.22×10^{3}	1.85×10^{9}
ft^2	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/ft^2	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 ft^2, multiply *k* in cm^2 by 1.08×10^{-3}.

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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 Benchmark 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 Benchmark 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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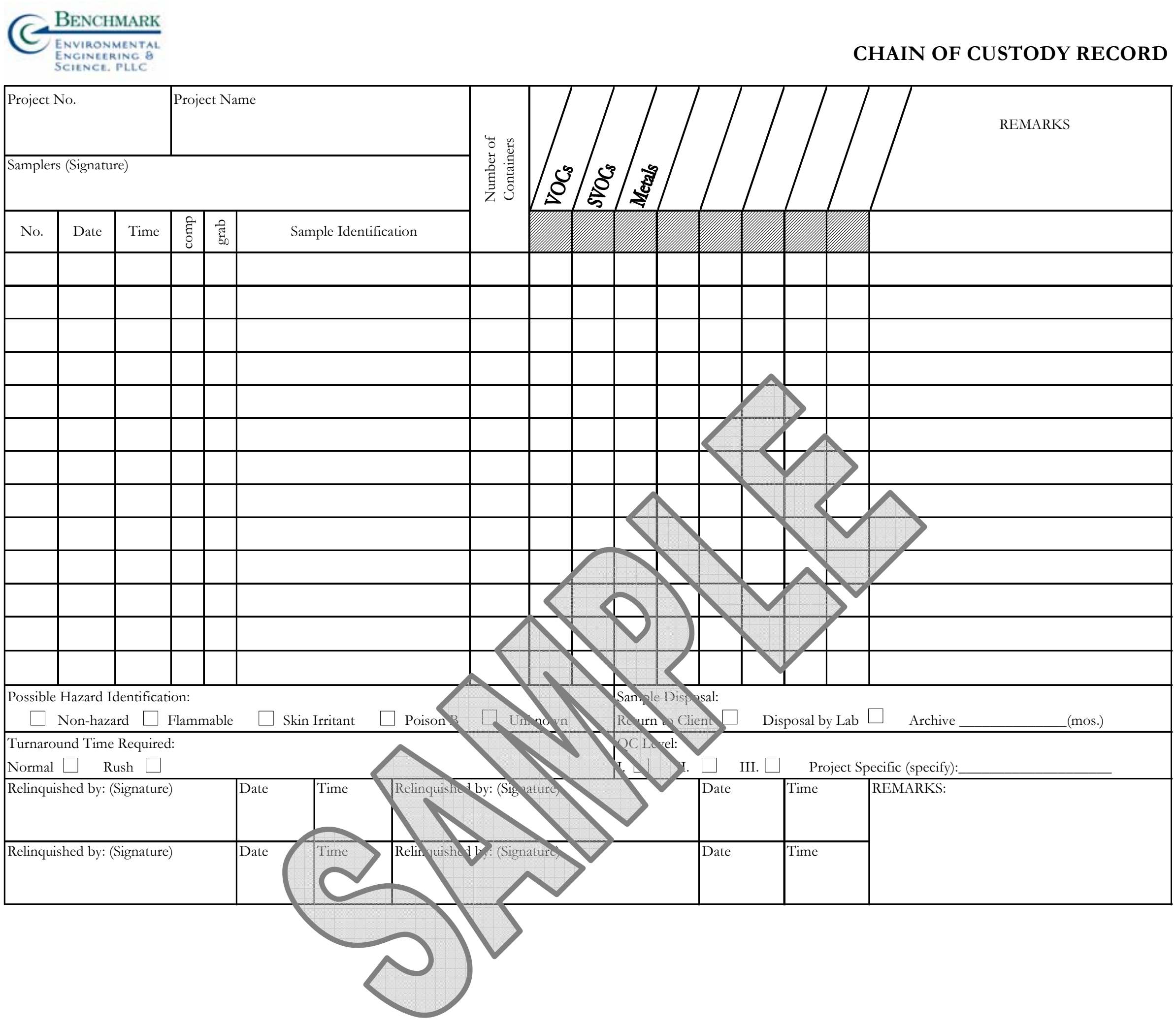
AIR SAMPLE COLLECTION SUMMARY LOG

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

Notes:

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



CHAIN OF CUSTODY RECORD

Project No.

Project Name

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	

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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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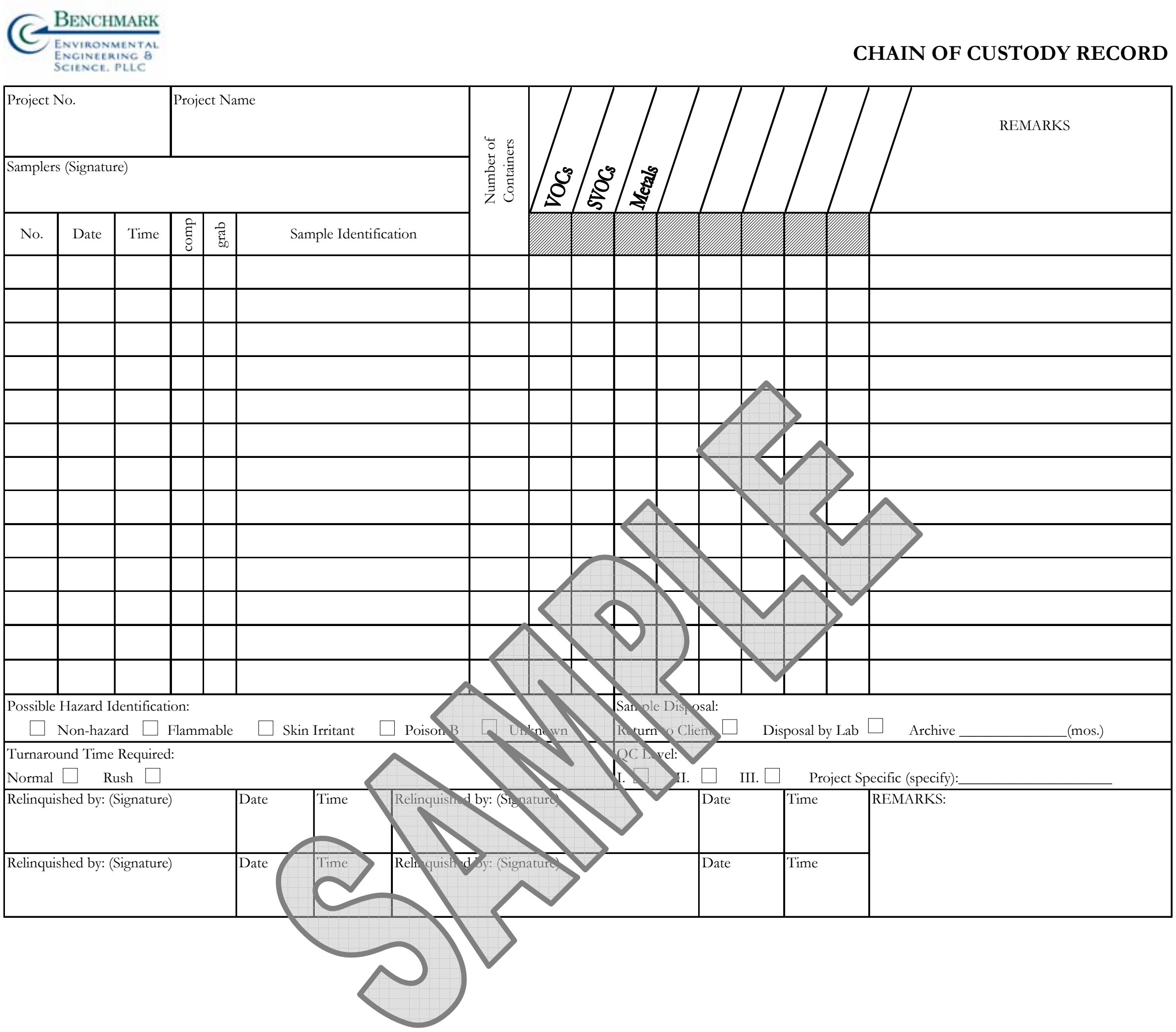
AIR SAMPLE COLLECTION SUMMARY LOG

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	

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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 Benchmark's Field Operating Procedures or manufacturers recommendations for calibration of field meters.

2. Collect split-spoon (or other sampler) samples in accordance with Benchmark'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.

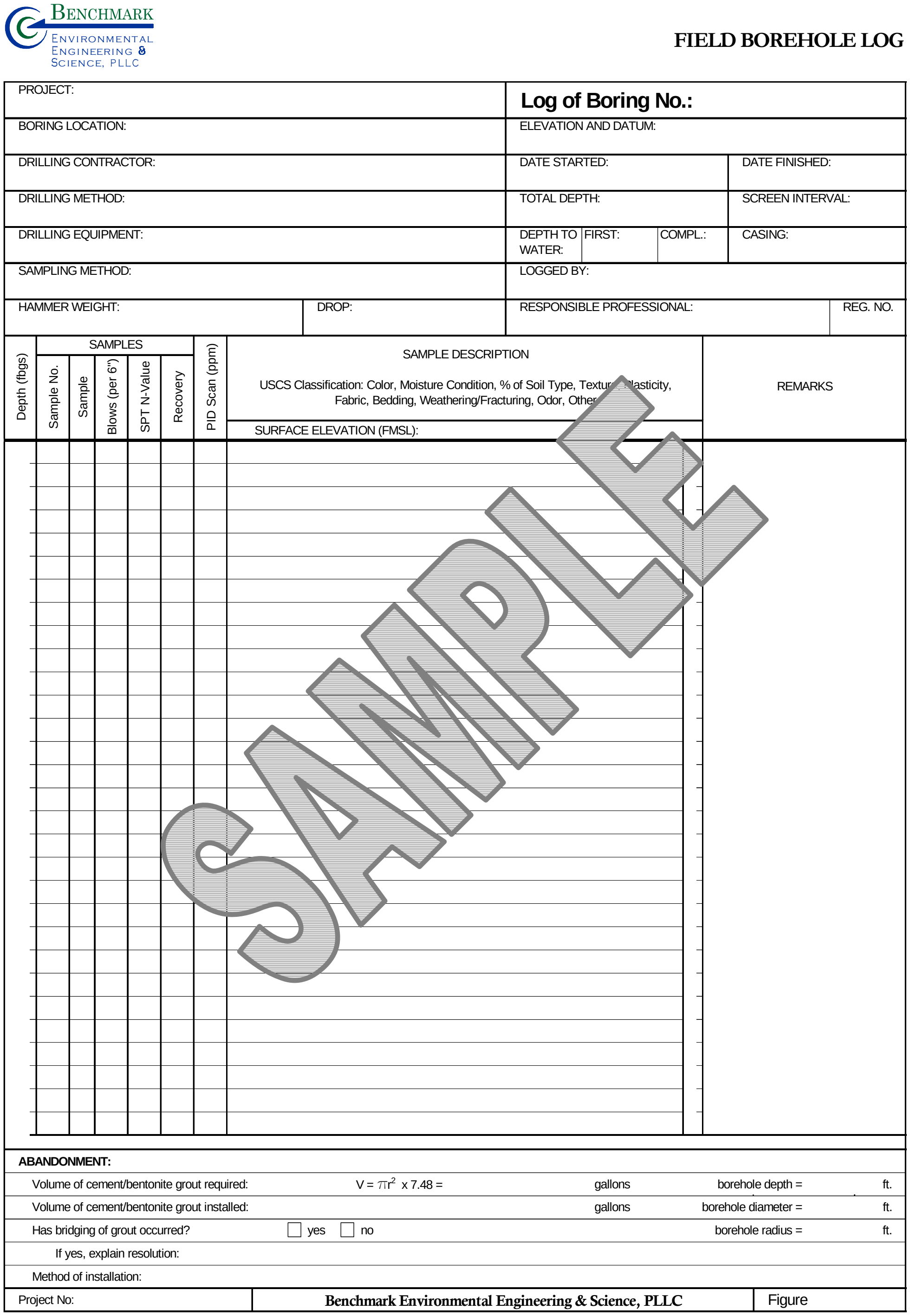
9. Record the maximum reading in parts per million by volume (ppmv) on the Field Borehole Log or Field Borehole/Monitoring Well Installation Log form (see attached samples) (see Documentation Requirements for Drilling and Well Installation FOP), at the depth interval corresponding to the depth of sample collection.

ATTACHMENTS

Field Borehole Log (sample)
Field Borehole/Monitoring Well Installation Log (sample)

REFERENCES

<u>Benchmark FOPs:</u>
010 *Calibration and Maintenance of Portable Flame Ionization Detector*
011 *Calibration and Maintenance of Portable Photoionization Detector*
015 *Documentation Requirements for Drilling and Well Installation*
058 *Split Spoon Sampling Procedures*



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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.

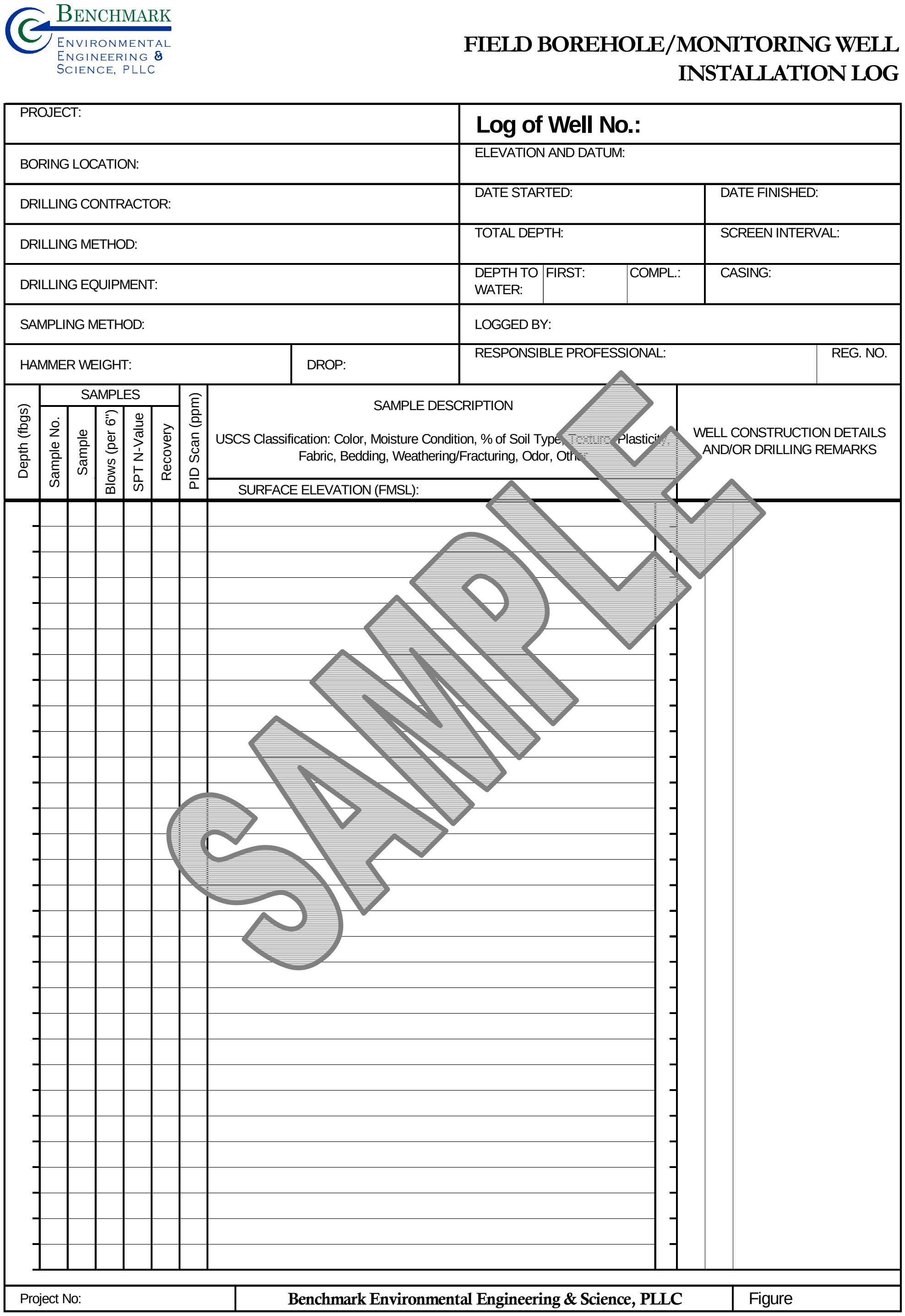
Volume of cement/bentonite grout installed: gallons borehole diameter = ft.

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					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
	Sample No.	Sample	Blows (per 6")	SPT N-Value	Recovery			

Project No:
Benchmark Environmental Engineering & Science, PLLC
Figure

TurnKey
Environmental
Restoration, LLC

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 TurnKey'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 TurnKey'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 TurnKey'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 TurnKey's FOP: Surface and Subsurface Soil Sampling Procedures.

ATTACHMENTS

Impacted Soil Excavation Log (sample)

REFERENCES

<u>TurnKey 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.)
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:

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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 Benchmark's Field Operating Procedures or manufacturers recommendations for calibration of field meters.
2. Collect desired soil sample in accordance with appropriate Benchmark 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 Benchmark'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 Benchmark's Sample Labeling, Storage and Shipment Procedures FOP.

9. All remaining soil from soil sample collection activities shall be containerized in accordance with Benchmark's Management of Investigative-Derived Waste (IDW) FOP and/or the Project Work Plan.

DESCRIPTIVE TERMS

All field soil samples will be described using the Unified Soil Classification System (USCS) presented in Figures 1 and 2 (attached). In addition to ASTM Method D2488, Method D1586, Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils (a.k.a., Standard Penetration Test, STP), when implemented, can also be used to classify the resistance of soils. In certain instances, it is desirable to supplement the USCS classification with a geologic interpretation of the soil sample that is supported by the soil descriptive terms presented in this section. The project manager should be consulted when making any geologic interpretation. Field test methods are provided to assist field personnel in classifying soil and are identified by a bold blue **FTM** and shaded. Classification of sampled soils will use the following ASTM descriptive terms and criteria:

- **Group Name** (USCS, see Figure 2)
- **Group Symbol** (USCS, see Figure 2) – only use if physical laboratory testing has been performed to substantiate. The USCS can be applied to most unconsolidated materials, and is represented by a two-letter symbol, except Peat (Pt).
    - The first letter includes: G (gravel), S (sand), M (silt), C (clay), and O (organic).
    - The second letter includes: P (poorly graded or uniform particle sizes), W (well graded or diversified particle sizes), H (high plasticity), and L (low plasticity).
    - Examples:
        - GW = well graded gravels and gravel-sand mixtures, little or no fines
        - GP = poorly graded gravels and gravel-sand mixtures, little or no fines
        - GM = silty gravels, gravel-sand-silt mixtures

    - GC = clayey gravels, gravel-sand-clay mixtures
    - SW = well graded sands and gravelly sands, little or no fines
    - SP = poorly graded sands and gravelly sands, little or no fines
    - SM = silty sand, sand-silt mixtures
    - SC = clayey sand sand-clay mixtures
    - ML = inorganic silts, very fine sands, rock flour, silty or clayey fine sands
    - CL = inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays
    - OL = organic silts and organic silty clays of low plasticity
    - MH = inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts (very rare)
    - CH = inorganic clays of high plasticity, fat clays
    - OH = organic clays of medium to high plasticity
    - Pt = peat, muck, and other highly organic soils

- **Angularity** (ASTM D2488; Table 1)
  - Angular – particles have sharp edges and relatively planar sides with unpolished surfaces
  - Subangular – particles are similar to angular description but have rounded edges
  - Subrounded – particles have nearly planar sides but have well-rounded corners and edges
  - Rounded – particles have smoothly curved sides and no edges
- **Particle Shape** (ASTM D2488; Table 2)
  - Flat – particles with width/thickness > 3
  - Elongated – particles with length/width > 3
  - Flat and Elongated – particles meet criteria for both flat and elongated
- **Moisture Condition** (ASTM D2488; Table 3)
  - Dry – absence of moisture, dusty, dry to the touch
  - Moist – damp, but no visible water
  - Wet – visible free water, usually soil is below water table
- **Reaction with Hydrochloric Acid (HCL)** (ASTM D2488; Table 4)
  - None – no visible reaction

  - Weak – some reaction, with bubbles forming slowly
  - Strong – violent reaction, with bubbles forming immediately
- **Consistency of Cohesive Soils** (ASTM D2488; Table 5)
  - Very soft – squeezes between fingers when fist is closed; easily penetrated several inches by fist (SPT = 2 or less)
  - Soft – easily molded by fingers; easily penetrated several inches by thumb (SPT = 2 to 4)
  - Firm – molded by strong pressure of fingers; can be penetrated several inches by thumb with moderate effort (SPT = 4 to 8)
  - Stiff – dented by strong pressure of fingers; readily indented by thumb but can be penetrated only with great effort (SPT = 8 to 15)
  - Very stiff – readily indented by thumbnail (SPT = 15 to 30)
  - Hard – indented with difficultly by thumbnail (SPT >30)
- **Cementation** (ASTM D2488; Table 6)
  - Weak – crumbles or breaks with handling or slight finger pressure
  - Moderate – crumbles or breaks with considerable finger pressure
  - Strong – will not crumble or break with finger pressure
- **Structure (Fabric)** (ASTM D2488; Table 7)
  - Varved – alternating 1 mm to 12 mm (0.04 – 0.5 inch) layers of sand, silt and clay
  - Stratified – alternating layers of varying material or color with the layers less than 6 mm (0.23 inches) thick; note thickness
  - Laminated – alternating layers of varying material or color with the layers less than 6 mm (0.23 inches) thick; note thickness
  - Fissured – contains shears or separations along planes of weakness
  - Slickensided – shear planes appear polished or glossy, sometimes striated

  - Blocky – cohesive soil that can be broken down into small angular lumps which resist further breakdown
  - Lensed – inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness
  - Homogeneous or Massive – same color and appearance throughout

- **Inorganic Fine-Grained Soil Characteristics** (ASTM D2488; Table 12)

  Several field tests can be performed to determine the characteristics of fine-grained soils (material passing the No. 40 sieve), such as dry strength, dilatency, and toughness. These field testing methods are described below.

  - **Dry Strength** (ASTM D2488; Table 8)

    FTM (Dry Strength): Select enough material and moisten with water until it can be molded or shaped without sticking to your fingers (slightly below the sticky limit) into a ball about 1 inch in diameter. From this ball, form three balls about ½ inch in diameter and allow to dry in air, or sun, or by artificial means (temperature not to exceed 60° C (140° F). Soil containing natural dry lumps about ½ inch in diameter may be used in place of molded balls, however the dry strengths are usually lower. Test the strength by crushing the dry balls or lumps between your fingers using the descriptions below.

    - None – the dry specimen crumbles with the slightest pressure of handling
    - Low – the dry specimen crumbles with some finger pressure
    - Medium – the dry specimen breaks into pieces or crumbles with considerable finger pressure
    - High – the dry specimen cannot be broken with finger pressure. The specimen will break into pieces between the thumb and a hard surface.
    - Very High – the dry specimen cannot be broken between the thumb and a hard surface

  - **Dilatency** (ASTM D2488; Table 9)

    FTM (Dilatency): Place enough material in your hand to form a ball approximately ½ inch in diameter and moisten with water until it can be molded or shaped without sticking to your fingers (slightly below the sticky limit). Smooth the ball in the palm of one hand with the blade of a knife or small spatula. Shake horizontally, striking the side of the hand vigorously against the other several times. Note the reaction of water appearing on the surface of the soil. The soil is said to have given a reaction to this test if, when it is shaken, water comes to the surface of the sample producing a smooth, shiny appearance. Squeeze the sample between the thumb and forefinger and note the reaction as follows:

- None – no visible change in the specimen
- Slow – water slowly appears on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing
- Rapid – water quickly appears on the surface of the specimen during shaking and disappears upon squeezing

- **Toughness** (ASTM D2488; Table 10)

  FTM (Toughness): Following the dilatency test above, shape the test specimen into an elongated pat and roll by hand on a smooth surface or between palms into a thread about 1/8 inch in diameter. Fold the sample threads and re-roll repeatedly until the thread crumbles at a diameter of about 1/8 inch (e.g., near the plastic limit). Note the pressure required to roll the thread near the plastic limit as well as the strength of the thread. After the thread crumbles, lump the pieces together and knead the lump until it crumbles. Describe the toughness as follows:

  - Low – only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and very soft.
  - Medium – medium pressure is required to roll the thread to near the plastic limit. The thread and the lump are soft.
  - High – considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump are firm.

Using the results of the dry strength, dilatency, and toughness test described above, classify the soil according to the following:

Soil Symbol	Dry Strength	Dilatency	Toughness
Silt (ML)	None to low	Slow to rapid	Low or thread cannot be formed
Lean clay (CL)	Medium to high	None to slow	Medium
Elastic Silt (MH)	Low to medium	None to slow	Low to medium
Fat Clay (CH)	High to very high	None	Low to medium high

- **Plasticity** (ASTM D2488; Table 11)

  Two field test methods can be used to determine plasticity of fine-grained soils (material passing the No. 40 sieve): the roll or thread test and the ribbon test. Each test is described below.

  FTM (Roll or Thread Test): As with the toughness test above, mix a representative portion of the soil sample with water until it can be molded or shaped without sticking to your fingers (slightly below the sticky limit). Place an elongated cylindrical sample on a nonabsorbent rolling surface (e.g., glass or was paper on a flat surface) and attempt to roll it into a thread approximately 1/8 inch in diameter. The results of this test are defined below (non-plastic to high plasticity).

  FTM (Ribbon Test): Form a roll from a handful of moist soil (slightly below the sticky limit) about ½ to ¾ inches in diameter and about 3 to 5 inches long. Place the material in the palm of your hand and, starting at one end, flatten the roll between your thumb and forefinger to form the longest and thinnest ribbon possible that can be supported by the cohesive properties of the material before breaking. If the soil sample holds together for a length of 6 to 10 inches without breaking, the material is considered to be both highly plastic and highly compressive (Fat Clay, CH). If the soil cannot be ribboned, it is non-plastic (Silt, ML or MH). If it can be ribboned only with difficulty into short lengths, it has low plasticity (Lean Clay, CL). Use the following terms to describe the plasticity of soil:

  - Nonplastic (ML or MH) – a 3 mm (0.12 inches) thread cannot be rolled at any water content
  - Low Plasticity (CL, ML, or MH) – the thread can barely be rolled, and crumbles easily
  - Medium Plasticity (CL) – the thread is easy to roll and not much time is required to reach the plastic limit before crumbling
  - High Plasticity (CH) – it takes considerable time rolling and kneading to reach the plastic limit; the thread can be rolled several times before crumbling

Note: A soil with as little as 20% clay will behave as a clayey soil. A soil needs 45% to over 60% medium to coarse sand to behave as a sandy soil. In a soil with 20% clay and 80% sand, the soil will behave as a clayey soil.

- **Relative Density of Cohesionless (Granular) Soils**
  - Very loose – easily penetrated 30 cm (1.2 inches) with 13 mm (0.5 inch) rebar pushed by hand (SPT = 0 to 4)
  - Loose – easily penetrated several cm with 13 mm (0.5 inch) rebar pushed by hand (SPT = 4 to 10)
  - Medium dense – easily to moderately penetrated with 13 mm (0.5 inch) rebar driven by 2.3 kg (6 pound) hammer (SPT = 10 to 30)
  - Dense – penetrated 0.3 m (1 foot) with difficulty using 13 mm (0.5 inch) rebar driven by 2.3 kg (6 pound) hammer (SPT = 30 to 50)
  - Very dense – penetrated only a few cm with 13 mm (0.5 inch) rebar driven by 2.3 kg (6 pound) hammer (SPT = >50)
- **Color** (use Munsel® Color System, as necessary)
- **Particle Size** (see Figure 3)
  - Boulder – larger than a basketball
  - Cobble – grapefruit, orange, volleyball
  - Coarse Gravel – tennis ball, grape

  - Fine Gravel – pea
  - Coarse Sand – rock salt
  - Medium Sand – opening in window screen
  - Fine Sand – sugar, table salt
  - Fines (silt and clay) – cannot visually determine size (unaided)

- **Gradation**
  - Well Graded (GW, SW) – full range and even distribution of grain sizes present
  - Poorly-graded (GP, SP) – narrow range of grain sizes present
  - Uniformly-graded (GP, SP) – consists predominantly of one grain size
  - Gap-graded (GP-SP) – within the range of grain sizes present, one or more sizes are missing

- **Organic Material** – Organic soils usually have a dark brown to black color and may have an organic odor. Often, organic soils will change color, for example, black to brown, when exposed to the air. Some organic soils will lighten in color significantly when air-dried. Organic soils normally will not have a high toughness or plasticity. The thread of the toughness test will be spongy.
  - PEAT – 50 to 100 percent organics by volume, primary constituent
  - Organic (soil name) – 15 to 50 percent organics by volume, secondary organic constituent
  - (Soil name) with some organics – 5 to 15 percent organics by volume, additional organic constituents

- **Fill Materials** – All soils should be examined to see if they contain materials indicative of man-made fills. Man-made fill items should be listed in each of the soil descriptions. Common fill indicators include glass, brick, dimensioned lumber, concrete, pavement sections, asphalt, metal, plastics, plaster etc. Other items that could suggest fill include buried vegetation mats, tree limbs, stumps etc. The soil description for a fill material should be followed by the term “FILL”, i.e., for a sandy silt with some brick fragments the description would be “SANDY

SILT (ML), with brick fragments (Fill)". The size and distribution of fill indicators should be noted. The limits (depth range) of fill material should be determined and identified at each exploration location.

- **Other Constituents/Characteristics**
  - Additional constituents and/or pertinent soil characteristics not included in the previous categories should be described depending on the scope and objectives of the project. Observations that may be discussed include:
    - Oxide staining
    - Odor
    - Origin
    - Presence of root cast
    - Presence of mica
    - Presence of gypsum
    - Presence of calcium carbonate
    - Percent by volume of cobbles & boulders with size description and appropriate rock classification
  - Other pertinent information from the exploratory program should be recorded, if it would be useful from a biddability/constructability perspective. The conditions that should be listed include caving or sloughing, difficulty in drilling and groundwater infiltration.

SOIL DESCRIPTIONS

Generally, soil descriptions collected during most investigations are not intended for civil engineering (construction) purposes, but rather for hydrogeologic and contaminant transport purposes. As such, the ASTM visual-manual assessments are somewhat limited in that they are only performed in order to indicate important information about potential hydraulic properties of a soil. Soil descriptions should be concise, stressing major constituents and characteristics, and should be given in a consistent order and format. The following order is recommended:

- Soil name. The basic name of the predominant grain size and a single-word modifier indicating the major subordinate grain size (i.e., mostly clay with some silt). The feel test can be used to determine the texture of the soil by rubbing some moist soil between your fingers; sand feels gritty, silt feels smooth, and clays feel sticky. The terms representing percentages of grain size to be used include:
  - Trace – particles are present, but estimated to be less than 5%
  - Few – 5 to 10%
  - Little – 15 to 25%
  - Some – 30 to 45%
  - Mostly – 50 to 100%
- Color (using Munsell® charts, as necessary). Color is an important property in identifying organic soils, and within a given locality it may also be useful in identifying materials of similar geologic origin. It the sample contains layers or patches of varying colors (e.g., mottled), this shall be noted and all representative colors shall be described. The color shall be described for moist samples, however if the color represents a dry condition, it must be stated as such in the log. Generally, colors become darker as the moisture content increases and lighter as the soil dries. Examples include:
  - Some fine-grained soils (OL, OH) with dark drab shades of brown or gray, including almost black, contain organic colloidal matter.
  - In contrast, clean, bright looking shades of gray, olive green, brown, red, yellow, and white are associated with inorganic soils.
  - Gray-blue or gray- and yellow-mottled colors frequently result from poor drainage.
  - Red, yellow, and yellowish brown result from the presence of iron oxides.

  - White to pink may indicate considerable silica, calcium carbonate, or aluminum compounds.
- Field moisture condition as dry, moist, or wet;
- Gradation or Plasticity. Granular soils (i.e., sands or gravels) should be described as well-graded, poorly graded, uniform, or gap-graded, depending on the gradation of the minus 3-inch fraction. Cohesive soils (i.e., silts and clays) should be described as non-plastic, low, medium, or high, depending on the results of the manual evaluation for dry strength, dilatency, toughness, and plasticity discussed previously.
- Consistency/Density. An estimate of consistency of a cohesive soil or density of a granular soil, usually based on the SPT results (see Descriptive Terms section of this FOP);
- Soil Structure or Mineralogy. Description of discontinuities, inclusions, and structures, including joints, fissures, and slickensides.
- Odor. Describe the odor if organic or unusual. Soils containing a significant amount of organic material usually have a distinctive odor of decaying vegetation. This is especially apparent in fresh samples, but if the samples are dried, the odor may often be revived by heating a moistened sample. If the odor is unusual (petroleum, chemical, etc.), it should be noted in the log.
- Other important geologic information such as consolidation, gravel size and shape, visible internal structure, root holes, mica, odors, etc.

The first step when describing soil is to determine if the sample is predominantly fine-grained or coarse-grained (see Figures 3 and 4). Coarse-grained soils are relatively easy to identify, however descriptions of fine-grained soils can be more difficult, requiring additional field tests to assist the field geologist arrive at the proper soils classification (see **FTMs** under Descriptive Terms above). These tests are explained in detail in the ASTM Standard D2488 and briefly herein. Generally, the differentiation between silt and clay is based on plasticity and "texture". However, tests for dry strength and dilatency, along with plasticity, can be very helpful and are recommended in the ASTM Standard. If additional tests are performed, in addition to plasticity, to classify the fines, record them with the soil description on the logs. Doing this will assist the reader (i.e., Project Manager) to follow the logic used to describe a soil (e.g., medium plasticity, low dry strength = elastic silt [MH]; not a lean clay [CL]).

Fines described in the classification should be modified by their plasticity (e.g., non-plastic fines, low plasticity fines, etc.) reserving the words "silt" and "clay" for the soil name.

In summary, adhering to the ASTM Standard and the guidelines outlined in this FOP will provide uniformity in soil descriptions provided by all field personnel. Prior to mobilization to the field, field staff should make sure to have laminated copies of the ASTM Standard flow charts and tables as well as this FOP (as necessary). Some examples of complete soil descriptions are as follows:

Coarse-grained Soil

POORLY GRADED FINE SAND w/ SILT: Dark grey, wet, mostly fine sand with some non-plastic fines, some iron-stained mottling, laminated, medium dense

Fine-grained Soil

LEAN CLAY: Dark reddish/brown, moist, mostly fines, medium plasticity, firm, no dilatency, medium dry strength, root holes.

Soil/Fill (option 1) – visual evidence of fill

FILL: Black, moist, mostly fines with some fine sand, slag, cinders, metal, brick, non-plastic, loose when disturbed, strong odor

Soil/Fill (option 2) – no visual evidence of fill, suspected reworked material

FILL (reworked): Black, moist, mostly fines with some fine sand and few coarse angular gravel, non-plastic, hard, loose when disturbed, mild odor

BORING AND MONITORING WELL INSTALLATION LOGS

Currently, Benchmark utilizes WinLoG software to construct subsurface logs and a template of the log is included in this FOP as an example. One of the most important functions of a boring/monitoring well installation log, besides transmitting the soil description, is to indicate where the "data" (soil samples) were collected, giving the reader an idea of how reliable or representative the description is. On each sample log, depths of attempted and recovered or non-recovered interval are shown. Odor, if noted, should be considered subjective and not necessarily indicative of specific compounds or concentrations.

Remember: all field logs should be NEAT, ACCURATE, and LEGIBLE. Don't forget that the well completion diagram completed for each well requires details of the surface completion (i.e., flush-mount, stick-up etc.). It is the responsibility of the field staff to double-check each log (i.e., soil names, classifications, well construction details etc.) prior to implementing into a final report. A registered professional (i.e., professional engineer, PE or professional geologist, PG) must review each log and will be ultimately responsible for its content and accuracy.

REQUIRED EQUIPMENT

- Knife
- Engineer's rule/measuring tape

- Permanent marker
- Pre-cleaned wide-mouth sample jars (typically provided by the driller)
- Pre-cleaned wide-mouth laboratory sample jars (provided by the laboratory)
- Stainless steel sampling equipment (i.e., spoons, spatulas, bowls etc.)
- 10x hand lens
- Hydrochloric acid
- ASTM D2488 flow charts (preferably laminated)
- ASTM D2488 test procedures (Tables 1 through 12) (preferably laminated)
- Camera (disposable, 35 mm or digital)
- Munsell soil color chart (as necessary)
- Project Field Book/field forms

ATTACHMENTS

Figure 1; Field Guide for Soil and Stratigraphic Analysis
Figure 2; USCS Soil Classification Flow Chart (modified from ASTM D2488)
Figure 3; Illustration of Particle Sizes
Figure 4; Grain-Size Scale (Modified Wentworth Scale)

Field Borehole Log (sample)

REFERENCES

American Society for Testing and Materials, 2008a. *ASTM D1586: Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.*

American Society for Testing and Materials, 2010. *ASTM D2487: Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).*

American Society for Testing and Materials, 2009a. *ASTM D2488: Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).*

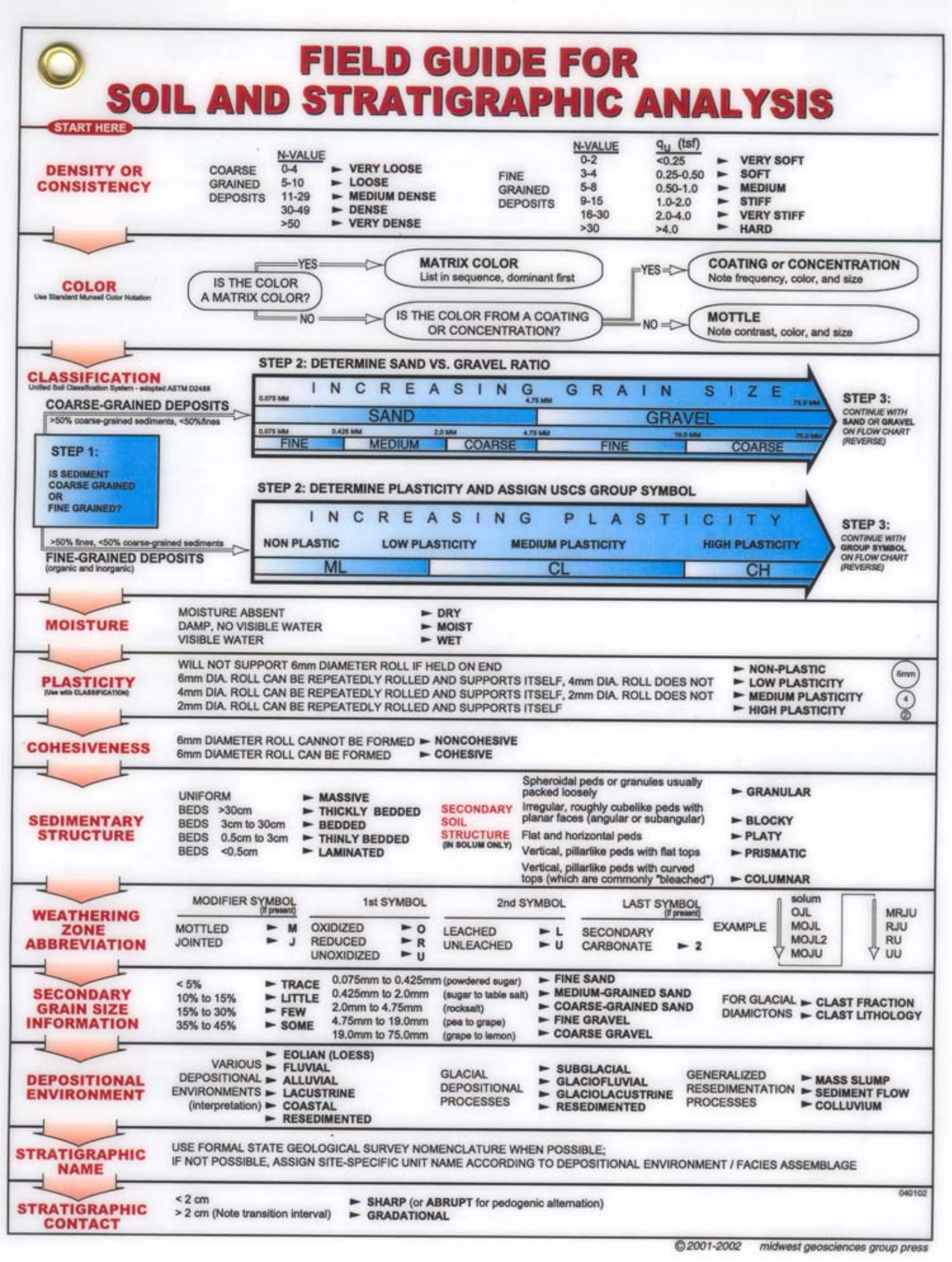
State of California, Department of Transportation, Engineering Service Center, Office of Structural Foundations, August 1996. *Soil & Rock Logging Classification Manual (Field Guide), by Joseph C. de Larios.*

Benchmark 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 — SAND — 4.75 MM — GRAVEL — 75.0 MM
0.075 MM — FINE — 0.425 MM — MEDIUM — 2.0 MM — COARSE — 4.75 MM — FINE — 19.0 MM — COARSE — 75.0 MM

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

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

< 2 cm ► SHARP (or ABRUPT for pedogenic alternation)
> 2 cm (Note transition interval) ► GRADATIONAL

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SOIL DESCRIPTION PROCEDURES USING THE VISUAL-MANUAL METHOD

FIGURE 2

USCS SOIL CLASSIFICATION FLOW CHART (MODIFIED FROM ASTM D2488)

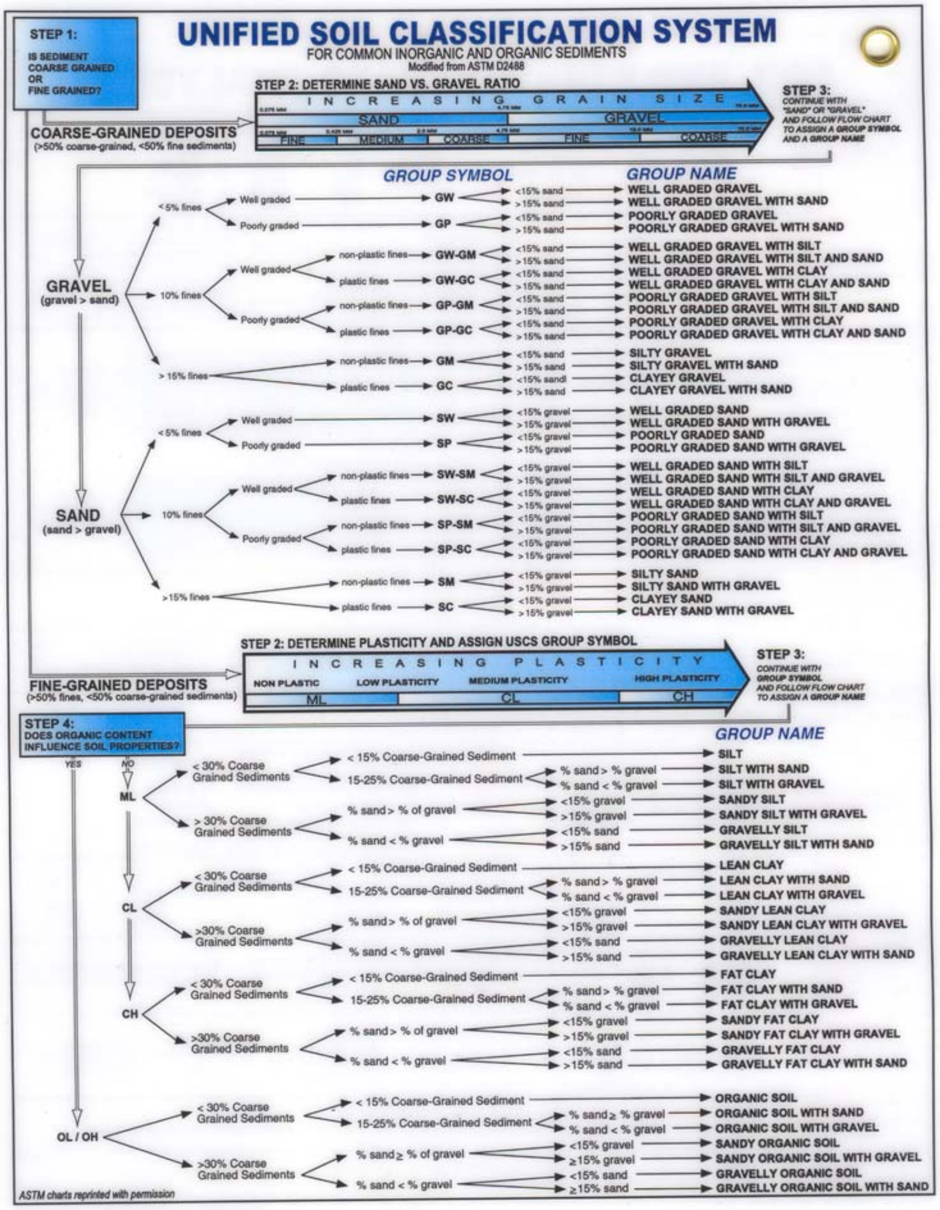


FIGURE 3

ILLUSTRATION OF PARTICLE SIZES

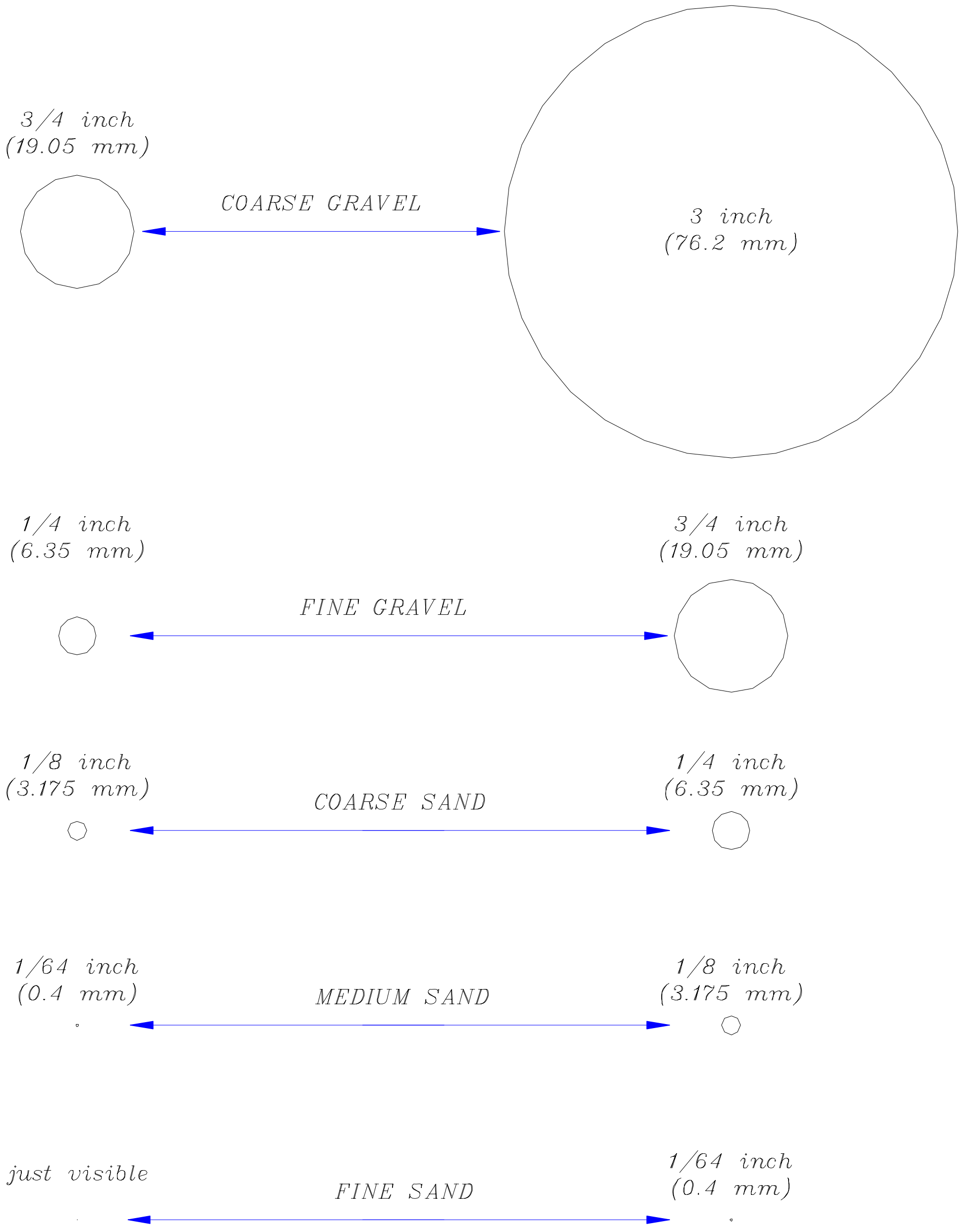


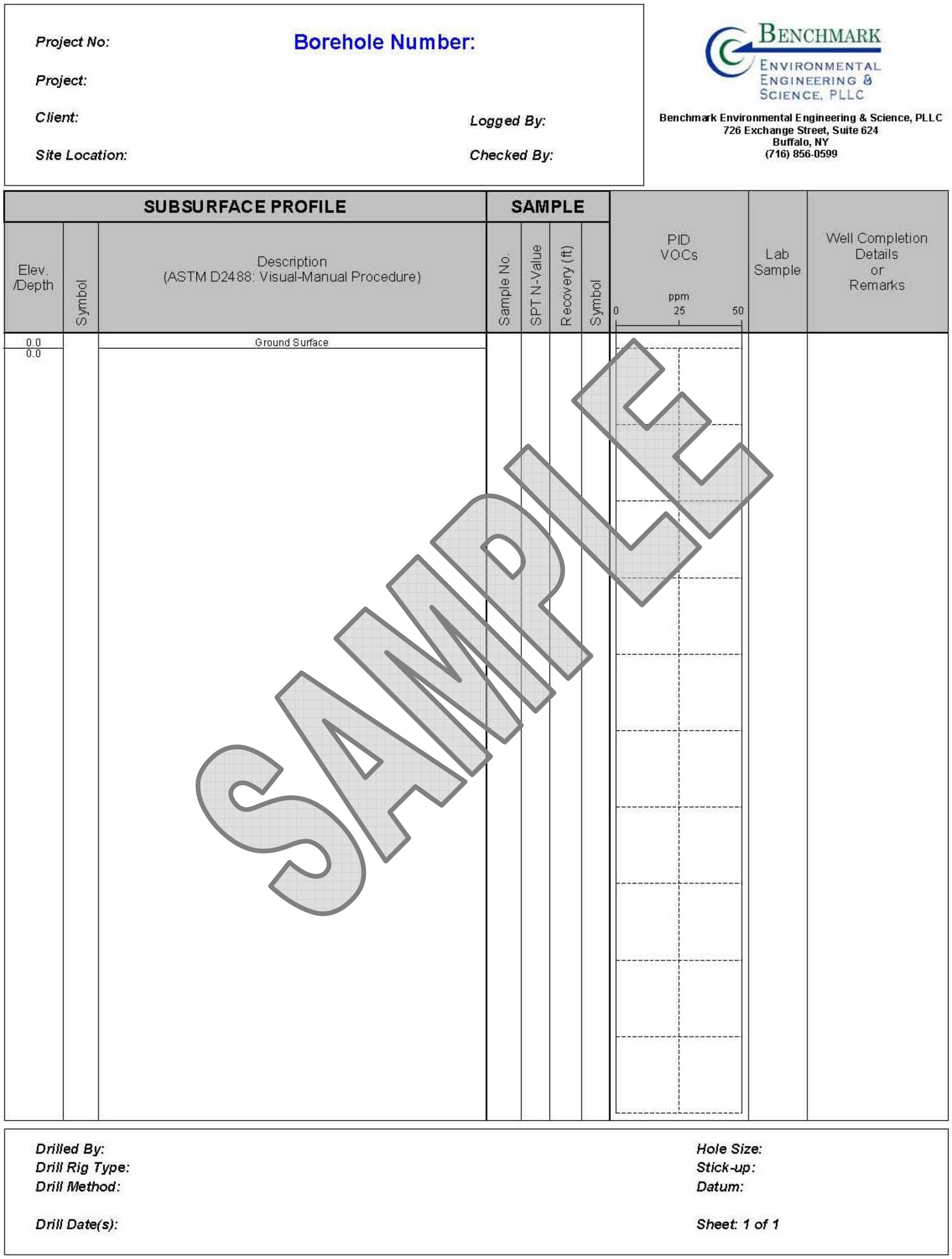
FIGURE 4

GRAIN-SIZE SCALE (MODIFIED WENTWORTH SCALE)

Grain size refers to the physical dimensions of particles of rock or other solid. This is different from the crystallite size, which is the size of a single crystal inside the solid (a grain can be made of several single crystals). Grain sizes can range from very small colloidal particles, through clay, silt, sand, and gravel, to boulders. Size ranges define limits of classes that are given names in the Wentworth scale used in the United States. The Krumbein *phi* (φ) scale, a modification of the Wentworth scale created by W. C. Krumbein, is a logarithmic scale computed by the equation: $\varphi = -\log_2(\text{grain size in mm})$.

φ scale	Size range (metric)	Size range (approx. inches)	Aggregate name (Wentworth Class)
< −8	> 256 mm	> 10.1 in	Boulder
−6 to −8	64–256 mm	2.5–10.1 in	Cobble
−5 to −6	32–64 mm	1.26–2.5 in	Very coarse gravel
−4 to −5	16–32 mm	0.63–1.26 in	Coarse gravel
−3 to −4	8–16 mm	0.31–0.63 in	Medium gravel
−2 to −3	4–8 mm	0.157–0.31 in	Fine gravel
−1 to −2	2–4 mm	0.079–0.157 in	Very fine gravel
0 to −1	1–2 mm	0.039–0.079 in	Very coarse sand
1 to 0	½–1 mm	0.020–0.039 in	Coarse sand
2 to 1	¼–½ mm	0.010–0.020 in	Medium sand
3 to 2	125–250 µm	0.0049–0.010 in	Fine sand
4 to 3	62.5–125 µm	0.0025–0.0049 in	Very fine sand
8 to 4	3.90625–62.5 µm	0.00015–0.0025 in	Silt
> 8	< 3.90625 µm	< 0.00015 in	Clay
<10	< 1 µm	< 0.000039 in	Colloid

In some schemes "gravel" is anything larger than sand (>2.0 mm), and includes "granule", "pebble", "cobble", and "boulder" in the above table. In this scheme, "pebble" covers the size range 4 to 64 mm (−2 to −6 φ).



Project No: **Borehole Number:**

Project:

Client: *Logged By:*

Site Location: *Checked By:*

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

TurnKey
Environmental
Restoration, LLC

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

PROCEDURE

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

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

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

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

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

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

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

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

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

10. Remove the split-spoon sampler from the sampling string and place on the plastic-covered surface.

11. Open the split-spoon sampler only when the TurnKey field geologist is prepared to describe and manage the sample.

12. Describe the sample in accordance with the Unified Soil Classification System in accordance with the TurnKey's FOP: Soil Description Procedures Using the Unified Soil Classification System (USCS).

13. Record all information in accordance with TurnKey's FOP: Documentation Requirements for Drilling and Well Installation.

14. Collect a portion of the sample for field screening as described in the TurnKey's FOP: Screening of Soil Samples for Organic Vapors During Drilling Activities.

15. If applicable, collect soil samples for volatile organic constituents (VOCs). If applicable, collect sample for semi-volatile, metals, geotechnical, or other off-site analysis.

16. The samples will be labeled, stored and shipped in accordance with the TurnKey's FOP: Sample Labeling, Storage and Shipment Procedures.

ATTACHMENTS

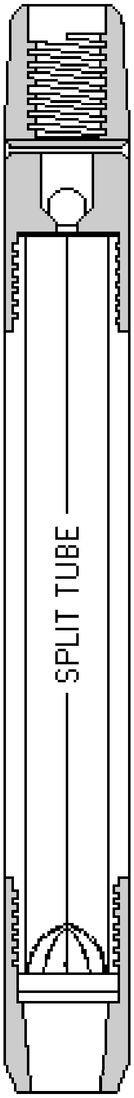
Figure 1; Split Spoon Sampler Schematic

REFERENCES

<u>TurnKey FOPs:</u>
015 *Documentation Requirements for Drilling and Well Installation*
046 *Sample Labeling, Storage and Shipment Procedures*
047 *Screening of Soil Samples for Organic Vapors During Drilling Activities*
054 *Soil Description Procedures Using the Unified Soil Classification System (USCS)*

FIGURE 1

SPLIT SPOON SAMPLER SCHEMATIC



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FIELD OPERATING PROCEDURES

Surface and Subsurface Soil Sampling Procedures

FOP 063.2

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 Benchmark's Field Operating Procedures or manufacturers recommendations for calibration of field meters.
4. Commence intrusive activities in accordance with specific Benchmark 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 Benchmark'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 Benchmark's Non-disposable and Non-dedicated Sampling Equipment Decontamination procedures.
7. Collect soil samples in accordance with the following sections.

SURFACE SOIL/FILL SAMPLING PROCEDURES

Collection of surface soil/fill samples facilitates the evaluation of potential health risks to current site receptors that may be exposed to soil/fill via direct contact, incidental ingestion, or inhalation of airborne particulates. The following procedure is in accordance with NYSDEC sampling protocol of surface soil/fill material.

1. Collect all soil samples using dedicated (or decontaminated non-dedicated) sampling tools (i.e., spoons, trowels, bowls etc.), preferably constructed of stainless steel.

2. If the sample area is vegetated, then collect the surface soil sample from 0 to 2 inches below ground surface (bgs) following removal of the sod.

3. If there is no soil present within the sample area (i.e., only slag, concrete, mixed with fines), excavate an area 12 inches by 12 inches by 6 inches deep, screen the material to less than 1/8 inch (No. 4 sieve), and submit the screened material for analysis. If there is not enough material to completely fill the sample jar, then expand the excavation 3 inches in all four directions screening the additional material. Expand the excavation in this manner until sufficient sample volume is obtained. Volatile organic analysis of surface soil/fill utilizing this method will yield negatively biased results and should not be performed.

SURFACE/SUBSURFACE SOIL SAMPLING PROCEDURES

1. Collect all soil samples using dedicated (or decontaminated non-dedicated) sampling tools (i.e., spoons, trowels, bowls etc.), preferably constructed of stainless steel.

   Surface soil samples are typically collected from 0 to 6 inches below ground surface (bgs). Subsurface soils are typically sampled from varying depths greater than 6-inches bgs based on field observations and as directed by the Project Work Plan.

2. Transfer samples for chemical (VOC, SVOC, Metals etc.) and physical (i.e., Atterberg Limits, Grain Size, Permeability etc.) analytical testing by direct grab (i.e., directly from the bucket of the excavation equipment, split-spoon sampler, hand auger etc.) using the dedicated (or decontaminated non-dedicated) sampling tools into appropriate laboratory-supplied containers and seal. The chemical or physical laboratory selected to perform the analysis should determine minimum sample volume for analysis.

3. Prepare collected samples in accordance with Benchmark'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 Benchmark log sheets depending on method of intrusion (i.e., drilling, test pitting, hand augering etc.); and on the Soil/Sediment Sample Collection Summary Log (sample attached).

PARAMETER-SPECIFIC PROCEDURES

1. Volatile Organic Compound (VOCs): Transfer sufficient soil volume to fill the laboratory-supplied container (typically 4 ounces) by packing the soil sample with the sampling tool to the top of the container leaving no headspace. At no time should a gloved hand (i.e., latex, nitrile etc.) be used to pack the sample into the sample container as the sample may be compromised via cross-contamination.

2. All Other Parameters: All other parameters include, but are not limited to, Semi-VOCs (SVOCs), polychlorinated biphenyls (PCBs), herbicides, pesticides, total metals etc. Transfer sufficient soil volume to fill the laboratory-supplied container by packing the soil sample with the sampling

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>Benchmark 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

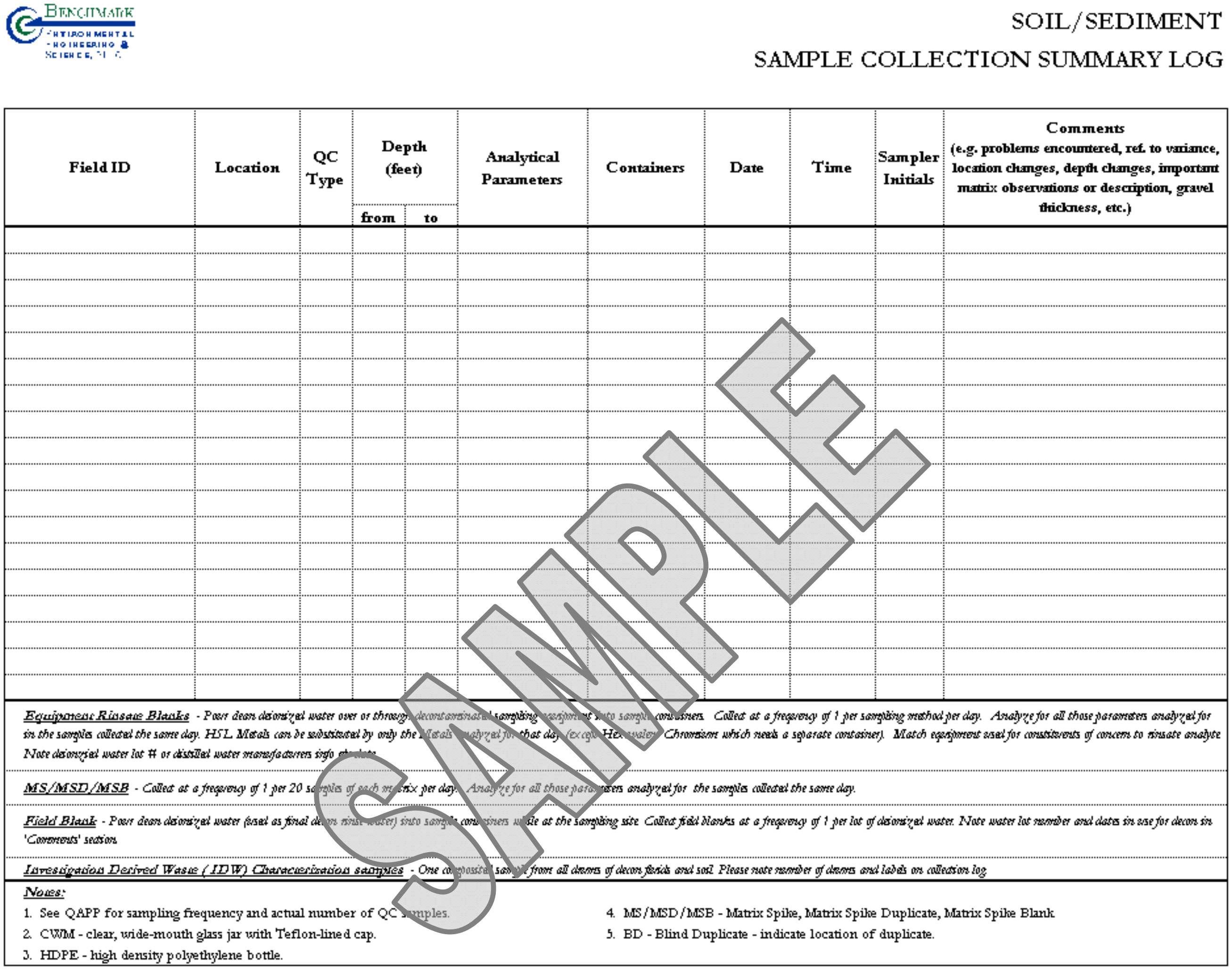
New Equipment:

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 [illegible]*

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/m³)	Other	

NOTE: SEE EQUIPMENT CALIBRATION LOG FOR DESCRIPTION OF EQUIPMENT TYPE.

Prepared By: Date:

BENCHMARK
ENVIRONMENTAL
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SCIENCE, PLLC

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 Benchmark'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 Benchmark'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 Benchmark 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 Benchmark'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 Benchmark 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.

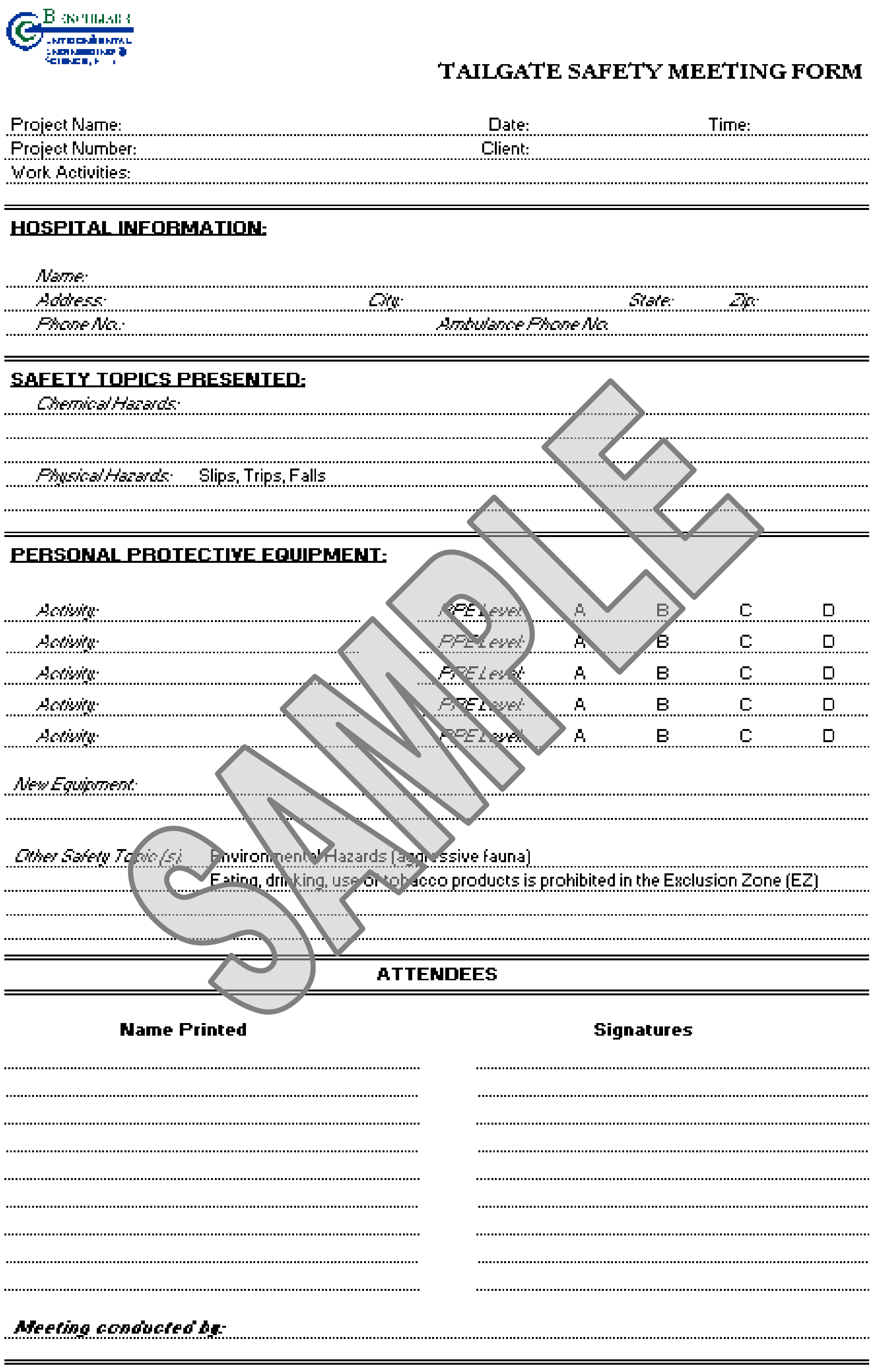
ATTACHMENTS

Tailgate Safety Meeting Form (sample)
Real Time Air Monitoring Log (sample)
Test Pit Excavation Log (sample)

REFERENCES

Benchmark 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:

BENCHMARK ENVIRONMENTAL ENGINEERING & SCIENCE, PLLC

REAL TIME AIR MONITORING LOG

Date:
Project Name:
Project Number:
Project Location:
Client:
Purpose of Air Monitoring:

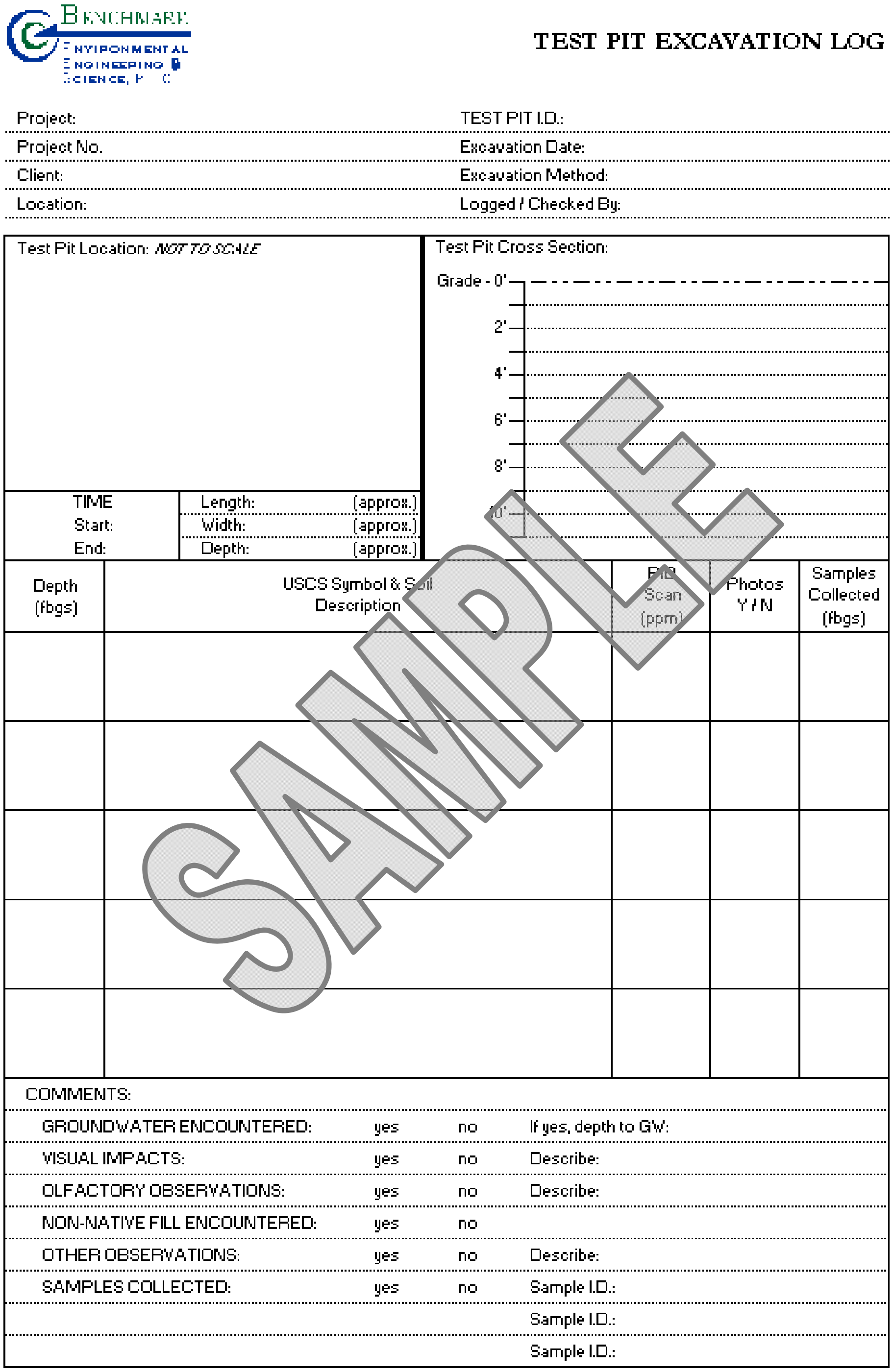
WEATHER CONDITIONS:

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:



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:

Grade - 0'
2'
4'
6'
8'
10'

TIME	Length: (approx.)
Start:	Width: (approx.)
End:	Depth: (approx.)

Depth (fbgs)	USCS Symbol & Soil Description	PID Scan (ppm)	Photos Y / N	Samples Collected (fbgs)

COMMENTS:

GROUNDWATER ENCOUNTERED:	yes	no	If yes, depth to GW:
VISUAL IMPACTS:	yes	no	Describe:
OLFACTORY OBSERVATIONS:	yes	no	Describe:
NON-NATIVE FILL ENCOUNTERED:	yes	no	
OTHER OBSERVATIONS:	yes	no	Describe:
SAMPLES COLLECTED:	yes	no	Sample I.D.:
			Sample I.D.:
			Sample I.D.:

BENCHMARK
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SCIENCE, PLLC

FIELD OPERATING PROCEDURES

Real-Time Air Monitoring During Intrusive Activities

FOP 073.2

REAL-TIME AIR MONITORING DURING INTRUSIVE ACTIVITIES PROCEDURE

PURPOSE

This guideline presents requirements for real-time community air monitoring and required responses during all project required intrusive activities, such as drilling, test pitting, earthwork construction etc. This procedure is consistent with the requirements for community air monitoring for all intrusive projects, including projects conducted at remediation sites, as established by the New York State Department of Health (NYSDOH) and the New York State Department of Environmental Conservation (NYSDEC). Accordingly, it follows procedures and practices outlined under NYSDEC's DER-10 (May 2010) Appendix 1A (NYSDOH's Generic Community Air Monitoring Plan) and Appendix 1B (Fugitive Dust and Particulate Monitoring).

This FOP requires real-time monitoring for constituents of concern (COC) (i.e., volatile organic compounds (VOCs), lower explosive limit (% LEL), particulates (i.e., dust) etc.) at the upwind and downwind perimeter as well as the exclusion zone of a project site during all intrusive activities. This FOP is not intended for use in establishing action levels for worker respiratory protection (see Project Health and Safety Plan (HASP) for worker protection action levels). Rather, its intent is to provide a measure of protection for the surrounding community from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The community, as referenced in this document, includes any off-site residences, public buildings/grounds and commercial or industrial establishments adjacent to the project site. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, this FOP helps to confirm that work activities did not spread contamination off-site through via air transport mechanisms. Community air monitoring shall be integrated with the construction worker personal exposure-monitoring program contained in the project and site-specific HASP.

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

MONITORING & MITIGATION PROCEDURE

Real-time air monitoring perimeter locations for monitoring stations will be established based on the location of the exclusion zone (i.e., immediate work area) and wind direction. Where wind direction is shifting or winds are calm, the downwind monitoring location will default to the perimeter location nearest the most sensitive receptor (i.e., residential property). All downwind receptors being equal, the downwind monitoring location will default to the perimeter location downwind of the prevailing winds at the site. Although additional site specific COCs may be monitored during real-time air monitoring activities, the most common COCs are discussed in this FOP, including organic vapors (i.e., VOCs), airborne particulates (i.e., fugitive dust) and combustible gases (i.e., methane) and oxygen.

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

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

ORGANIC VAPORS

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

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

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

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

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

- **<u>Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures</u>**

    - When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 ppm, monitoring should occur within the occupied structure (s). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 mcg/m3, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 mcg/m3 or less at the monitoring point.

- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen SUlfide, carbon monoxide) may also need to be monitored Response levels and actions should be pre-determined, as necessary, for each site.

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

Major Vapor Emission Response Plan

Upon activation of Major Vapor Emission Response Plan, the following activities will be undertaken:

1. All Emergency Response Contacts as listed below and in the Site-Specific Health and Safety Plan will be contacted.
2. The local police authorities will immediately be contacted by the Site Safety and Health Officer and advised of the situation.
3. The Site Safety and Health Officer will determine if site workers can safely undertake source abatement measures. Abatement measures may include covering the source area with clean fill or plastic sheeting, or consolidating contaminated materials to minimize surface area. The Site Safety and Health Officer will adjust worker personal protective equipment as necessary to protect workers from over-exposure to organic vapors.

The following personnel are to be notified by the Site Safety and Health Officer in the listed sequence if the Major Vapor Emission Response Plan is activated:

Contact	Phone
Police/Fire Department	911
New York State DOH	(518) 402-7860
New York State DEC Region 8	(585) 226-2466, switchboard

New York State DEC Region 9	(716) 851-7220
State Emergency Response Hotline	(800) 457-7362

In addition, the Site Safety and Health Officer will provide these authorities with a description of the apparent source of the contamination and abatement measures being taken by the contractor, if any.

AIRBORNE PARTICULATES

Fugitive dust suppression and airborne particulate monitoring shall be performed during any intrusive activities involving disturbance or handling of site soil/fill materials. Fugitive dust suppression techniques will include the following minimum measures:

- Spraying potable water on all excessively dry work areas and roads.
- All fill materials leaving the site will be hauled in properly covered containers or haul trailers.
- Additional dust suppression efforts may be required as discussed below.

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

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (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

TurnKey FOPs:
006 *Calibration and Maintenance of Combustible Gas/Oxygen Meter*
010 *Calibration and Maintenance of Flame Ionization Detector*
011 *Calibration and Maintenance of Portable Photoionization Detector*
084 *Calibration and Maintenance of Portable Particulate Meter*

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:

TurnKey
Environmental
Restoration, LLC

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 TurnKey's Field Operating Procedure (FOP) for Drill Site Selection Procedure prior to implementing any drilling activity.
2. Perform drill rig safety checks with the driller by completing the Drilling Safety Checklist form (sample attached).
3. Conduct tailgate health and safety meeting with project team and drillers by completing the Tailgate Safety Meeting Form (sample attached).
4. Calibrate air-monitoring equipment in accordance with the appropriate TurnKey's FOPs or manufacturers recommendations.
5. Ensure all drilling equipment (i.e., rods, 4-foot sampler, dedicated PVC sleeves) appear clean and free of soil prior to initiating any subsurface intrusion. Decontamination of drilling equipment should be in accordance with TurnKey's Drilling and Excavation Equipment Decontamination Procedures FOP.
6. Mobilize the Geoprobe™ rig to the site and position over the borehole.
7. Level and stabilize the rig and recheck the rig location against the planned drilling location.

8. Fully advance the sampler into the subsurface using an ATV-mounted direct-push Geoprobe™ drill rig and 1.5-inch diameter sampler, typically 4-feet in length and fitted with a dedicated PVC sleeve, for each four-foot core of soil.

9. Retrieve the 4-foot sample core from the driller, place on a piece of polyethylene tarp, and cut open using a sharp utility knife.

10. Visually characterize each 4-foot soil core using the Unified Soil Classification System (USCS) in accordance with TurnKey's Soil Description Procedures Using the USCS FOP.

11. Scan each 4-foot core for total volatile organic vapors with a calibrated Photovac 2020 PID equipped with a 10.6 eV lamp, and report any visual and/or olfactory observations. Record PID scan measurements in the Project Field Book and appropriate field forms.

12. If required, collect a representative soil sample for headspace determinations. In general, soil samples representative of each 4-foot core interval are collected, placed in a sealable plastic bag, and kept at or near room temperature (approximately 65-70° F) for a minimum of 15 minutes prior to measurement. Record PID headspace determination measurements in the Project Field Book and appropriate field forms.

13. Check sampler and rods periodically during drilling to ensure the boring is plumb. Adjust rig position as necessary to maintain plumb.

14. Continue drilling until reaching the assigned total depth, or until sampler refusal occurs. Sampler refusal is when the drilling penetration drops below 0.1 feet per 2 minutes, with the full weight of the rig on the sampler.

15. Plug and abandon boreholes not used for temporary well installation in accordance with TurnKey's Field Operating Procedure for Abandonment of Borehole. Boreholes to be used as temporary wells should be completed in accordance with TurnKey's Temporary Well (Piezometer) Construction Procedures FOP.

16. Decontaminate all non-dedicated drilling tools between boring locations using potable tap water and a phosphate-free detergent (i.e., Alconox™) in accordance with TurnKey's Drilling and Excavation Equipment Decontamination Procedures FOP.

OTHER PROCEDURAL ISSUES

- Borings will not be over drilled (rat holed) without the express permission of the TurnKey field supervisor. All depth measurements should be accurate to the nearest 0.1 foot, to the extent practicable.

- Potable water may be placed in the sampler stem if critically necessary for borehole control or to accomplish sampling objectives. This will be performed only with the express permission of the TurnKey field supervisor.

ATTACHMENTS

Drilling Safety Checklist (sample)
Tailgate Safety Meeting Form (sample)

REFERENCES

<u>TurnKey FOPs:</u>
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

DRILLING SAFETY CHECKLIST

Project:
Date:
Project No.:
Drilling Company:
Client:
Drill Rig Type:

ITEMS TO CHECK	OK	ACTION NEEDED
“Kill switches” installed by the manufacturer are in operable condition and all workers at the drill site are familiar with their location and how to activate them?		
“Kill switches” are accessible to workers on both sides of the rotating stem? NOTE: Optional based on location and number of switches provided by the manufacturer.		
Cables on drill rig are free of kinks, frayed wires, “bird cages” and worn or missing sections?		
Cables are terminated at the working end with a proper eye splice, either swaged Coupling or using cable clamps?		
Cable clamps are installed with the saddle on the live or load side? Clamps should not be alternated and should be of the correct size and number for the cable size to which it is installed. Clamps are complete with no missing parts?		
Hooks installed on hoist cables are the safety type with a functional latch to prevent accidental separation?		
Safety latches are functional and completely span the entire throat of the hook and have positive action to close the throat except when manually displaced for connecting or disconnecting a load?		
Drive shafts, belts, chain drives and universal joints shall be guarded to prevent accidental insertion of hands and fingers or tools.		
Outriggers shall be extended prior to and whenever the boom is raised off its cradle. Hydraulic outriggers must maintain pressure to continuously support and stabilize the drill rig even while unattended.		
Outriggers shall be properly supported on the ground surface to prevent settling into the soil.		
Controls are properly labeled and have freedom of movement? Controls should not be blocked or locked in an action position.		
Safeties on any device shall not be bypassed or neutralized.		
Controls shall be operated smoothly and cables and lifting devices shall not be jerked or operated erratically to overcome resistance.		
Slings, chokers and lifting devices are inspected before using and are in proper working order? Damaged units are removed from service and are properly tagged?		
Shackles and clevises are in proper working order and pins and screws are fully inserted before placing under a load?		
High-pressure hoses have a safety (chain, cable or strap) at each end of the hose section to prevent whipping in the event of a failure?		
Rotating parts of the drill string shall be free of sharp projections or hooks, which could entrap clothing or foreign objects?		

DRILLING SAFETY CHECKLIST

Project: Date:

ITEMS TO CHECK	OK	ACTION NEEDED
Wire ropes should not be allowed to bend around sharp edges without cushion material.		
The exclusion zone is centered over the borehole and the radius is equal or greater than the boom height?		
The work area around the borehole shall be kept clear of trip hazards and walking surfaces should be free of slippery material.		
Workers shall not proceed higher than the drilling deck without a fall restraining device and must attach the device in a manner to restrict fall to less than 6 feet.		
A fire extinguisher of appropriate size shall be immediately available to the drill crew. The drill crew shall have received annual training on proper use of the fire extinguisher.		
29 CFR 1910.333 © (3) Except where electrical distribution and transmission lines have been de-energized and visibly grounded, drill rigs will be operated proximate to, under, by, or near power lines only in accordance with the following: .333 © (3) (ii) 50 kV or less -minimum clearance is 10 ft. For 50 kV or over - 10ft. Plus ½ in. For each additional kV **TurnKey Policy: Maintain 20 feet clearance**		
29 CFR 1910.333 © (3) (iii) While the rig is in transit with the boom in the down position, clearance from energized power lines will be maintained as follows: Less than 50 kV - 4 feet 50 to 365 kV - 10 feet 365 to 720 kV - 16 feet		

Name: (printed)

Signed: Date:

TurnKey Environmental Restoration, LLC

TAILGATE SAFETY MEETING FORM

Project Name: Date: Time:
Project Number: Client:
Work Activities:

HOSPITAL INFORMATION:

Name:
Address: *City:* *State:* *Zip:*
Phone No.: *Ambulance Phone No.*

SAFETY TOPICS PRESENTED:

Chemical Hazards:

Physical Hazards: Slips, Trips, Falls

PERSONAL PROTECTIVE EQUIPMENT:

Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D
Activity:	*PPE Level:*	A	B	C	D

New Equipment:

Other Safety Topic (s): Environmental Hazards (aggressive fauna)
Eating, drinking, use of tobacco products is prohibited in the Exclusion Zone (EZ)

ATTENDEES

Name Printed	**Signatures**

Meeting conducted by:

TurnKey
Environmental
Restoration, LLC

FIELD OPERATING PROCEDURES

Stockpile Sampling Procedures for Chemical Analysis

FOP 079.0

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 Benchmark 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

Benchmark FOPs:
046 Sample Labeling, Storage and Shipment Procedures

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FIELD OPERATING PROCEDURES

Stockpile & Borrow Source Sampling Procedures for Physical Analysis

FOP 080.0

STOCKPILE & BORROW SOURCE SAMPLING PROCEDURES FOR PHYSICAL ANALYSIS

PURPOSE

This guideline presents a method for collecting representative soil samples from stockpiled borrow source material for physical analysis.

GENERAL

Generally, one of two methods will be utilized to collect soil samples for analysis. One method is to collect the samples by digging a series of representative test pits at the borrow source area and obtaining samples from those test pits. The other method involves collecting samples from representative stockpiles (normally after the material has been mechanically screened). Both procedures are discussed within this method.

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.

STOCKPILED SOIL SAMPLING METHOD

As shown in the attached Figure 1, twelve (12) samples of approximate equal volume should be collected from the top, middle and bottom of each 1000 CY stockpile by CQA personnel and composited in the field to give one representative aliquot per 1000 CY.

Stockpile Sampling Procedure

1. Using a shovel or backhoe, penetrate the pile to a depth of about two to three feet.
2. Collect a sample using the shovel.

3. Transfer the sample to a specially prepared mixing area.
4. Repeat Steps 1 through 3 at each 1,000 CY stockpile.
5. Mix subsamples using shovel into one homogenous mass and place in a properly labeled 5-gallon bucket. Fill each bucket completely and cover.
6. Attach a label to each container and record location referencing the stockpile identification number. The label may be made with permanent marker on the side (not top) of the container or using adhesive-back paper labels affixed to the side of the container. At a minimum, the labels should be identified with the following information:
    - Project Name
    - Sample number.
    - Initials of CQA inspector or sample collection personnel.
    - Date of collection.
    - Location of collection (i.e. stockpile I.D.)
7. Return remaining contents of composite sample to stockpile.
8. Deliver the samples to the laboratory for analysis as soon as possible.
9. All information pertinent to each sampling event should be recorded by sampling personnel in the field at the time of sample collection. Each report should correspond to each stockpile and will contain the following information:
    - Project Name
    - Sample number or numbers collected
    - Field observations.
    - Climatologic conditions.
    - Date and time of collection.
    - Approximate location of test pit.
    - Name of person who collected sample.

BORROW AREA TEST PIT SAMPLING METHOD

Prior to obtaining representative soil samples, test holes should be excavated at the borrow area to determine the actual depth and lateral extent of the borrow source soil material. A base line should then be established and a grid system staked in the field. Five samples should be collected at equidistant locations for each 5000 cubic yards (CY) of soil designated for use in the borrow areas (at approximately mid-depth).

Borrow Area Sampling Procedure

1. Using a shovel, collect a representative sample at approximately mid-depth at each of the sampling locations representing 1000 CY of the proposed excavation area.
2. Transfer each sample into a labeled separate 5-gallon bucket. Fill each bucket completely and cover.
3. Attach a label to each container and record location referencing the established grid system in the borrow area. The label may be made with permanent marker on the side (not top) of the container or using adhesive-back paper labels affixed to the side of the container. At a minimum, the labels should be identified with the following information:
    - Project Name
    - Sample number.
    - Initials of CQA inspector or sample collection personnel.
    - Date of collection.
    - Location of collection (i.e. location of borrow area grid system location)
4. Deliver the samples to the laboratory for analysis as soon as possible.
5. All information pertinent to each sampling event should be recorded by sampling personnel in the field at the time of sample collection. Each report should correspond to each test pit and will contain the following information:
    - Project Name
    - Sample number or numbers collected
    - Field observations.
    - Climatologic conditions.
    - Date and time of collection.
    - Approximate location of test pit.
    - Name of person who collected sample.

ATTACHMENTS

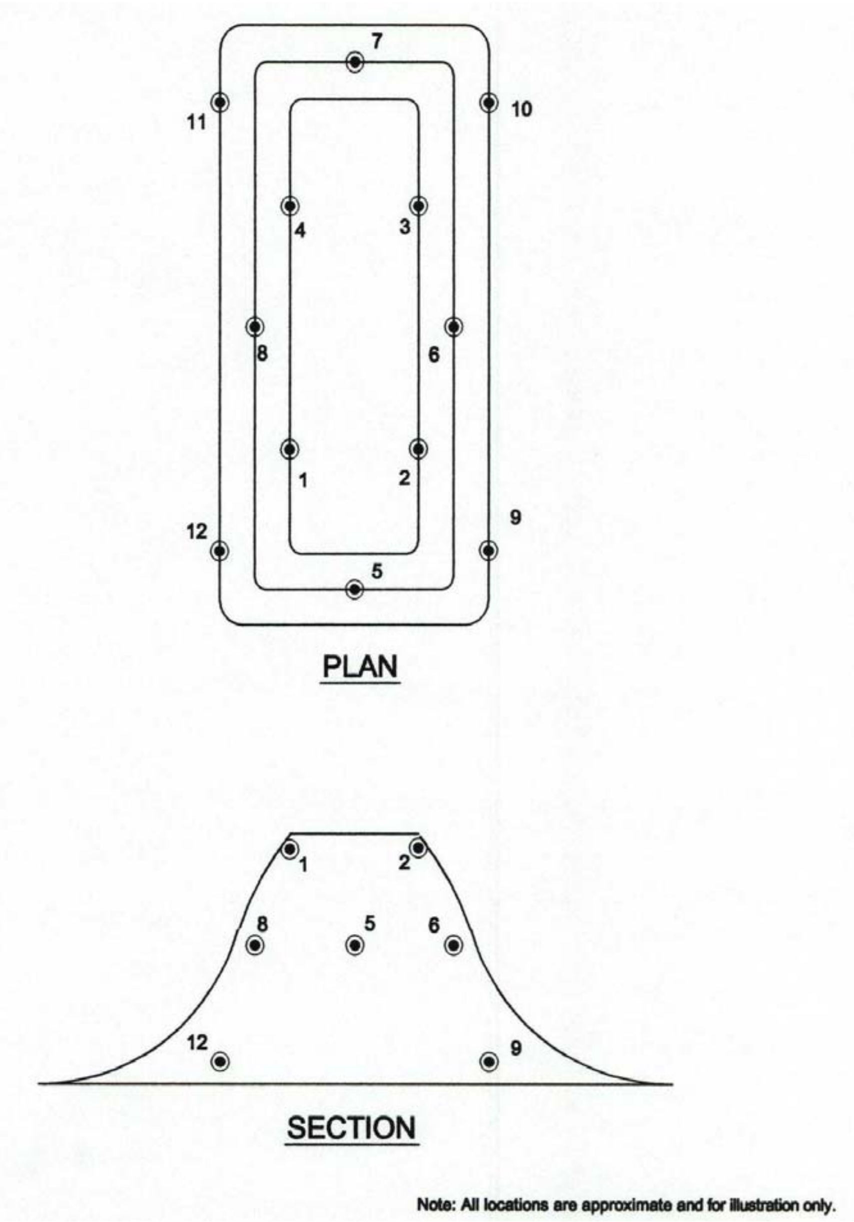
Figure 1; Stockpile Sampling Methodology

REFERENCES

None

FIGURE 4

1,000 CY STOCKPILE SAMPLING METHODOLOGY



Note: All locations are approximate and for illustration only.

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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 Benchmark 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.*

Benchmark 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.

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FIELD OPERATING PROCEDURES

Calibration & Maintenance of Portable Particulate Meter

FOP 084.0

CALIBRATION AND MAINTENANCE OF PORTABLE PARTICULATE METER

PURPOSE

This guideline describes a method for calibration of a portable particulate meter, specifically the Thermo Electron Corporation MIE DataRAM 4 (Model DR-4000). The DataRAM 4 measures the concentration of airborne particulate matter (liquid or solid), as well as mean particle size, air temperature, and humidity, providing direct and continuous readout as well as electronic recording of the information. This parameter is of interest both as a general indicator of air quality, and because of its pertinence to community air monitoring typically required at most construction/remediation/investigation sites. The DataRAM covers a wide measurement range from 0.0001 mg/m^3 to 400 mg/m^3. With its large capacity internal data logging capabilities with data retrieval on screen or downloaded, the DataRAM can store up to 50,000 data points, including individual point averages, particle size, temperature, and humidity with time stamp as well as overall average and maximum concentration.

Because the DataRAM meter must be factory calibrated once a year, this guideline presents a method for start-up, operation, and maintenance, which is performed to verify instrument function. All field instruments will be calibrated, verified and recalibrated at frequencies required by their respective operating manuals or manufacturer's specifications, but not less than once each year. Field personnel should have access to all operating manuals for the instruments used for the field measurements. This procedure also documents critical maintenance activities for this meter. The user should reference the manufacturer's instruction manual prior to operating this unit.

ACCURACY & PRECISION

The calibrated accuracy of the DataRAM 4 particulate meter is within ± 2% of reading ± precision over the temperature range of -4° to 158° F (-10° to 50° C) and 10 to 95% relative humidity (non-condensing). The precision is ± 1% of reading or ± 0.001 mg/m^3, whichever is greater (1-second averaging) and ± 0.3% of reading or ± 0.0003 mg/m^3, whichever is greater (10-second averaging).

INSTRUMENT PANEL VIEW

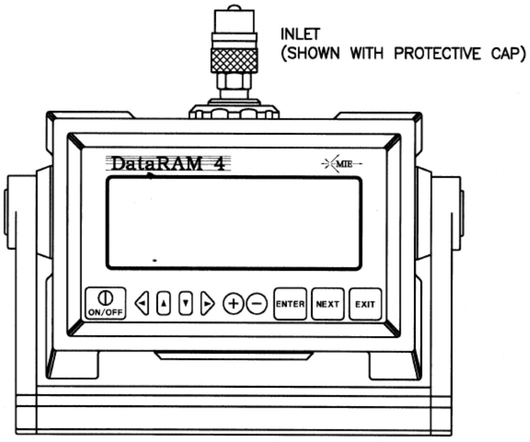


FIGURE 1. FRONT–PANEL VIEW OF DataRAM

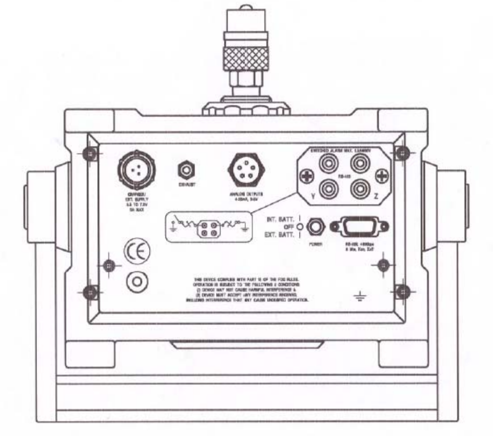


FIGURE 2. BACK–PANEL VIEW OF DataRAM

MAINTENANCE

General Guidelines

The DataRAM 4 is designed to be repaired at the factory. No user serviceable components are inside the metal enclosure of the DataRAM 4 with exception of the filter cartridge or the analytic filter holder. Access to the internal components of the unit by others than authorized MIE personnel voids warranty.

Unless a MALFUNCTION message is displayed, or other operational problems occur, the DataRAM 4 should be returned to the factory once every two years for routine check out, test, cleaning and calibration check.

Battery Charging and Cycling

If the DataRAM 4 is to be operated without its charger/power supply, i.e., deriving power from its internal battery, this battery should be fully charged before initiating a run. The

DataRAM 4 charger/power supply can be connected continuously to the instrument whether the DataRAM 4 is on or off. If the charger/power supply is not connected, the internal battery will discharge very slowly depending on storage temperature. Low storage temperature reduces battery capacity. High storage temperatures, however, reduce battery life which is of the order of 8 years at 20°C (68°F), and only 2 years at 40°C (104°F).

In general, the user should maintain the battery charge as high as possible in order to extend its charge/discharge cycling capacity (this characteristic differs from that of nickel-cadmium batteries).

<u>Instrument Storage</u>
If the DataRAM 4 is to be stored for an extended period of time (i.e., 3 months or more), place the 3-position switch on the back panel in its OFF position (mid-position), in order to minimize gradual battery discharge. This will have no effect on data retention or internal clock function. It is recommended, however, that the battery be recharged every 3 months in order to prolong battery life.

During storage always snap on quick-connect cap over the instrument inlet to protect the sensing optics from gradual dust contamination. Store DataRAM 4 in a dry environment.

<u>Filter Replacement</u>
To replace either of two types of filters used with DataRAM 4, place the instrument on its back rubber feet (front panel facing upward). On the bottom surface of the DataRAM, locate the large threaded plastic filter cover and holding the cross bar, rotate this cover counterclockwise. Remove cover and the filter holder within the open cavity.

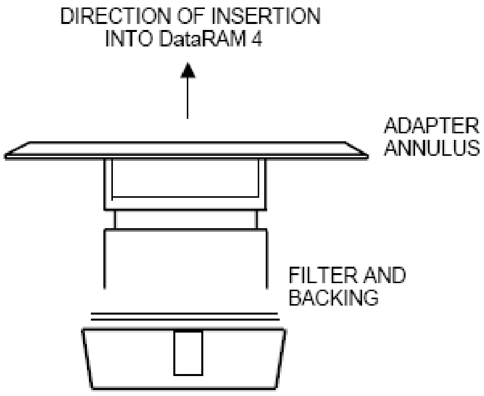
> *HEPA Filter Cartridge Replacement*
> The DataRAM 4 is shipped from the factory with the HEPA filter cartridge installed. This cartridge can be identified by its metallic cover. Remove this cartridge. Clean the internal black rubber gasket against which the cartridge is normally compressed. Install new HEPA-type cartridge (MIE part no. MSA-95302) by inserting its wider ridged end first. Reposition threaded plastic cover engaging threads carefully; rotate cover clockwise, hand tightening firmly. Properly dispose of used cartridge to prevent inadvertent re-use.

Analytic Filter Installation/Replacement

In order to install or replace the analytical filter holder, proceed as follows. Remove the HEPA cartridge normally in place. Remove (separate) the inlet cover (with the blue plug) of the Millipore plastic filter holder from the rest of that holder assembly containing the white membrane filter. Insert firmly the gray plastic adapter annulus into the open face of the filter holder assembly. Remove the red plastic plug from the exhaust nipple of the filter holder assembly. Ensure that all three components of the holder assembly are fully compressed to preclude any leafage. Insert the assembly into the filter cavity of the DataRAM 4 with the gray plastic adapter annulus bearing against the internal black gasket (adapter annulus inserted first). Reposition threaded plastic cover and hand-tighten carefully and firmly. Set aside HEPA cartridge for future use.

In order to remove and/or to replace the membrane filter within its holder, remove the gray plastic adapter annulus and separate (pry apart) the two transparent plastic rings that compress the membrane filter. Make sure to remove and replace only the membrane filter (using tweezers), leaving the white backing disc in the holder. A new membrane filter should then be placed over that backing and the sealing ring should then be inserted to trap and compress the filter and backing discs. For storage, the inlet cap with the blue plug should be inserted as well as the red plug on the back of the filter holder.

Analytical filter holder with adapter annulus inserted



Cleaning of Optical Sensing Chamber

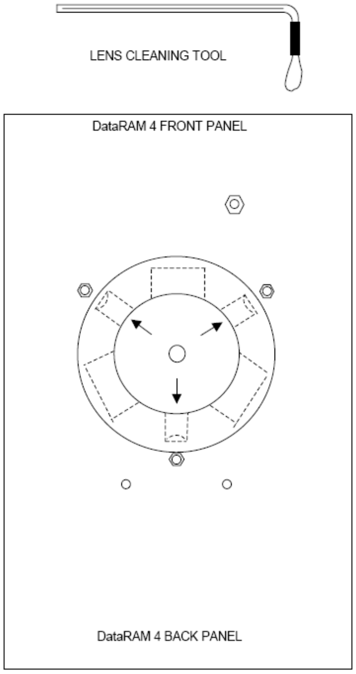
Although the DataRAM 4 incorporates filtered air shielding of the critical optical sensing surfaces, continued sampling of airborne particles at high concentrations may result in gradual build-up of contamination on those interior surfaces of the sensing chamber components. This may cause an excessively high optical background level. If this background level does becomes excessive, the DataRAM 4 will alert the user at the completion of the zeroing sequence by the display of a BACKGROUND HIGH message. If this message is presented, the DataRAM 4 can continue to be operated providing accurate measurements. However, it is then advisable to clean the front surfaces of the optical lenses within the sensing chamber at the first convenient opportunity, as described below. The tools required for this cleaning are: an intense concentrated light source (e.g., flash light) to view the inside of the sensing chamber, denatured alcohol, a soft lint-free cloth, and the special cleaning tool provided with the DataRAM 4 consisting of a cut-off cotton swab inserted in a plastic sleeve and held by a right-angle Allen wrench.

Proceed as follows to clean the lens surfaces within the sensing chamber:

- **Make sure to shut off power completely before proceeding with cleaning**
- Install the stainless steel cover on the inlet of the DataRAM 4 to protect this fitting.
- Place the DataRAM 4 upside down on a table, resting the instrument on the inlet cover and the rear protective bumper.
- Unscrew the gray plastic cover of the filter cavity on the bottom surface of the DataRAM 4.
- Remove the filter cartridge from its cavity.
- Carefully clean the black soft filter-sealing gasket within the filter cavity by wiping it with the lint-free soft cloth. Use alcohol if necessary.
- Shine the concentrated light source into the sensing chamber located about 3 cm (1¼ in.) beyond the soft-sealing gasket in the filter cavity.
- Locate the three smaller side cavities inside the sensing chamber, identified by the arrows on that figure (see page 6). These three cavities contain the lenses of the two sources and the common detector of the DataRAM 4. The frontal surfaces of these lenses are likely to require cleaning if the instrument indicates BACKGROUND HIGH.
- Wet the cotton swab of the lens-cleaning tool with alcohol (e.g., methanol, ethanol, or rubbing alcohol).

- Holding the cleaning tool by its long handle, insert this tool into the sensing chamber without touching the walls of this chamber.
- Direct the cotton swab tip towards the opening of one of the three smaller cavities as indicated by the arrows of the figure below, and insert the cotton tip into this cavity as far as it will go. Gently wipe that internal surface touched by the swab tip by a rotating motion. Carefully withdraw the swab tip from the cavity.
- Repeat previous cleaning step for the other two small cavities.
- Carefully remove the cleaning tool from the sensing chamber. Allow the alcohol to dry leaving the filter cavity open for about 15 minutes.
- Re-insert the filter cartridge into its cavity and close it with its gray plastic cover, hand-tightening it firmly. Remove the inlet cap and store on its pod on the back panel.
- Place the DataRAM 4 right side up and key ON. Proceed to check its optical background by running the ZERO/INITIALIZE check as. The message READY! should appear at the end of this check indicating that the lens contamination has been eliminated. Should the message BACKGROUND HIGH persist after completion of the above-described lens cleaning procedure, please contact the factory.

Lens cleaning tool and bottom view of open filter cavity showing location of sensor chamber lens cavities (arrows).



FACTORY CALIBRATION

For mass concentration measurements, each DataRAM 4 is factory calibrated against a set of reference monitors that, in turn, are periodically calibrated against a gravimetric standard traceable to the National Institute of Standards and Testing (NIST).

The primary factory reference method consists of generating a dust aerosol by means of a fluidized bed generator, and injecting continuously the dust into a mixing chamber from which samples are extracted concurrently by two reference filter collectors and by two master real-time monitors that are used for the routine calibration of every DataRAM 4.

The primary dust concentration reference value is obtained from the weight increase of the two filters due to the dust collected over a measured period of time, at a constant and known flow rate. The two master real-time monitors are then adjusted to agree with the reference mass concentration value (obtained from averaging the measurements of the two gravimetric filters) to within ±1%.

Three primary, NIST traceable, measurements are involved in the determination of the reference mass concentration: the weight increment from the dust collected on the filter, the sampling flow rate, and the sampling time. Additional conditions that must be met are: a) suspended dust concentration uniformity at all sampling inlets of the mixing chamber; b) identical sample transport configurations leading to reference and instrument under calibration; and c) essentially 100% collection efficiency of filters used for gravimetric reference for the particle size range of the test dust.

The test dust used for the MIE factory calibration of the DataRAM 4 is SAE Fine (ISO Fine) supplied by Powder Technology, Inc. It has the following physical characteristics (as dispersed into the mixing chamber):

- Mass median aerodynamic particle diameter: 2 to 3 µm
- Geometric standard deviation of lognormal size distribution: 2.5
- Bulk density: 2.60 to 2.65 g/cm3
- Refractive index: 1.54

In addition to the mass calibration described above, the DataRAM 4 is factory calibrated using a gas with known scattering coefficient in order to adjust the relative scattering irradiance at the two source wavelengths.

ATTACHMENTS

None

TurnKey Environmental Restoration, LLC

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 TurnKey'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

TurnKey FOPs:

040 Non-disposable and Non-dedicated Sampling Equipment Decontamination

APPENDIX F

STORM WATER POLLUTION PREVENTION PLAN

(PROVIDED ELECTRONICALLY)

Carmina • Wood • Morris DPC

487 Main Street Suite 500 Buffalo, New York 14203 P: 716.842.3165 F: 716.842.0263 W: cwm-ae.com

Architecture Engineering Interior Design

STORMWATER POLLUTION PREVENTION PLAN
for
CONSTRUCTION ACTIVITIES

At

Elmwood Ave Condominiums
1111 Elmwood Avenue
City of Buffalo, Erie County, New York

Prepared for

Affinity Elmwood Gateway Properties, LLC
(Operator)

105 Affinity Lane
Buffalo, New York 14215
Telephone: (716) 833-1000

Prepared by

Carmina Wood Morris, D.P.C.

487 Main Street
Buffalo, New York 14203

Telephone: (716) 842-3165
Fax: (716) 842-0263

CHRISTOPHER WOOD
076394

November 2017

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101 SCOPE

A. **PURPOSE:** Affinity Elmwood Gateway Properties, LLC (AEGP) has placed an emphasis on following the New York State Department of Environmental Conservation (NYSDEC) SPDES General Permit for Stormwater Discharges from Construction Activity governing storm water discharges during construction, and in accordance with erosion control practices. The Contractor's participation in this program is mandatory and its non-compliance is subject to various remedies, including without limitation, monetary set-offs, withholding payments; reimbursement for costs, expenses (including reasonable attorney's fees), fines and civil penalties incurred by AEGP; and/or liquidated damages. This section provides a descriptive explanation of AEGP's Storm Water Pollution Prevention Program and required Contractor participation.

The Engineer of record for this project certifies that this SWPPP meets the requirements and is in compliance with the New York State Stormwater Management Design Manual and latest NYSDEC Phase II stormwater regulation requirements.

B. **SPDES General Permit for Stormwater Discharges from Construction Activity:** Regulations promulgated by the NYSDEC to regulate the discharge of storm water from construction activities on sites where more than one (1) acre of soil is disturbed. One of the ways to comply with these regulations for affected sites is to request coverage under the General Permit for Construction Activities for New York State. In order to use the General Permit, a Notice of Intent (NOI) form must be completed and mailed to the NYSDEC at least 5 business days prior to any earth-disturbing activities (this time frame may increase to 60 business days if a full review of the SWPPP is determined necessary by the NYSDEC) and a Storm Water Pollution Prevention Plan (SWPPP) for the site must be prepared and followed during the construction activities.

Approval from a regulated, traditional land use control MS4:

1. An **owner or operator** of a construction activity that is <u>not</u> subject to the requirements of a regulated, traditional land use control MS4 must first develop a SWPPP in accordance with all applicable requirements of this permit and then submit a completed NOI form to the NYSDEC.

2. An **owner or operator** of a construction activity that is subject to the requirements of a regulated, traditional land use control MS4 must first develop a SWPPP in accordance with all applicable requirements of this permit and then have its SWPPP reviewed and accepted by the MS4 prior to submitting the NOI to the NYSDEC. The **owner or operator** shall have the "MS4 SWPPP Acceptance" form signed by the principal executive officer or ranking elected official from the regulated, traditional land use control MS4, or by a duly authorized representative of that person, and then submit that form along with the NOI to the address referenced under "Notice of Intent (NOI) Submittal".

C. **RESPONSIBILITIES OF THE CONTRACTOR:** The Contractor shall manage the discharge of storm water from the site in accordance with the NYSDEC General Permit for Construction Activities conditions and the following provisions of this section. The Operator shall be responsible for conducting the storm water management practices in accordance with the permit. The Contractor shall be responsible for providing **qualified inspector**s to conduct the inspections required by the SWPPP. The Contractor shall be responsible for any enforcement action taken or imposed by federal, state, or local agencies, including the cost of fines, construction delays, and remedial actions resulting from the Contractor's failure to comply with the permit provisions. It shall be the responsibility of the Contractor to make any changes to the SWPPP necessary when the Contractor or any of his subcontractors elects to use borrow or fill or material storage sites, either contiguous to or remote from the construction site, when such sites are used solely for this construction site. Such sites are considered to be part of the construction site covered by the permit and this SWPPP. Off-site borrow, fill, or material storage sites which are used for multiple construction projects are not subject to this requirement, unless specifically required by state or local jurisdictional entity regulations. The Contractor should consider this requirement in negotiating with earthwork subcontractors, since the choice of an off-site borrow, fill, or material storage site may impact their duty to implement, make changes to, and perform inspections required by the SWPPP for the site.

D. **NOTICE OF INTENT:** The Operator has petitioned the NYSDEC for coverage under the storm water discharges during construction at this site to be covered by the SPDES General Permit for Construction Activity for the State of New York. A Notice of Intent (NOI) for coverage under this permit has been filed by the Operator. The SWPPP must be prepared prior to submittal of the NOI form. The Operator will require the Contractor to be a co-permittee with the Operator. The Contractor will be required to post the NOI at the construction site along with any building permits.

E. **CONTRACTOR CERTIFICATION & TRAINING:** Proof of Training/Certification of the Contractor's designated individual shall be kept on site at all times.

F. **REQUIREMENTS FOR THE GENERAL CONTRACTOR AND SUBCONTRACTOR(S):** The General Contractor and Subcontractor(s) shall sign the "Contractor's Certification Statement" (located in the Appendix of this report) verifying they have been instructed on how to comply with and fully understand the requirements of the SPDES General Permit for Construction Activity for the State of New York and the SWPPP. These certifications must be signed, by a responsible corporate officer or other party meeting the "Signatory Requirements" of the SPDES General Permit, on behalf of each entity, prior to the beginning of any construction activities.

G. **STORM WATER POLLUTION PREVENTION PROGRAM LOCATION REQUIREMENTS:** The SWPPP is meant to be a working document that shall be maintained at the site of the Construction Activities at all times throughout the project, shall be readily available upon request by the

Operator’s personnel or NYSDEC or any other agency with regulatory authority over storm water issues, and shall be kept on-site until the site complies with the Final Stabilization section of this document. A sign or other notice must be posted near the main entrance of the construction site which contains a completed NOI, the location of the SWPPP and the name and phone number of a contact person responsible for scheduling SWPPP viewing times, and any other state specific requirements.

H. INSPECTIONS AND RECORD-KEEPING:

A. General Construction Site Inspection and Maintenance Requirements

1. The **owner or operator** must ensure that all erosion and sediment control practices and all post-construction stormwater management practices identified in the SWPPP are maintained in effective operating condition at all times.
2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York, or protect the public health and safety and/or the environment.

B. Owner or operator Maintenance Inspection Requirements

1. The **owner or operator** shall inspect, in accordance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, the erosion and sediment controls identified in the SWPPP to ensure that they are being maintained in effective operating condition at all times.
2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the **owner or operator** can stop conducting the maintenance inspections. The **owner or operator** shall begin conducting the maintenance inspections in accordance with Part IV.B.1 of the General Permit as soon as soil disturbance activities resume.
3. For construction sites where soil disturbance activities have been shut down with partial project completion, the **owner or operator** can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved final stabilization and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. **Qualified inspector Inspection Requirements**

The **owner or operator** shall have a **qualified inspector** conduct site inspections in conformance with the following requirements:

Note: The **trained contractor** identified in Part III.A.6 of the General Permit **cannot** conduct the **qualified inspector** site inspections unless they meet the **qualified inspector** qualifications included in Appendix A of the General Permit. In order to perform these inspections, the trained contractor would have to be a:

- Licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- Registered Landscape Architect, or
- Someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity.

1. A **qualified inspector** shall conduct site inspections for all construction activities identified in Tables 1 and 2 of Appendix B of the General Permit, with the exception of:

    a. The construction of a single family residential subdivision with 25% or less impervious cover at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C of the General Permit and not directly discharging to one of the 303(d) segments listed in Appendix E of the General Permit;

    b. The construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E of the General Permit;

    c. Construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

    d. Construction activities located in the watersheds identified in Appendix D of the General Permit that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the **qualified inspector** shall conduct site inspections in accordance with the following timetable:

    a. For construction sites where soil disturbance activities are on-going, the **qualified inspector** shall conduct a site inspection at least once every seven (7) calendar days.

    b. For construction sites where soil disturbance activities are on-going and the **owner or operator** has received authorization in accordance with Part II.C.3 of the General Permit to **disturb greater than five (5) acres** of soil at any one time, the **qualified inspector** shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

    c. For construction sites where soil disturbance activities have been **temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas**, the **qualified inspector** shall conduct a site inspection at least once every thirty (30) calendar days. The **owner or operator** shall notify the Regional Office stormwater contact person (see contact information in Appendix F of the General Permit) or, in areas under the jurisdiction of a regulated, traditional land use control MS4, the MS4 (provided the MS4 is not the **owner or operator** of the construction activity) in writing prior to reducing the frequency of inspections.

    d. For construction sites where **soil disturbance activities have been shut down with partial project completion**, the **qualified inspector** can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved final stabilization and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The **owner or operator** shall notify the Regional Office stormwater contact person or, in areas under the jurisdiction of a regulated, traditional land use control MS4, the MS4 (provided the MS4 is not the **owner or operator** of the construction activity) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the **owner or operator** shall have the **qualified inspector** perform a final inspection and certify that all disturbed areas have achieved final stabilization, and all temporary, structural erosion and sediment control measures have been removed; and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the “Final Stabilization” and “Post-Construction Stormwater Management Practice” certification statements on the NOT. The **owner or operator** shall then submit the completed NOT form to the address in Part II.A.1 of the General Permit.

3. At a minimum, the **qualified inspector** shall inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved final stabilization, all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of discharge from the construction site.

4. The **qualified inspector** shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

   a. Date and time of inspection;

   b. Name and title of person(s) performing inspection;

   c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

   d. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any discharges of sediment from the construction site. Include discharges from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

   e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any discharges of sediment to the surface waterbody;

   f. Identification of all erosion and sediment control practices that need repair or maintenance;

   g. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

   h. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

   i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

k. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The **qualified inspector** shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The **qualified inspector** shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The **qualified inspector** shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the **qualified inspector** shall notify the **owner or operator** and appropriate contractor or subcontractor identified in Part III.A.6 of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the **qualified inspector**. Pursuant to Part II.C.2 of the General Permit, the inspection reports shall be maintained on site with the SWPPP.

Record Retention - The **owner or operator** shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the site achieves final stabilization. This period may be extended by the Department, in its sole discretion, at any time upon written notification.

I. **SWPPP MODIFICATIONS:** The inspection report should also identify if any revisions to the SWPPP are warranted due to unexpected conditions. The SWPPP is meant to be a dynamic working guide that is to be kept current and amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants or when the plan proves to be ineffective in eliminating or significantly minimizing pollutant discharges. The Contractor's failure to modify or report deficiencies to the Operator will result in the Contractor being liable for fines and construction delays resulting from any federal, state, or local agency enforcement action.

J. **FINAL STABILIZATION AND TERMINATION OF PERMIT COVERAGE:** A site can be considered finally stabilized when all soil disturbing activities have been completed and a uniform perennial vegetative cover with a density of **85%** for the unpaved areas and areas not covered by permanent structures has been established or equivalent permanent stabilization measures have been established and the facility no longer discharges storm water associated with construction activities and a Notice of Termination (NOT) form filed by the Operator(s) with the NYSDEC. The Operator's Project Manager must complete the NOT. The NOT must be signed by the signatory (or equivalent position) on the NOI and subsequently submitted to the appropriate agency. The Operator's Project Manager must provide a completed copy of the NOT to the Contractor for inclusion in the SWPPP, which will then be optically scanned into the final SWPPP document as required. This filing terminates coverage under the General Permit and terminates the Contractor's responsibility to implement the SWPPP, but the requirements of the SWPPP, including periodic inspections, must be continued until the NOT is filed. The **owner or operator** shall also have the **qualified inspector** perform a final site inspection prior to submitting the NOT to the Department. Final payment and/or the release of retainage will be withheld until all provisions of the SWPPP have been submitted, completed and accepted by the Operator.

102 PROJECT NAME AND LOCATION

Elmwood Ave Condominiums

1111 Elmwood Avenue

City of Buffalo, County of Erie, New York

Easting: 183609

Northing: 4760098

Estimated Area of Site ≈ 1.1 acres

Estimated Area to be disturbed by Construction Activities ≈ 1.1+/- acres

A general location map is included as Appendix A.

103 OPERATOR'S NAME AND ADDRESS

Affinity Elmwood Gateway Properties, LLC (Operator)

105 Affinity Lane

Buffalo, NY 14215

Contact Person: Judy Tucker

Telephone: 716-833-1000 x 105

104 PROJECT DESCRIPTION

The project consists of the redevelopment of 1111 Elmwood Avenue and 605 Forest Avenue which is located on the southeast corner of Elmwood and Forest Avenues is the City of Buffalo. Proposed is a new four story mixed use building that will include 44 condominiums, 3 first floor retail spaces of up to 3,500 g.s.f. each, and a below grade 97 space parking facility to accommodate these uses. The site was previously a combination of 12 parcels that were developed as a mix of commercial retail space and apartments within multiple structures. The overall project is approximately 1.1 acres and is located in the Urban Center (N-2) Zoning of the Unified Development Ordinance. The 1111 Elmwood property is zoned N-2C - Mixed Use Center and the 605 Forest property is zoned N-2R - Residential. The estimated time for completion of the construction project is approximately 18 months.

<u>Soil disturbing activities will include:</u>

A. Construction of temporary construction exit points
B. Installation of temporary erosion control devices
C. Demolition of existing structures on site
D. Excavation of site to design grades per civil/architectural plans
E. Installation of temporary/permanent shoring
F. Installation of storm sewer pipes and inlets
G. Construction of utilities
H. Final grading & landscaping
I. Construction of buildings

This project is owned by **Affinity Elmwood Gateway Properties, LLC** and will be developed by the same. The work area consists of approximately 1.1 acres for which erosion and sediment controls have been developed and fully addressed in this written plan and the Erosion and Sediment Control Plans. See the construction documents for additional details

105 RUNOFF COEFFICIENT, SOILS, AND RAINFALL INFORMATION

The initial runoff curve number for the pre-construction site is "CN" = 94. The post-construction runoff curve number for the site will be "CN" = 96. The site is 1.1 acres of which approximately 1.1 acres will be disturbed by construction activities.

Hydrologic soil groups (HSG) are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The predominant soil types within the proposed project disturbance area consists of Type UmA – Urban land-Collamer complex, 1 to 6 percent slopes, HSG C/D, Urban development.

The site is in Erie County, which receives an average of approximately 45 inches rainfall annually with the highest amounts of rainfall received in the months of May thru September. Annual snow for this area is approximately 120 inches.

106 WATERS

The runoff generated from this site will discharge to the Buffalo Sewer Authority controlled storm water relief drain within Forest Avenue which ultimately discharges to the Niagara River.

107 INDIAN COUNTRY LANDS

This project is not located on Indian Lands.

108 ENDANGERED AND THREATENED SPECIES14222

No endangered or threatened species have been determined to be on the site.

109 CRITICAL HABITAT

See section 108 above

110 HISTORIC PLACES

The Project is the subject of a full SEQRA Environmental Impact Statement (EIS), which has addressed potential impacts on and mitigation for National Register of Historic Places known as Elmwood Avenue Historic Districts “West” and “East,” as well as the H.H. Richardson complex to the northwest of the Site.

111 WETLANDS AND/OR OTHER SURFACE WATERS

No wetlands or surface waters are located on the site.

112 EROSION AND SEDIMENT CONTROLS

112.1 STABILIZATION PRACTICES

Stabilization practices for this site include:

A. Land clearing activities shall be done only in areas where earthwork will be performed and shall progress as earthwork is needed.
B. Use of stabilization method for all slopes having a slope greater than 1V:3H.
C. Permanent seeding and planting of all unpaved areas using the hydromulching grass seeding technique.
D. Mulching exposed areas.

E. Vegetation preservation in undisturbed areas.
F. Frequent watering to minimize wind erosion during construction.

   a. **For sites where 5 acres or more are disturbed at any one time**: In areas where soil disturbance activity has been temporarily or permanently ceased, temporary and/or permanent soil stabilization measures shall be installed and/or implemented within seven (7) days from the date the soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the most current version of the New York Standards and Specifications for Erosion and Sediment Control.

   b. The **owner or operator** shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

   c. The **owner or operator** shall install any additional measures needed to protect water quality.

112.2 STRUCTURAL PRACTICES

Structural practices for this site include:

A. Inlet protection using a method detailed in the Construction Documents.
B. Perimeter protection using temporary silt fence/silt sock or silt sock.
C. Stabilized Construction Entrance.
D. Temporary stone wash off areas.
E. Storm sewer, curb/gutter.
F. Sediment traps and basins.

Note: The Standard Erosion Control Details are included in Appendix L

112.3 SEQUENCE OF MAJOR ACTIVITIES

The Contractor will be responsible for implementing the following erosion control and storm water management control measures. The Contractor may designate these tasks to certain subcontractors as he sees fit, but the ultimate responsibility for implementing these controls and ensuring their proper functioning remains with the Contractor. The order of activities will be as follows:

A. Construct temporary construction exits at locations shown on the Demolition & Erosion Control Plan Sheet.
B. Install perimeter silt fence/silt socks/silt sock in the locations shown on the Demolition & Erosion Control Plan Sheet.
C. Demolition/removal of existing structures.
D. Clear & Grub site.
E. Install temporary/permanent shoring.

F. Commence site grading/excavation.
G. Disturbed areas of the site where construction activity has ceased for more than 14 days shall be temporarily seeded and watered.
H. Construction of buildings.
I. Installation of proposed utilities.
J. Finalize pavement subgrade preparation.
K. Construct all curb, drainage inlets, storm sewer pipes and storm sewer manholes, as shown on the plans. Install temporary inlet protection at the locations of all inlets.
L. Dust control.
M. Remove inlet protection around inlets and manholes no more than 48 hours prior to placing stabilized base course.
N. Install base material as required for pavement.
O. Carry out final grading and seeding and planting.
P. Clean storm system following construction, clean detention basins of any silt and return to design grades.
Q. Remove silt fencing/silt sock only after all paving is complete and exposed surfaces are stabilized.
R. Remove temporary construction exits only prior to pavement construction in these areas.

Note: Sediment control storage during construction (traps & basins) during construction shall be 134 cy per acre of disturbance per NYSDEC requirements.

112.4 STORM WATER MANAGEMENT

The proposed storm sewer system will discharge to the existing 48” storm overflow sewer within Forest Avenue which is controlled by the Buffalo Sewer Authority. The on-site system will collect runoff generated from the proposed rooftops and greenspace to the east of the building. Discharge rates will be restricted to at or below existing rates and any resulting differences will be attenuated within on-site underground detention.

NYSDEC Requirements:

NYSDEC SPDES requirements dictate that if greater than 1.0 acre of soil disturbance is proposed during construction of the project that the General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-15-002 will apply. The NYSDEC defines disturbance as exposure of the subsoil of any subbase area that is currently stone or gravel. The New York State Stormwater Management Design Manual (January, 2015) has been used to design the proposed stormwater management system.

The project includes the redevelopment of previously developed parcels which allows it to fall under the Redevelopment Activity guidelines found in Chapter 9 of the NYSDEC Storm Water Design Manual. This chapter outlines alternative approaches for addressing stormwater management including requirements for Water Quantity control sizing and Water Quality treatment objectives. The project does involve lands that were part of a brownfield cleanup project, therefore infiltration type stormwater management practices will be limited as the NYSDEC classifies this as a hotspot.

Water Quantity:

The redevelopment activities proposed will not result in a change to hydrology that increases the discharge rate from the project site, therefore the 10-year Overbank Flooding and 100-year Extreme Storm Protection storm event storage criteria do not apply. The proposed runoff generated for the 10-year storm is 3.73 cfs which is 1.58 cfs lower than the existing discharge of 5.31 cfs. The proposed runoff generated for the 100-year storm is 6.39 cfs which is 2.88 cfs lower than the existing discharge of 9.27 cfs. Due to the reduction in discharge rates, no onsite stormwater storage will be required.

Channel Protection is not required for this redevelopment project since there will not be an increase to the 1-year 24 hour runoff rate. The proposed runoff rate for the 1-year 24 hour discharge is 2.08 cfs which is 0.78 lower than the existing runoff rate of 2.86 cfs. Therefore, providing 24 hour detention of the 1-year storm will not be required.

Water Quality:

The NYSDEC requires Water Quality treatment prior to discharge. Water Quality treatment will be provided by implementing the use of alternative SMPs to treat 75% of the water quality volume from the disturbed, impervious area as well as any additional runoff from tributary areas that are not within the disturbed, impervious area. Proposed will be the installation of a proprietary practice, a manufactured treatment system, designed to treat a minimum of 2,477 cubic feet, which is 75% of the calculated total water quality volume for the site.

Summary of Stormwater Runoff:

Storm Event	**Existing Runoff (CFS)**	**Proposed Runoff (CFS)**	**Decrease in Runoff (CFS)**	**System Discharge (CFS)**	**Pipe Storage (CF)**
1-year	2.86	2.08	0.78	2.08	7
10-year	5.31	3.73	1.58	3.63	91
100-year	9.27	6.39	2.88	6.31	471

113 OTHER CONTROLS

113.1 OFF-SITE VEHICLE TRACKING

A stabilized construction exit will be provided to help reduce vehicle tracking of sediments. Existing paved areas will remain as long as possible and will be used for vehicle wash areas and to further aid in the reduction of vehicle tracking of sediments. The paved streets adjacent to the site entrance shall be inspected daily and swept as necessary to remove any excess mud, dirt, or rock tracked from the site. Dump trucks hauling material to/from the construction site will be covered with a tarpaulin. The job site superintendent will be responsible for seeing that these procedures are followed.

113.2 EXCAVATION SPOIL MATERIALS

Excavation spoil materials are generated during the excavation of the development's building and utilities installation. These materials must be properly managed to prevent them from contributing to storm water discharges. The materials generated from the development of this project will be hauled off-site or stockpiled for re-use in designated areas which will have temporary erosion & sediment control measures installed. Any removal from site will be done under the necessary permits required by the local governing agencies.

113.3 DUST CONTROL

Minimizing wind erosion and controlling dust will be accomplished by one or more of the following methods:

A. Frequent watering of excavation and fill areas.

B. Providing gravel or paving at entrance/exit drives, parking areas and transit paths.

113.4 WASTE DISPOSAL

If needed, all waste materials will be collected and stored in securely lidded metal dumpsters rented from an approved waste management company. The dumpster will comply with all local and state solid waste management regulations.

All trash and construction debris from the site will be deposited in the dumpsters. The dumpsters will be emptied when full and then hauled to a NYSDEC approved landfill for proper disposal. No construction waste will be buried on-site. All personnel will be instructed regarding the correct procedures for waste disposal.

113.5 SANITARY WASTE

If needed, portable toilet units or field offices with toilet facilities connected to the municipal sanitary sewer will be used for sanitary purposes. All portable toilet units will be emptied a minimum of once per week by a licensed portable facility provided in compliance with local and state regulations.

113.6 CONCRETE WASTE FROM CONCRETE TRUCKS

A. Emptying of excess unhardened concrete and/or washout from concrete delivery trucks will be allowed on the job site, but in either (1) specifically designated diked areas which have been prepared to prevent contact between concrete and/or washout and storm water which will be discharged from the site or (2) in locations where waste concrete will be poured into forms to make rip-rap or other useful concrete products.

B. Hardened waste concrete from the designated diked areas described above will be disposed of in accordance with applicable local and state regulations with regards to disposal of construction debris.

113.7 HAZARDOUS SUBSTANCES & HAZARDOUS WASTE

A. All hazardous waste materials will be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job superintendent, who will also be responsible for seeing these practices are followed. Material Safety Data Sheets (MSDS's) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such products are stored and/or used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction office. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

B. The contractor will implement the Spill Prevention Control and Countermeasures (SPCC) Plan found within this SWPPP and will train all personnel in the proper cleanup and handling of spilled materials. No spilled hazardous materials of hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge shall be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the job superintendent to properly train all personnel in the use of the SPCC plan.

C. Any spills of hazardous materials which are in excess of the Reportable Quantities as defined by the EPA regulations shall be immediately reported to the EPA National Response Center at 1-100-424-1102. From SWPPP-9 "Reportable Quantity Release Form" must be filled out.

D. In order to minimize the potential for a spill of hazardous materials to come in contact with storm water, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, under cover, when not in use.
2. The minimum practical quantity of all such materials will be kept on the job site.
3. A spill control and containment kit (containing for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.
4. All of the product in a container will be used before the container is disposed of. All such containers will be triple rinsed with water prior to disposal. The rinse water used in these containers will be disposed of in a manner in compliance with state and federal regulations and will not be allowed to mix with storm water discharges.
5. All products will be stored in and used from the original container with the original product label.
6. All products will be used in strict compliance with instructions on the product label.
7. The disposal of excess or used products will be in strict compliance with instructions on the product label.

113.8 CONTAMINATED SOILS

A. Any contaminated soils (resulting from spills of materials with hazardous properties) which may result from construction activities will be contained and cleaned up immediately in accordance with the procedures given in the Spill Prevention Control and Countermeasures (SPCC) Plan and in accordance with applicable state and federal regulations.

B. The job site superintendent will be responsible for seeing that these procedures are followed.

114 COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

The Contractor will obtain copies of any and all local and state regulations which are applicable to storm water management, erosion control, and pollution minimization at this job site and will comply fully with such regulations. The Contractor will submit written evidence of such compliance if requested by the Operator or any agent of a regulatory body. The Contractor will comply with all conditions of the SPDES General Permit for Construction Activity for the State of New York, including the conditions related to maintaining the SWPPP and evidence of compliance with the SWPPP at the job site and allowing regulatory personnel access to the job site and to records in order to determine compliance.

The SWPPP for this site development project requires regulated MS4 approval from the City of Buffalo. All changes to the SWPPP must be approved by the City of Buffalo prior to applying changes to the SWPPP in the field.

115 INSPECTION AND MAINTENANCE PROCEDURES

The following inspection and maintenance practices will be used to maintain erosion and sediment controls and stabilization measures.

1. All control measures will be inspected by the owner/operator at least weekly and shall continue until the site complies with the Final Stabilization section of this document (See Section 116)
2. All control measures will be inspected by a Qualified Professional at least weekly and shall continue until the site complies with the Final Stabilization section of this document (See Section 116)
3. All measures will be maintained in good working order; if repairs or other measures are found to be necessary, they will be initiated within 24 hours of report.
4. Built up sediment will be removed from silt fence/silt sock when it has reached one-third the height of the fence.
5. Silt fence/silt socks will be inspected for depth of sediment, tears, etc., to see if the fabric is securely attached to the fence posts, and to see that the fence posts are securely in the ground.
6. Temporary and permanent seeding and all other stabilization measures will be inspected for bare spots, washouts, and healthy growth.
7. A maintenance inspection report will be made after each inspection. Copies of the report forms to be completed by the inspector are included in this SWPPP.
8. The job site superintendent will be responsible for selecting and training the individuals who will be responsible for these inspections, maintenance and repair activities, and filling out inspection and maintenance reports.
9. Personnel selected for the inspection and maintenance responsibilities will receive training from the job site superintendent. They will be trained in all the inspection and

maintenance practices necessary for keeping the erosion and sediment controls that are used onsite in good working order. They will also be trained in the completion of, initiation of actions required by, and the filing of the inspection forms. Documentation of this personnel training will be kept on site with the SWPPP.

10. Disturbed areas and materials storage areas will be inspected for evidence of or potential for pollutants entering stormwater systems.

11. Report to the NYSDEC within 24 hours any noncompliance with the SWPPP that will endanger public health or the environment. Follow up with a written report within 5 days of the noncompliance event. The following events require 24 hour reporting: a) any unanticipated bypass which exceeds any effluent limitation in the permit, b) any upset which exceeds any effluent limitation in the permit, and c) a violation of a maximum daily discharge limitation for any of the pollutants listed by the NYSDEC in the permit to be reported within 24 hours. The written submission must contain a description of the non-compliance and its cause; the period of non-compliance, including exact dates and times, and if the non-compliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the non-compliance.

12. Releases of hazardous substances or oil in excess of reportable quantities (as established under 40 CFR 110, 40 CFR 117 or 40 CFR 302) must be reported.

Upon completion of construction, the property owner is responsible for ensuring that the stormwater facilities are regularly inspected and maintained. Maintenance and inspection procedures are as follows.

1. On a quarterly basis and following significant rainfall events or snow-melts, perform the following:

    - Inspect catch basins, storm manholes, treatment structures, storm piping and stormwater pond for debris and accumulation of sediment.
    - Remove and properly dispose of any collected debris and sediment in accordance with applicable state, federal and local regulations.
    - Flush piping with water if necessary to remove accumulated sediment.
    - Clean treatment structures per manufacturer's recommendations
    - Check all stone outfall structures for erosion and re-stone if necessary to prevent further erosion.

    - Inspect grassed/landscaped areas for un-vegetated areas or areas with less than 85% healthy stand of grass and reseed and mulch as necessary. Water daily if reseeded in July and August.
    - A record of all inspections should be kept.

2. Maintain all lawn areas by regular mowing, including the grassed slopes of the stormwater pond and any grass swales. Any eroded areas shall be regarded, seeded and mulched immediately.

116 INSPECTION AND MAINTENANCE REPORT FORMS

Once installation of any required or optional erosion control device or measure has been implemented, inspections shall be performed by a Qualified Professional at least once every seven (7) calendar days. For construction sites where soil disturbance activities are on-going and the **owner or operator** has received authorization in accordance with Part II.C.3 of the General Permit to disturb greater than five (5) acres of soil at any one time, the **qualified inspector** shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days. The owner and contractor shall obtain from the MS4 an approval for disturbing more than five-acres at any given time. For construction sites where active construction has been suspended, inspection frequency under the general permit can be reduced to once every 30 days, provided temporary stabilization measures have been applied to all disturbed areas. The forms found in this SWPPP shall be used by the inspectors to inventory and report the condition of each measure to assist in maintaining the erosion and sediment control measures in good working order.

These report forms shall become an integral part of the SWPPP and shall be made readily accessible to governmental inspection officials, the Operator’s Engineer, and the Operator for review upon request during visits to the project site. In addition, copies of the reports shall be provided to any of these persons, upon request, via mail or facsimile transmission. Inspection and maintenance report forms are to be maintained by the permittee for five years following the final stabilization of the site.

117 OTHER RECORD-KEEPING REQUIREMENTS

The Contractor shall keep the following records related to construction activities at the site:

- Dates when major grading activities occur and the areas which were graded
- Dates and details concerning the installation of structural controls
- Dates when construction activities cease in an area
- Dates when an areas is stabilized, either temporarily or permanently

- Dates of rainfall and the amount of rainfall
- Dates and descriptions of the character and amount of any spills of hazardous materials
- Records of reports filed with regulatory agencies if reportable quantities of hazardous materials spilled

118 SPILL PREVENTION CONTROL AND COUNTERMEASURES (SPCC) PLAN

118.1 MATERIALS COVERED

The following materials or substances are expected to be present onsite during construction:

- Concrete/Additives/Wastes
- Cleaning solvents
- Sanitary wastes
- Detergents
- Petroleum based products
- Paints/Solvents
- Pesticides
- Solid and construction wastes
- Acids
- Fertilizers
- Soil stabilization additives

118.2 MATERIAL MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. The job site superintendent will be responsible for ensuring that these procedures are followed.

A. Good Housekeeping

The following good housekeeping practices will be followed onsite during the construction project.

1. An effort will be made to store only enough products required to do the job.
2. All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers will be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
3. Products will be kept in their original containers with the original manufacturer's label in legible condition.
4. Substances will not be mixed with one another unless recommended by the manufacturer.

5. Whenever possible, all of a product will be used up before disposing of the container.
6. Manufacturer's recommendations for proper use and disposal will be followed.
7. The job site superintendent will be responsible for daily inspections to ensure proper use and disposal of materials.

B. Hazardous Products

These practices will be used to reduce the risks associated with hazardous materials. Material Safety Data Sheets (MSDS's) for each substance with hazardous properties that is used on the job site will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained in the SWPPP file at the job site construction trailer office. Each employee who must handle a substance with hazardous properties will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

1. Products will be kept in original containers with the original labels in legible condition.
2. Original labels and material safety data sheets (MSDS's) will be procured and used for each material.
3. If surplus product must be disposed of, manufacturer's or local/state/federal recommended methods for proper disposal will be followed.
4. A spill control and containment kit (containing for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.
5. All of the product in a container will be used before the container is disposed of. All such containers will be triple rinsed with water prior to disposal. The rinse water used in these containers will be disposed of in a manner in compliance with state and federal regulations and will not be allowed to mix with storm water discharges.

C. Hazardous Waste

All hazardous waste materials will be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel will be instructed in these practices by the job site superintendent, who will also be responsible for seeing that these practices are followed.

D. Product Specific Practices

The following product specific practices will be followed on the job site.

1. Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products will be stored in tightly sealed containers which are clearly labeled. Any petroleum storage tanks stored onsite will be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations. The location of any fuel tanks and/or equipment storage areas must be identified on a plan by the contractor once the locations have been determined.

2. Fertilizers

Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked in the soil to limit exposure to stormwater. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

3. Paints, Paint Solvents, and Cleaning Solvents

All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and federal regulations.

4. Concrete Wastes

Concrete trucks will be allowed to wash out or discharge surplus concrete or drum wash water on the site, but only in either (1) specifically designated diked areas which have been prepared to prevent contact between the concrete and/or wash out and storm water which will be discharged from the site or (2) in locations where waste concrete can be poured into forms to make riprap or other useful concrete products.

The hardened residue from the concrete wash out diked areas will be disposed of in the same manner as other non-hazardous construction waste materials or may be broken up and used on site as deemed appropriate by the Contractor. The job site superintendent will be responsible for seeing that these procedures are followed.

All concrete wash out areas will be located in an area where the likelihood of the area contributing to storm water discharges is negligible. If required, additional BMPs must be implemented to prevent concrete wastes from contributing to storm water discharges. The location of concrete wash out area(s) must be identified on a plan by the contractor once the locations have been determined. In addition, a standard detail on the construction of the concrete wash out shall be included on this plan.

E. Solid and Construction Wastes

All waste materials will be collected and stored in an appropriately covered container and/or securely lidded metal dumpster rented from a local waste management company which must be a solid waste management company licensed to do business in New York and the City of Lackawanna. The dumpster will comply with all local and state solid waste management regulations.

All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied a minimum of twice per week or more often if necessary, and the trash will be hauled to a landfill approved by the NYSDEC. No construction waste materials will be buried on site. All personnel will be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers will be located in an area where the likelihood of the containers contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges. The location of waste dumpsters and roll-off containers must be identified on a plan by the contractor once the locations have been determined.

F. Sanitary Wastes

Portable toilet units or field offices with toilet facilities connected to the municipal sanitary sewer will be used for sanitary purposes. All portable toilet units will be emptied a minimum of once per week by a licensed portable facility provided in compliance with local and state regulations.

All sanitary waste units will be located in an area where the likelihood of the unit contributing to storm water discharges is negligible. If required, additional BMPs must be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges. The location of sanitary waste units must be identified on a plan by the contractor once the locations have been determined.

G. Contaminated Soils

Any contaminated soils (resulting from spills of materials with hazardous properties) which may result from construction activities will be contained and cleaned up immediately in accordance with the procedures given in the Materials Management Plan and in accordance with applicable state and federal regulations.

118.3 SPILL PREVENTION AND RESPONSE PROCEDURES

The Contractor will train all personnel in the proper handling and cleanup of spilled materials. No spilled hazardous materials or hazardous wastes will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the job site superintendent to properly train all personnel in spill prevention and clean up procedures.

A. In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps will be implemented:

1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
2. The minimum practical quantity of all such materials will be kept on the job site.
3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided at the storage site.
4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

B. In the event of a spill, the following procedures should be followed

1. All spills will be cleaned up immediately after discovery.
2. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.
3. The project manager and the Engineer of Record will be notified immediately.

   Spills of toxic or hazardous materials will be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) must be immediately reported to the EPA National Response Center, telephone 1-100-424-1102. From SWPPP-9 “Reportable Quantity Release Form” must be filled out.

4. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to prevent the recurrence of such releases and to respond to such releases.

C. The job site superintendent will be the spill prevention and response coordinator. He will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the office trailer onsite.

119 CONTROL OF NON-STORM WATER DISCHARGES

Certain types of discharges are allowable under the NYSDEC SPDES General Permit for Construction Activity for the State of New York, and it is the intent of this SWPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this SWPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. The following allowable non-storm water discharges which may occur at the job site include:

A. Discharges from firefighting activities.

B. Fire hydrant flushings (see note below)

C. Waters used to wash vehicles or control dust in order to minimize offsite sediment tracking.

D. Routine external building washdown which does not use detergents.

E. Pavement wash waters where spills or leaks of hazardous materials have not occurred or detergents have not been used.

F. Air conditioning condensate.

G. Springs or other uncontaminated groundwater, including dewatering ground water infiltration.

H. Foundation or footing drains where no contamination with process materials such as solvents is present.

Note: The Contractor shall discharge any super-chlorinated water from water distribution pipe disinfection activities into sanitary sewer system

120 STORM WATER CONTROL FACILITY MAINTENANCE

The proposed stormwater system shall be inspected 2 times per year (spring & fall) for removal of silt & debris.

The proposed catch basins & yard drains shall be inspected 2 times per year (spring & fall) for removal of silt & debris.

Appendix A

Site Location Map

Elmwood & Forest

Legend

- ☐ Council Districts
- ☐ Erie County Municipal Bounda
- 🟥 Parcels
- World Street Map

Notes

1: 4,513

0.1 | 0 | 0.07 | 0.1 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere
© MIS Department, City of Buffalo

Appendix B

NYSDEC Notice of Intent (NOI)

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR ☐☐☐☐☐☐
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-15-002

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-
RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)
Affinity Elmwood Gateway Properties, LLC

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Birtch

Owner/Operator Contact Person First Name
P. Jeffrey

Owner/Operator Mailing Address
105 Affinity Lane

City
Buffalo

State
NY

Zip
14215 -

Phone (Owner/Operator)
716 - 833 - 1000

Fax (Owner/Operator)
- -

Email (Owner/Operator)
jbirtch@ChasonCOS.com

FED TAX ID
26 - 3631020 (not required for individuals)

Project Site Information

Project/Site Name
Elmwood Ave Condominiums

Street Address (NOT P.O. BOX)
1111 Elmwood Ave

Side of Street
○ **North** ○ **South** ● **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)
Buffalo

State: NY
Zip: 14222 -
County: Erie
DEC Region: 9

Name of Nearest Cross Street
Forest Ave

Distance to Nearest Cross Street (Feet)
0

Project In Relation to Cross Street
○ **North** ● **South** ○ **East** ○ **West**

Tax Map Numbers
Section-Block-Parcel
89.62-1-1.1

Tax Map Numbers
1.21 2 31-39

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you **must** go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting)	**Y Coordinates (Northing)**
183609	4760098

2. What is the nature of this construction project?

○ **New Construction**

● **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

4107089829

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

○ FOREST
○ PASTURE/OPEN LAND
○ CULTIVATED LAND
○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
○ INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
● COMMERCIAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY
○ PARKING LOT
○ OTHER

Post-Development Future Land Use

○ SINGLE FAMILY HOME
○ SINGLE FAMILY SUBDIVISION
Number of Lots
○ TOWN HOME RESIDENTIAL
○ MULTIFAMILY RESIDENTIAL
○ INSTITUTIONAL/SCHOOL
○ INDUSTRIAL
● COMMERCIAL
○ MUNICIPAL
○ ROAD/HIGHWAY
○ RECREATIONAL/SPORTS FIELD
○ BIKE PATH/TRAIL
○ LINEAR UTILITY (water, sewer, gas, etc.)
○ PARKING LOT
○ CLEARING/GRADING ONLY
○ DEMOLITION, NO REDEVELOPMENT
○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
○ OTHER

***Note**: for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	**Total Area To Be Disturbed**	**Existing Impervious Area To Be Disturbed**	**Future Impervious Area Within Disturbed Area**
1.1	1.1	0.8	0.9

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ **Yes** ○ **No**

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	**B**	**C**	**D**
%	%	%	100 %

7. Is this a phased project? ○ **Yes** ○ **No**

8. Enter the planned start and end dates of the disturbance activities.

Start Date 11/15/2017 - **End Date** 05/15/2019

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

Scajacquada Creek

9a. Type of waterbody identified in Question 9?

○ Wetland / State Jurisdiction On Site (Answer 9b)
○ Wetland / State Jurisdiction Off Site
○ Wetland / Federal Jurisdiction On Site (Answer 9b)
○ Wetland / Federal Jurisdiction Off Site
○ Stream / Creek On Site
● Stream / Creek Off Site
○ River On Site
○ River Off Site
○ Lake On Site
○ Lake Off Site
○ Other Type On Site
○ Other Type Off Site

9b. How was the wetland identified?

● Regulatory Map
○ Delineated by Consultant
○ Delineated by Army Corps of Engineers
○ Other (identify)

10.	Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-15-002?	● Yes ○ No
11.	Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002?	○ Yes ● No
12.	Is the project located in one of the watershed areas associated with AA and AA-S classified waters? **If no, skip question 13.**	○ Yes ● No
13.	Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? **If Yes, what is the acreage to be disturbed?** .	○ Yes ● No
14.	Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area?	○ Yes ● No

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ● Yes ○ No ○ Unknown

16. What is the name of the municipality/entity that owns the separate storm sewer system?

Buffalo Sewer Authority

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ Yes ● No ○ Unknown

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ Yes ● No

19. Is this property owned by a state authority, state agency, federal government or local government? ○ Yes ○ No

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ Yes ● No

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ● Yes ○ No

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ● Yes ○ No
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ● Yes ○ No

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

● **Professional Engineer (P.E.)**
○ **Soil and Water Conservation District (SWCD)**
○ **Registered Landscape Architect (R.L.A)**
○ **Certified Professional in Erosion and Sediment Control (CPESC)**
○ **Owner/Operator**
○ **Other**

SWPPP Preparer
Carmina Wood Morris, DPC

Contact Name (Last, Space, First)
Wood, Christopher

Mailing Address
487 Main Street, Suite 500

City
Buffalo

State NY Zip 14203-

Phone 716-842-3165 Fax 716-842-0263

Email
cwood@cwm-ae.com

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name Christopher **MI**

Last Name Wood

Signature

Date 11/08/2017

25. Has a construction sequence schedule for the planned management practices been prepared? ● Yes ○ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

○ **Check Dams**
○ **Construction Road Stabilization**
○ **Dust Control**
○ **Earth Dike**
○ **Level Spreader**
○ **Perimeter Dike/Swale**
○ **Pipe Slope Drain**
○ **Portable Sediment Tank**
○ **Rock Dam**
○ **Sediment Basin**
○ **Sediment Traps**
● **Silt Fence**
● **Stabilized Construction Entrance**
● **Storm Drain Inlet Protection**
○ **Straw/Hay Bale Dike**
○ **Temporary Access Waterway Crossing**
○ **Temporary Stormdrain Diversion**
○ **Temporary Swale**
○ **Turbidity Curtain**
○ **Water bars**

Biotechnical

○ **Brush Matting**
○ **Wattling**

Vegetative Measures

○ **Brush Matting**
○ **Dune Stabilization**
○ **Grassed Waterway**
○ **Mulching**
○ **Protecting Vegetation**
○ **Recreation Area Improvement**
● **Seeding**
○ **Sodding**
○ **Straw/Hay Bale Dike**
○ **Streambank Protection**
○ **Temporary Swale**
● **Topsoiling**
○ **Vegetating Waterways**

Permanent Structural

○ **Debris Basin**
○ **Diversion**
○ **Grade Stabilization Structure**
○ **Land Grading**
○ **Lined Waterway (Rock)**
○ **Paved Channel (Concrete)**
○ **Paved Flume**
○ **Retaining Wall**
○ **Riprap Slope Protection**
○ **Rock Outlet Protection**
○ **Streambank Protection**

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: **Completion of Questions 27-39 is not required if response to Question 22 is No.**

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

○ **Preservation of Undisturbed Areas**
○ **Preservation of Buffers**
○ **Reduction of Clearing and Grading**
○ **Locating Development in Less Sensitive Areas**
○ **Roadway Reduction**
○ **Sidewalk Reduction**
○ **Driveway Reduction**
○ **Cul-de-sac Reduction**
○ **Building Footprint Reduction**
○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

● All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

0.057 **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)
RR Techniques (Area Reduction)			
○ Conservation of Natural Areas (RR-1) ...	.	and/or	.
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)	.	and/or	.
○ Tree Planting/Tree Pit (RR-3)	.	and/or	.
○ Disconnection of Rooftop Runoff (RR-4)..	.	and/or	.
RR Techniques (Volume Reduction)			
○ Vegetated Swale (RR-5)			.
○ Rain Garden (RR-6)			.
○ Stormwater Planter (RR-7)			.
○ Rain Barrel/Cistern (RR-8)			.
○ Porous Pavement (RR-9)			.
○ Green Roof (RR-10)			.
Standard SMPs with RRv Capacity			
○ Infiltration Trench (I-1)			.
○ Infiltration Basin (I-2)			.
○ Dry Well (I-3)			.
○ Underground Infiltration System (I-4)			.
○ Bioretention (F-5)			.
○ Dry Swale (O-1)			.
Standard SMPs			
○ Micropool Extended Detention (P-1)			.
○ Wet Pond (P-2)			.
○ Wet Extended Detention (P-3)			.
○ Multiple Pond System (P-4)			.
○ Pocket Pond (P-5)			.
○ Surface Sand Filter (F-1)			.
○ Underground Sand Filter (F-2)			.
○ Perimeter Sand Filter (F-3)			.
○ Organic Filter (F-4)			.
○ Shallow Wetland (W-1)			.
○ Extended Detention Wetland (W-2)			.
○ Pond/Wetland System (W-3)			.
○ Pocket Wetland (W-4)			.
○ Wet Swale (O-2)			.

Table 2 - Alternative SMPs (DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	**Total Contributing Impervious Area(acres)**
○ **Hydrodynamic**	.
● **Wet Vault**	0.95
○ **Media Filter**	.
○ **Other**	.

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name CrystalClean CST-1 Model 446

Manufacturer CrystalStream Technologies

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

. **acre-feet**

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ **Yes** ○ **No**

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

. **acre-feet**

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

○ **Yes** ○ **No**

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining
total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

0.057 **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a). 0.057

35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ● **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required . **acre-feet**

CPv Provided . **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development . **CFS**

Post-development . **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development . **CFS**

Post-development . **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.
○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ● Yes ○ No

If Yes, Identify the entity responsible for the long term Operation and Maintenance

Affinity Elmwood Gateway Properties,
LLC

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

The project includes the redevelopment of previously developed parcels which allows it to fall under the Redevelopment Activity guidelines found in Chapter 9 of the NYSDEC Storm Water Design Manual. This chapter outlines alternative approaches for addressing stormwater management including requirements for Water Quantity control sizing and Water Quality treatment objectives. The project does involve lands that were part of a brownfield cleanup project, therefore infiltration type stormwater management practices will be limited as the NYSDEC classifies this as a hotspot.
Water Quantity:
The redevelopment activities proposed will not result in a change to hydrology that increases the discharge rate from the project site, therefore the 10-year Overbank Flooding and 100-year Extreme Storm Protection storm event storage criteria do not apply. The proposed runoff generated for the 10-year storm is 3.73 cfs which is 1.58 cfs lower than the existing discharge of 5.31 cfs. The proposed runoff generated for the 100-year storm is 6.39 cfs which is 2.88 cfs lower than the existing discharge of 9.27 cfs. Due to the reduction in discharge rates, no onsite stormwater storage will be required. Channel Protection is not required for this redevelopment project since there will not be an increase to the 1-year 24 hour runoff rate. The proposed runoff rate for the 1-year 24 hour discharge is 2.08 cfs which is 0.78 lower than the existing runoff rate of 2.86 cfs. Therefore, providing 24 hour detention of the 1-year storm will not be required.
Water Quality:
The NYSDEC requires Water Quality treatment prior to discharge. Water Quality treatment will be provided by implementing the use of alternative SMPs to treat 75% of the water quality volume from the disturbed, impervious area as well as any additional runoff from tributary areas that are not within the disturbed, impervious area. Proposed will be the installation of a proprietary practice, a manufactured treatment system, designed to treat a minimum of 2,477 cubic feet, which is 75% of the calculated total water quality volume for the site.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

○ Air Pollution Control

○ Coastal Erosion

○ Hazardous Waste

○ Long Island Wells

○ Mined Land Reclamation

○ Solid Waste

○ Navigable Waters Protection / Article 15

○ Water Quality Certificate

○ Dam Safety

○ Water Supply

○ Freshwater Wetlands/Article 24

○ Tidal Wetlands

○ Wild, Scenic and Recreational Rivers

○ Stream Bed or Bank Protection / Article 15

○ Endangered or Threatened Species(Incidental Take Permit)

○ Individual SPDES

○ SPDES Multi-Sector GP NYR

○ Other

○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? **If Yes, Indicate Size of Impact.** . ○ **Yes** ● **No**

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? **(If No, skip question 43)** ● **Yes** ○ **No**

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ● **Yes** ○ **No**

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. NYR

3547089826

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name P. Jeffrey

MI

Print Last Name Birtch

Owner/Operator Signature

Date 11/08/2017

P. Jeffrey Birtch
MEMBER

Appendix C

MS4 SWPPP Acceptance Form

NYS Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information

1. Owner/Operator Name: Affinity Elmwood Gateway Properties, LLC
2. Contact Person: Judy Tucker
3. Street Address: 105 Affinity Lane
4. City/State/Zip: Buffalo, NY 14215

II. Project Site Information

5. Project/Site Name: Elmwood - Forest Condos
6. Street Address: 1111 Elmwood Avenue
7. City/State/Zip: Buffalo, NY 14222

III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information

8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:

IV. Regulated MS4 Information

11. Name of MS4:
12. MS4 SPDES Permit Identification Number: NYR20A
13. Contact Person:
14. Street Address:
15. City/State/Zip:
16. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Additional Information

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

Appendix D

Engineer’s Report

Carmina·Wood·Morris DPC

487 Main Street Suite 600 Buffalo, New York 14203 P: 716.842.3165 F: 716.842.0263 W: cwm-ae.com

Architecture Engineering Interior Design

ENGINEER'S REPORT
FOR
ELMWOOD AVENUE CONDOMINIUMS
1111 ELMWOOD AVENUE
BUFFALO, NEW YORK

STATE OF NEW YORK
R. CHRISTOPHER WOOD
076394
LICENSED PROFESSIONAL ENGINEER

GENERAL

The project consists of the redevelopment of 1111 Elmwood Avenue and 605 Forest Avenue which is located on the southeast corner of Elmwood and Forest Avenues is the City of Buffalo. Proposed is a new four story mixed use building that will include 44 condominiums, 3 first floor retail spaces of up to 3,500 g.s.f. each, and a below grade 97 space parking facility to accommodate these uses. The site was previously a combination of 12 parcels that were developed as a mix of commercial retail space and apartments within multiple structures. The overall project is approximately 1.1 acres and is located in the Urban Center (N-2) Zoning of the Unified Development Ordinance. The 1111 Elmwood property is zoned N-2C - Mixed Use Center and the 605 Forest property is zoned N-2R - Residential.

EXISTING CONDITIONS

Sanitary Sewer

The existing sanitary services to each of the 12 parcels are proposed to be abandoned per City of Buffalo regulations.

Water Service

The existing water services to each of the 12 parcels are proposed to be abandoned per City of Buffalo regulations.

Storm Sewer

The majority of stromwater runoff generated sheet drains off-site into existing BSA storm collection systems within Elmwood and Forest Avenues.

PROPOSED FACILITIES

Sanitary Sewer

The proposed sanitary sewer service will consist of (2) two new 6" SDR-35 PVC sanitary laterals at 2.0% minimum that will exit the building on the west side and tie into the existing 10” VT Buffalo Sewer Authority combination sewer # 5508 on the east side of Elmwood Avenue.

Design Parameters:

Proposed Condominiums:
(5) 1 Bedroom Condominiums @ 110 gpd/bdrm = 550 gpd
(30) 2 Bedroom Condominiums @ 110 gpd/bdrm = 6,600 gpd
(6) 3 Bedroom Condominiums @ 110 gpd/bdrm = 1,980 gpd

Proposed Retail Space:
8,500 gsf @ 0.1 gpd/gsf = 850 gpd

Total Sanitary Demand: 9,980 gpd

Peak Sanitary Demand (4.26 peaking factor): 42,563 gpd

The hydraulic loading rate is per “New York State Design Standards for Intermediate Wastewater Treatment Systems” March 5, 2014, NYSDEC. See attached sanitary sewer demand calculations.

Water Service

A new 4” Class 52 Ductile Iron domestic service will be tapped off the existing 12" City of Buffalo water main along the north side of Forest Avenue and continue into a utility room within the basement of the proposed building where a 4” domestic meter and backflow preventor will be installed. A new 6” class 52 ductile iron fire service will also be tapped off the existing 12” main and have a 6” backflow preventor installed prior to connection to the building sprinkler system designed by others. Backflow preventor design and selection to be performed by others.

The proposed utility room will have heat and light provided. Drainage as a result of testing or failure will be provided by gravity to a sump pump within the basement of the building.

The proposed water system will provide domestic water and fire protection to the building. The fire protection/sprinkler system is to be designed by others.

Domestic summary:

Peak operating Demand: 18.30 gpm
Water main: 12” on Forest Avenue
Static Pressure: 58 psi (per Buffalo Division of Water)

Friction Loss:	0.01 psi
Loss through meter & RPZ:	13 psi
Elevation Loss:	0 psi
Pressure after meter & RPZ:	45 psi

Repairs to all devices will be made during off hours, dual backflow preventors are not required. The proposed building is not located in a 100-year flood plain.

Disinfection of the water service following installation will be continuous feed, according to AWWA C-651, latest revision.

Storm Sewer

The proposed storm sewer system will discharge to the existing 48″ storm overflow sewer within Forest Avenue which is controlled by the Buffalo Sewer Authority. The on-site system will collect runoff generated from the proposed rooftops and greenspace to the east of the building. Discharge rates will be restricted to at or below existing rates and any resulting differences will be attenuated within on-site underground detention.

NYSDEC Requirements:

NYSDEC SPDES requirements dictate that if greater than 1.0 acre of soil disturbance is proposed during construction of the project that the General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-15-002 will apply. The NYSDEC defines disturbance as exposure of the subsoil of any subbase area that is currently stone or gravel. The New York State Stormwater Management Design Manual (January, 2015) has been used to design the proposed stormwater management system.

The project includes the redevelopment of previously developed parcels which allows it to fall under the Redevelopment Activity guidelines found in Chapter 9 of the NYSDEC Storm Water Design Manual. This chapter outlines alternative approaches for addressing stormwater management including requirements for Water Quantity control sizing and Water Quality treatment objectives. The project does involve lands that were part of a brownfield cleanup project, therefore infiltration type stormwater management practices will be limited as the NYSDEC classifies this as a hotspot.

Water Quantity:

The redevelopment activities proposed will not result in a change to hydrology that increases the discharge rate from the project site, therefore the 10-year Overbank Flooding and 100-year Extreme Storm Protection storm event storage criteria do not apply. The proposed runoff generated for the 10-year storm is 3.73 cfs which is 1.58 cfs lower than the existing discharge of 5.31 cfs. The proposed runoff generated for the 100-year storm is 6.39 cfs which is 2.88 cfs lower than the existing discharge of 9.27 cfs. Due to the reduction in discharge rates, no onsite stormwater storage will be required.

Channel Protection is not required for this redevelopment project since there will not be an increase to the 1-year 24 hour runoff rate. The proposed runoff rate for the 1-year 24 hour discharge is 2.08 cfs which is 0.78 lower than the existing runoff rate of 2.86 cfs. Therefore, providing 24 hour detention of the 1-year storm will not be required.

Water Quality:

The NYSDEC requires Water Quality treatment prior to discharge. Water Quality treatment will be provided by implementing the use of alternative SMPs to treat 75% of the water quality volume from the disturbed, impervious area as well as any additional runoff from tributary areas that are not within the disturbed, impervious area. Proposed will be the installation of a proprietary practice, a manufactured treatment system, designed to treat a minimum of 2,477 cubic feet, which is 75% of the calculated total water quality volume for the site.

Summary of Stormwater Runoff:

Storm Event	**Existing Runoff (CFS)**	**Proposed Runoff (CFS)**	**Decrease in Runoff (CFS)**	**System Discharge (CFS)**	**Pipe Storage (CF)**
1-year	2.86	2.08	0.78	2.08	7
10-year	5.31	3.73	1.58	3.63	91
100-year	9.27	6.39	2.88	6.31	471

DOMESTIC WATER & SANITARY DEMAND CALCULATIONS

CARMINA WOOD MORRIS, D.P.C.
487 MAIN STREET, SUITE 600
BUFFALO, NEW YORK, 14203
(716) 842-3165
FAX (716) 842-0263

Project No.: 16.018 Date: 10/5/2017
Project Name: Elmwood - Forest Condos
Project Address: 1111 Elmwood Ave.
Subject: Sanitary Sewage & Domestic Water Demand Calcs
Sheet: 1 of 1

Sanitary Sewage Demand Calculations:

Proposed Condominiums:

5 1 bedroom condos @ 110 gpd = 550 gpd
30 2 bedroom condos @ 220 gpd = 6,600 gpd
6 3 bedroom condos @ 330 gpd = 1,980 gpd

Proposed Retail:

8,500 SQ FT (incl. storage) @ 0.1 gpd = 850 gpd

Total Demand = 9,980 gpd

Determine Peak Demand Baseed on Population:

Population (P in thousands) = 0.083 (based on 1 person per bedroom)

$$\text{Peaking Factor} = \frac{18 + P^{0.5}}{4 + P^{0.5}} = 4.26$$

Total Peak Daily Demand = 42,563 gpd

42,563 gpd x 1 cf/7.48 gal x 1day/18hr x 1hr/60min x 1min/60sec = 0.088 cfs Q_{peak}

Water Demand Calculations:

Proposed Apartments - Restaurant - Retail Building:

9,980 gpd x 1.1 = 10,978 gpd *use 110% of sewage demand

*use 1.8 peaking factor and assume a 18 hour day

10,978 gpm x 1day/18hr x 1hr/60min = 10.16 gpm

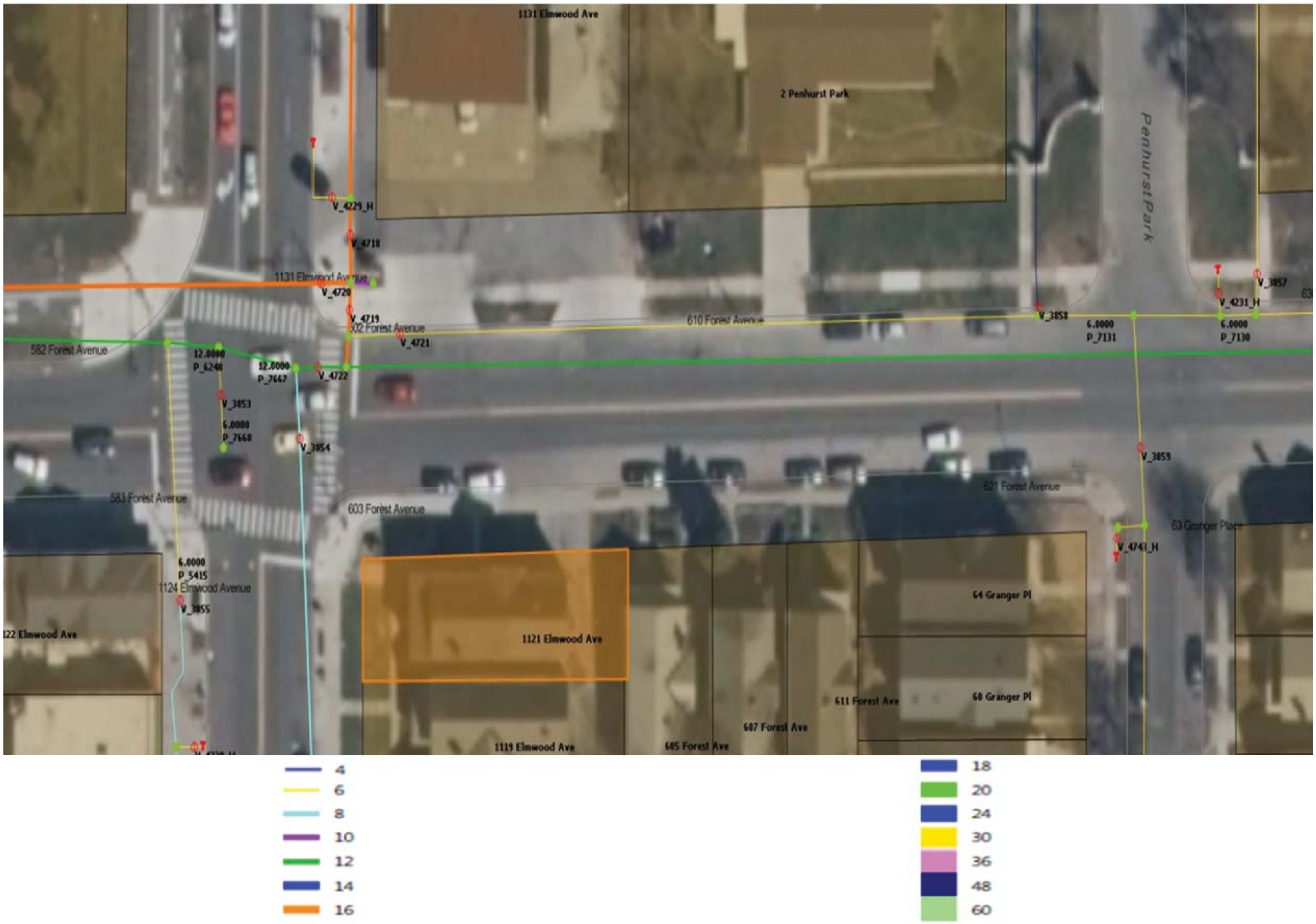
10.16 gpm x 1.8 = 18.30 gpm Q_{peak}

Headlosses:

Q_{peak} = 18.30 gpm
Pipe = 4 inch Ductile Iron C = 140
Length = 70 LF (approx. distance from tap to RPZ)

$$H_L = \frac{10.44\ L\ Q^{1.85}}{C^{1.85}\ D^{4.866}} = \frac{10.44(70)(24.26)^{1.85}}{(140)^{1.85}\ (4)^{4.866}} = 0.02 \text{ ft} = 0.01 \text{ psi}$$

Δ elev = 0 ft = 0.00 psi *RPZ is located in the basement
Loss through meter = 1 psi
Loss through RPZ = 12 psi
Total Losses = 13.0 psi
Static Pressure = 58 psi *per Buffalo Division of Water
Residual Pressure Following RPZ = 58 - 13 = 45.0 psi (available after rpz & meter)



ID	Street From	Street To	Diameter	Location Description
P_5415	W side, Bird Ave.	Forest Ave.	6	8½ ft W of W curb
P_6248	Elmwood Ave.	Lincoln Pkwy.	12	11 ft S of N curb
P_6579	Elmwood Ave.	Lincoln Pkwy.	6	4 ft S of N curb
P_6580	E side, Potomac Ave.	Forest Ave.	8	8½ ft E of E curb
P_7131	Elmwood Ave.	Lincoln Pkwy.	6	4 ft S of N curb
P_7667	Elmwood Ave.	Lincoln Pkwy.	12	11 ft S of N curb
P_7668			6	
P_7669	Ashland Ave.	Elmwood Ave.	12	3 ft N of N curb
P_7707	Richmond Ave.	Elmwood Ave.	16	29 ft N of N curb
P_7709	Forest Ave.	800 ft N of Penhurst Pk.	16	18½ ft E of E curb
P_8908	Forest Ave.	800 ft N of Penhurst Pk.	16	18½ ft E of E curb
P_8909	Forest Ave.	800 ft N of Penhurst Pk.	16	18½ ft E of E curb
P_8951	Bird Ave.	Forest Ave.	6	6 ft E of W curb
P_9279	Elmwood Ave.	Lincoln Pkwy.	12	11 ft S of N curb
P_9280	Elmwood Ave.	Lincoln Pkwy.	12	11 ft S of N curb

BUFFALO DIVISION OF WATER
FLOW TEST
HYDRANT MAINTENANCE CHECK LIST

Flow Test By: BRIAN D. LACKIE & PERRY SULLIVAN Date: 5-17-12

Hydrant No. 1A- 1ST HYD EAST OF RICHMOND
1B- 1ST HYD. EAST OF ABBOTTSFORD Model UAR

Location: FOREST (NIAGARA TO LINCOLN)

CHECK OFF & COMMENT ON ITEMS BELOW

FLOW TEST:

MAIN SIZE 12"

SUPPLY SIZE 6"

NOZZLE SIZE 2.5" AND COEF. FACTORED IN

HOW LONG 10 min.

STATIC PRESSURE 58 psi @ hyd # 1A

RESIDUAL PRESSURE 56 psi @ hyd # 1A

PITOMETER PRESSURE 42.5 psi @ hyd # 1B

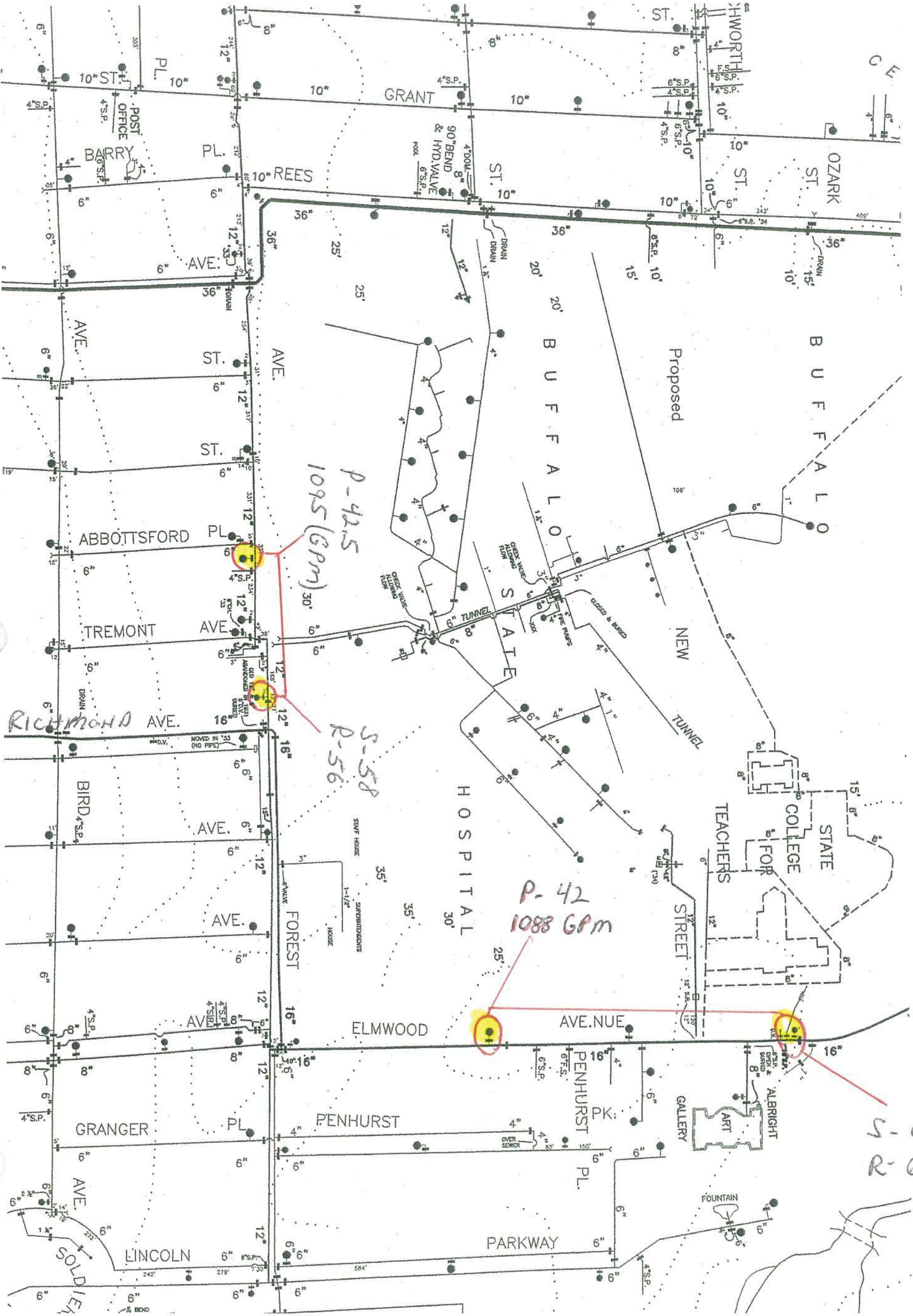
FLOW IN GPM 1095 @ hyd # 1B

TIME OF TEST AM

DATE OF TEST 5-17-12

FLUSHED HYDRANT: YES ✓ NO

COMMENTS & DEFECTS:



P-42.5
1095 (GPM)

S-58
R-56

P-42
1088 GPM

S-62
R-60

5-17-12

STORMWATER RUNOFF CALCULATIONS & SUMMARIES

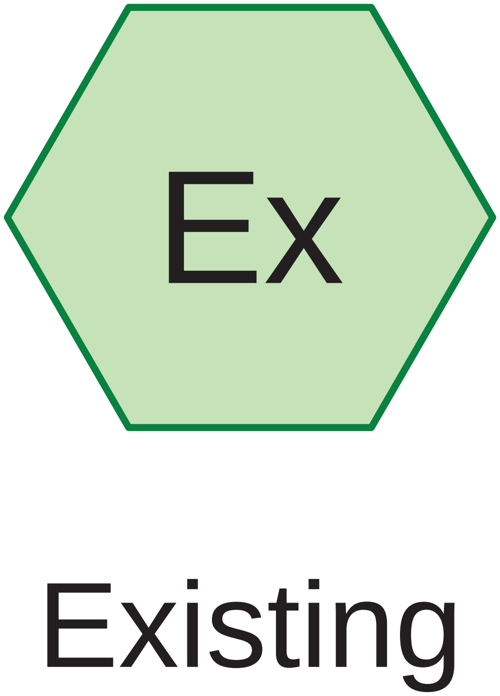
Events for Subcatchment Ex: Existing

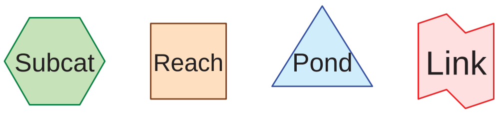
Event	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
1-Year	2.86	5,086	1.28
2-Year	3.50	6,319	1.58
5-Year	4.44	8,181	2.05
10-Year	5.31	9,913	2.49
25-Year	6.64	12,633	3.17
50-Year	7.85	15,138	3.80
100-Year	**9.27**	**18,086**	**4.54**

Events for Pond 3P: 18" pipe

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
1-Year	2.08	2.08	96.81	7
2-Year	2.51	2.50	96.93	15
5-Year	3.15	3.11	97.18	44
10-Year	3.73	3.63	97.42	91
25-Year	4.62	4.38	97.84	211
50-Year	5.44	5.08	98.31	354
100-Year	**6.39**	**6.31**	**99.30**	**471**

HYDROCAD REPORTS





Routing Diagram for 16.018 Existing 1111 Elmwood
Prepared by Carmina Wood Morris, DPC, Printed 11/13/2017
HydroCAD® 10.00-20 s/n 05020 © 2017 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
11,751	80	>75% Grass cover, Good, HSG D (Ex)
36,107	98	Roofs, HSG D (Ex)
47,858	**94**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
47,858	HSG D	Ex
0	Other	
47,858		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	0	11,751	0	11,751	>75% Grass cover, Good	
0	0	0	36,107	0	36,107	Roofs	
0	**0**	**0**	**47,858**	**0**	**47,858**	**TOTAL AREA**	

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Ex: Existing Runoff Area=47,858 sf 75.45% Impervious Runoff Depth=1.28"
Flow Length=100' Slope=0.0550 '/' Tc=0.9 min CN=94 Runoff=2.86 cfs 5,086 cf

Total Runoff Area = 47,858 sf Runoff Volume = 5,086 cf Average Runoff Depth = 1.28"
24.55% Pervious = 11,751 sf 75.45% Impervious = 36,107 sf

Summary for Subcatchment Ex: Existing

[49] Hint: Tc<2dt may require smaller dt

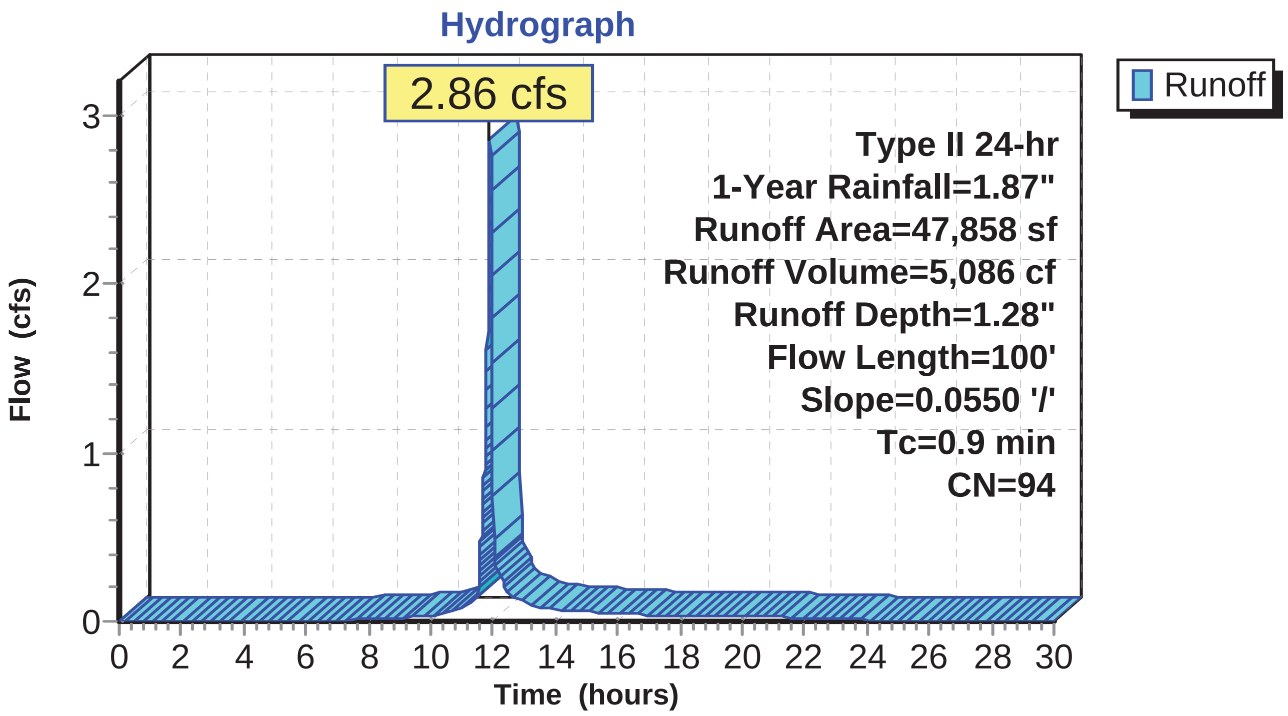
Runoff = 2.86 cfs @ 11.91 hrs, Volume= 5,086 cf, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (sf)	CN	Description
11,751	80	>75% Grass cover, Good, HSG D
36,107	98	Roofs, HSG D
47,858	94	Weighted Average
11,751		24.55% Pervious Area
36,107		75.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0550	1.82		**Sheet Flow, over pvmt** Smooth surfaces n= 0.011 P2= 2.50"

Subcatchment Ex: Existing



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Ex: Existing Runoff Area=47,858 sf 75.45% Impervious Runoff Depth=2.49"
Flow Length=100' Slope=0.0550 '/' Tc=0.9 min CN=94 Runoff=5.31 cfs 9,913 cf

Total Runoff Area = 47,858 sf Runoff Volume = 9,913 cf Average Runoff Depth = 2.49"
24.55% Pervious = 11,751 sf 75.45% Impervious = 36,107 sf

Summary for Subcatchment Ex: Existing

[49] Hint: Tc<2dt may require smaller dt

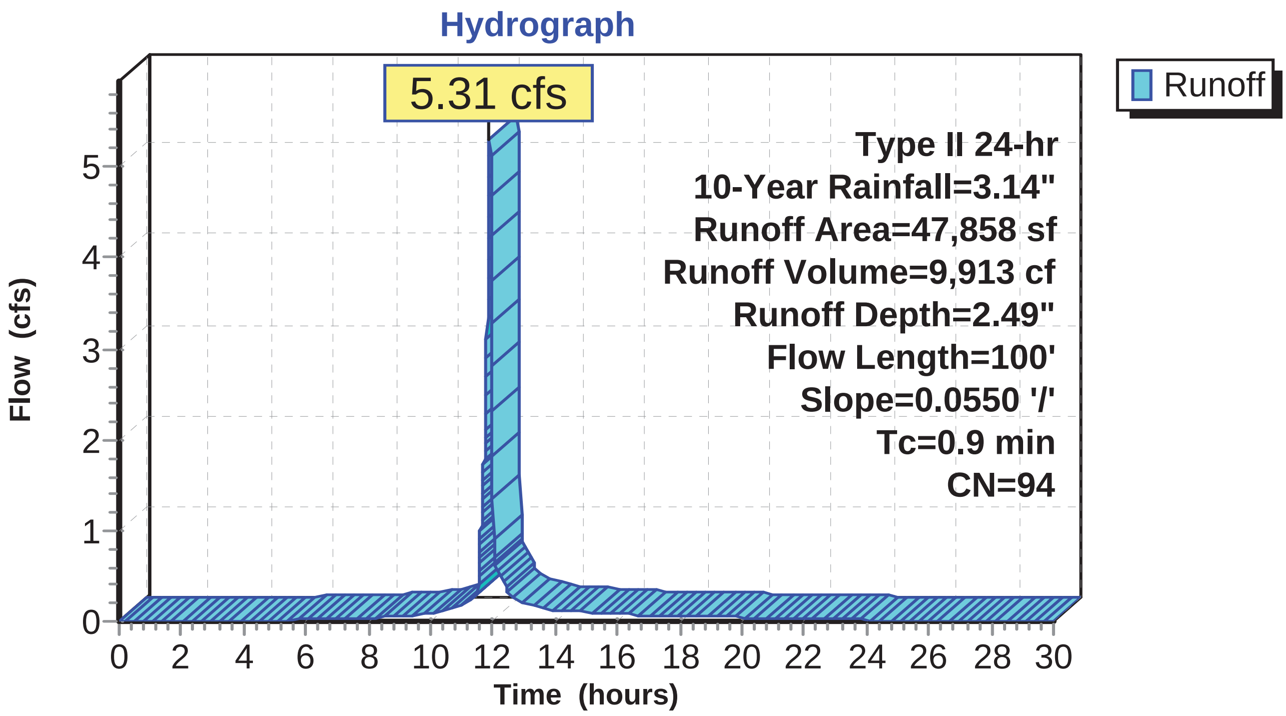
Runoff = 5.31 cfs @ 11.91 hrs, Volume= 9,913 cf, Depth= 2.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (sf)	CN	Description
11,751	80	>75% Grass cover, Good, HSG D
36,107	98	Roofs, HSG D
47,858	94	Weighted Average
11,751		24.55% Pervious Area
36,107		75.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0550	1.82		**Sheet Flow, over pvmt** Smooth surfaces n= 0.011 P2= 2.50"

Subcatchment Ex: Existing



Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Ex: Existing Runoff Area=47,858 sf 75.45% Impervious Runoff Depth=4.54"
Flow Length=100' Slope=0.0550 '/' Tc=0.9 min CN=94 Runoff=9.27 cfs 18,086 cf

Total Runoff Area = 47,858 sf Runoff Volume = 18,086 cf Average Runoff Depth = 4.54"
24.55% Pervious = 11,751 sf 75.45% Impervious = 36,107 sf

Summary for Subcatchment Ex: Existing

[49] Hint: Tc<2dt may require smaller dt

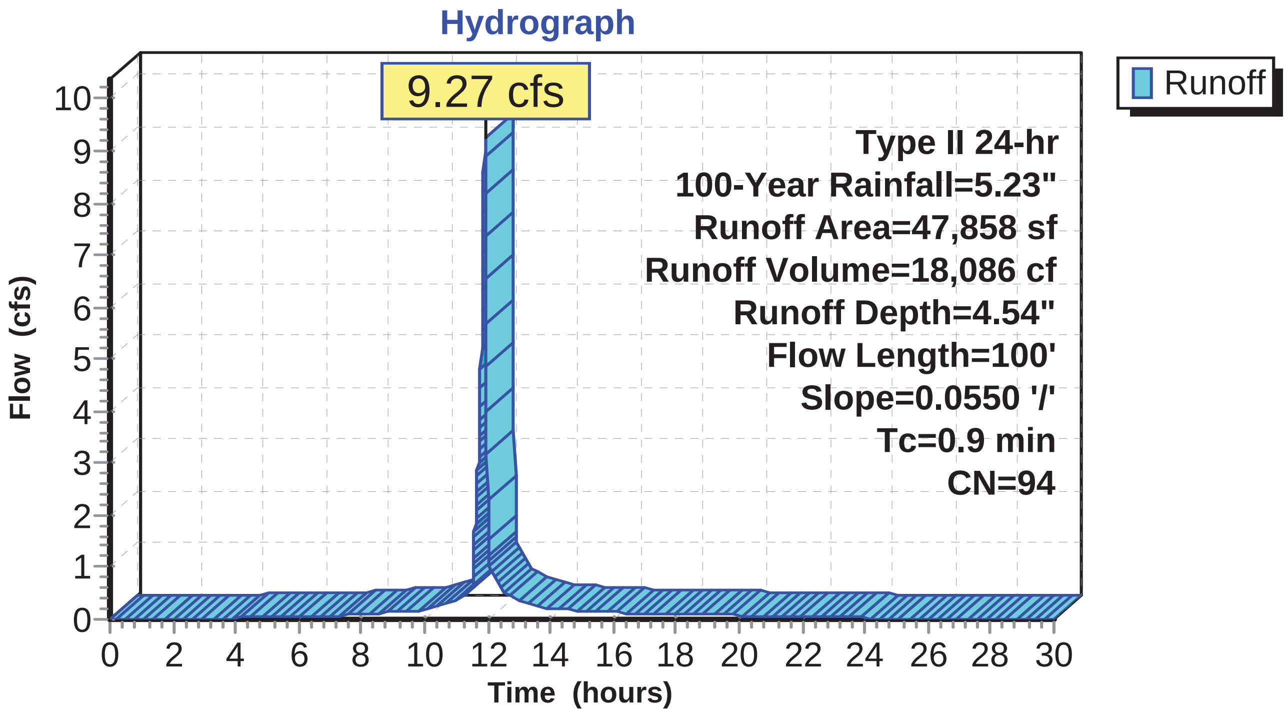
Runoff = 9.27 cfs @ 11.91 hrs, Volume= 18,086 cf, Depth= 4.54"

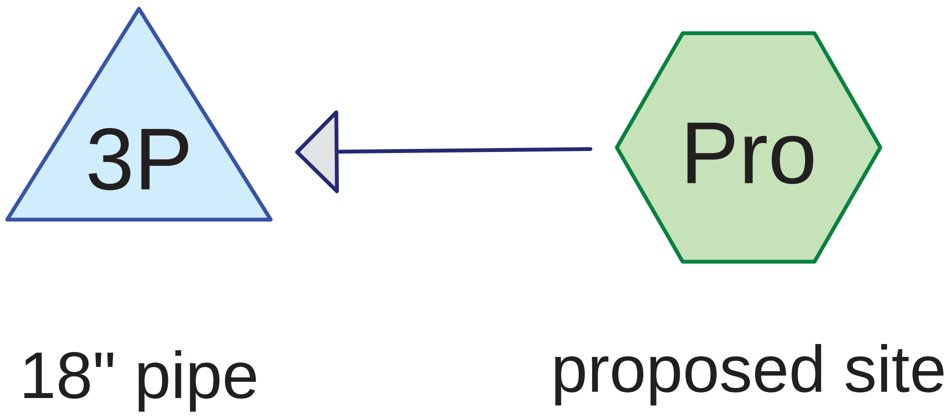
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Year Rainfall=5.23"

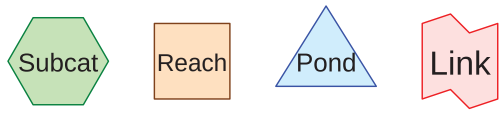
Area (sf)	CN	Description
11,751	80	>75% Grass cover, Good, HSG D
36,107	98	Roofs, HSG D
47,858	94	Weighted Average
11,751		24.55% Pervious Area
36,107		75.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0550	1.82		**Sheet Flow, over pvmt** Smooth surfaces n= 0.011 P2= 2.50"

Subcatchment Ex: Existing







Routing Diagram for 16.018 Proposed 1111 Elmwood with pipe
Prepared by Carmina Wood Morris, DPC, Printed 11/13/2017

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
6,535	80	>75% Grass cover, Good, HSG D (Pro)
40,015	98	Roofs, HSG D (Pro)
1,308	98	Unconnected pavement, HSG D (Pro)
47,858	**96**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
0	HSG C	
47,858	HSG D	Pro
0	Other	
47,858		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
0	0	0	6,535	0	6,535	>75% Grass cover, Good	
0	0	0	40,015	0	40,015	Roofs	
0	0	0	1,308	0	1,308	Unconnected pavement	
0	**0**	**0**	**47,858**	**0**	**47,858**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	3P	96.00	94.60	70.0	0.0200	0.013	12.0	0.0	0.0

```
Time span=0.00-30.00 hrs, dt=0.02 hrs, 1501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method  -  Pond routing by Dyn-Stor-Ind method

SubcatchmentPro: proposed site         Runoff Area=47,858 sf   86.35% Impervious   Runoff Depth=1.45"
                          Flow Length=338'   Slope=0.0100 '/'   Tc=13.4 min   CN=96   Runoff=2.08 cfs  5,778 cf

Pond 3P: 18" pipe                                   Peak Elev=96.81'  Storage=7 cf   Inflow=2.08 cfs  5,778 cf
                            12.0"  Round Culvert  n=0.013  L=70.0'  S=0.0200 '/'   Outflow=2.08 cfs  5,778 cf

            Total Runoff Area = 47,858 sf   Runoff Volume = 5,778 cf   Average Runoff Depth = 1.45"
                                            13.65% Pervious = 6,535 sf     86.35% Impervious = 41,323 sf
```

Summary for Subcatchment Pro: proposed site

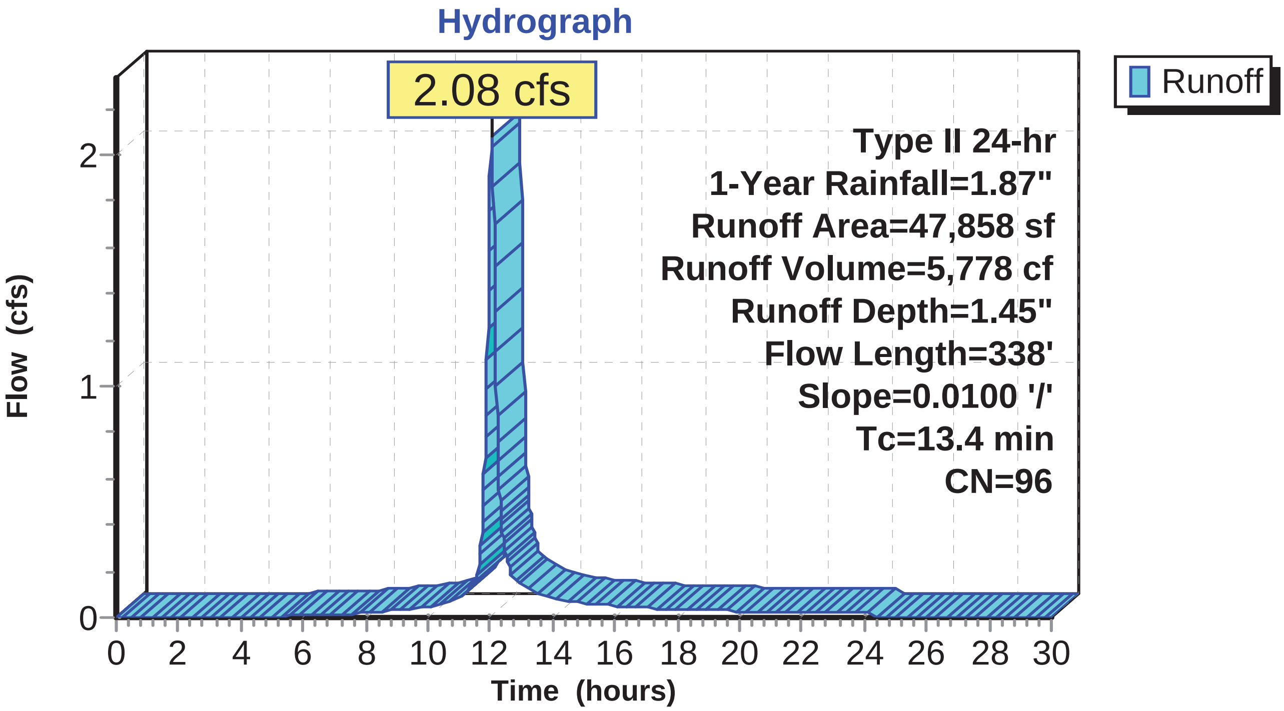
Runoff = 2.08 cfs @ 12.05 hrs, Volume= 5,778 cf, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr 1-Year Rainfall=1.87"

Area (sf)	CN	Description
6,535	80	>75% Grass cover, Good, HSG D
40,015	98	Roofs, HSG D
1,308	98	Unconnected pavement, HSG D
47,858	96	Weighted Average
6,535		13.65% Pervious Area
41,323		86.35% Impervious Area
1,308		3.17% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	78	0.0100	0.11		**Sheet Flow, over grass** Grass: Short n= 0.150 P2= 2.50"
1.4	260		3.00		**Direct Entry, pipe flow**
13.4	338	Total			

Subcatchment Pro: proposed site



Summary for Pond 3P: 18" pipe

Inflow Area = 47,858 sf, 86.35% Impervious, Inflow Depth = 1.45" for 1-Year event
Inflow = 2.08 cfs @ 12.05 hrs, Volume= 5,778 cf
Outflow = 2.08 cfs @ 12.05 hrs, Volume= 5,778 cf, Atten= 0%, Lag= 0.2 min
Primary = 2.08 cfs @ 12.05 hrs, Volume= 5,778 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 96.81' @ 12.05 hrs Surf.Area= 52 sf Storage= 7 cf

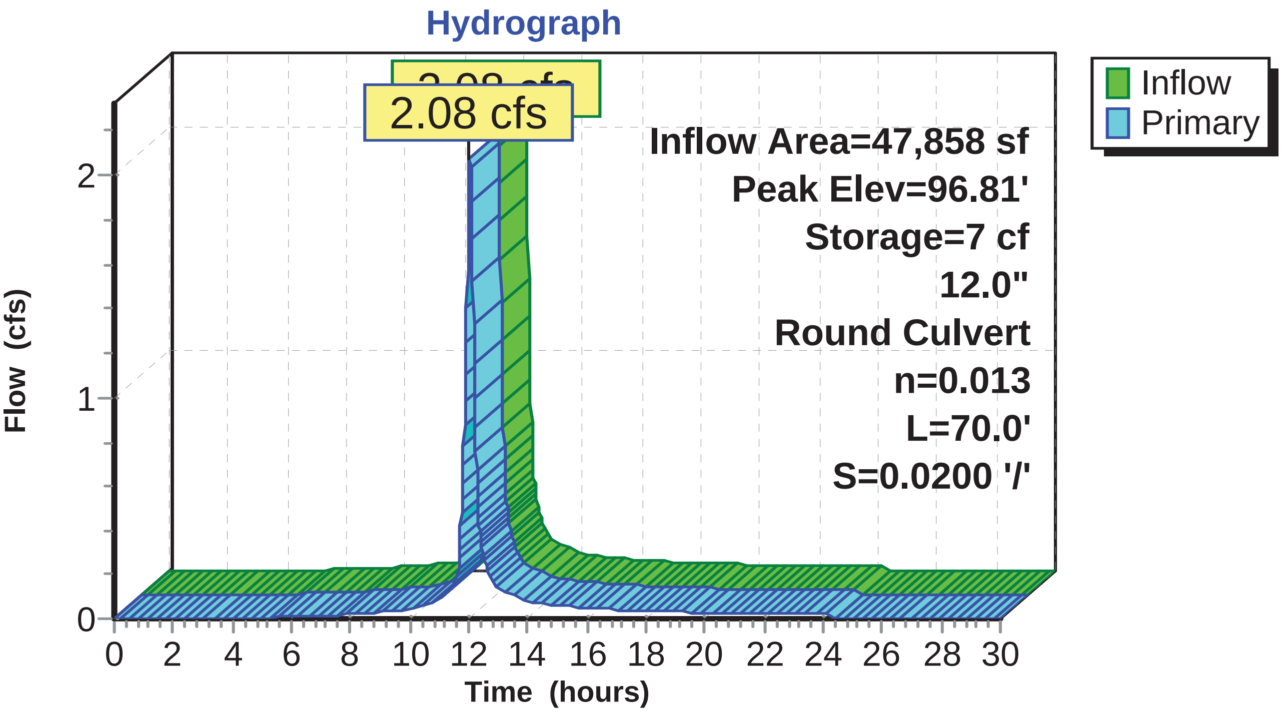
Plug-Flow detention time= 0.0 min calculated for 5,778 cf (100% of inflow)
Center-of-Mass det. time= 0.0 min (794.5 - 794.4)

Volume	Invert	Avail.Storage	Storage Description
#1	96.50'	468 cf	**18.0" Round 18" Pipe** L= 265.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	**12.0" Round 12"** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 96.00' / 94.60' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.07 cfs @ 12.05 hrs HW=96.80' (Free Discharge)
↑**1=12"** (Inlet Controls 2.07 cfs @ 3.05 fps)

Pond 3P: 18" pipe



Time span=0.00-30.00 hrs, dt=0.02 hrs, 1501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Pro: proposed site Runoff Area=47,858 sf 86.35% Impervious Runoff Depth=2.69"
Flow Length=338' Slope=0.0100 '/' Tc=13.4 min CN=96 Runoff=3.73 cfs 10,728 cf

Pond 3P: 18" pipe Peak Elev=97.42' Storage=91 cf Inflow=3.73 cfs 10,728 cf
12.0" Round Culvert n=0.013 L=70.0' S=0.0200 '/' Outflow=3.63 cfs 10,728 cf

Total Runoff Area = 47,858 sf Runoff Volume = 10,728 cf Average Runoff Depth = 2.69"
13.65% Pervious = 6,535 sf 86.35% Impervious = 41,323 sf

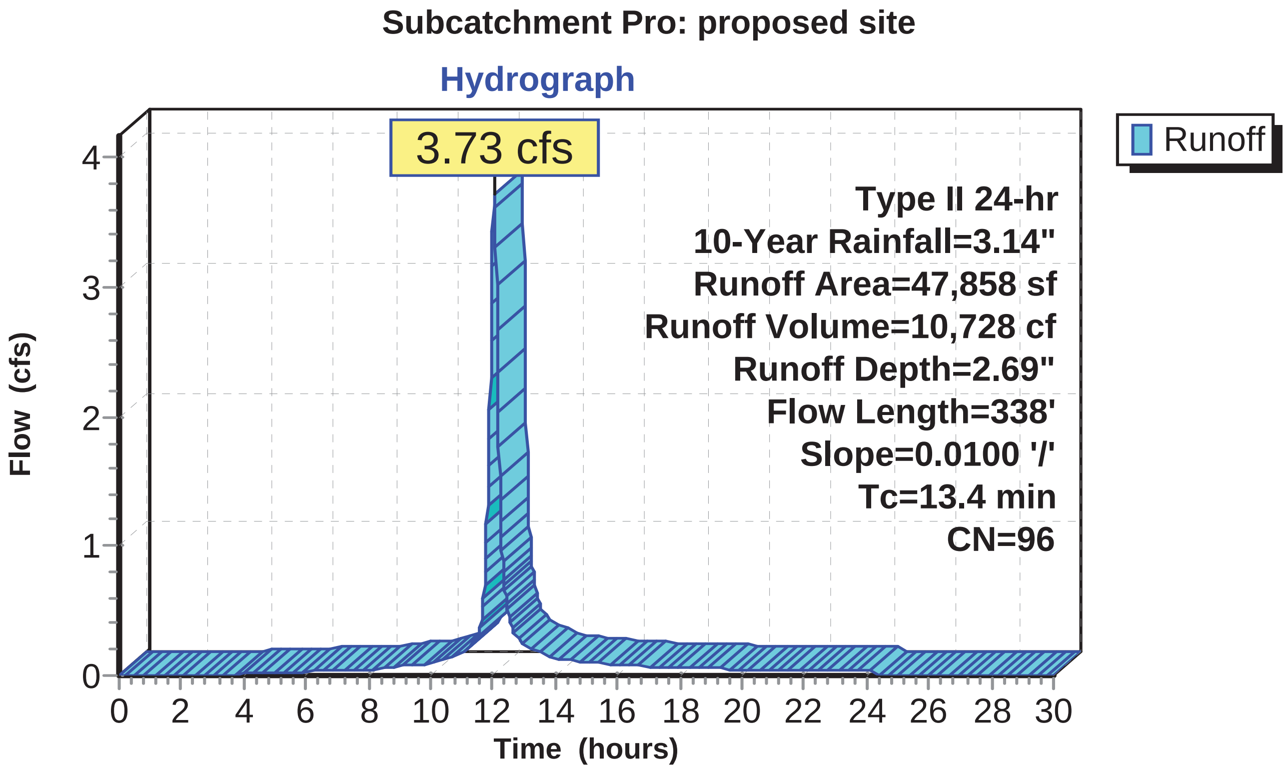
Summary for Subcatchment Pro: proposed site

Runoff = 3.73 cfs @ 12.05 hrs, Volume= 10,728 cf, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr 10-Year Rainfall=3.14"

Area (sf)	CN	Description
6,535	80	>75% Grass cover, Good, HSG D
40,015	98	Roofs, HSG D
1,308	98	Unconnected pavement, HSG D
47,858	96	Weighted Average
6,535		13.65% Pervious Area
41,323		86.35% Impervious Area
1,308		3.17% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	78	0.0100	0.11		**Sheet Flow, over grass** Grass: Short n= 0.150 P2= 2.50"
1.4	260		3.00		**Direct Entry, pipe flow**
13.4	338	Total			



Summary for Pond 3P: 18" pipe

Inflow Area = 47,858 sf, 86.35% Impervious, Inflow Depth = 2.69" for 10-Year event
Inflow = 3.73 cfs @ 12.05 hrs, Volume= 10,728 cf
Outflow = 3.63 cfs @ 12.07 hrs, Volume= 10,728 cf, Atten= 2%, Lag= 1.5 min
Primary = 3.63 cfs @ 12.07 hrs, Volume= 10,728 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 97.42' @ 12.07 hrs Surf.Area= 228 sf Storage= 91 cf

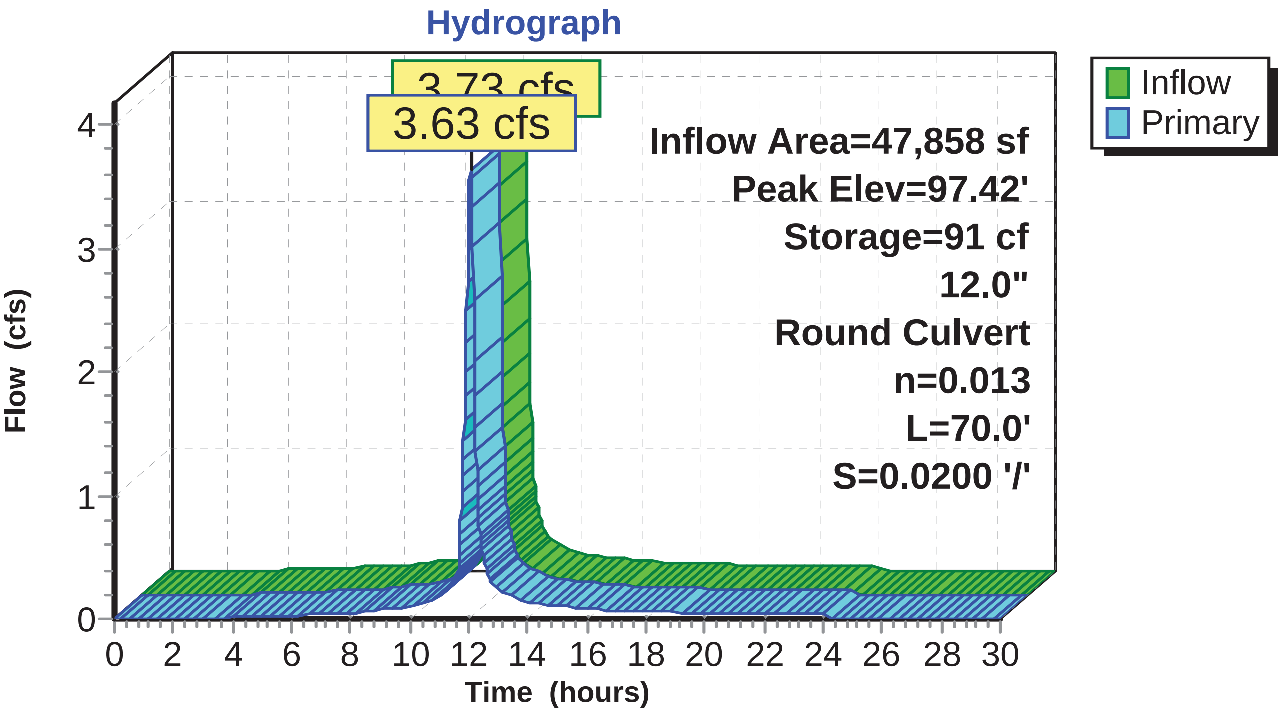
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.1 min (778.0 - 778.0)

Volume	Invert	Avail.Storage	Storage Description
#1	96.50'	468 cf	**18.0" Round 18" Pipe** L= 265.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	**12.0" Round 12"** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 96.00' / 94.60' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.62 cfs @ 12.07 hrs HW=97.42' (Free Discharge)
↑—**1=12"** (Inlet Controls 3.62 cfs @ 4.62 fps)

Pond 3P: 18" pipe



Time span=0.00-30.00 hrs, dt=0.02 hrs, 1501 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment Pro: proposed site Runoff Area=47,858 sf 86.35% Impervious Runoff Depth=4.76"
Flow Length=338' Slope=0.0100 '/' Tc=13.4 min CN=96 Runoff=6.39 cfs 18,988 cf

Pond 3P: 18" pipe Peak Elev=99.30' Storage=468 cf Inflow=6.39 cfs 18,988 cf
12.0" Round Culvert n=0.013 L=70.0' S=0.0200 '/' Outflow=6.31 cfs 18,989 cf

Total Runoff Area = 47,858 sf Runoff Volume = 18,988 cf Average Runoff Depth = 4.76"
13.65% Pervious = 6,535 sf 86.35% Impervious = 41,323 sf

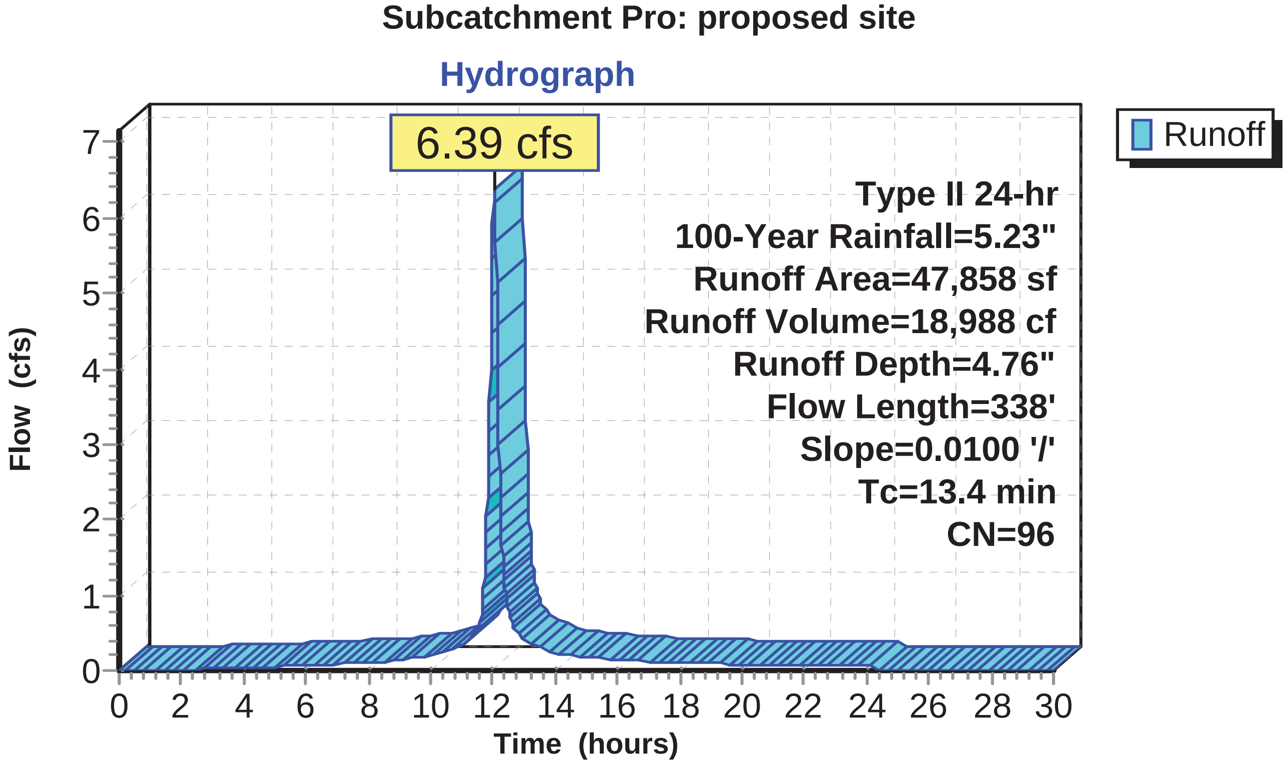
Summary for Subcatchment Pro: proposed site

Runoff = 6.39 cfs @ 12.04 hrs, Volume= 18,988 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs
Type II 24-hr 100-Year Rainfall=5.23"

Area (sf)	CN	Description
6,535	80	>75% Grass cover, Good, HSG D
40,015	98	Roofs, HSG D
1,308	98	Unconnected pavement, HSG D
47,858	96	Weighted Average
6,535		13.65% Pervious Area
41,323		86.35% Impervious Area
1,308		3.17% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	78	0.0100	0.11		**Sheet Flow, over grass** Grass: Short n= 0.150 P2= 2.50"
1.4	260		3.00		**Direct Entry, pipe flow**
13.4	338	Total			



Summary for Pond 3P: 18" pipe

Inflow Area = 47,858 sf, 86.35% Impervious, Inflow Depth = 4.76" for 100-Year event
Inflow = 6.39 cfs @ 12.04 hrs, Volume= 18,988 cf
Outflow = 6.31 cfs @ 12.07 hrs, Volume= 18,989 cf, Atten= 1%, Lag= 1.3 min
Primary = 6.31 cfs @ 12.07 hrs, Volume= 18,989 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.02 hrs / 2
Peak Elev= 99.30' @ 12.07 hrs Surf.Area= 2 sf Storage= 468 cf

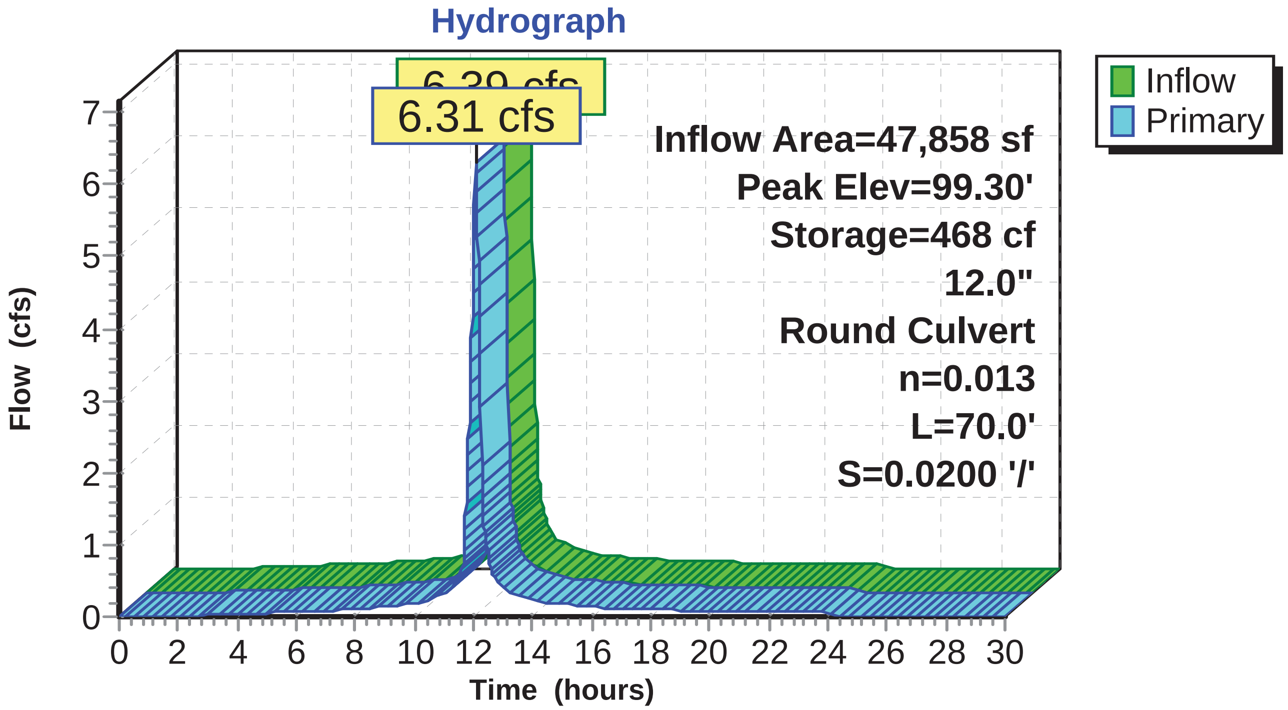
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.3 min (764.7 - 764.4)

Volume	Invert	Avail.Storage	Storage Description
#1	96.50'	468 cf	**18.0" Round 18" Pipe** L= 265.0' S= 0.0050 '/'

Device	Routing	Invert	Outlet Devices
#1	Primary	96.00'	**12.0" Round 12"** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 96.00' / 94.60' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=6.24 cfs @ 12.07 hrs HW=99.23' (Free Discharge)
↑—**1=12"** (Barrel Controls 6.24 cfs @ 7.95 fps)

Pond 3P: 18" pipe



WATER QUALITY TREATMENT STRUCTURE
CRYSTALSTREAM TECHNOLOGIES

Water Quality Design Report

Buffalo, NY

Project:	**Elmwood Avenue Condos**
Engineer:	**Carmina Wood Morris**

Water Quality:

Calculation Method:	1.00" First Flush
Rainfall Data Area:	Buffalo, NY
Report Date:	11/14/2017

Project Data:

Total Area:	1.10 acres
Impervious Area:	0.95 acres
Pipe Size:	12 HDPE
Treatment Flow Limit:	5.80 cfs
WQ Flow:	1.07 cfs

CrystalStream Summary:

Model No:	446
This HLR:	29.91 gpm/sf
Target HLR:	26.00 gpm/sf

Special Note: All CrystalStream Technologies water quality devices offer no restrictions to storm water flow and are able to pass through all flows that are delivered to them.

Basis for Approval and Design Guidelines

The Environmental Protection Agency (EPA) has tested the CrystalStream water quality vault under its Environmental Technology Verification Program (ETV). This program meets the requirements of Buffalo, NY. Those requirements were derived from the strict testing and analysis in the ETV program which was used to evaluate the CrystalStream device in Griffin, Georgia.

The CrystalStream device was verified to remove 89% of suspended sediments using the “Suspended Sediment Concentration” method (SSC – ASTM-D3977-97) and 40% of Phosphorus using the SM-4500-P B,E method. Other parameters including nitrates, nitrites and TKN also showed impressive removal rates which are not addressed in the GSMM. The entire report is posted for public review and analysis on the EPA’s website at: http://www.epa.gov/etv/pubs/09_vr_pbm.pdf.

The design parameters claimed by CrystalStream for the Model 1056 tested under the ETV program were a maximum storm capacity (25-year event) of 17.5 cubic feet per second (cfs), and a water quality treatment capacity of 3.5 cfs. These design numbers reflect a hydraulic loading rate (HLR) for water quality of 0.070 feet per second (fps) or 31.42 gallons per minute (gpm) per square foot (sf). The HLR is the single most important factor in determining the ability of a vault to capture particulate matter, and is determined by dividing the surface area of a vault by the rate of flow (Q) in cfs. If the surface area is expressed as length (L) times width (W), then the HLR is calculated by the following formula:

$$\text{HLR} = \frac{Q}{LW}$$

With Q expressed in cubic feet per second, and LW expressed in square feet, the units for HLR are in feet per second. As the HLR gets lower, performance increases. Most people convert the HLR to gallons per minute per square foot, because the number is larger and easier to deal with and the units seem more logical. The CrystalStream device tested by the EPA in Griffin had an HLR for the water quality flow of:

$$\text{HLR} = \frac{3.5\text{ cfs}}{50\text{ sf}} = 0.070\text{ fps or } 31.42\text{ gpm/sf}$$

Using gallons per minute per square foot, which is a rate of flow per unit of area, is a more intuitive way of understanding HLR and will be the parameter that CrystalStream uses to evaluate performance of all water quality units. All designs submitted will adhere to the chart shown in Figure 1 except as noted. To enhance performance beyond the device tested by the EPA, the proposed maximum HLR for each model has been selected to be at or below 26 gpm/sf. This provides a design cushion that can absorb variations in site and atmospheric conditions. When the rainfall patterns and intensities in the project area or the basin hydrologic characteristics differ to a significant degree from those that existed in the area where our water quality device was tested, a further analysis is performed. The project area climatological data is correlated with the test site data and the appropriateness of applying a larger HLR is evaluated.

By adhering to the policy of designing all devices at or below the HLR of the device tested and verified by the EPA at 89% removal of suspended solids, CrystalStream asserts that the performance of devices approved by Buffalo, NY will have equal or better performance than that achieved by the tested device. New York Redevelopment Regulations requires treatment of 75% of the storm water flow required for first time development (See calculation below)

FIGURE 1 - CrystalStream Hydraulic Loading Chart 8/31/2010

Model	**Width**	**Length**	**Sqft**	**Target WQ flow**	**Target HLR** ft/sec	**Target HLR** gpm/sf	**Total Flow**
646	4	6	24	1.4	0.058	26.00	6.0
846	4	8	32	1.9	0.058	26.00	8.0
856	5	8	40	2.3	0.058	26.00	10.0
866	6	8	48	2.8	0.058	26.00	12.5
956	5	9	45	2.6	0.058	26.00	12.5
1056	5	10	50	2.9	0.058	26.00	15.0
1266	6	12	72	4.2	0.058	26.00	24.0
1246	4	12	48	2.8	0.058	26.00	12.0
1856	5	18	90	5.2	0.058	26.00	23.0
2056	5	20	100	5.8	0.058	26.00	25.0
2466	6	24	144	8.3	0.058	26.00	36.0
CrystalStream Model 1056 Hydraulic Loading "As Tested"*							
1056	5	10	50	3.5	0.070	**31.42**	17.5

Target values are design values that have been developed over time by calculations, testing and by field observations to be reasonable values to use when sizing our water quality devices. The variableness inherent in rainfall flow calculations, pollutant generation rates and site geometry render these values a generalized goal that may vary by 10-15%.

Project Specific Data – Buffalo, NY

Water Quality Vault Specifications for Elmwood Avenue Condos
CST-1 Model 446

This unit drains 1.10 acres, with a 25-year flow of 4.38 cfs. (This Unit is located downstream of the detention facility). The target design flow for the 446 model as configured is 5.00 cfs (for an internal vertical exit velocity of 1 fps). The resultant internal vertical exit velocity of a 4.38 cfs inflow is 0.88 fps, which is within the range of the speed needed to restrict sediment export during this studied storm. Maximum design flows can vary based on site hydrology and pollutant characteristics. This unit is sized for water quality requirements and due to its location below the pond is more than adequate for the 25-year flow.

The internal velocity at the 1" water quality (first flush) storm peak flow of 1.07 cfs (see calculation below) is 0.21 fps. During this peak, the scour velocity of 0.29 fps (0.09 m/s) for 31 micron particles is not exceeded, and all lesser storms will have lower velocities. This unit meets local standards during this peak event, and will exceed them at other times. Regularly scheduled maintenance will assure low exposure to high peak flows.

Calculation for Peak Discharge of Water Quality Storm

1"- 24 hour peak flow (Modified SCS Method, after Pitt)

Assumptions: A = 1.10 acres of drainage area = 47,916 sf.
CN = 98, T_c = 5 min. = 0.08 hr.
I_a read from TR-55 Table 4-1 for 98 = 0.041
P = 1"
I_a / P = 0.041 (See SCS Type III Unit Peak Discharge, read Q_u at 0.08 hr and I_a / P)
Q_u = 1000 csm

%I = 0.95 ac. Impervious / 1.10 ac. Total X (100) = 86%
R_v = .009 (I) +.05 = .009 (86) +.05 = 0.827273
WQ_R = 1" * 0.827273 = 0.827 in./ac.

WQ Flow Calculation:

A = 1.10 ac. / 640 ac. / sq. mi. = 0.00172 sq. mi.
Q_p = Q_u * A* WQ_R = 1000 csm / in. * 0.00172 sq. mi. * 0.827 in / ac.
= 1.42 cfs.
= 1.42 cfs x 0.75 = 1.07 cfs **For Redevelopment**

HLR Design Criterion (Per Figure 1 Chart)

Model 446 - Target HLR = 26.00 This Project HLR = **29.91 OK**
[HLR = (1.07 cfs * 448.8 gpm/cfs)/16 sf = 29.91 gpm/sf **]**

General Specifications (See detail sheet)

The spill protection capacity, under normal conditions, where the ambient water level in the front portion of the vault can be replaced with spill material is 254 gallons. In an artificial or emergency situation where the downstream pipe is blocked, the maximum spill storage capacity, above the trapped ambient water, is 682 gallons. This volume does not include storage in the upstream piping system.

This unit is not subject to traffic loadings and is constructed with 5,000 psi, 6" reinforced concrete walls and floor.

The 3.50 ft. riser/lid combination above the unit is constructed in the same manner as the walls.

A 2.5' x 2.5' grate in the reinforced concrete lid provide easy access for cleaning. Contractor will be required to build up ± 0.90 in the field to match final grade.

A separate oil chamber is provided with an adjustable weir. This weir will be set at the approximate 6 month, 30 minute storm intensity, so that oil should be pushed over the skimmer at least once during two clean out cycle periods. The weir will be adjusted based on actual field results.

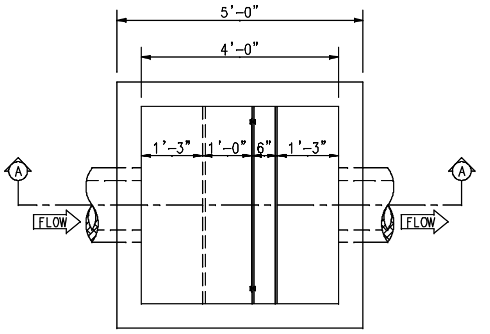
The exit pipe, when evaluated as a submerged circular orifice under inlet control will flow a maximum of 5.80 cfs with the water level in the vault at the top of the oil reservoir. This is sufficient to pass the 100+ year flow coming to the unit as configured.

Earl E Duckett Jr.

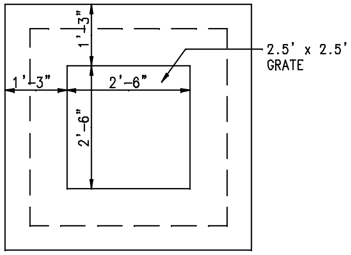
CrystalStream Technologies
Principal Engineer

Manufactured by: Practical Best Management - 1-800-748-6945 www.crystalstream.com

1. ALL PIPES SHALL BE CONSTRUCTED TO BE FLUSH WITH THE INSIDE WALLS.
2. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL PIPES AND STRUCTURES BETWEEN AND AROUND THE WATER QUALITY VAULTS.
3. VAULT LIFTING CONNECTIONS SHALL BE LOCATED ON THE OUTSIDE OF THE VAULT WALLS.
4. CONCRETE VAULT PRE-CASTER IS RESPONSIBLE FOR THE STRUCTURAL INTEGRITY OF THE CONCRETE VAULTS. WALL AND SLAB THICKNESSES SHALL BE ALTERED ACCORDINGLY.

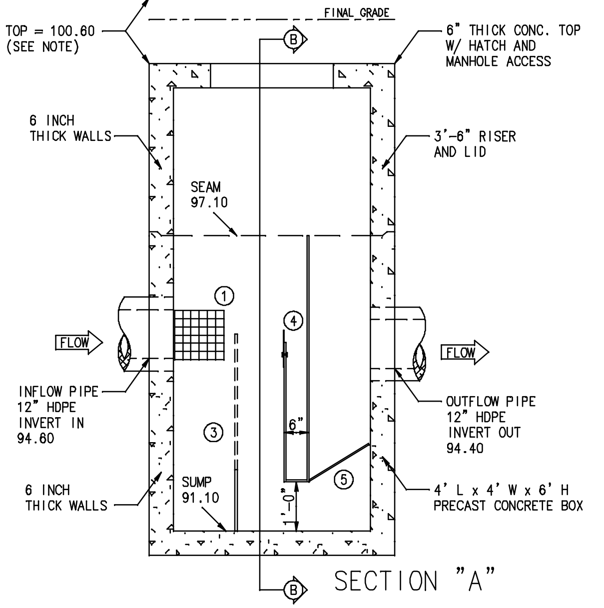


TOP VIEW (INTERNAL)

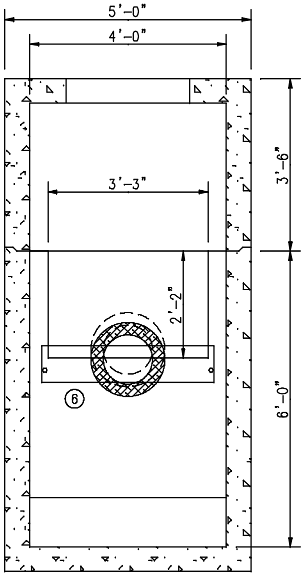


TOP VIEW (SLAB)

Castings for access openings (grate, MH, etc.) shall be shipped loose. Due to uneven terrain contractor shall extend the openings about 0.90 ft. above the top of the slab to final grade and install castings in the field to a final top surface of about 101.50 by a method approved by local authorities.



SECTION "A"



SECTION "B"

LEGEND

① EXPANDED ALUMINUM BASKET W/ 1/4" MESH LINING, 1'-0" H x 1'-0" L x 4'-0" W, Upfit 3'-6" FROM SUMP

③ 2ND INTERNAL BAFFLE W/ 1" HOLES DRILLED AT 1 1/4" O.C., 4'-0" H.

④ SPILL PROTECTION RESERVOIR 5'-0" H. WITH A 2'-2" FRONT CUT.

⑤ 3/4"COCONUT FIBER FILTER IN ALUMINUM FRAME 1'-5" LONG.

⑥ 1/4"ALUMINUM PLATE, 9" H., 3'-6" WIDE.

CRYSTALSTREAM "CRYSTALCLEAN" WATER QUALITY VAULT
MODEL "446 "

JURISDICTION: Buffalo, NY

Protected by U.S. Patent No's: 6,797,161; 6,936,163; 6,939,461; 6,951,607; 6,994,783; 7,011,743, 7,037,436

c&w-ElmwoodCondos_R1 11/14/2017 p.a.d.s.

CrystalStream Technologies

SPECIFICATIONS
1. TOTAL FLOW CAPACITY SHALL BE 5 CFS.
2. WATER QUALITY FLOW OF 1.07 CFS MUST BE TREATED WITH A HYDRAULIC LOADING RATE OF 30 GPM/SF OR LESS.
3. SPILL PROTECTION CAPACITY SHALL BE 254 GALLONS BEFORE OVERFLOW.
4. ANY CHANGES OR SUBSTITUTIONS MUST BE APPROVED BY THE ENGINEER AND THE REVIEWING AUTHORITY.

JOB NAME:
Elmwood Avenue
Condos
Device No.: CST-1
NYO-017-110617

DESIGN FIRM: Carmina Wood Morris

Appendix E

NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-15-002

NEW YORK
STATE OF
OPPORTUNITY
Department of
Environmental
Conservation

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP-0-15-002

Issued Pursuant to Article 17, Titles 7, 8 and Article 70
of the Environmental Conservation Law

Effective Date: January 29, 2015

Expiration Date: January 28, 2020

Modification Date:

July 14, 2015 – Correction of typographical error in definition of "New Development", Appendix A

November 23, 2016 – Updated to require the use of the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. The use of this standard will be required as of February 1, 2017.

John J. Ferguson
Chief Permit Administrator

Authorized Signature

11-14-16
Date

Address: NYS DEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York's *State Pollutant Discharge Elimination System ("SPDES")* is a NPDES-approved program with permits issued in accordance with the *Environmental Conservation Law ("ECL").*

This general permit ("permit") is issued pursuant to Article 17, Titles 7, 8 and Article 70 of the ECL. An *owner or operator* may obtain coverage under this permit by submitting a Notice of Intent ("NOI") to the Department. Copies of this permit and the NOI for New York are available by calling (518) 402-8109 or at any New York State Department of Environmental Conservation ("the Department") regional office (see Appendix G).They are also available on the Department's website at:
http://www.dec.ny.gov/

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a point source and therefore, pursuant to Article 17-0505 of the ECL, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. They cannot wait until there is an actual *discharge* from the construction site to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES
FROM CONSTRUCTION ACTIVITIES

Part I. PERMIT COVERAGE AND LIMITATIONS

A. Permit Application

This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

B. Effluent Limitations Applicable to Discharges from Construction Activities

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part I.B.1. (a) – (f) of this permit. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part I.B.1.(a) – (f) of this permit and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in the Stormwater Pollution Prevention Plan ("SWPPP") the reason(s) for the deviation or alternative design and provide information

which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

a. **Erosion and Sediment Controls.** Design, install and maintain effective erosion and sediment controls to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such controls must be designed, installed and maintained to:

   (i) *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharge*s;

   (ii) Control stormwater *discharge*s to *minimize* channel and streambank erosion and scour in the immediate vicinity of the *discharge* points;

   (iii) *Minimize* the amount of soil exposed during *construction activity*;

   (iv) *Minimize* the disturbance of *steep slopes*;

   (v) *Minimize* sediment *discharge*s from the site;

   (vi) Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce *pollutant discharge*s, unless *infeasible*;

   (vii) *Minimize* soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted; and

   (viii) Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover.

b. **Soil Stabilization**. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that *directly discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. See Appendix A for definition of *Temporarily Ceased*.

c. **Dewatering**. *Discharge*s from dewatering activities, including *discharge*s from dewatering of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be designed, installed, implemented and maintained to:

(i) *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. This applies to washing operations that use clean water only. Soaps, detergents and solvents cannot be used;

(ii) *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use) ; and

(iii) Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Prohibited *Discharges*.** The following *discharge*s are prohibited:

(i) Wastewater from washout of concrete;

(ii) Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials;

(iii) Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance;

(iv) Soaps or solvents used in vehicle and equipment washing; and

(v) Toxic or hazardous substances from a spill or other release.

f. Surface Outlets. When discharging from basins and impoundments, the outlets shall be designed, constructed and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-construction Stormwater Management Practice Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must select, design, install, and maintain the practices to meet the *performance criteria* in the New York State Stormwater Management Design Manual ("Design Manual"), dated January 2015, using sound engineering judgment. Where post-construction stormwater management practices ("SMPs") are not designed in conformance with the *performance criteria* in the Design Manual, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity* that requires post-construction stormwater management practices pursuant to Part III.C. of this permit must design the practices to meet the applicable *sizing criteria* in Part I.C.2.a., b., c. or d. of this permit.

a. *Sizing Criteria* for *New Development*

(i) Runoff Reduction Volume ("RRv"): Reduce the total Water Quality Volume ("WQv") by application of RR techniques and standard SMPs with RRv capacity. The total WQv shall be calculated in accordance with the criteria in Section 4.2 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.a.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (“Cpv”): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:
  (1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or

  (2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) Overbank Flood Control Criteria (“Qp”): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:
  (1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
  (2) A downstream analysis reveals that overbank control is not required.

(v) Extreme Flood Control Criteria (“Qf”): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:
  (1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
  (2) A downstream analysis reveals that overbank control is not required.

b. ***Sizing Criteria*** **for** ***New Development*** **in Enhanced Phosphorus Removal Watershed**

(i) Runoff Reduction Volume (RRv): Reduce the total Water Quality Volume (WQv) by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24 hour design storm over the post-developed watershed and shall be calculated in accordance with the criteria in Section 10.3 of the Design Manual.

(ii) Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part I.C.2.b.(i) of this permit due to *site limitations* shall direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv shall be documented in the SWPPP. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the SWPPP must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 10.3 of the Design Manual. The remaining portion of the total WQv that cannot be reduced shall be treated by application of standard SMPs.

(iii) Channel Protection Volume (Cpv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event; remaining after runoff reduction. The Cpv requirement does not apply when:

(1) Reduction of the entire Cpv is achieved by application of runoff reduction techniques or infiltration systems, or

(2) The site *discharge*s directly to tidal waters, or fifth order or larger streams.

(iv) Overbank Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:

(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that overbank control is not required.

(v) Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:

(1) the site *discharge*s directly to tidal waters or fifth order or larger streams, or
(2) A downstream analysis reveals that overbank control is not required.

c. ***Sizing Criteria* for *Redevelopment Activity***

(i) Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* shall be addressed by one of the following options. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C of this permit) shall calculate the WQv in accordance with Section 10.3 of the Design Manual. All other *redevelopment activities* shall calculate the WQv in accordance with Section 4.2 of the Design Manual.

(1) Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the Design Manual must be applied to all newly created pervious areas, or
(2) Capture and treat a minimum of 25% of the WQv from the disturbed, *impervious area* by the application of standard SMPs; or reduce 25% of the WQv from the disturbed, *impervious area* by the application of RR techniques or standard SMPs with RRv capacity., or
(3) Capture and treat a minimum of 75% of the WQv from the disturbed, *impervious area* as well as any additional runoff from tributary areas by application of the alternative practices discussed in Sections 9.3 and 9.4 of the Design Manual., or
(4) Application of a combination of 1, 2 and 3 above that provide a weighted average of at least two of the above methods. Application of this method shall be in accordance with the criteria in Section 9.2.1(B) (IV) of the Design Manual.

If there is an existing post-construction stormwater management practice located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 – 4 above.

(ii) Channel Protection Volume (Cpv): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iii) Overbank Flood Control Criteria (Qp): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

(iv) Extreme Flood Control Criteria (Qf): Not required if there are no changes to hydrology that increase the *discharge* rate from the project site.

d. ***Sizing Criteria*** **for Combination of *Redevelopment Activity* and *New Development***

Construction projects that include both *New Development* and *Redevelopment Activity* shall provide post-construction stormwater management controls that meet the *sizing criteria* calculated as an aggregate of the *Sizing Criteria* in Part I.C.2.a. or b. of this permit for the *New Development* portion of the project and Part I.C.2.c of this permit for *Redevelopment Activity* portion of the project.

D. Maintaining Water Quality

The Department expects that compliance with the conditions of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any discharge to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater *discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standards*; the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this general permit and document in accordance with Part IV.C.4. of this general permit. To address the *water quality standard* violation the *owner or operator* may need to provide additional information, include and implement appropriate controls in the SWPPP to correct the problem, or obtain an individual SPDES permit.

If there is evidence indicating that despite compliance with the terms and conditions of this general permit it is demonstrated that the stormwater *discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if the Department determines that a modification of the permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit. The Department may require the *owner or operator* to obtain an individual SPDES permit to continue discharging.

E. Eligibility Under This General Permit

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph F. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater *discharge*s from *construction activities*.

3. Notwithstanding paragraphs E.1 and E.2 above, the following non-stormwater *discharges* may be authorized by this permit: *discharge*s from firefighting activities; fire hydrant flushings; waters to which cleansers or other components have not been added that are used to wash vehicles or control dust in accordance with the SWPPP, routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated *groundwater* or spring water; uncontaminated *discharge*s from construction site de-watering operations; and foundation or footing drains where flows are not contaminated with process materials such as solvents. For those entities required to obtain coverage under this permit, and who *discharge* as noted in this paragraph, and with the exception of flows from firefighting activities, these *discharge*s must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with *water quality standards* in Part I.D of this permit.

4. The *owner or operator* must maintain permit eligibility to *discharge* under this permit. Any *discharges* that are not compliant with the eligibility conditions of this permit are not authorized by the permit and the *owner or operator* must either apply for a separate permit to cover those ineligible *discharges* or take steps necessary to make the *discharge* eligible for coverage.

F. Activities Which Are Ineligible for Coverage Under This General Permit

All of the following are **not** authorized by this permit:

1. *Discharge*s after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharge*s that are mixed with sources of non-stormwater other than those expressly authorized under subsection E.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII.K. of this permit;

4. *Construction activities* or *discharges* from *construction activities* that may adversely affect an endangered or threatened species unless the *owner or operator* has obtained a permit issued pursuant to 6 NYCRR Part 182 for the project or the Department has issued a letter of non-jurisdiction for the project. All documentation necessary to demonstrate eligibility shall be maintained on site in accordance with Part II.C.2 of this permit.

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which disturb one or more acres of land with no existing *impervious cover*; and

   c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture (“USDA”) Soil Survey for the County where the disturbance will occur.

7. *Construction activities* for linear transportation projects and linear utility projects:

   a. Where the *discharge*s from the *construction activities* are tributary to waters of the state classified as AA or AA-s; and

   b. Which disturb two or more acres of land with no existing *impervious cover*; and

   c. Which are undertaken on land with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the USDA Soil Survey for the County where the disturbance will occur.

8. *Construction activities* that have the potential to affect an *historic property*, unless there is documentation that such impacts have been resolved. The following documentation necessary to demonstrate eligibility with this requirement shall be maintained on site in accordance with Part II.C.2 of this permit and made available to the Department in accordance with Part VII.F of this permit:

    a. Documentation that the *construction activity* is not within an archeologically sensitive area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the construction site within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the construction site within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant.

        - 1-5 acres of disturbance - 20 feet
        - 5-20 acres of disturbance - 50 feet
        - 20+ acres of disturbance - 100 feet, or

    b. DEC consultation form sent to OPRHP, and copied to the NYS DEC Agency Historic Preservation Officer (APO), and
        (i) the State Environmental Quality Review (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or
        (ii) documentation from OPRHP that the *construction activity* will result in No Impact; or
        (iii) documentation from OPRHP providing a determination of No Adverse Impact; or
        (iv) a Letter of Resolution signed by the owner/operator, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA); or

    c. Documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:
        (i) No Affect
        (ii) No Adverse Affect

(iii) Executed Memorandum of Agreement, or

d. Documentation that:
  (i) SHPA Section 14.09 has been completed by NYS DEC or another state agency.

9. *Discharge*s from *construction activities* that are subject to an existing SPDES individual or general permit where a SPDES permit for *construction activity* has been terminated or denied; or where the *owner or operator* has failed to renew an expired individual permit.

Part II. OBTAINING PERMIT COVERAGE

A.Notice of Intent (NOI) Submittal

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then submit a completed NOI form to the Department in order to be authorized to *discharge* under this permit. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI that the Department prepared. Both versions of the NOI are located on the Department's website (http://www.dec.ny.gov/). The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the following address.

NOTICE OF INTENT
NYS DEC, Bureau of Water Permits
625 Broadway, 4th Floor
Albany, New York 12233-3505

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first prepare a SWPPP in accordance with all applicable requirements of this permit and then have its SWPPP reviewed and accepted by the *regulated, traditional land use control MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed in accordance with Part VII.H., and then submit that form along with a completed NOI to the Department. An *owner or operator* shall use either the electronic (eNOI) or paper version of the NOI.

   The paper version of the NOI shall be signed in accordance with Part VII.H. of this permit and submitted to the address in Part II.A.1.

The requirement for an *owner or operator* to have its SWPPP reviewed and accepted by the *MS4* prior to submitting the NOI to the Department does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.E. (Change of *Owner or Operator*) or where the *owner or operator* of the *construction activity* is the *regulated, traditional land use control MS4*.

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

B. Permit Authorization

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied <u>all</u> of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act ("SEQRA") have been satisfied, when SEQRA is applicable. See the Department's website (http://www.dec.ny.gov/) for more information,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act ("UPA")* (see 6 NYCRR Part 621) have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Permit Administrator at the Regional Office listed in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

   c. the final SWPPP has been prepared, and

   d. a complete NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.B.2 above

will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

a. For *construction activities* that are not subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives a complete electronic version of the NOI (eNOI) for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.; or

(ii) Sixty (60) business days from the date the Department receives a complete NOI (electronic or paper version) for *construction activities* with a SWPPP that has not been prepared in conformance with the design criteria in technical standard referenced in Part III.B.1. or, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C., the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, or;

(iii) Ten (10) business days from the date the Department receives a complete paper version of the NOI for *construction activities* with a SWPPP that has been prepared in conformance with the design criteria in the technical standard referenced in Part III.B.1 and the *performance criteria* in the technical standard referenced in Parts III.B., 2 or 3, for *construction activities* that require post-construction stormwater management practices pursuant to Part III.C.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

(i) Five (5) business days from the date the Department receives both a complete electronic version of the NOI (eNOI) and signed "*MS4* SWPPP Acceptance" form, or

(ii) Ten (10) business days from the date the Department receives both a complete paper version of the NOI and signed "MS4 SWPPP Acceptance" form.

4. The Department may suspend or deny an *owner's or operator's* coverage

under this permit if the Department determines that the SWPPP does not meet the permit requirements. In accordance with statute, regulation, and the terms and conditions of this permit, the Department may deny coverage under this permit and require submittal of an application for an individual SPDES permit based on a review of the NOI or other information pursuant to Part II.

5. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department. The *owner or operator* shall not *commence construction activity* on the future or additional areas until their authorization to *discharge* under this permit goes into effect in accordance with Part II.B. of this permit.

C. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination (“NOT”) has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4. of this permit.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-15-002), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form, inspection reports, and all documentation necessary to demonstrate eligibility with this permit at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department. The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:
   a. The *owner or operator* shall

have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. of this permit every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

b. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016.

c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

d. The *owner or operator* shall install any additional site specific practices needed to protect water quality.

e. The *owner or operator* shall include the requirements above in their SWPPP.

4. In accordance with statute, regulations, and the terms and conditions of this permit, the Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, the Department may order an immediate stop to all activity at the site until the non-compliance is remedied. The stop work order shall be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

5. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the *regulated, traditional land use control MS4* in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *regulated, traditional land use control MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *regulated, traditional land use control MS4* prior to commencing construction of the post-construction stormwater management practice

D. Permit Coverage for Discharges Authorized Under GP-0-10-001

1. Upon renewal of SPDES General Permit for Stormwater Discharges from *Construction Activity* (Permit No. GP-0-10-001), an *owner or operator* of *a construction activity* with coverage under GP-0-10-001, as of the effective date of GP-0-15-002, shall be authorized to *discharge* in accordance with GP-0-15-002, unless otherwise notified by the Department.

   An *owner or operator* may continue to implement the technical/design components of the post-construction stormwater management controls provided that such design was done in conformance with the technical standards in place at the time of initial project authorization. However, they must comply with the other, non-design provisions of GP-0-15-002.

E. Change of *Owner or Operator*

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, <u>in writing,</u> of the requirement to obtain permit coverage by submitting a NOI with the Department. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.A.1. of this permit. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or operator* was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. A SWPPP shall be prepared and implemented by the *owner or operator* of each *construction activity* covered by this permit. The SWPPP must document the selection, design, installation, implementation and maintenance of the control measures and practices that will be used to meet the effluent limitations in Part I.B. of this permit and where applicable, the post-construction stormwater management practice requirements in Part I.C. of this permit. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*. A copy of the completed, final NOI shall be included in the SWPPP.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the *pollutants* in stormwater *discharges* and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP:

   a. whenever the current provisions prove to be ineffective in minimizing *pollutants* in stormwater *discharges* from the site;

   b. whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the *discharge* of *pollutants*; and

   c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* the Department or other regulatory authority.

5. The Department may notify the *owner or operator* at any time that the

SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.C.4. of this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP. The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor.* The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

> "I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater *discharge*s from *construction activities* and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the construction site. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Where erosion and sediment control practices are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must demonstrate *equivalence* to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

   a. Background information about the scope of the project, including the location, type and size of project;

   b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours ; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater *discharge*(s);

   c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

   d. A construction phasing plan and sequence of operations describing the intended order of *construction activities*, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of this general permit and the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of *final stabilization*;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6. of this permit, to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the construction site; and

l. Identification of any elements of the design that are not in conformance with the design criteria in the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, dated November 2016. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. Post-construction stormwater management practice component – The *owner or operator* of any construction project identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the applicable *sizing criteria* in Part I.C.2.a., c. or d. of this permit and the *performance criteria* in the technical standard, New York State Stormwater Management Design Manual dated January 2015

Where post-construction stormwater management practices are not designed in conformance with the *performance criteria* in the technical standard, the *owner or operator* must include in the SWPPP the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

The post-construction stormwater management practice component of the SWPPP shall include the following:

a. Identification of all post-construction stormwater management practices to be constructed as part of the project. Include the dimensions, material specifications and installation details for each post-construction stormwater management practice;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. A Stormwater Modeling and Analysis Report that includes:

    (i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points;

    (ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and post-construction stormwater management practices;

    (iii) Results of stormwater modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre and post-development runoff rates and volumes for the different storm events;

    (iv) Summary table, with supporting calculations, which demonstrates that each post-construction stormwater management practice has been designed in conformance with the *sizing criteria* included in the Design Manual;

(v) Identification of any *sizing criteria* that is not required based on the requirements included in Part I.C. of this permit; and

(vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the Design Manual. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the Design Manual;

d. Soil testing results and locations (test pits, borings);

e. Infiltration test results, when required; and

f. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the applicable *sizing criteria* in Part I.C.2. b., c. or d. of this permit and the *performance criteria,* Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.f. above.

C. Required SWPPP Components by Project Type

Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1 of this permit. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3 of this permit.

Part IV. INSPECTION AND MAINTENANCE REQUIREMENTS

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures) and all post-construction stormwater management practices identified in the SWPPP are inspected and maintained in accordance with Part IV.B. and C. of this permit.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York, or protect the public health and safety and/or the environment.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity* identified in Tables 1 and 2 of Appendix B shall have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor shall begin implementing corrective actions within one business day and shall complete the corrective actions in a reasonable time frame.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections. The *trained contractor* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. of this permit as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. Qualified Inspector Inspection Requirements

The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. and IV.B. of this permit **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- Registered Landscape Architect, or
- someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, <u>with the exception of</u>:

   a. the construction of a single family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

   b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is <u>not</u> located in one of the watersheds listed in Appendix C and <u>not</u> directly discharging to one of the 303(d) segments listed in Appendix E;

   c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

   d. *construction activities* located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

   a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

   b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.C.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the *regulated, traditional land use control MS4* (provided the *regulated, traditional land use control MS4* is not the *owner or operator* of the *construction activity*) in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice" certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.A.1 of this permit.

e. For construction sites that directly *discharge* to one of the 303(d) segments listed in Appendix E or is located in one of the watersheds listed in Appendix C, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of *discharge* to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of *discharge* from the construction site.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

   a. Date and time of inspection;

   b. Name and title of person(s) performing inspection;

   c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

   d. A description of the condition of the runoff at all points of *discharge* from the construction site. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

   e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

   f. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance;

   g. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

   h. Description and sketch of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection;

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s);

k. Identification and status of all corrective actions that were required by previous inspection; and

l. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of this permit of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector.* Pursuant to Part II.C.2. of this permit, the inspection reports shall be maintained on site with the SWPPP.

Part V. TERMINATION OF PERMIT COVERAGE

A. Termination of Permit Coverage

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.A.1 of this permit. The NOT form shall be one which is associated with this permit, signed in accordance with Part VII.H of this permit.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

   a. Total project completion - All *construction activity* identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

   b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

   c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.E. of this permit.

   d. The *owner or operator* obtains coverage under an alternative SPDES general permit or an individual SPDES permit.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "*Final Stabilization*" and "Post-Construction Stormwater Management Practice certification statements on the NOT, certify that all the requirements in Part V.A.2.a. or b. of this permit have been achieved.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *regulated, traditional land use control MS4* sign the "MS4 Acceptance" statement on the NOT in accordance with the requirements in Part VII.H. of this permit. The *regulated, traditional land use control MS4* official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The *regulated, traditional land use control MS4* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) required in Part V.A.3. of this permit.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

   a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

   b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

   c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record,

   d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility; the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION OF RECORDS

A. Record Retention

The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the Department receives a complete NOT submitted in accordance with Part V. of this general permit.

B. Addresses

With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.A.1 of this permit), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate DOW Water (SPDES) Program contact at the Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply

The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE). *Construction activity* shall not resume until written permission to do so has been received from the RWE.

B. Continuation of the Expired General Permit

This permit expires five (5) years from the effective date. If a new general permit is not issued prior to the expiration of this general permit, an *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the terms and conditions of this general permit, if it is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, until a new general permit is issued.

C. Enforcement

Failure of the *owner or operator,* its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. Duty to Mitigate

The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. Duty to Provide Information

The *owner or operator* shall furnish to the Department, within a reasonable specified time period of a written request, all documentation necessary to demonstrate eligibility and any information to determine compliance with this permit or to determine whether cause exists for modifying or revoking this permit, or suspending or denying coverage under this permit, in accordance with the terms and conditions of this permit. The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

G. Other Information

When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any of the documents required by this permit , or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or *impervious area*), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department using the contact information in Part II.A. of this permit. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. Signatory Requirements

1. All NOIs and NOTs shall be signed as follows:

   a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

(ii) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

(i) the chief executive officer of the agency, or

(ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. of this permit or by a duly authorized representative of that person. A person is a duly authorized representative only if:

a. The authorization is made in writing by a person described in Part VII.H.1. of this permit;

b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of *equivalent* responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. Property Rights

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

K. Requirement to Obtain Coverage Under an Alternative Permit

1. The Department may require any *owner or operator* authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any *discharge*r authorized by a general permit to apply for an individual SPDES permit, it shall notify the *discharge*r in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from *owner or operator* receipt of the notification letter, whereby the authorization to

discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Permit Administrator at the Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Department, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. When an individual SPDES permit is issued to a discharger authorized to *discharge* under a general SPDES permit for the same *discharge*(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. Proper Operation and Maintenance

The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. Inspection and Entry

The *owner or operator* shall allow an authorized representative of the Department, EPA, applicable county health department, or, in the case of a construction site which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

1. Enter upon the *owner's or operator's* premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment), practices or operations regulated or required by this permit.

4. Sample or monitor at reasonable times, for purposes of assuring permit compliance or as otherwise authorized by the Act or ECL, any substances or parameters at any location.

N. Permit Actions

This permit may, at any time, be modified, suspended, revoked, or renewed by the Department in accordance with 6 NYCRR Part 621. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions

Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with *construction activity* covered by this permit, the *owner or operator* of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Any Department initiated permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports

In accordance with 6NYCRR Part 750-2.4 and 750-2.5, any person who knowingly makes any false material statement, representation, or certification in any application, record, report or other document filed or required to be maintained under this permit, including reports of compliance or noncompliance shall, upon conviction, be punished in accordance with ECL §71-1933 and or Articles 175 and 210 of the New York State Penal Law.

R. Other Permits

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A

Definitions

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both “sewage” and “stormwater”.

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for “*Construction Activity(ies)*” also.

***Construction Activity*(ies) -** means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a construction site by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a construction site to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or point source.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Equivalent (Equivalence) – means that the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 and Section 70-0117 of the ECL authorizing a category of discharges.

Groundwater(s) - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Historic Property – means any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State
or National Registers of Historic Places.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – means not technologically possible, or not economically practicable and achievable in light of best industry practices.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct *construction activities* are occurring, or will occur, under one plan. The term “plan” in “larger common plan of development or sale” is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that *construction activities* may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same “common plan” is not concurrently being disturbed.

Minimize – means reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters,

ditches, man-made
channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
(ii) Designed or used for collecting or conveying stormwater;
(iii) Which is not a *combined sewer*; and
(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

New Development – means any land disturbance that does not meet the definition of Redevelopment Activity included in this appendix.

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department’s receipt and acceptance of a complete Notice of Intent. This letter documents the owner’s or operator’s authorization to discharge in accordance with the general permit for stormwater discharges from *construction activity*.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the *construction activity* is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications.

Performance Criteria – means the design criteria listed under the “Required Elements” sections in Chapters 5, 6 and 10 of the technical standard, New York State Stormwater Management Design Manual, dated January 2015. It does not include the Sizing Criteria (i.e. WQv, RRv, Cpv, Qp and Qf) in Part I.C.2. of the permit.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq .

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York..

Redevelopment Activity(ies) – means the disturbance and reconstruction of existing impervious area, including impervious areas that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is required to gain coverage under New York State DEC’s SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s).

Routine Maintenance Activity - means *construction activity* that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Stream bank restoration projects (does not include the placement of spoil material),
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that makes the transition between the road shoulder and the ditch or embankment,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or embankment,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

Site limitations – means site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical site limitations include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of site limitations shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – means the criteria included in Part I.C.2 of the permit that are used to size post-construction stormwater management control practices. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), Overbank Flood (Qp), and Extreme Flood (Qf).

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Steep Slope – means land area with a Soil Slope Phase that is identified as an E or F, or the map unit name is inclusive of 25% or greater slope, on the United States Department of Agriculture ("USDA") Soil Survey for the County where the disturbance will occur.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – means that an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet *water quality standards*, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* is responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part

621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B

Required SWPPP Components by Project Type

Table 1
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single family home not located in one of the watersheds listed in Appendix C or not *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E
- Construction of a barn or other agricultural building, silo, stock yard or pen.

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects
- Bike paths and trails
- Sidewalk construction projects that are not part of a road/ highway construction or reconstruction project
- Slope stabilization projects
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics
- Spoil areas that will be covered with vegetation
- Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields), excluding projects that *alter hydrology from pre to post development* conditions
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions
- Demolition project where vegetation will be established and no redevelopment is planned
- Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*
- Structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State”, excluding projects that involve soil disturbances of less than five acres and construction activities that include the construction or reconstruction of impervious area

The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

- All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

Table 2

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other agricultural building(e.g. silo) and structural practices as identified in Table II in the “Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State” that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional, includes hospitals, prisons, schools and colleges
- Industrial facilities, includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW’s and water treatment plants
- Office complexes
- Sports complexes
- Racetracks, includes racetracks with earthen (dirt) surface
- Road construction or reconstruction
- Parking lot construction or reconstruction
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover,* and constructed as part of an over-head electric transmission line project , wind-power project, cell tower project, oil or gas well drilling project, sewer or water main project or other linear utility project
- All other construction activities that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C

Watersheds Where Enhanced Phosphorus Removal Standards Are Required

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

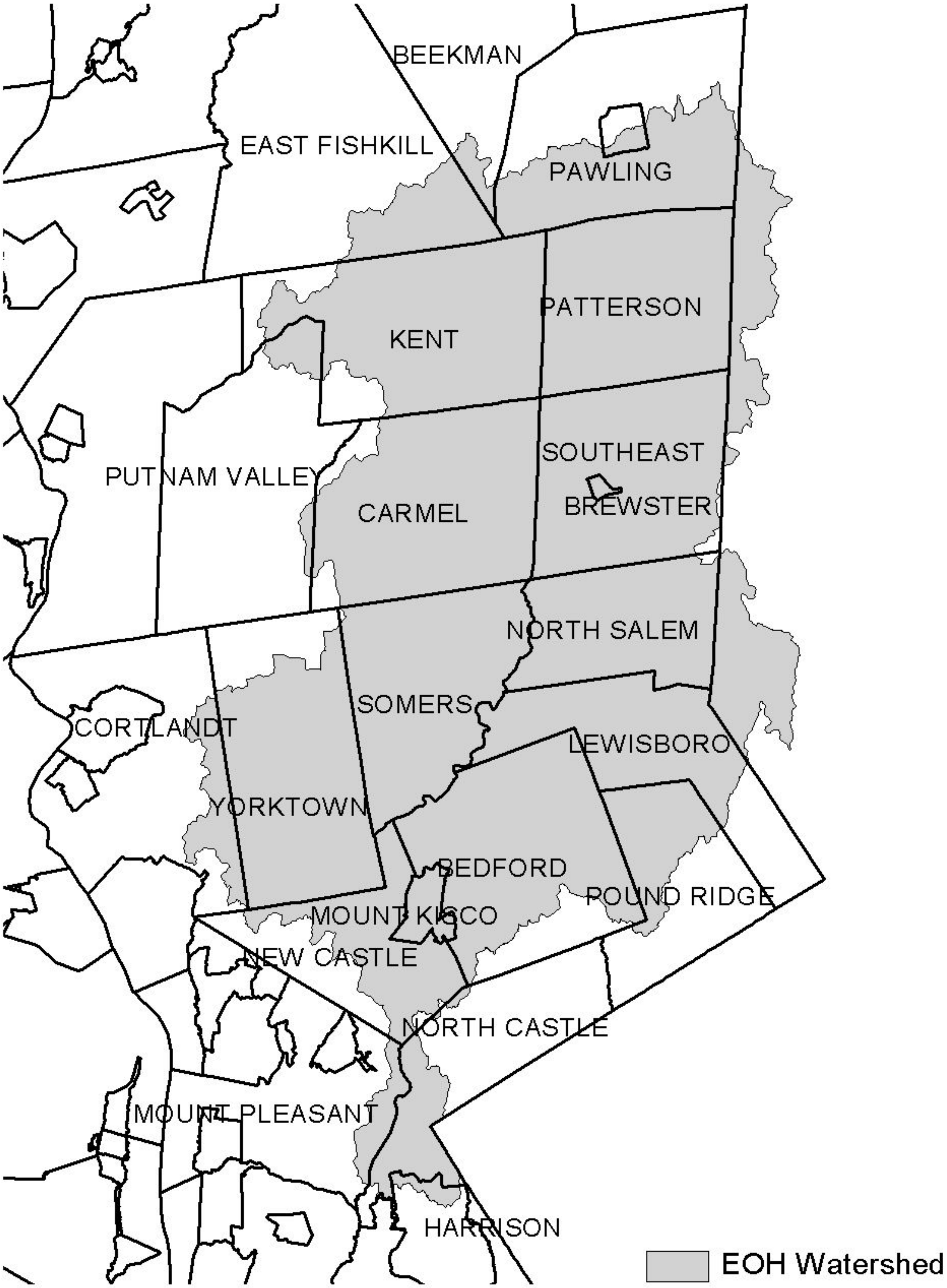


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

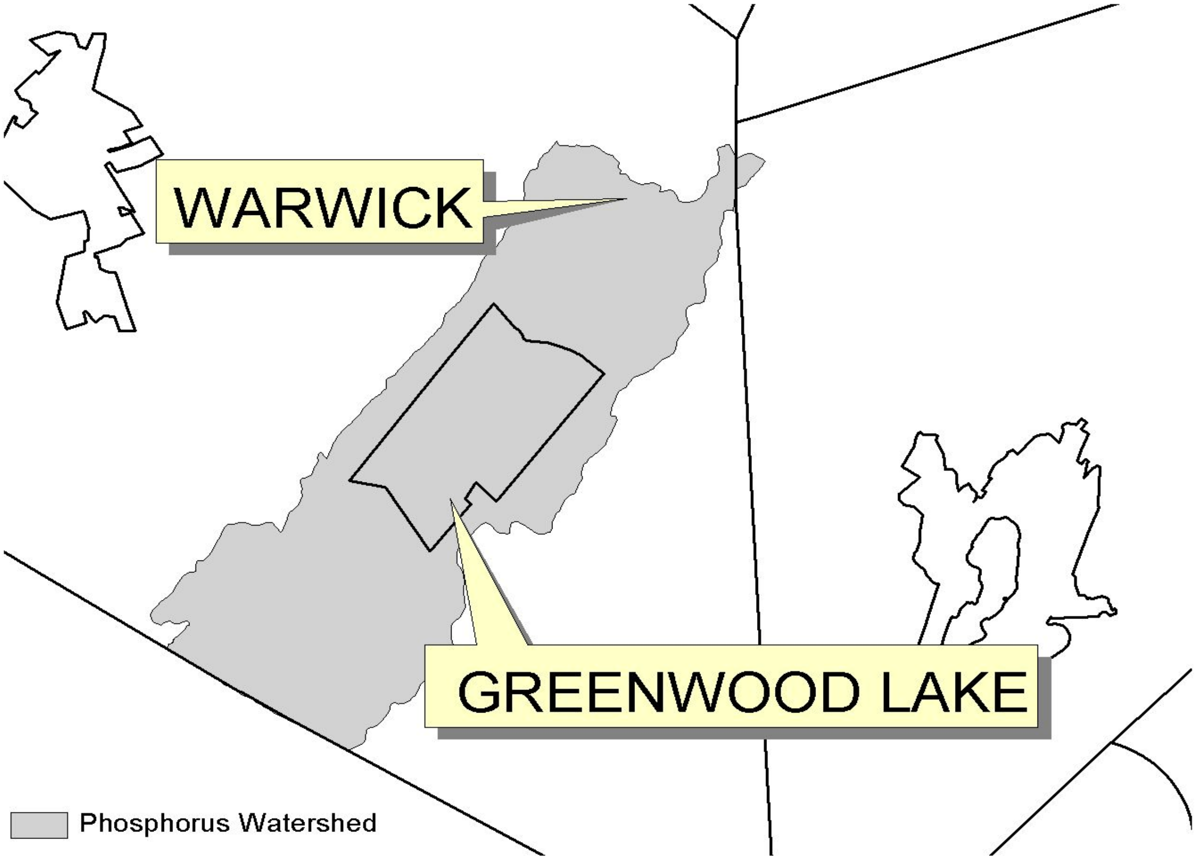


Figure 4 - Oscawana Lake Watershed

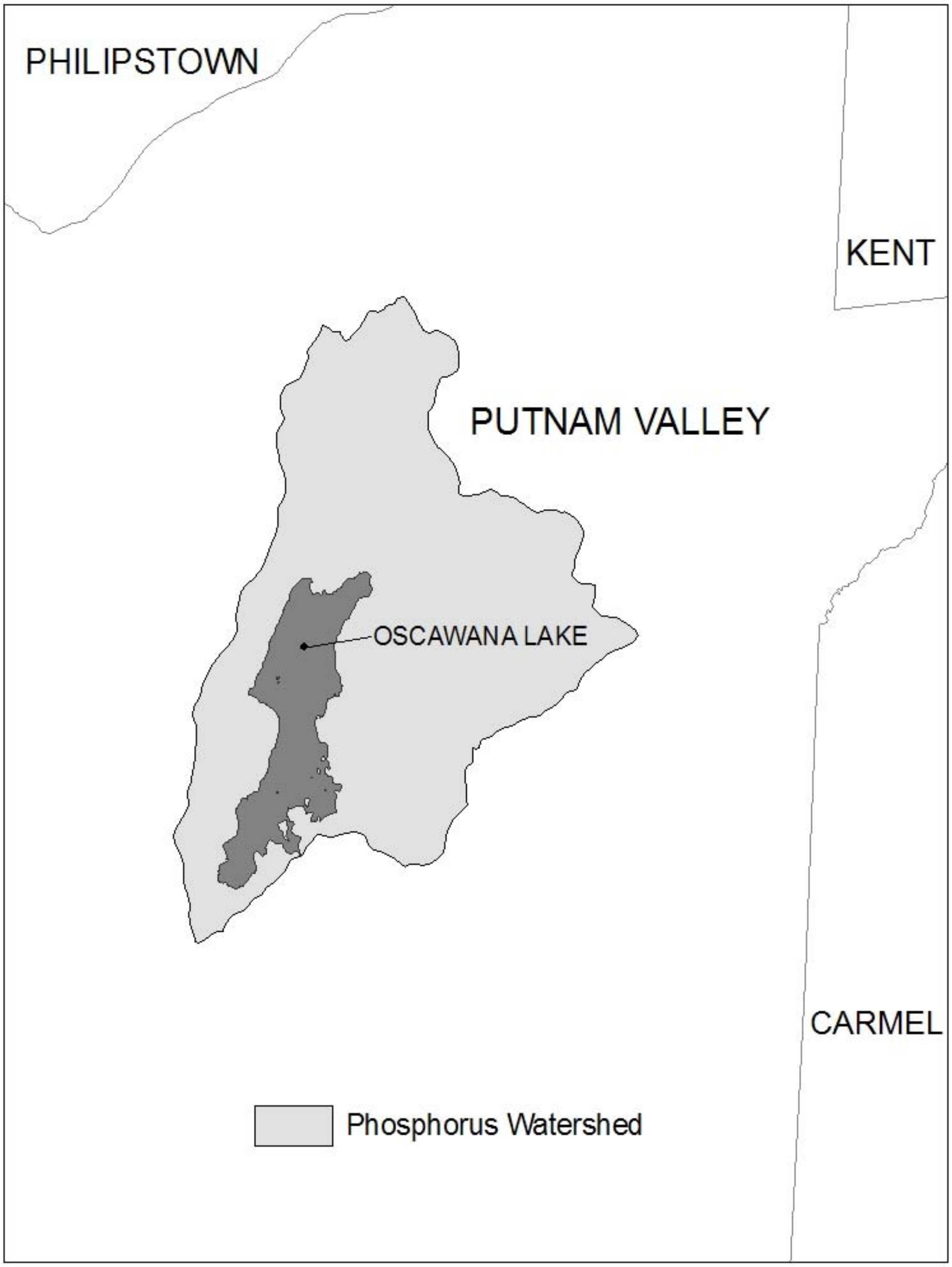
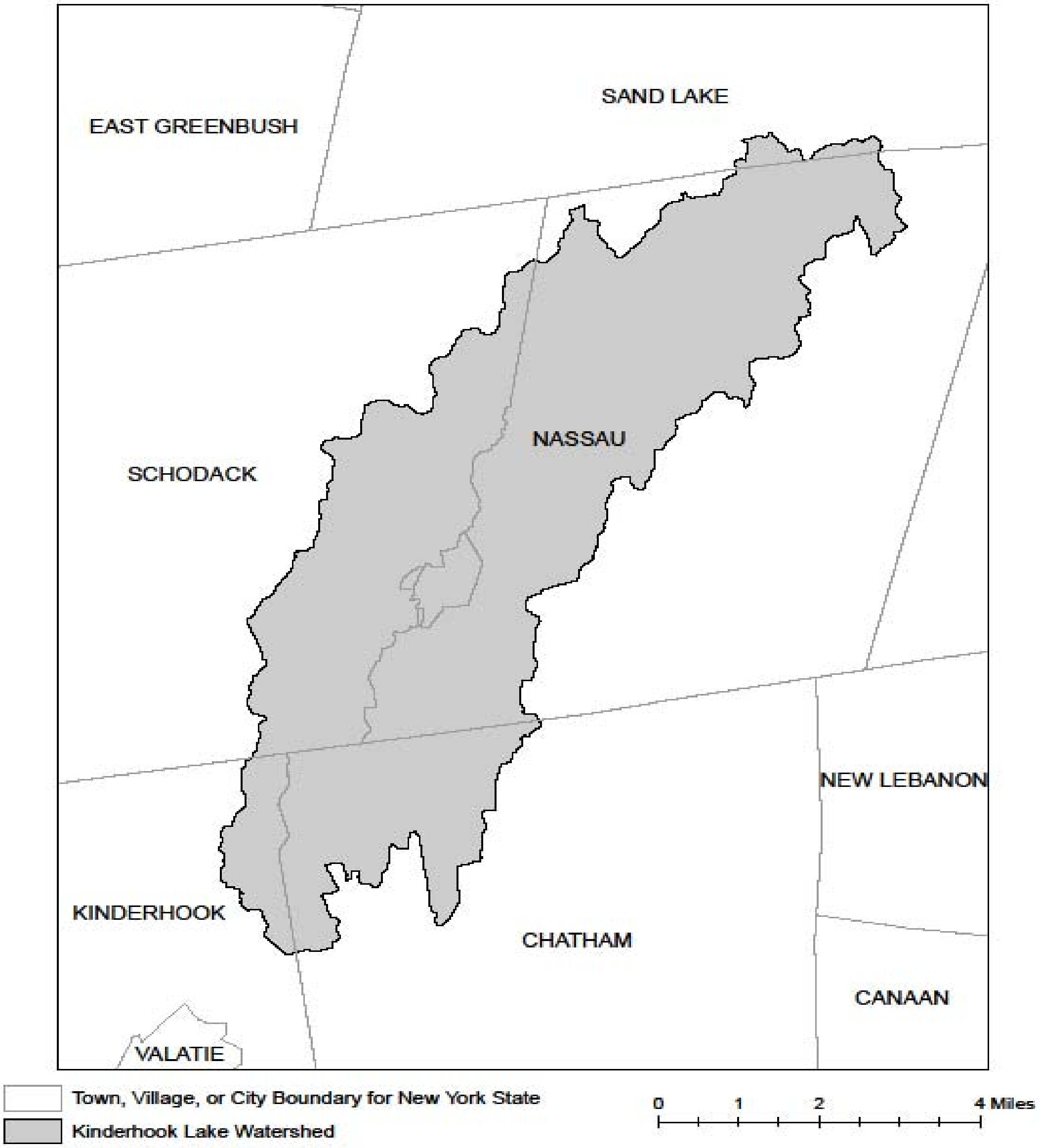


Figure 5: Kinderhook Lake Watershed



APPENDIX D

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E

List of 303(d) segments impaired by pollutants related to *construction activity* (e.g. silt, sediment or nutrients). *Owners or operators* of single family home and single family residential subdivisions with 25% or less total impervious cover at total site build-out that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the New York State Stormwater Management Design Manual (“Design Manual”), dated January 2015.

COUNTY	WATERBODY	COUNTY	WATERBODY
Albany	Ann Lee (Shakers) Pond, Stump Pond	Greene	Sleepy Hollow Lake
Albany	Basic Creek Reservoir	Herkimer	Steele Creek tribs
Allegheny	Amity Lake, Saunders Pond	Kings	Hendrix Creek
Bronx	Van Cortlandt Lake	Lewis	Mill Creek/South Branch and tribs
Broome	Whitney Point Lake/Reservoir	Livingston	Conesus Lake
Broome	Fly Pond, Deer Lake	Livingston	Jaycox Creek and tribs
Broome	Minor Tribs to Lower Susquehanna (north)	Livingston	Mill Creek and minor tribs
		Livingston	Bradner Creek and tribs
Cattaraugus	Allegheny River/Reservoir	Livingston	Christie Creek and tribs
Cattaraugus	Case Lake	Monroe	Lake Ontario Shoreline, Western
Cattaraugus	Linlyco/Club Pond	Monroe	Mill Creek/Blue Pond Outlet and tribs
Cayuga	Duck Lake	Monroe	Rochester Embayment - East
Chautauqua	Chautauqua Lake, North	Monroe	Rochester Embayment - West
Chautauqua	Chautauqua Lake, South	Monroe	Unnamed Trib to Honeoye Creek
Chautauqua	Bear Lake	Monroe	Genesee River, Lower, Main Stem
Chautauqua	Chadakoin River and tribs	Monroe	Genesee River, Middle, Main Stem
Chautauqua	Lower Cassadaga Lake	Monroe	Black Creek, Lower, and minor tribs
Chautauqua	Middle Cassadaga Lake	Monroe	Buck Pond
Chautauqua	Findley Lake	Monroe	Long Pond
Clinton	Great Chazy River, Lower, Main Stem	Monroe	Cranberry Pond
Columbia	Kinderhook Lake	Monroe	Mill Creek and tribs
Columbia	Robinson Pond	Monroe	Shipbuilders Creek and tribs
Dutchess	Hillside Lake	Monroe	Minor tribs to Irondequoit Bay
Dutchess	Wappinger Lakes	Monroe	Thomas Creek/White Brook and tribs
Dutchess	Fall Kill and tribs	Nassau	Glen Cove Creek, Lower, and tribs
Erie	Green Lake	Nassau	LI Tribs (fresh) to East Bay
Erie	Scajaquada Creek, Lower, and tribs	Nassau	East Meadow Brook, Upper, and tribs
Erie	Scajaquada Creek, Middle, and tribs	Nassau	Hempstead Bay
Erie	Scajaquada Creek, Upper, and tribs	Nassau	Hempstead Lake
Erie	Rush Creek and tribs	Nassau	Grant Park Pond
Erie	Ellicott Creek, Lower, and tribs	Nassau	Beaver Lake
Erie	Beeman Creek and tribs	Nassau	Camaans Pond
Erie	Murder Creek, Lower, and tribs	Nassau	Halls Pond
Erie	South Branch Smoke Cr, Lower, and tribs	Nassau	LI Tidal Tribs to Hempstead Bay
		Nassau	Massapequa Creek and tribs
Erie	Little Sister Creek, Lower, and tribs	Nassau	Reynolds Channel, east
Essex	Lake George (primary county: Warren)	Nassau	Reynolds Channel, west
Genesee	Black Creek, Upper, and minor tribs	Nassau	Silver Lake, Lofts Pond
Genesee	Tonawanda Creek, Middle, Main Stem	Nassau	Woodmere Channel
Genesee	Oak Orchard Creek, Upper, and tribs	Niagara	Hyde Park Lake
Genesee	Bowen Brook and tribs	Niagara	Lake Ontario Shoreline, Western
Genesee	Bigelow Creek and tribs	Niagara	Bergholtz Creek and tribs
Genesee	Black Creek, Middle, and minor tribs	Oneida	Ballou, Nail Creeks
Genesee	LeRoy Reservoir	Onondaga	Ley Creek and tribs
Greene	Schoharie Reservoir	Onondaga	Onondaga Creek, Lower and tribs

APPENDIX E

List of 303(d) segments impaired by pollutants related to construction activity, cont’d.

COUNTY	WATERBODY
Onondaga	Onondaga Creek, Middle and tribs
Onondaga	Onondaga Creek, Upp, and minor tribs
Onondaga	Harbor Brook, Lower, and tribs
Onondaga	Ninemile Creek, Lower, and tribs
Onondaga	Minor tribs to Onondaga Lake
Onondaga	Onondaga Creek, Lower, and tribs
Ontario	Honeoye Lake
Ontario	Hemlock Lake Outlet and minor tribs
Ontario	Great Brook and minor tribs
Orange	Monhagen Brook and tribs
Orange	Orange Lake
Orleans	Lake Ontario Shoreline, Western
Oswego	Pleasant Lake
Oswego	Lake Neatahwanta
Putnam	Oscawana Lake
Putnam	Palmer Lake
Putnam	Lake Carmel
Queens	Jamaica Bay, Eastern, and tribs (Queens)
Queens	Bergen Basin
Queens	Shellbank Basin
Rensselaer	Nassau Lake
Rensselaer	Snyders Lake
Richmond	Grasmere, Arbutus and Wolfes Lakes
Rockland	Congers Lake, Swartout Lake
Rockland	Rockland Lake
Saratoga	Ballston Lake
Saratoga	Round Lake
Saratoga	Dwaas Kill and tribs
Saratoga	Tribs to Lake Lonely
Saratoga	Lake Lonely
Schenectady	Collins Lake
Schenectady	Duane Lake
Schenectady	Mariaville Lake
Schoharie	Engleville Pond
Schoharie	Summit Lake
Schuyler	Cayuta Lake
St. Lawrence	Fish Creek and minor tribs
St. Lawrence	Black Lake Outlet/Black Lake
Steuben	Lake Salubria
Steuben	Smith Pond
Suffolk	Millers Pond
Suffolk	Mattituck (Marratooka) Pond
Suffolk	Tidal tribs to West Moriches Bay
Suffolk	Canaan Lake
Suffolk	Lake Ronkonkoma
Suffolk	Beaverdam Creek and tribs
Suffolk	Big/Little Fresh Ponds
Suffolk	Fresh Pond
Suffolk	Great South Bay, East
Suffolk	Great South Bay, Middle
Suffolk	Great South Bay, West
Suffolk	Mill and Seven Ponds
Suffolk	Moriches Bay, East
Suffolk	Moriches Bay, West
Suffolk	Quantuck Bay
Suffolk	Shinnecock Bay (and Inlet)
Sullivan	Bodine, Montgomery Lakes
Sullivan	Davies Lake
Sullivan	Pleasure Lake
Sullivan	Swan Lake
Tompkins	Cayuga Lake, Southern End
Tompkins	Owasco Inlet, Upper, and tribs
Ulster	Ashokan Reservoir
Ulster	Esopus Creek, Upper, and minor tribs
Ulster	Esopus Creek, Lower, Main Stem
Ulster	Esopus Creek, Middle, and minor tribs
Warren	Lake George
Warren	Tribs to L.George, Village of L George
Warren	Huddle/Finkle Brooks and tribs
Warren	Indian Brook and tribs
Warren	Hague Brook and tribs
Washington	Tribs to L.George, East Shr Lk George
Washington	Cossayuna Lake
Washington	Wood Cr/Champlain Canal, minor tribs
Wayne	Port Bay
Wayne	Marbletown Creek and tribs
Westchester	Lake Katonah
Westchester	Lake Mohegan
Westchester	Lake Shenorock
Westchester	Reservoir No.1 (Lake Isle)
Westchester	Saw Mill River, Middle, and tribs
Westchester	Silver Lake
Westchester	Teatown Lake
Westchester	Truesdale Lake
Westchester	Wallace Pond
Westchester	Peach Lake
Westchester	Mamaroneck River, Lower
Westchester	Mamaroneck River, Upp, and tribs
Westchester	Sheldrake River and tribs
Westchester	Blind Brook, Lower
Westchester	Blind Brook, Upper, and tribs
Westchester	Lake Lincolndale
Westchester	Lake Meahaugh
Wyoming	Java Lake
Wyoming	Silver Lake

Note: The list above identifies those waters from the final New York State “2014 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy”, dated January 2015, that are impaired by silt, sediment or nutrients.

APPENDIX F

LIST OF NYS DEC REGIONAL OFFICES

Region	COVERING THE FOLLOWING COUNTIES:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) PERMIT ADMINISTRATORS	DIVISION OF WATER (DOW) WATER (SPDES) PROGRAM
1	NASSAU AND SUFFOLK	50 CIRCLE ROAD STONY BROOK, NY 11790 TEL. (631) 444-0365	50 CIRCLE ROAD STONY BROOK, NY 11790-3409 TEL. (631) 444-0405
2	BRONX, KINGS, NEW YORK, QUEENS AND RICHMOND	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4997	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4933
3	DUTCHESS, ORANGE, PUTNAM, ROCKLAND, SULLIVAN, ULSTER AND WESTCHESTER	21 SOUTH PUTT CORNERS ROAD NEW PALTZ, NY 12561-1696 TEL. (845) 256-3059	100 HILLSIDE AVENUE, SUITE 1W WHITE PLAINS, NY 10603 TEL. (914) 428 - 2505
4	ALBANY, COLUMBIA, DELAWARE, GREENE, MONTGOMERY, OTSEGO, RENSSELAER, SCHENECTADY AND SCHOHARIE	1150 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2069	1130 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2045
5	CLINTON, ESSEX, FRANKLIN, FULTON, HAMILTON, SARATOGA, WARREN AND WASHINGTON	1115 STATE ROUTE 86, PO BOX 296 RAY BROOK, NY 12977-0296 TEL. (518) 897-1234	232 GOLF COURSE ROAD WARRENSBURG, NY 12885-1172 TEL. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROAD AVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVE. BUFFALO, NY 14203-2999 TEL. (716) 851-7070

Appendix F

Forms

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

Owner/Operator Certification Form

SPDES General Permit For Stormwater Discharges From Construction Activity
(GP-0-15-002)

Project/Site Name: Elmwood - Forest Condos

eNOI Submission Number: ____________________

eNOI Submitted by: ☐ **Owner/Operator** ☐ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Owner/Operator First Name M.I. Last Name

____
Signature

P. Jeffrey Birtch
MEMBER

11-8-17
Date

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges
From Construction Activity (GP-0-15-002)

Project Site Information

Project/Site Name

Elmwood - Forest Condos

Owner/Operator Information

Owner/Operator (Company Name/Private Owner/Municipality Name)

Carmina Wood Morris, DPC

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Christopher		Wood, PE
First name	MI	Last Name

Signature

Date

Revised: April 2015

STORM WATER POLLUTION PREVENTION PLAN
CONTRACTOR'S CERTIFICATION STATEMENT

Elmwood – Forest Condos

CONTRACTOR'S CERTIFICATION:

"I certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP for the construction site identified in such SWPPP as a condition of authorization to discharge storm water. I also understand that the operator must comply with the terms and conditions of the New York State Pollutant Discharge Elimination System (SPDES) general permit for storm water discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards."

Note: The contractor shall have at least one NYSDEC trained individual onsite at all times when earthwork and other SWPPP associated work is being performed from each contractor(s) and subcontractor(s). <u>Each contractor(s) and subcontractor(s) shall provide copies of these individuals' certifications to the City of Buffalo.</u>

Name: ____
(Print)

Signature: ____________________________________

Title: ____

Company Name: _______________________________

Address: _____________________________________

Telephone Number: ___________________________

Date: ____

Scope of Services: ____

Trained Individual(s) Responsible for Implementation: ____

This form must be signed by a responsible corporate officer or other party meeting the
"Signatory Requirements" of the NYSDEC SPDES General Permit

Appendix G

NYSDEC Notice of Termination (NOT)

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person:

4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

III. Reason for Termination

9a. ☐ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ______________________________

9b. ☐ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ____ ____ ____ ____ ____ ____
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. ☐ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? ☐ yes ☐ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? ☐ yes ☐ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

____

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? ☐ yes ☐ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

☐ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

☐ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

☐ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

☐ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? ____________________ (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? ☐ yes ☐ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature: Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

Title/Position:

Signature: Date:

IX. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:

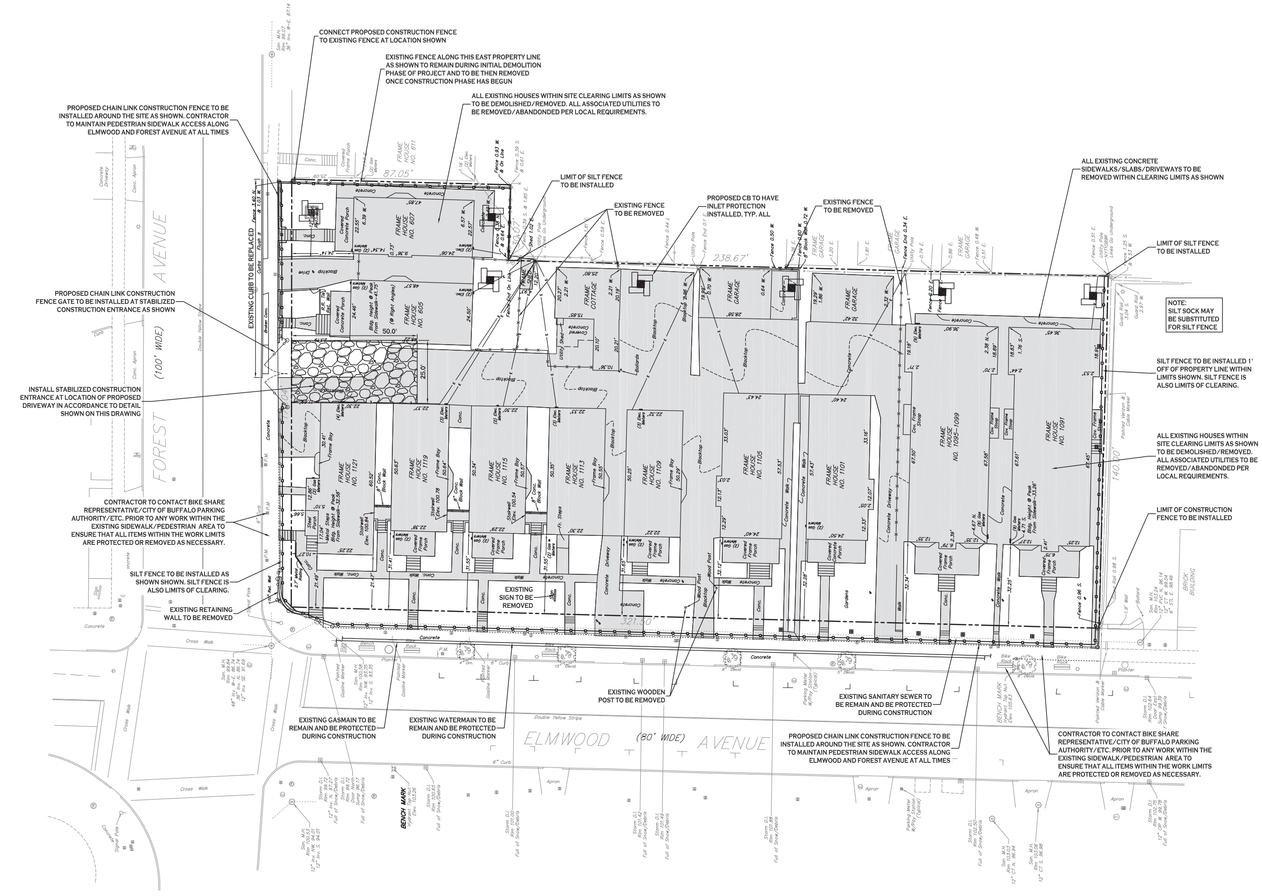
Title/Position:

Signature: Date:

(NYS DEC Notice of Termination - January 2015)

Appendix H

Construction Documents



DEMOLITION & EROSION CONTROL PLAN

SCALE: 1"=20'

EROSION CONTROL PLAN

THE FOLLOWING EROSION CONTROL PROCEDURE SHALL BE ADHERED TO BY THE CONTRACTOR:

1. INSTALL TEMPORARY SILT FENCE BARRIERS AS DIRECTED BY THE OWNER AND AS SHOWN ON THE EROSION CONTROL PLAN TO PREVENT SEDIMENT MIGRATION. ALL SILT FENCE BARRIERS SHALL BE INSTALLED IN ACCORDANCE WITH THE DETAILS SHOWN ON THE PLANS.
2. ALL SILT FENCE BARRIERS SHALL BE REPLACED WHEREVER THEY BECOME CLOGGED OR INOPERABLE.
3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTENANCE AND REMOVAL OF TEMPORARY SEDIMENTATION CONTROLS.
4. THE CONTRACTOR MUST CONTROL DUST DURING CONSTRUCTION. DURING EARTHWORK OPERATIONS, WATER-SPREADING EQUIPMENT SHALL BE PROVIDED BY THE CONTRACTOR, AND WATER SPREAD AS NECESSARY AND AS DIRECTED BY THE OWNER IN ORDER TO CONTROL DUST.
5. DIRT OR DEBRIS LEFT ON LOCAL PUBLIC ROADS AS A RESULT OF THIS CONSTRUCTION PROJECT SHALL BE REMOVED AND ROAD SURFACES CLEANED BY THE CONTRACTOR ON A DAILY BASIS.
6. ALL DISTURBED AREAS (EXCEPT STABILIZED STONE AREAS) SHALL BE SEEDED IMMEDIATELY AFTER FINE GRADING TAKES PLACE AND AS SOON AS PHYSICALLY POSSIBLE.
7. THE CONTRACTOR IS RESPONSIBLE FOR THE MAINTENANCE OF DOWNSTREAM STORM SEWERS, DITCHES, AND CULVERTS. SILT BUILDUP FOUND TO BE A RESULT OF THIS SITE CONSTRUCTION WORK SHALL BE REMOVED FROM DOWNSTREAM CULVERTS BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER OR THE TOWN.
8. ALL SOIL EROSION AND SEDIMENT CONTROL DEVICES AND MATERIALS SHALL BE MAINTAINED UNTIL THE NEW SLOPES ARE STABILIZED WITH SEEDING AND/OR SLOPE PROTECTION, AS DIRECTED BY THE ENGINEER.
9. THE CONTRACTOR SHALL FOLLOW THE REGULATIONS SET FORTH IN THE NYSDEC SPDES GENERAL PERMIT FOR STORM WATER DISCHARGES FROM CONSTRUCTION ACTIVITIES.
10. ON-SITE STORAGE OF MATERIALS & EQUIPMENT SHALL BE DONE SO IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THIS PROJECT, THIS SHALL INCLUDE IMPLEMENTATION OF A SPILL PREVENTION PLAN FOR SPILLAGE OF FUEL, OIL, PESTICIDES, ETC.
11. ON-SITE STOCKPILING OF EXCESS FILL, SPOILS, TOPSOIL OR STONE MATERIALS SHALL BE DONE SO IN ACCORDANCE WITH THE STORM WATER POLLUTION PREVENTION PLAN (SWPPP) PREPARED FOR THIS PROJECT, THIS SHALL INCLUDE INSTALLING TEMPORARY SILT FENCE AROUND THE BASE OF STOCKPILES.
12. THE TOPSOIL SHALL BE STRIPPED AND STOCKPILED ON SITE FOR RE-USE AS DIRECTED BY THE OWNER. ALL LOCAL ORDINANCES REGARDING THE SALE OF TOPSOIL MUST BE FOLLOWED. TOPSOIL MAY NOT BE REMOVED WITHOUT A PERMIT.

SEQUENCE OF MAJOR ACTIVITIES

THE CONTRACTOR WILL BE RESPONSIBLE FOR IMPLEMENTING THE FOLLOWING EROSION CONTROL AND STORM WATER MANAGEMENT CONTROL MEASURES. THE CONTRACTOR MAY DESIGNATE THESE TASKS TO CERTAIN SUBCONTRACTORS AS HE SEES FIT, BUT THE ULTIMATE RESPONSIBILITY FOR IMPLEMENTING THESE CONTROLS AND ENSURING THEIR PROPER FUNCTIONING REMAINS WITH THE CONTRACTOR. THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS:

A. COMMENCE REMEDIATION ACTIVITIES WHICH DISTURB UNDER 1 ACRE.
B. INSTALL STABILIZED CONSTRUCTION ENTRANCE
C. INSTALL PERIMETER SILT FENCES/SILT SOCK IN THE LOCATIONS SHOWN ON THE DEMOLITION AND EROSION CONTROL PLAN SHEET.
D. CLEAR & GRUB SITE.
E. ROUGH GRADING AND INSTALLATION OF STONE SUBBASE IN PAVED AREAS AND BUILDING PADS.
F. INSTALL STONE CHECK DAMS IN SWALES WHERE SHOWN.
G. COMMENCE OTHER SITE GRADING.
H. DISTURBED AREAS OF THE SITE WHERE CONSTRUCTION ACTIVITY HAS CEASED FOR MORE THAN 14 DAYS SHALL BE TEMPORARILY SEEDED AND WATERED.
I. FINALIZE PAVEMENT SUBGRADE PREPARATION.
J. CONSTRUCT ALL CURB, DRAINAGE INLETS, STORM SEWER PIPES AND STORM SEWER MANHOLES, AS SHOWN ON THE PLANS. INSTALL TEMPORARY INLET PROTECTION AT THE LOCATIONS OF ALL NEW INLETS.
K. REMOVE INLET PROTECTION AROUND INLETS AND MANHOLES NO MORE THAN 48 HOURS PRIOR TO PLACING STABILIZED BASE COURSE.
L. INSTALL BASE MATERIAL AS REQUIRED FOR PAVEMENT.
M. CARRY OUT FINAL GRADING AND SEEDING AND PLANTING.
N. CLEAN STORM SYSTEM FOLLOWING CONSTRUCTION.
O. REMOVE SILT FENCING ONLY AFTER ALL PAVING IS COMPLETE AND EXPOSED SURFACES ARE STABILIZED.

NOTES:

1. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PROTECT THOSE ITEMS TO REMAIN, SUCH AS TREES, PROPERTY CORNER PINS, UTILITY POLES, VALVES, HYDRANTS, CURBS, MANHOLES AND CATCH BASINS.
2. TEMPORARY SILT FENCE AND EROSION CONTROL DEVICES TO BE INSTALLED AS DIRECTED BY THE OWNERS FIELD REPRESENTATIVE. MAINTAIN UNTIL VEGETATION IS ESTABLISHED AND PAVEMENT IS INSTALLED.
3. THE CONTRACTOR SHALL INSTALL STABILIZED CONSTRUCTION ENTRANCES WHERE ACCESSING THE SITE FROM PAVED ROADWAYS.
4. THE CONTRACTOR SHALL INSTALL TEMPORARY TRAFFIC CONTROL DEVICES IN ACCORDANCE WITH NYS M.U.T.C.D. STANDARDS PRIOR TO STARTING WORK.

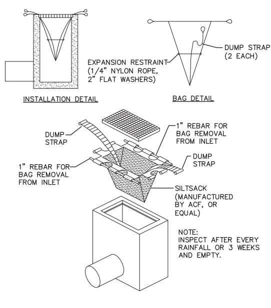
INSPECTION AND MAINTENANCE PROCEDURES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ASSIGNING AN INDIVIDUAL TO BE RESPONSIBLE FOR THE INSPECTION AND MAINTENANCE OF TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES. THE WORK MAY INCLUDE, BUT NOT LIMITED TO THE FOLLOWING:
   - 1.1. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN CALENDAR DAYS.
   - 1.2. ALL EROSION CONTROL MEASURES SHALL BE MAINTAINED IN GOOD WORKING ORDER. AS DEEMED NECESSARY BY THE TOWN AND ENGINEER, REPAIRS SHALL BE COMPLETED WITHIN 24 HOURS OF BEING REPORTED.
   - 1.3. CHECK AND REPAIR SILT FENCING AND EROSION CONTROL DEVICES, AS NECESSARY.
   - 1.4. TEMPORARY AND PERMANENT SEEDING AND PLANTING WILL BE INSPECTED FOR BARE SPOTS, WASHOUTS, AND HEALTHY GROWTH AND REPAIRED AS NECESSARY.
   - 1.5. NEIGHBORING ROADWAYS WILL BE MONITORED TO ENSURE THAT ANY TRACKED MUD, DIRT, OR ROCK IS SWEPT AS NECESSARY.

RESTORATION NOTES

1. THE ADJACENT AREAS DISTURBED OR DAMAGED DURING CONSTRUCTION MUST BE RESTORED IN KIND TO THE SATISFACTION OF THE OWNER.
2. WHEN RESTORING LAWN AREAS ADJACENT TO NEW CONSTRUCTION, ON-SITE MATERIAL MAY BE USED TO BACKFILL THE AREA WITHIN SIX INCHES OF THE FINISHED SURFACE. ON-SITE MATERIAL SHALL BE THOROUGHLY COMPACTED AND FREE OF GRASS CLUMPS, TREE ROOTS PIECES OF ASPHALT AND OTHER EXTRANEOUS MATERIALS, AND STONES LARGER THAN 1 INCH IN SIZE.
3. ALL DISTURBED UNSURFACED AREAS SHALL RECEIVE FOUR INCHES OF TOPSOIL, SEED AND MULCH AND SHALL BE WATERED UNTIL A HEALTHY STAND OF GRASS IS OBTAINED.
4. WHEN ADJACENT ASPHALT, CONCRETE OR PAVING STONE AREAS ARE DISTURBED AS PART OF THE CONSTRUCTION, THE CONTRACTOR SHALL BE REQUIRED TO REPLACE THE DAMAGED OR EXCAVATED AREA. THE PERIMETER OF THE DISTURBED AREA SHALL BE SAW CUT FULL DEPTH, SO THAT ALL LINES ARE STRAIGHT AND TRUE. PAVING STONES SHALL BE REPLACED IN WHOLE UNITS ONLY, AND ALL REPLACEMENT PAVING STONES ARE TO MATCH THE EXISTING ONES IN SIZE, SHAPE AND COLOR. ASPHALT SHALL BE COMPACTED TO A SMOOTH FINISH AND SHALL BE FLUSH WITH THE EXISTING ADJACENT AREA THAT IS TO REMAIN.

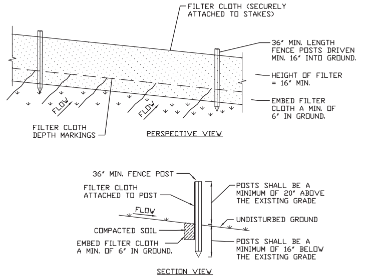
NOTE: CONTRACTOR SHALL ADHERE TO SITE APPROVED SWPPP FOR REQUIRED EROSION AND SEDIMENT CONTROLS NEED FOR THIS PROJECT



NOTE: INSPECT AFTER EVERY RAINFALL OR 3 WEEKS AND EMPTY.

SILT SACK DETAIL

NOT TO SCALE

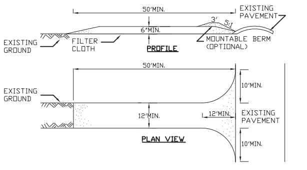


CONSTRUCTION SPECIFICATIONS

1. WOVEN FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

SILT FENCE DETAIL

NOT TO SCALE

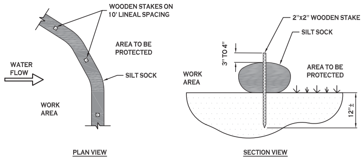


CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

STABILIZED CONSTRUCTION ENTRANCE DETAIL

NOT TO SCALE



NOTES:

CONTRACTOR SHALL INSPECT AND MAINTAIN SILT SOCK AS NEEDED DURING THE DURATION OF CONSTRUCTION PROJECT.

CONTRACTOR SHALL REMOVE SEDIMENT COLLECTED AT THE BASE OF THE SILT SOCK WHEN IT HAS REACHED $\frac{1}{2}$ OF THE EXPOSED HEIGHT OF THE SILT SOCK. ALTERNATIVELY, RATHER THAN CREATE A SOIL DISTURBING ACTIVITY, THE ENGINEER MAY CALL FOR ADDITIONAL SILT SOCK TO BE ADDED AT AREAS OF HIGH SEDIMENTATION, PLACED IMMEDIATELY ON TOP OF THE EXISTING SEDIMENT LADEN SILT SOCK.

SILT SOCK DETAIL

NOT TO SCALE

DEMOLITION & EROSION CONTROL LEGEND

EX. BUILDING/PAVEMENT/SIDEWALK/CURBING TO BE REMOVED WITHIN LIMITS AS SHOWN	▨
PROPOSED SILT FENCE	─□─□─□─
EXISTING TREE TO BE REMOVED	☒
PROPOSED STORM INLET PROTECTION	⊞

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS, CARMINA WOOD MORRIS, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

20' 20 0 20 40Ft.

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REVISIONS:
No. Description Date

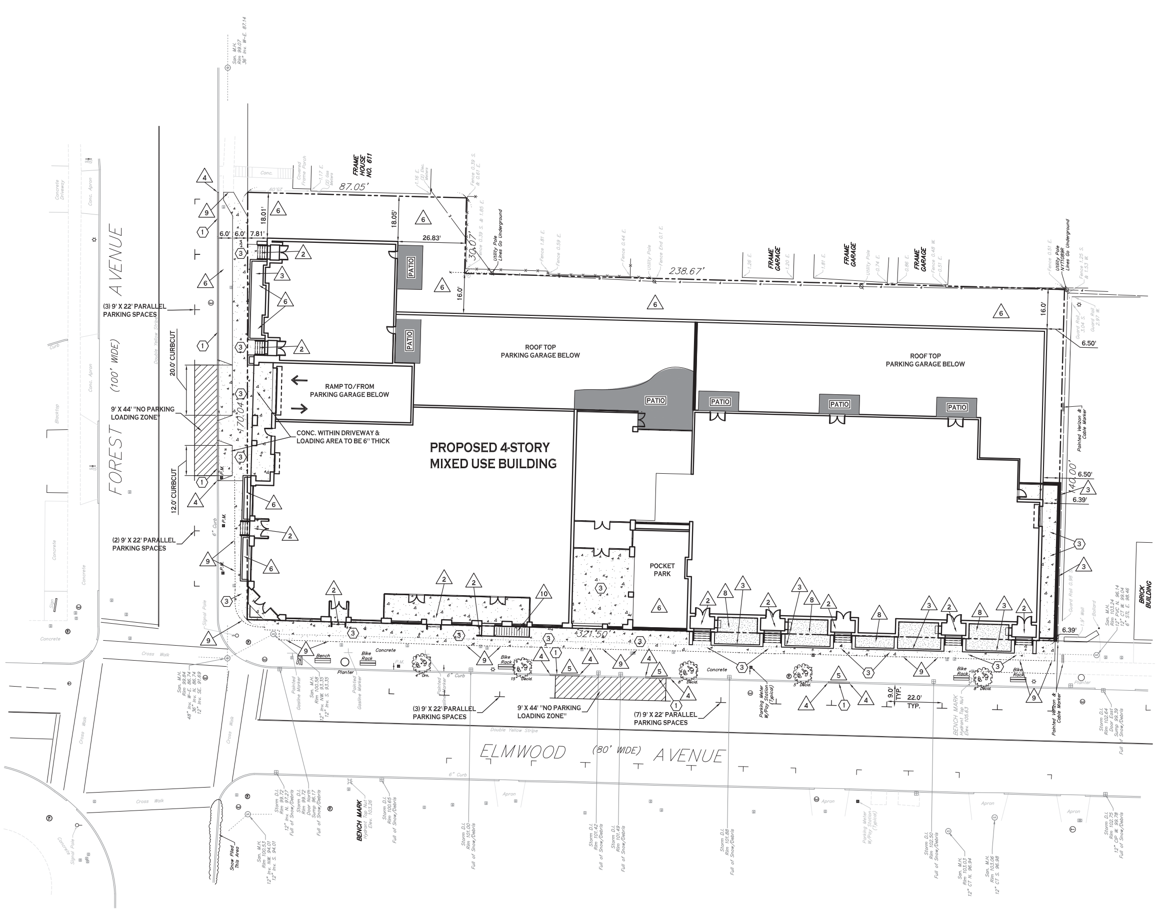
PROJECT NAME:
New Construction - PHASE 1:
Elmwood Ave Condominiums
1111 Elmwood Avenue
Buffalo, New York

Bidding Documents: 10/16/2017
Drawn by: jlp
Scale: 1:20

DRAWING NAME:
Demolition & Erosion Control Plan

DRAWING NO.
C-001

Project no.: 16.018



SITE PLAN

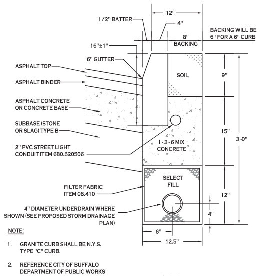
SCALE: 1"=20'

DETAIL LEGEND SEE SITE DETAIL SHEET

1. GRANITE CURB - CITY OF BUFFALO SPEC
2. EXTERIOR CONCRETE SLAB ON GRADE
3. CONCRETE SIDEWALK

NOTE LEGEND

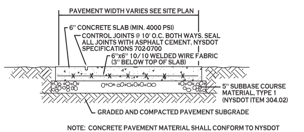
1. CAST IN PLACE CONCRETE RATINING WALL, COORDINATE WITH STRUCTURAL PLANS
2. ENTRANCE STAIRS, SEE ARCHITECTURAL DRAWINGS
3. LANDSCAPE RETAINING WALL, COORDINATE WITH ARCHITECTURAL PLANS
4. RUNOUT CURB IN 2' OR MATCH EXISTING CURB
5. EXISTING DRIVEWAY APRON & CURB CUT TO BE REMOVED, REPLACE SIDEWALK & CURB PER CITY SPEC.
6. LANDSCAPED AREA - SEE LANDSCAPE PLAN, IF NO PLANTINGS, INSTALL TOPSOIL & SEED
7. CURBED LANDSCAPED AREA - SEE LANDSCAPE PLAN FOR PLANTINGS
8. LANDSCAPED PATIO AREA - SEE LANDSCAPE PLAN FOR PLANTINGS
9. MATCH INTO EXISTING SIDEWALK
10. RAMP 1V:12H MAX., COORDINATE WITH ARCHITECTURAL PLANS



NOTE:

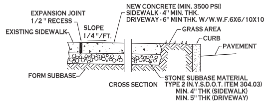
1. GRANITE CURB SHALL BE N.Y.S. TYPE "C" CURB.
2. REFERENCE CITY OF BUFFALO DEPARTMENT OF PUBLIC WORKS DIVISION OF ENGINEERING SS-1.

GRANITE CURB - 1
(CITY OF BUFFALO DETAIL: N.T.S.)



NOTE: CONCRETE PAVEMENT MATERIAL SHALL CONFORM TO NYSDOT STANDARD SPECIFICATION 501 AND CONSTRUCTION METHODS SHALL CONFORM TO NYSDOT STANDARD SPECIFICATION 502-3.

EXTERIOR CONCRETE
SLAB-ON-GRADE SECTION - 2



NOTES:

1. CONTROL JOINTS TO BE AT 5'-0" O.C., BOTH WAYS WHERE APPLICABLE. SEE SPECIFICATIONS FOR FURTHER JOINT REQUIREMENTS NYSDOT 702-0700.
2. CONCRETE SIDEWALK AND DRIVEWAY MATERIAL SHALL CONFORM TO NYSDOT STANDARD SPECIFICATION 501 AND CONSTRUCTION METHODS SHALL CONFORM TO NYSDOT STANDARD SPECIFICATION 608-3.
3. SUBBASE GRADE SHALL FOLLOW THE PROPOSED GRADE OF THE SIDEWALK AND SLOPE AWAY FROM BUILDING WHERE APPLICABLE, PROVIDE CONTINUOUS STONE PATH TO CURB UNDERDRAIN WHERE PROVIDED.
4. FULL DEPTH EXPANSION JOINTS SHALL BE INSTALLED EVERY 20' O.C., BOTHWAYS WHERE APPLICABLE. SEE SPECIFICATIONS FOR FURTHER JOINT REQUIREMENTS NYSDOT 702-0700.
5. SEE CURB DETAIL FOR DOWLING REQUIREMENTS WHERE ABUTTING CURB.
6. INSTALL 6" LONG #3 DOWELS @ 12" O.C. WHERE SIDEWALK ABUTS A BUILDING WALL AT AN ENTRANCE, THICKEN SIDEWALK TO 6" AT BUILDING WALL AND INSTALL DOWEL CENTERED IN THE 6" DEPTH. DOWELS AND THICKENING OF SIDEWALK SHALL EXTEND 18" EITHER SIDE OF ENTRANCE.
7. INSTALL 1/2" PREMOLDED EXPANSION JOINT WITH BACKER ROD & SEALANT WHERE SIDEWALK ABUTS BUILDING OR OTHER STRUCTURE.

CONCRETE SIDEWALK - 3

NOTES:

1. ALL RADII SHALL BE 3'-0" UNLESS OTHERWISE NOTED.
2. ALL DISTURBED AREAS: SHALL HAVE 4" MIN. OF TOPSOIL AND SEED.
3. ALL DIMENSIONS FROM PROPERTY LINES SHALL BE MEASURED PERPENDICULAR TO THE PROPERTY LINE.
4. CENTER ENTRANCE SIDEWALKS ON DOOR OPENINGS.
5. BUILDING DIMENSIONS ARE APPROXIMATE, REFER TO ARCHITECTURAL DRAWINGS FOR LAYOUT DIMENSIONS.

GENERAL NOTES:

1. INSTALL ALL MATERIALS TO MANUFACTURER'S RECOMMENDATIONS AND BEST STANDARDS OF TRADE INVOLVED.
2. SUBSTITUTIONS SHALL BE MADE ONLY WITH OWNER'S APPROVAL AND BE OF EQUIVALENT QUALITY TO WHAT IS SPECIFIED.
3. WORK SHALL BE COMPLETED IN STRICT ACCORDANCE WITH ALL LOCAL CODES AND OSHA SAFETY RULES AND REGULATIONS.
4. VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS AT THE SITE. NOTIFY OWNER & ENGINEER OF DISCREPANCIES IN CONDITIONS SHOWN ON DRAWINGS PRIOR TO PROCEEDING WITH THE WORK.
5. CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF ANY EXISTING STRUCTURES TO REMAIN AND ANY FINISH MATERIAL INSTALLED WHILE WORKING ON OTHER COMPONENTS.
6. CONTRACTOR SHALL KEEP JOB FREE OF DEBRIS AND MAKE FINAL CLEANUP TO SATISFACTION OF OWNER.
7. CONTRACTOR SHALL ASCERTAIN THE LOCATION OF ALL UTILITIES PRIOR TO CONSTRUCTION SO THAT THIS WORK WILL NOT DISTURB EXISTING LINES AND/OR INSTALLATIONS. COORDINATE ALL WORK WITH THE APPLICABLE UTILITY COMPANIES.
8. CONTRACTOR SHALL OBTAIN AND PAY FOR ALL REQUIRED PERMITS NECESSARY TO PERFORM THE WORK.

SITE LEGEND

PROPERTY LINE	—··—··—
PROPOSED CURB	———
PROPOSED SIDEWALK / CONCRETE PAD	▨
NUMBER OF PARKING SPACES	(27)
PROPOSED SIGN	●
PROPOSED LIGHT POLE W/ SINGLE FIXTURE	●■
PROPOSED LIGHT POLE W/ DOUBLE FIXTURE	■●■
PROPOSED WALL MOUNTED FIXTURE	├■

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS, CARMINA WOOD MORRIS, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

20' 20 0 20 40Ft.

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REVISIONS:

No.	Description	Date

PROJECT NAME:

New Construction - PHASE 1:

Elmwood Ave Condominiums

1111 Elmwood Avenue
Buffalo, New York

Bidding Documents: 10/16/2017
Drawn by: jlp
Scale: 1:20

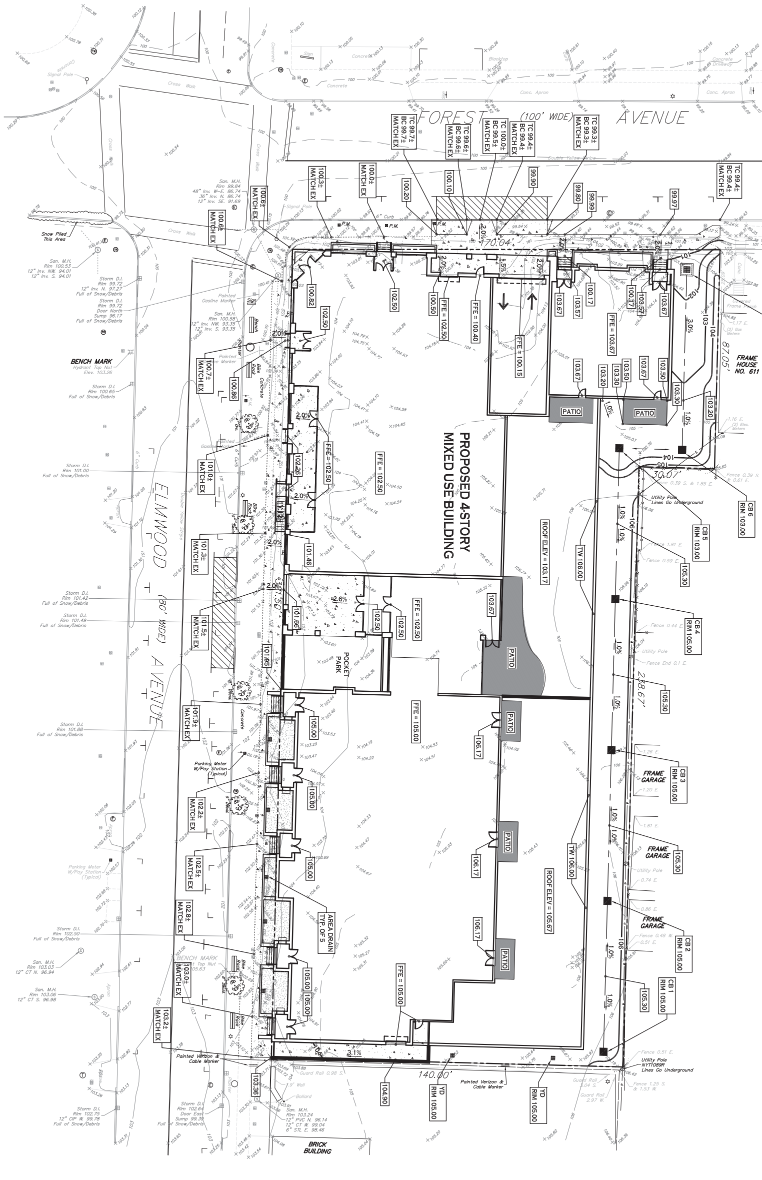
DRAWING NAME:

Site Plan

DRAWING NO.

C-100

Project no.: 16.018



SITE PLAN
SCALE: 1"=20'

N

PROPOSED GRADING LEGEND

PROPOSED CONTOUR	—101—
PROPOSED SPOT ELEVATION	100.80
PROPOSED TOP / BOTTOM OF CURB ELEV.	TC 100.50 BC 100.00
PROPOSED CATCH BASIN	■ CB
PAVEMENT / GROUND SLOPE	→
PROPOSED YARD DRAIN	● YD
PROPOSED MANHOLE	● MH

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS. CARMINA WOOD MORRIS, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

20' 20 0 20 40Ft.

PROJECT NAME:

New Construction - PHASE 1:

Elmwood Ave Condominiums

1111 Elmwood Avenue
Buffalo, New York

REVISIONS:

No.	Description	Date

Bidding Documents: 10/16/2017
Drawn by: jlp
Scale: 1:20

DRAWING NAME:
Grading Plan

DRAWING NO.
C-200

Project no.: 16.018

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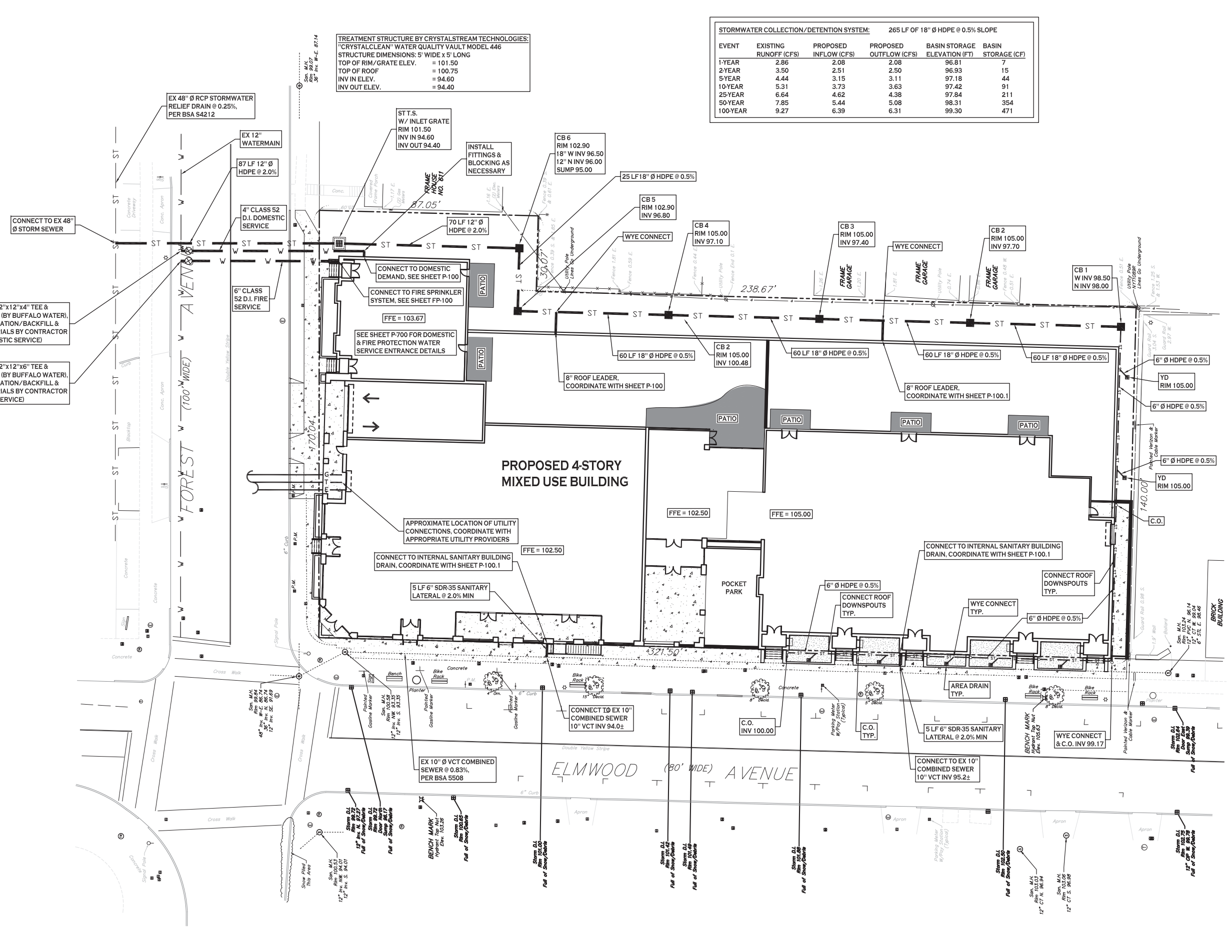
TREATMENT STRUCTURE BY CRYSTALSTREAM TECHNOLOGIES:
"CRYSTALCLEAN" WATER QUALITY VAULT MODEL 446
STRUCTURE DIMENSIONS: 5' WIDE x 5' LONG
TOP OF RIM/GRATE ELEV. = 101.50
TOP OF ROOF = 100.75
INV IN ELEV. = 94.60
INV OUT ELEV. = 94.40

STORMWATER COLLECTION/DETENTION SYSTEM: 265 LF OF 18" Ø HDPE @ 0.5% SLOPE

EVENT	EXISTING RUNOFF (CFS)	PROPOSED INFLOW (CFS)	PROPOSED OUTFLOW (CFS)	BASIN STORAGE ELEVATION (FT)	BASIN STORAGE (CF)
1-YEAR	2.86	2.08	2.08	96.81	7
2-YEAR	3.50	2.51	2.50	96.93	15
5-YEAR	4.44	3.15	3.11	97.18	44
10-YEAR	5.31	3.73	3.63	97.42	91
25-YEAR	6.64	4.62	4.38	97.84	211
50-YEAR	7.85	5.44	5.08	98.31	354
100-YEAR	9.27	6.39	6.31	99.30	471



SITE PLAN
SCALE: 1"=20'

PROPOSED GRADING LEGEND

PROPOSED CONTOUR	—101—
PROPOSED SPOT ELEVATION	100.80
PROPOSED TOP/BOTTOM OF CURB ELEV.	TC 100.50 BC 100.00
PROPOSED CATCH BASIN	■ CB
PAVEMENT/GROUND SLOPE	→
PROPOSED YARD DRAIN	● YD
PROPOSED MANHOLE	● MH

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS, CARMINA WOOD MORRIS, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

20' 20 0 20 40Ft.

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REVISIONS:

No.	Description	Date

PROJECT NAME:
New Construction - PHASE 1:
Elmwood Ave Condominiums
1111 Elmwood Avenue
Buffalo, New York

Bidding Documents: 10/16/2017
Drawn by: jlp
Scale: 1:20

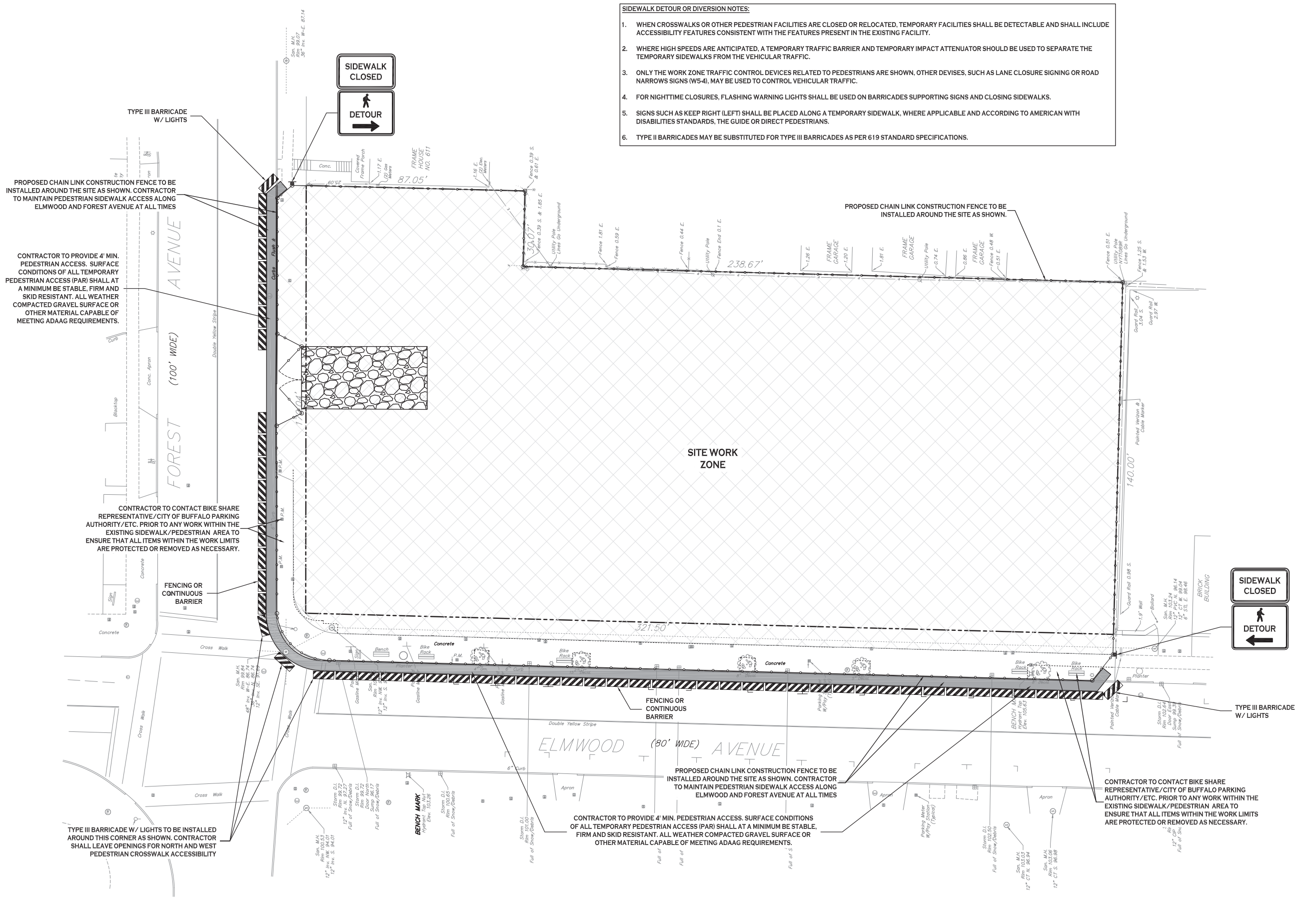
DRAWING NAME:
Storm Drainage & Utility Plan

DRAWING NO.
C-300

Project no.: 16.018

SIDEWALK DETOUR OR DIVERSION NOTES:

1. WHEN CROSSWALKS OR OTHER PEDESTRIAN FACILITIES ARE CLOSED OR RELOCATED, TEMPORARY FACILITIES SHALL BE DETECTABLE AND SHALL INCLUDE ACCESSIBILITY FEATURES CONSISTENT WITH THE FEATURES PRESENT IN THE EXISTING FACILITY.
2. WHERE HIGH SPEEDS ARE ANTICIPATED, A TEMPORARY TRAFFIC BARRIER AND TEMPORARY IMPACT ATTENUATOR SHOULD BE USED TO SEPARATE THE TEMPORARY SIDEWALKS FROM THE VEHICULAR TRAFFIC.
3. ONLY THE WORK ZONE TRAFFIC CONTROL DEVICES RELATED TO PEDESTRIANS ARE SHOWN, OTHER DEVISES, SUCH AS LANE CLOSURE SIGNING OR ROAD NARROWS SIGNS (W5-4), MAY BE USED TO CONTROL VEHICULAR TRAFFIC.
4. FOR NIGHTTIME CLOSURES, FLASHING WARNING LIGHTS SHALL BE USED ON BARRICADES SUPPORTING SIGNS AND CLOSING SIDEWALKS.
5. SIGNS SUCH AS KEEP RIGHT (LEFT) SHALL BE PLACED ALONG A TEMPORARY SIDEWALK, WHERE APPLICABLE AND ACCORDING TO AMERICAN WITH DISABILITIES STANDARDS, THE GUIDE OR DIRECT PEDESTRIANS.
6. TYPE II BARRICADES MAY BE SUBSTITUTED FOR TYPE III BARRICADES AS PER 619 STANDARD SPECIFICATIONS.



TYPE III BARRICADE W/ LIGHTS

PROPOSED CHAIN LINK CONSTRUCTION FENCE TO BE INSTALLED AROUND THE SITE AS SHOWN. CONTRACTOR TO MAINTAIN PEDESTRIAN SIDEWALK ACCESS ALONG ELMWOOD AND FOREST AVENUE AT ALL TIMES

CONTRACTOR TO PROVIDE 4' MIN. PEDESTRIAN ACCESS. SURFACE CONDITIONS OF ALL TEMPORARY PEDESTRIAN ACCESS (PAR) SHALL AT A MINIMUM BE STABLE, FIRM AND SKID RESISTANT. ALL WEATHER COMPACTED GRAVEL SURFACE OR OTHER MATERIAL CAPABLE OF MEETING ADAAG REQUIREMENTS.

CONTRACTOR TO CONTACT BIKE SHARE REPRESENTATIVE/CITY OF BUFFALO PARKING AUTHORITY/ETC. PRIOR TO ANY WORK WITHIN THE EXISTING SIDEWALK/PEDESTRIAN AREA TO ENSURE THAT ALL ITEMS WITHIN THE WORK LIMITS ARE PROTECTED OR REMOVED AS NECESSARY.

PROPOSED CHAIN LINK CONSTRUCTION FENCE TO BE INSTALLED AROUND THE SITE AS SHOWN.

TYPE III BARRICADE W/ LIGHTS TO BE INSTALLED AROUND THIS CORNER AS SHOWN. CONTRACTOR SHALL LEAVE OPENINGS FOR NORTH AND WEST PEDESTRIAN CROSSWALK ACCESSIBILITY

PROPOSED CHAIN LINK CONSTRUCTION FENCE TO BE INSTALLED AROUND THE SITE AS SHOWN. CONTRACTOR TO MAINTAIN PEDESTRIAN SIDEWALK ACCESS ALONG ELMWOOD AND FOREST AVENUE AT ALL TIMES

CONTRACTOR TO PROVIDE 4' MIN. PEDESTRIAN ACCESS. SURFACE CONDITIONS OF ALL TEMPORARY PEDESTRIAN ACCESS (PAR) SHALL AT A MINIMUM BE STABLE, FIRM AND SKID RESISTANT. ALL WEATHER COMPACTED GRAVEL SURFACE OR OTHER MATERIAL CAPABLE OF MEETING ADAAG REQUIREMENTS.

CONTRACTOR TO CONTACT BIKE SHARE REPRESENTATIVE/CITY OF BUFFALO PARKING AUTHORITY/ETC. PRIOR TO ANY WORK WITHIN THE EXISTING SIDEWALK/PEDESTRIAN AREA TO ENSURE THAT ALL ITEMS WITHIN THE WORK LIMITS ARE PROTECTED OR REMOVED AS NECESSARY.

TYPE III BARRICADE W/ LIGHTS

N

MAINTENANCE & PROTECTION PLAN

SCALE: 1"=20'

MTP LEGEND

TEMPORARY WORK ZONE TRAFFIC CONTROL SIGN	⫞
CHANNELIZING DEVICE (20' SPACING MAX.)	■
WORK ZONE	▨
TEMPORARY CONCRETE BARRIER	▨

NOTE: BOUNDARY AND TOPOGRAPHIC INFORMATION PROVIDED BY OTHERS, CARMINA WOOD MORRIS, D.P.C. ASSUMES NO RESPONSIBILITY FOR ITS ACCURACY.

20' 20 0 20 40Ft.

Carmina
Wood
Morris DPC
487 Main Street Suite 600
Buffalo, New York 14203
P 716.842.3165
F 716.842.0263

REVISIONS:

No.	Description	Date

PROJECT NAME:
New Construction - PHASE 1:
Elmwood Ave Condominiums
1111 Elmwood Avenue
Buffalo, New York

Bidding Documents: 10/16/2017
Drawn by: jlp
Scale: 1:20

DRAWING NAME:
Maintenance & Protection of Traffic Plan

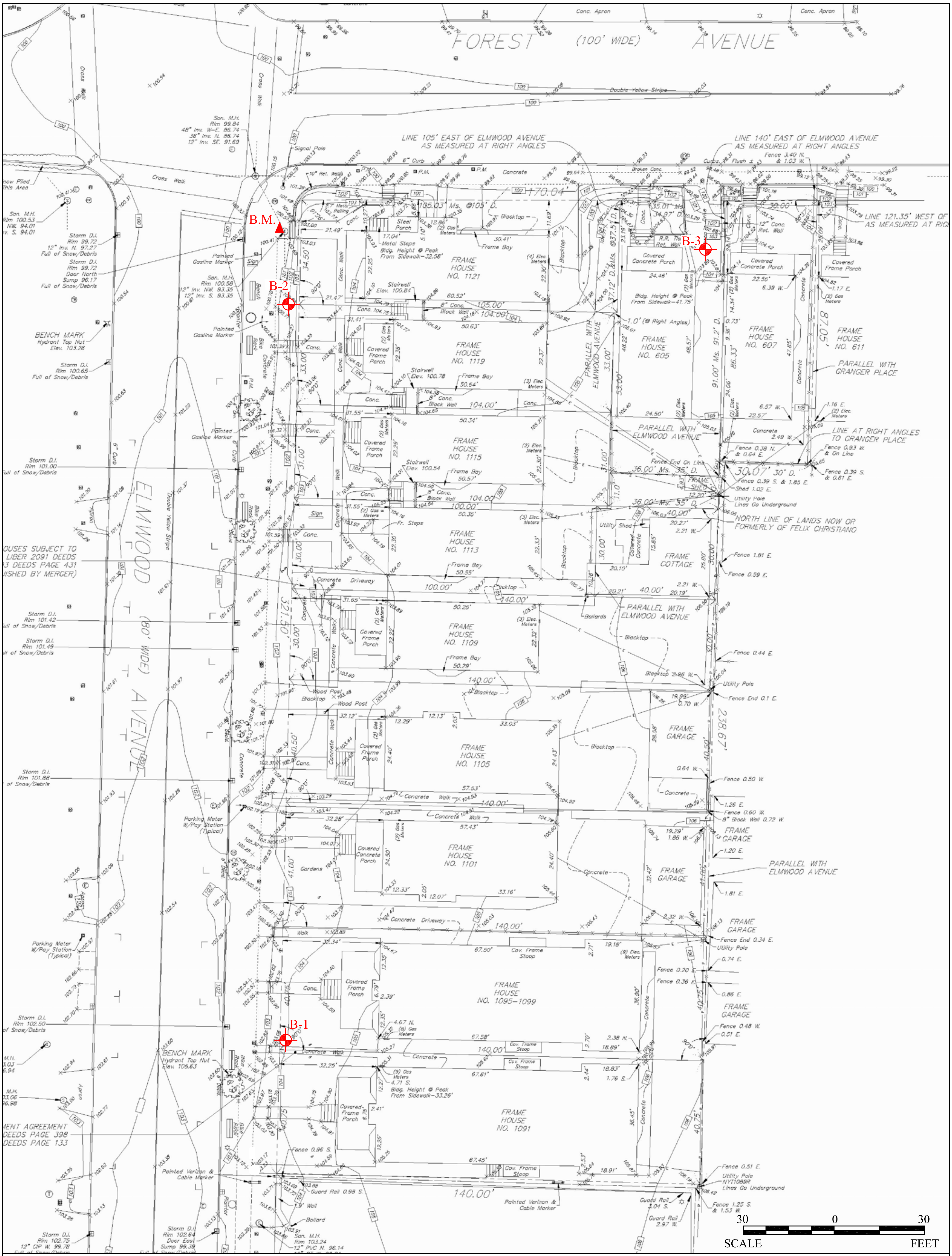
DRAWING NO.
MPT-100

Project no.: 16.018

Appendix I

Soils Information –

Map & Boring Logs by Empire GEO Services, Inc.



LEGEND:

B-1 INDICATES APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING.

B.M. ▲ BENCHMARK: RIM OF SANITARY SEWER MANHOLE. REPORTED ELEVATION = 100.58 FEET.

N

NOTE:

FIGURE DEVELOPED FROM 2/29/2016 SITE SURVEY PREPARED BY MILLARD, MACKAY & DELLES LAND SURVEYORS, LLP. .

EMPIRE GEO SERVICES INC
a subsidiary of SJB Services, Inc.

PROPOSED MIXED USE BUILDING
ELMWOOD AVENUE AND FOREST AVENUE
BUFFALO, NEW YORK

SUBSURFACE EXPLORATION PLAN

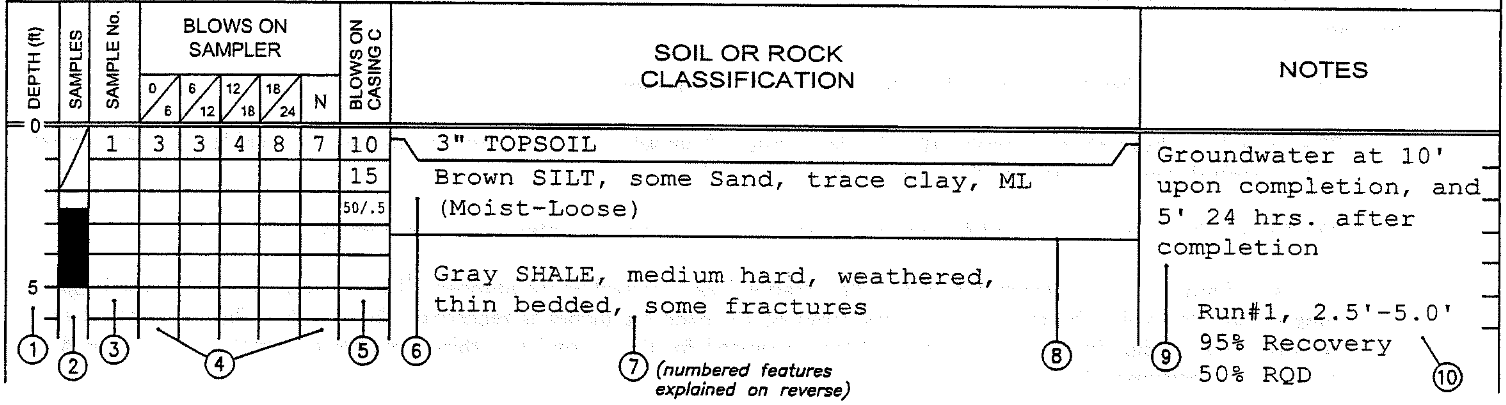
DR BY: WMA	SCALE: 1" ~ 30'	PROJECT NO.: BE-17-072
CHKD BY: TRS	DATE: 05/24/17	FIGURE NO: 2

SJB SERVICES, INC.
SUBSURFACE LOG

DATE	
STARTED	
FINISHED	
SHEET	OF

PROJ. No.	
HOLE No.	
SURF. ELEV.	
G.W. DEPTH	

PROJECT ______________________ LOCATION ______________________



3" TOPSOIL

Brown SILT, some Sand, trace clay, ML (Moist-Loose)

Gray SHALE, medium hard, weathered, thin bedded, some fractures

Groundwater at 10' upon completion, and 5' 24 hrs. after completion

Run#1, 2.5'-5.0'
95% Recovery
50% RQD

(numbered features explained on reverse)

TABLE I

⧄	Split Spoon Sample
▐	Shelby Tube Sample
☒	Geoprobe Macro-Core
↕	Auger or Test Pit Sample
■	Rock Core

TABLE II

Identification of soil type is made on basis of an estimate of particle sizes, and in the case of fine grained soils also on basis of plasticity.

Soil Type	Soil Particle Size	
Boulder	>12"	Coarse Grained (Granular)
Cobble	3" - 12"	
Gravel - Coarse	3" - 3/4"	
- 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 III

The following terms are used in classifying soils consisting of mixtures of two or more soil types. The estimate is based on weight of total sample.

Term	Percent 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 IV

The relative compactness or consistency is described in accordance with the following terms:

Granular Soils		Cohesive Soils	
Term	Blows per Foot, N	Term	Blows per Foot, N
Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Firm	10 - 30	Medium	4 - 8
Compact	30 - 50	Stiff	8 - 15
Very Compact	>50	Very Stiff	15 - 30
		Hard	>30

(Large particles in the soils will often significantly influence the blows per foot recorded during the penetration test)

TABLE V

Varved	Horizontal uniform layers or seams of soil(s).
Layer	Soil deposit more than 6" thick.
Seam	Soil deposit less than 6" thick.
Parting	Soil deposit less than 1/8" thick.
Laminated	Irregular, horizontal and angled seams and partings of soil(s).

TABLE VI

Rock Classification Term		Meaning
Hardness	- Soft	Scratched by fingernail
	- Medium Hard	Scratched easily by penknife
	- Hard	Scratched with difficulty by penknife
	- Very Hard	Cannot be scratched by penknife
Weathering	- Very Weathered	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.
	- Weathered	
	- Sound	

Rock Classification Term		Meaning	
Bedding	- Laminated	(<1")	Natural breaks in Rock Layers
	- Thin Bedded	(1" - 4")	
	- Bedded	(4" - 12")	
	- Thick Bedded	(12" - 36")	
	- Massive	(>36")	

(Fracturing refers to natural breaks in the rock oriented at some angle to the rock layers)

DATE:
START 5/3/2017
FINISH 5/3/2017

SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-1
SURF. ELEV 104.2'
G.W. DEPTH See Notes

PROJECT: PROPOSED MIXED USE BUILDING
PROJ. NO.: BE-17-072
LOCATION: ELMWOOD AVE & FOREST AVE
BUFFALO, NY

DEPTH FT.		SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N		SOIL OR ROCK CLASSIFICATION	NOTES
		1	2	3				TOPSOIL	Driller noted Topsoil at
			4	6		7		Brown Silty CLAY, little f-c Sand, tr.organics	the ground surface
		2	5	5				(moist, FILL)	
			6	7		11		Becomes Dark Brown	
5		3	4	5				Brown Silty CLAY, little f-c Sand, tr.gravel	
			8	9		13		(moist, stiff, CL)	
		4	6	7				Brown Clayey SILT, some fine Sand	
			10	9		17		(moist-wet, v.stiff, ML)	
		5	5	6				Contains "and" fine Sand (stiff)	
10			9	13		15			
		6	4	8				Brown Silty CLAY, little f-c Sand (moist, stiff, CL)	
			7	10		15			NQ '2' Size Rock Core
								Gray DOLOSTONE Rock, medium hard, sound,	RUN #1: 12.5' - 17.5'
15								thinly to thickly bedded	REC = 97%
									RQD = 90%
									RUN #2: 17.5' - 22.5'
20								Weathered seam from 19.8' - 20.3'	REC = 100%
									RQD = 70%
25								Boring Complete at 22.5'	No Free Standing
									Water encountered
									before Coring
									Free Standing Water
30									recorded at 15' after
									Coring
									Driller noted core
									water loss at 18'
35									
40									

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: J. FRIDMAN

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 5/2/2017
FINISH 5/2/2017
SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-2
SURF. ELEV 102.1'
G.W. DEPTH See Notes

PROJECT: PROPOSED MIXED USE BUILDING
LOCATION: ELMWOOD AVE & FOREST AVE
BUFFALO, NY
PROJ. NO.: BE-17-072

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	1	3			TOPSOIL	Driller noted Topsoil at
		3	4		6	Brown Silty CLAY, little f-c Sand, tr.organics	the ground surface
	2	6	6			(moist, FILL)	
		6	6		12	Brown Silty CLAY, little f-c Sand, tr.gravel	
5	3	3	4			(moist, stiff, CL)	
		6	8		10		
	4	9	6				
		7	8		13		
	5	6	9				
10		9	50/0.3		18	Contains litle fine Gravel (v.stiff)	NQ '2' Size Rock Core
						Gray DOLOSTONE Rock, medium hard, sound, thinly to thickly bedded	RUN #1: 10.0' - 15.0' REC = 80% RQD = 73%
15							
							RUN #2: 15.0' - 20.0' REC = 78% RQD = 64%
20							
						Boring Complete at 20.0'	No Free Standing Water encountered before Coring Free Standing Water recorded at 2' after Coring
25							
30							
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: S. WOLKIEWICZ

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

DATE:
START 5/2/2017
FINISH 5/2/2017

SHEET 1 OF 1

SJB SERVICES, INC.
SUBSURFACE LOG

HOLE NO. B-3
SURF. ELEV 103.2'
G.W. DEPTH See Notes

PROJECT: PROPOSED MIXED USE BUILDING
PROJ. NO.: BE-17-072
LOCATION: ELMWOOD AVE & FOREST AVE
BUFFALO, NY

DEPTH FT.	SMPL NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	N	SOIL OR ROCK CLASSIFICATION	NOTES
	1	–	2			ASPHALT	Driller noted Asphalt at
		3	3		6	Gray f-c GRAVEL and f-c Sand, tr.silty clay	the ground surface
	2	2	1			(moist-wet, FILL)	
		1	1		2		
5	3	1	1			Brown Silty CLAY, some f-c Gravel, little f-c Sand	
		1	3		2	(moist-wet, FILL)	
	4	2	2				
		2	3		4		
	5	2	3			Brown Silty CLAY, little f-c Sand	
10		4	4		7	(moist-wet, medium, CL)	
	6	14	10			Contains some f-c Sand, tr.gravel (v.stiff)	
		8	7		18		
							NQ '2' Size Rock Core
15						Gray DOLOSTONE Rock, medium hard, sound,	RUN #1: 13.0' - 18.0'
						thinly to thickly bedded	REC = 80%
							RQD = 56%
20							RUN #2: 18.0' - 23.0'
							REC = 86%
							RQD = 77%
25						Boring Complete at 23.0'	Free Standing Water
							recorded at 9'
							before Coring
							Free Standing Water
30							recorded at 10' after
							Coring
							Driller noted core
							water loss at 13' to 23'
35							
40							

N = NO. BLOWS TO DRIVE 2-INCH SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFIED BY: Geologist

DRILLER: J. FRIDMAN

DRILL RIG TYPE : CME-550X

METHOD OF INVESTIGATION ASTM D-1586 USING HOLLOW STEM AUGERS

Appendix J

SHPO Correspondence

The following letters are addressed by the SEQRA Lead Agency in the Final Environmental Impact Statement, § 2 (Responses to Comment Category 12 - Historic Resources) and § 4.3.3.

NEW YORK
STATE OF
OPPORTUNITY.

Parks, Recreation,
and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

October 21, 2016

Ms. Nadine Marrero
Director of Planning
City of Buffalo
65 Niagara Square
901 City Hall
Buffalo, NY 14202

Re: SEQRA
Affinity Elmwood Gateway - 1111 Elmwood: 11 Demolitions and Development
1111 Elmwood Avenue
Buffalo, Erie County
16PR06500

Dear Ms. Marrero:

Thank you for requesting the comments of the Office of Parks, Recreation and Historic Preservation's Division for Historic Preservation (OPRHP/DHP) as part of your SEQRA process. These comments are those of OPRHP/DHP and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6 NYCRR Part 617).

We have reviewed the submitted material dated September 23, 2016.

The project involves the demolition of eleven contributing buildings to the National Register listed Elmwood Historic District (East). Additionally, the large condominium building, which is proposed to take the place of the contributing properties, will be visible from the National Historic Landmark Buffalo State Hospital and the National Register listed Elmwood Historic District (West). We recommend that these impacts to important historic resources be considered in your review. An alternatives analysis could be requested. This would include finding another site for the project. Another possibility is for the developer to change the project considerably and incorporate the historic buildings into the project.

Please be aware that if this project will involve state or federal permits, funding or licenses it may be subject to a review by those agencies and this office for impacts to historic and archaeological resources under Section 106 of the National Historic Preservation Act or Section 14.09 of NYS Parks Recreation and Historic Preservation Law.

If I can be of further assistance, please contact me at 518-268-2158.

Sincerely,

Sloane Bullough

Sloane Bullough
Historic Sites Restoration Coordinator

via e-mail only

NEW YORK STATE OF OPPORTUNITY. | Parks, Recreation and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

December 19, 2016

Ms. Nadine Marrero
Director of Planning City of Buffalo
65 Niagara Square/City Hall
Buffalo, NY 14202
(via email only)

Re: SEQRA
Affinity Elmwood Gateway - 12 Demolitions and Development
1111 Elmwood Avenue (vic.), Buffalo, Erie County
16PR06500

Dear Ms. Marrero:

I am writing to follow up our Agency's letter of October 21 regarding the ongoing SEQRA review of this action. I have now had an opportunity to assess the Draft Environmental Impact Statement that was accepted on November 17 by the city acting as the Lead Agency for this action. I am offering the following comments as an interested agency in this review.

First, let me restate that the project is located within the boundary of the Elmwood (East) Historic District and is substantially contiguous to the Elmwood (West) Historic District. Both areas are listed in the New York State and National Registers of Historic Places.

Regarding these historic districts, our office cannot agree with the statement found in the DEIS, which states: "*Although 12 buildings on the Site are listed as "contributing" to the historic district, none are reported to be associated with a significant historical or cultural event, architect or person or possess unique or innovative architectural features or elements".* (DEIS, pg. 6)

As defined by the National Park Service: "*A district derives its importance from being a unified entity, even though it is often composed of a wide variety of resources. The identity of a district results from the interrelationship of its resources, which can convey a visual sense of the overall historic environment or be an arrangement of historically or functionally related properties.*" (NPS Bulletin 15, Pg. 5) The involved historic districts derive their primary significance from being highly intact *collections* of interrelated buildings not as individually resources. As such, these resources cannot be evaluated individually or in isolation.

Next, the location of this activity within and adjacent to National Register properties is a Type I action under SEQRA and should require a more thorough analysis of potential impacts to these resources. While SEQRA does not establish specific types of impacts to historic properties we generally base our substantive comments on the guidance provided by Section 14.09 of New York State Parks, Recreation and Historic Preservation Law and its associated regulations (9 NYCRR Part 428).

Impacts that may adversely affect historic resources are defined generally by these regulations as those that 1) destroy or alter all or part of a historic resource, 2) isolate or alter a history property's environment, or 3) introduce visual, audible or atmospheric elements which are out of character with the historic property or alter its setting.(9 NYCRR Part 428.7(a))

Using these regulations as guidance the demolition of 12 contributing buildings in the National Register district will adversely impact the district. Furthermore, the monumental scale of the new complex will dwarf the surrounding areas, which are composed primarily of two and three-story residential and commercial buildings. The project eliminates the rhythm of the existing streetscape and introduces new construction that will impose, in our opinion, visual impacts that will clearly and demonstrably alter the setting and environment of both Elmwood historic districts.

The DEIS notes that the demolition of the historic buildings and their replacement with the new mixed use development will "*improve the visual environment*" of the area. Our office would disagree with this statement. We found that the height and quasi-super block nature of the new construction significantly and negatively alters the character of the surrounding historic districts.

A review of Section 2.3 (Historic, Archaeological and Cultural Resources) of the DEIS does not appear to provide a prerequisite "hard look" at the actual impacts to affected historic resources. For the reasons previously noted, our office cannot agree with the analysis in this section that states: "*In any event the Project is expected to enhance the appearance of the existing deteriorating buildings at the corner of Elmwood and Forest Avenues, and therefore result in a beneficial impact to the surrounding land uses and character of the area*." (DEIS, pg. 34)

The analysis found in section 2.4 of the DEIS would also appear to support the potential impacts that the project may have. The tables presented in this section note the tallest height of the surrounding buildings to be two and one-half stories with a maximum individual size (commercial property) of 12,510 square feet. (DEIS, Tables 5, 6 & 7) This is in marked contrast to the proposed five-story, 166,000 square foot building to be placed in this neighborhood.

We believe that our agency's comments are consistent with those of the Lead Agency's Positive Declaration. In that document the city's Office of Strategic Planning noted that this action has the potential to "*result in substantial impact on the neighborhood character*." We agree that in scale, design and visual qualities the proposed new development will have negative impacts on the surrounding historic resources.

Our office appreciates the opportunity to provide comments on this action to the SEQRA Lead Agency. If additional information is needed or if I can be of any further assistance please do not hesitate to contact me at (518) 268-2166 or john.bonafide@parks.ny.gov.

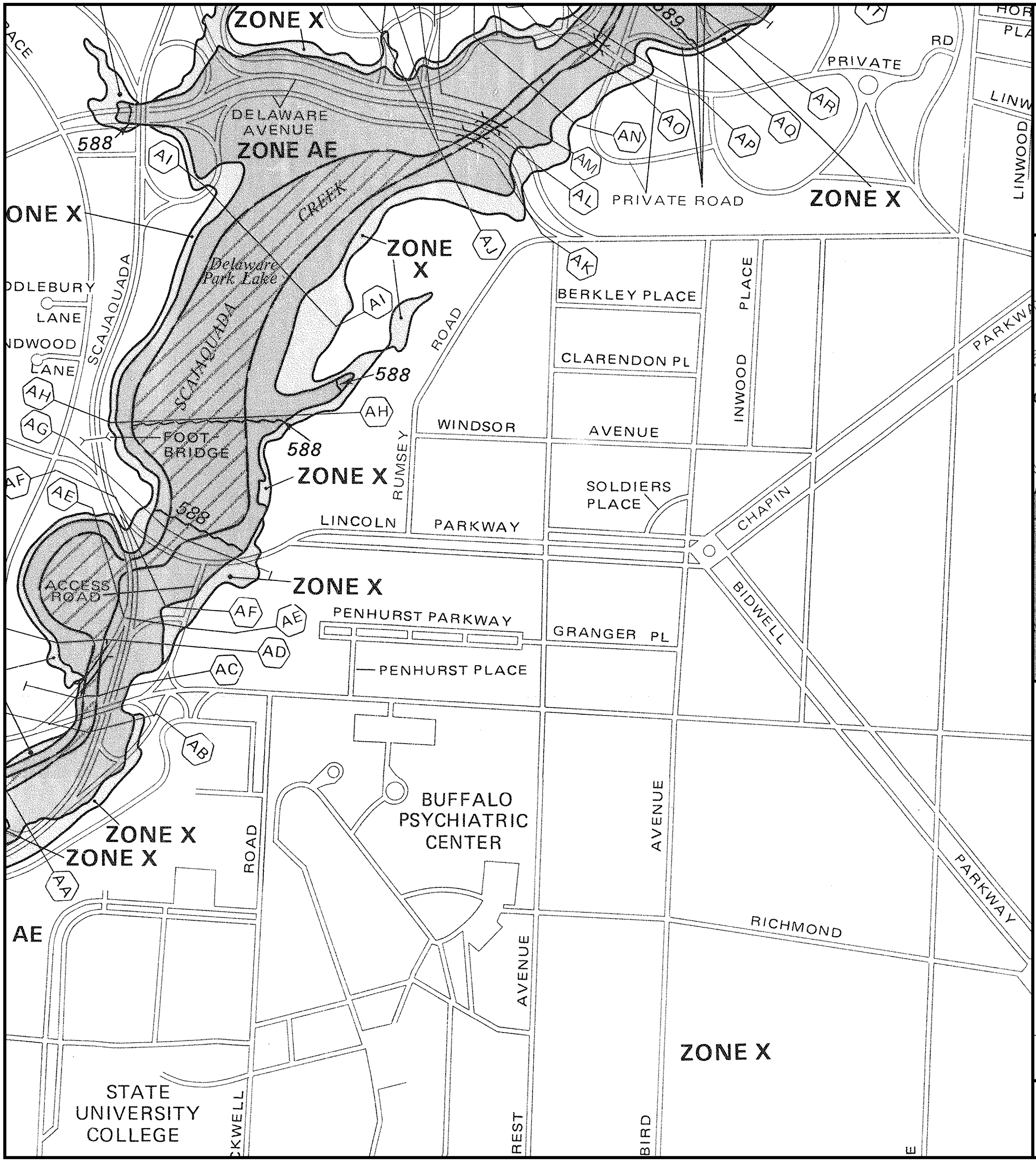
Sincerely,

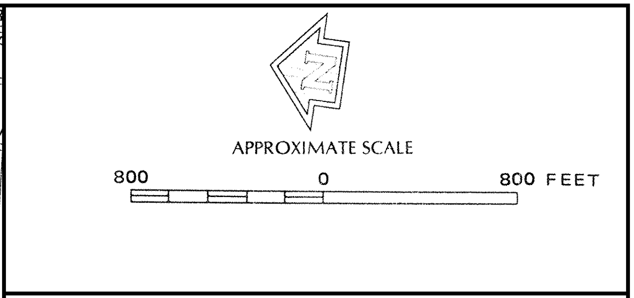
John A. B

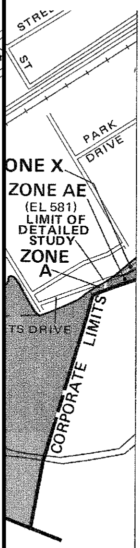
John A. Bonafide
Director,
Technical Preservation Services Bureau
Agency Historic Preservation Officer

Appendix K

FEMA Map







NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
BUFFALO,
NEW YORK
ERIE COUNTY

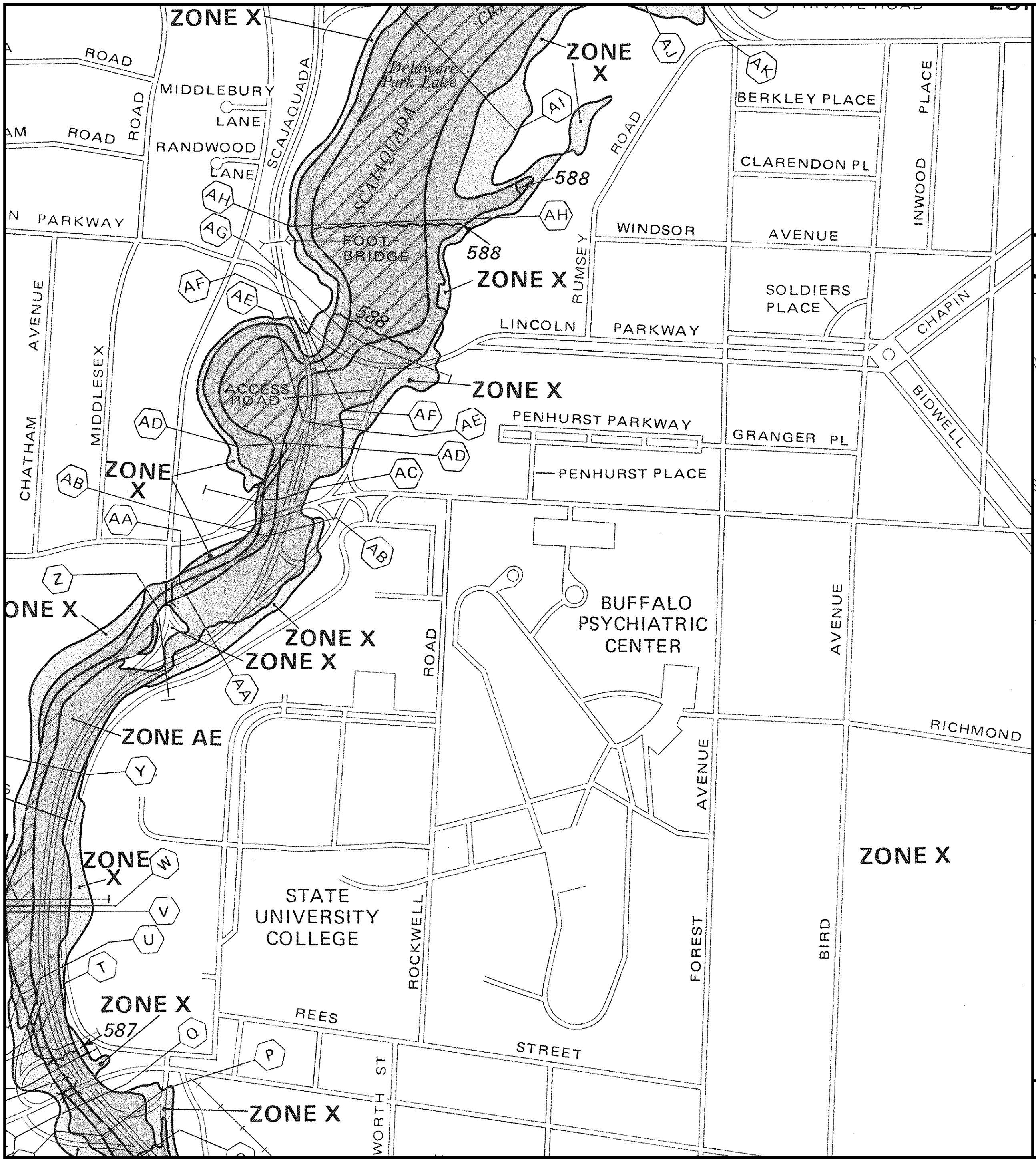
PANEL 15 OF 20
(SEE MAP INDEX FOR PANELS NOT PRINTED)

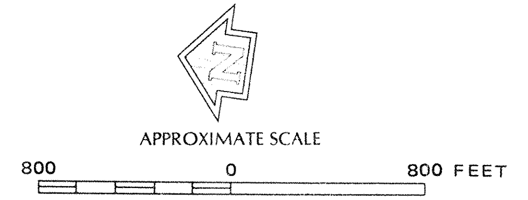
COMMUNITY-PANEL NUMBER
360230 0015 C

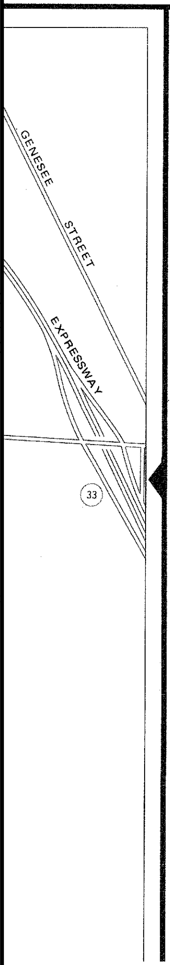
MAP REVISED:
AUGUST 23, 1999

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov







LEGEND

▨ SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A	No base flood elevations determined.
ZONE AE	Base flood elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding; velocities also determined.
ZONE A99	To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.
ZONE V	Coastal flood with velocity hazard (wave action); no base flood elevations determined.
ZONE VE	Coastal flood with velocity hazard (wave action); base flood elevations determined.

▨ FLOODWAY AREAS IN ZONE AE

▨ OTHER FLOOD AREAS

ZONE X	Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

☐ OTHER AREAS

ZONE X	Areas determined to be outside 500-year floodplain.
ZONE D	Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS†

▨ Identified 1983	▨ Identified 1990 or Later	▨ Otherwise Protected Areas Identified 1991 or Later

†Coastal barrier areas are normally located within or adjacent to special flood hazard areas.

———	Floodplain Boundary
— — —	Floodway Boundary
– – –	Zone D Boundary
▨	Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
~~513~~~~	Base Flood Elevation Line; Elevation in Feet*
Ⓓ———Ⓓ	Cross Section Line
(EL 987)	Base Flood Elevation in Feet Where Uniform Within Zone*

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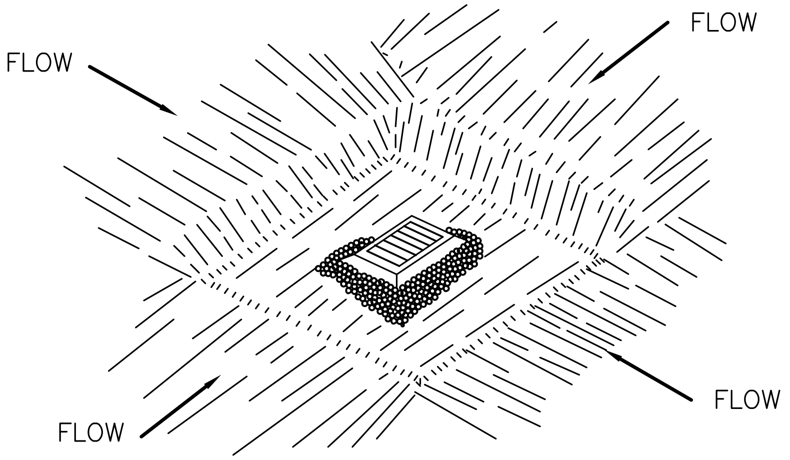
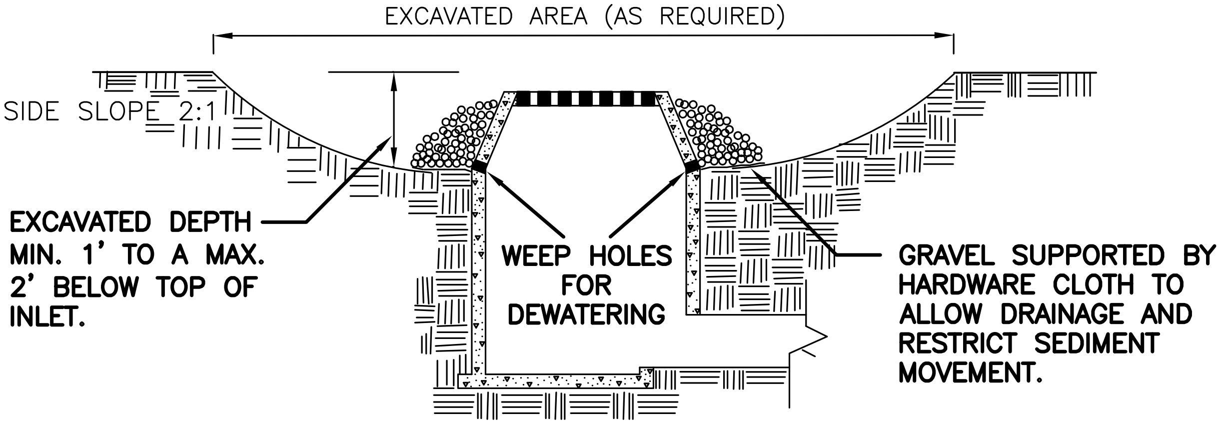
Appendix L

Standard Erosion Control Details





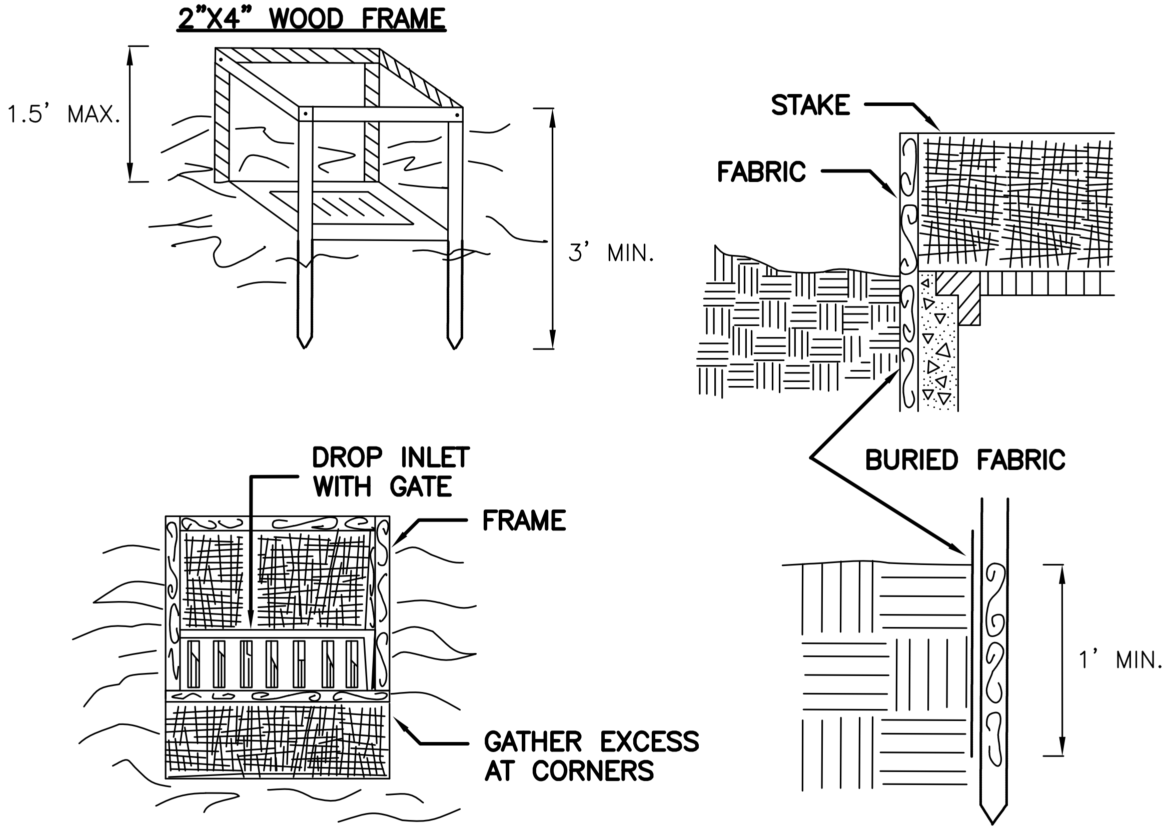
CONSTRUCTION SPECIFICATIONS

1. CLEAR THE AREA OF ALL DEBRIS THAT WILL HINDER EXCAVATION.
2. GRADE APPROACH TO THE INLET UNIFORMLY AROUND THE BASIN.
3. WEEP HOLES SHALL BE PROTECTED BY GRAVEL.
4. UPON STABILIZATION OF CONTRIBUTING DRAINAGE AREA, SEAL WEEP HOLES, FILL BASIN WITH STABLE SOIL TO FINAL GRADE, COMPACT IT PROPERLY AND STABILIZE WITH PERMANENT SEEDING.

MAXIMUM DRAINAGE AREA 1 ACRE

INLET PROTECTION DETAIL 1

NOT TO SCALE



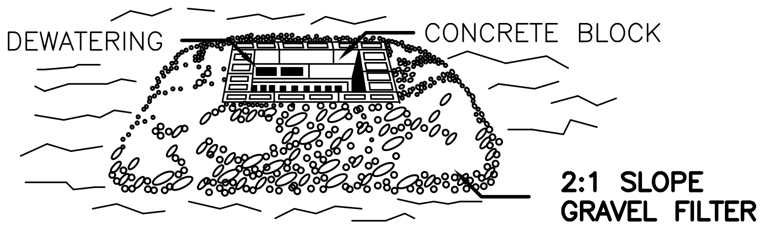
CONSTRUCTION SPECIFICATIONS

1. FILTER FABRIC SHALL HAVE AN EOS OF 40-85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

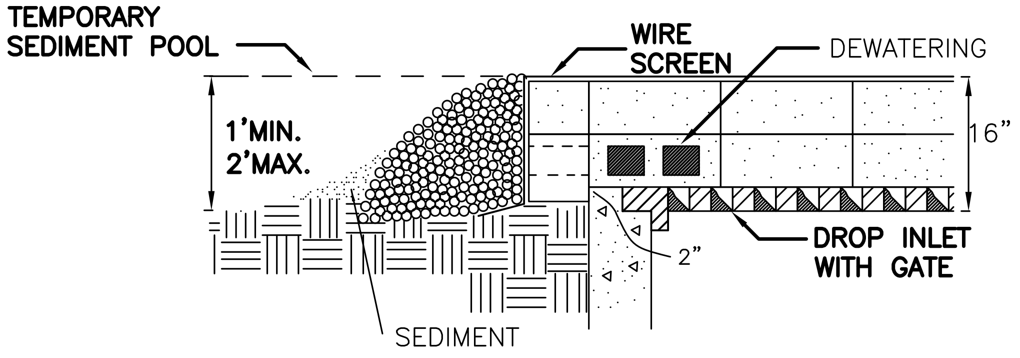
MAXIMUN DRAINAGE AREA 1 ACRE

INLET PROTECTION DETAIL 2

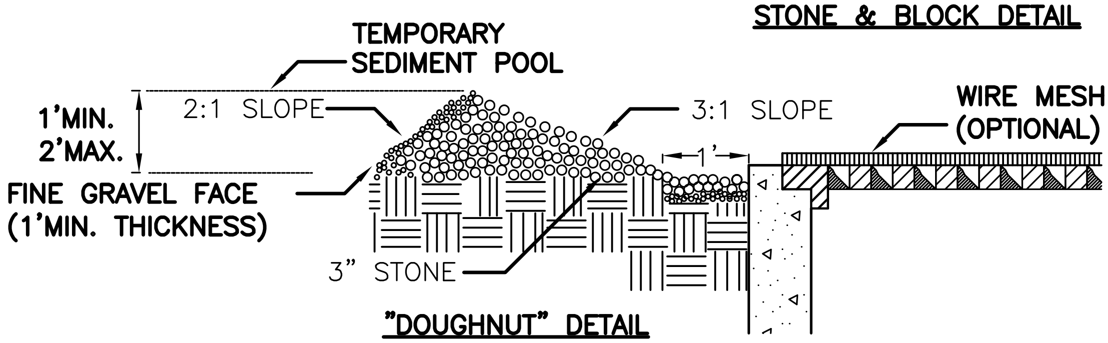
NOT TO SCALE



STONE & BLOCK PLAN VIEW



STONE & BLOCK DETAIL



"DOUGHNUT" DETAIL

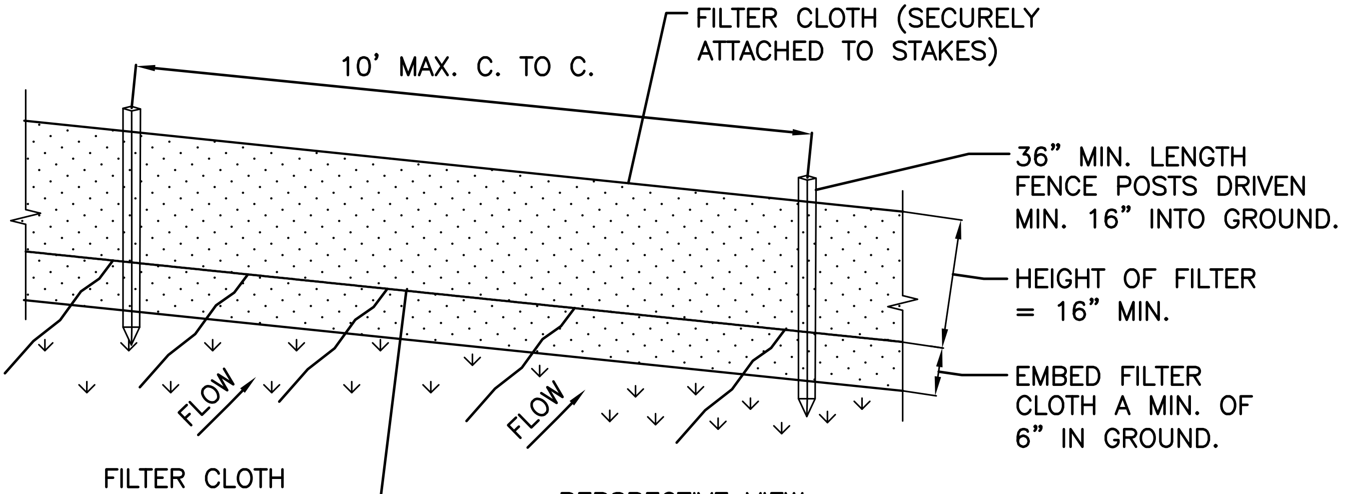
CONSTRUCTION SPECIFICATIONS

1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING. FOUNDATION SHALL BE 2 INCHES MINIMUM BELOW REST OF INLET AND BLOCKS SHALL BE PLACED AGAINST INLET FOR SUPPORT.
2. HARDWARE CLOTH OR 1/2" WIRE MESH SHALL BE PLACED OVER BLOCK OPENINGS TO SUPPORT STONE.
3. USE CLEAN STONE OR GRAVEL 1/2–3/4 INCH IN DIAMETER PLACED 2 INCHES BELOW TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER.
4. FOR STONE STRUCTURES ONLY, A 1 FOOT THICK LAYER OF THE FILTER STONE WILL BE PLACED AGAINST THE 3 INCH STONE AS SHOWN ON THE DRAWINGS.

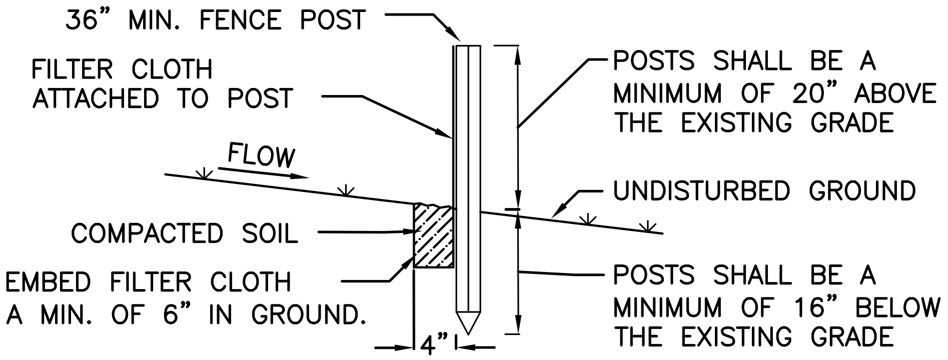
MAXIMUM DRAINAGE AREA 1 ACRE

INLET PROTECTION DETAIL 3

NOT TO SCALE



PERSPECTIVE VIEW



SECTION VIEW

CONSTRUCTION SPECIFICATIONS

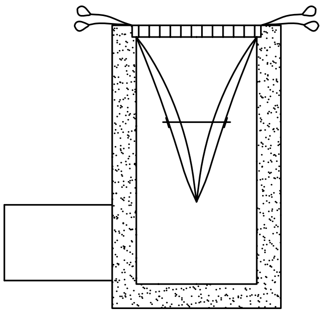
1. WOVEN FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.

2. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVER–LAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.

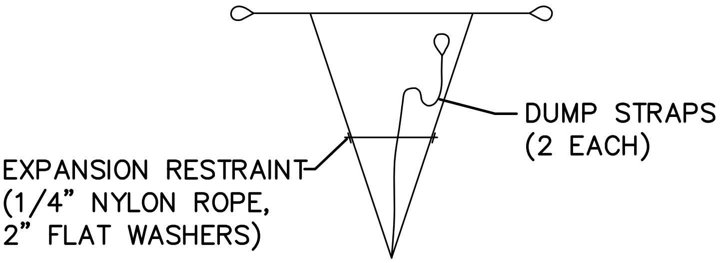
3. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

SILT FENCE DETAIL (WITHOUT WIRE MESH BACKING)

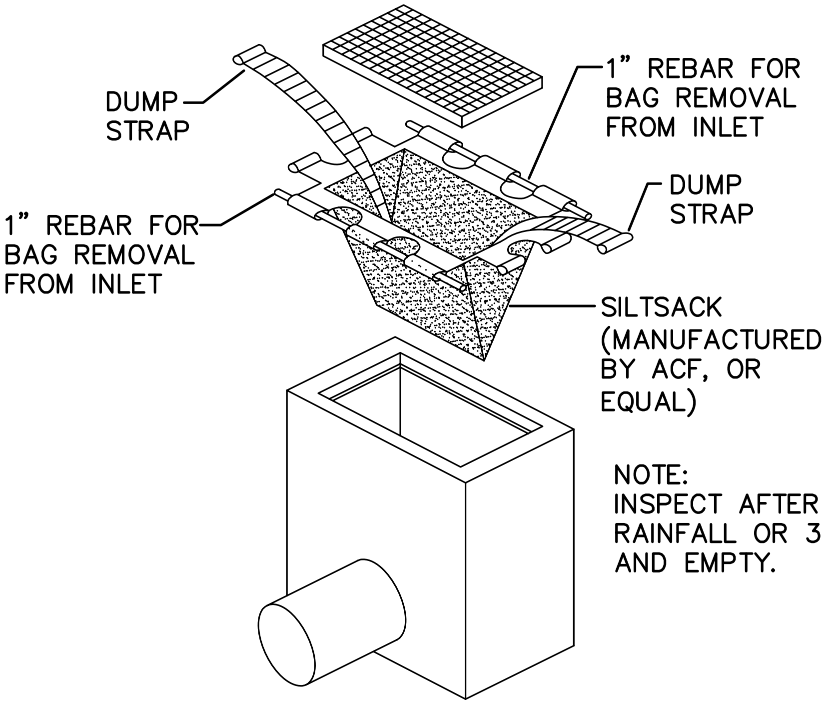
NOT TO SCALE



INSTALLATION DETAIL



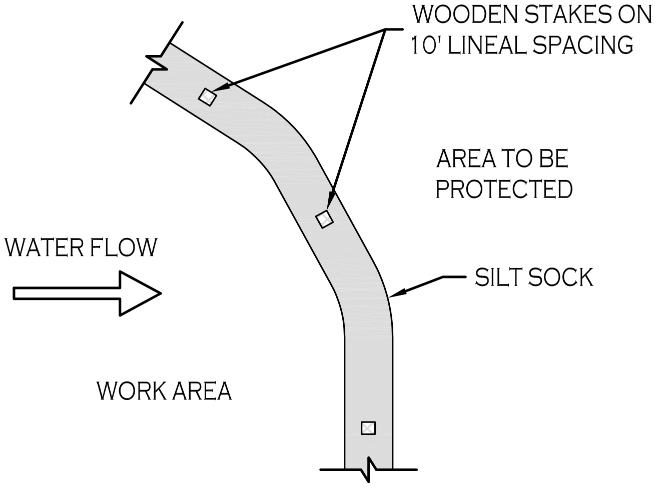
BAG DETAIL



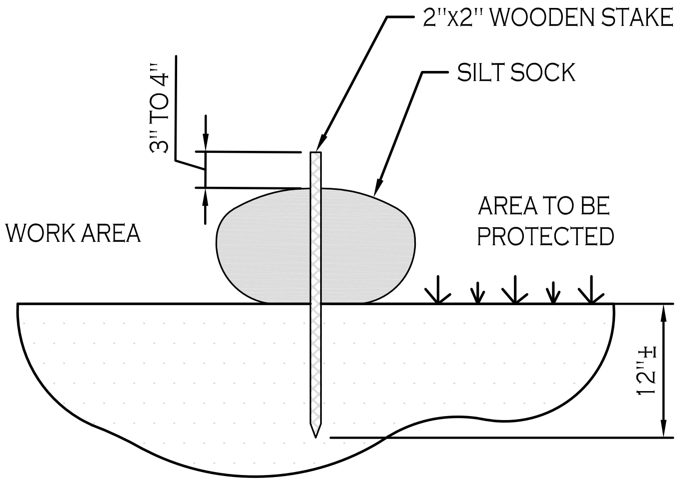
NOTE:
INSPECT AFTER EVERY RAINFALL OR 3 WEEKS AND EMPTY.

SILT SACK DETAIL

NOT TO SCALE



PLAN VIEW



SECTION VIEW

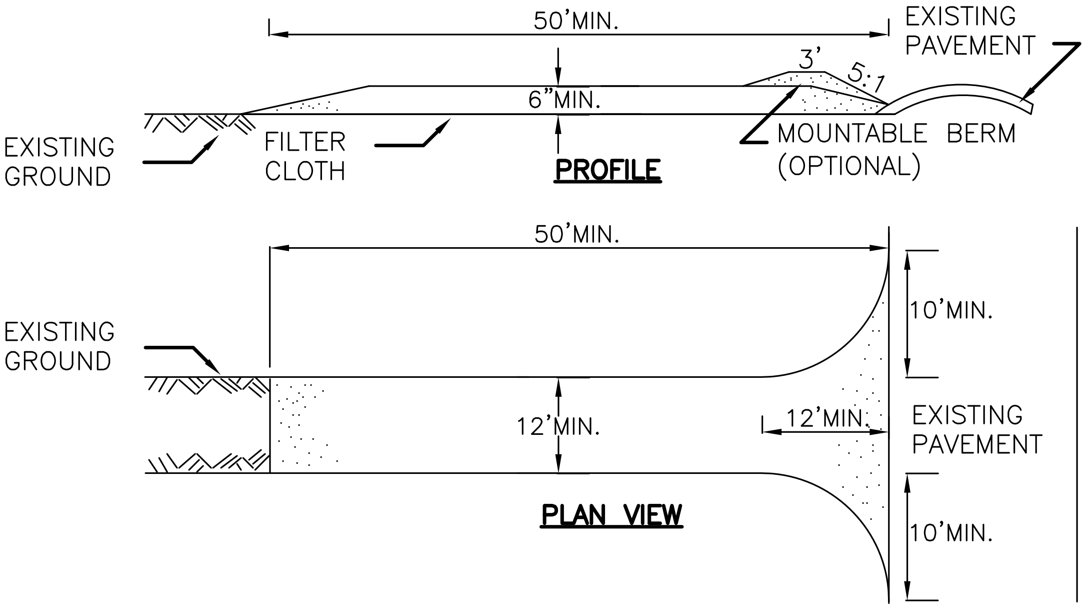
NOTES:

CONTRACTOR SHALL INSPECT AND MAINTAIN SILT SOCK AS NEEDED DURING THE DURATION OF CONSTRUCTION PROJECT.

CONTRACTOR SHALL REMOVE SEDIMENT COLLECTED AT THE BASE OF THE SILT SOCK WHEN IT HAS REACHED $\frac{1}{2}$ OF THE EXPOSED HEIGHT OF THE SILT SOCK. ALTERNATIVELY, RATHER THAN CREATE A SOIL DISTURBING ACTIVITY, THE ENGINEER MAY CALL FOR ADDITIONAL SILT SOCK TO BE ADDED AT AREAS OF HIGH SEDIMENTATION, PLACED IMMEDIATELY ON TOP OF THE EXISTING SEDIMENT LADEN SILT SOCK.

SILT SOCK DETAIL

N.T.S.



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE – USE 2" STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS – NOT LESS THAN SIX (6) INCHES.
4. WIDTH – TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY–FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACTED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

STABILIZED CONSTRUCTION ENTRANCE DETAIL

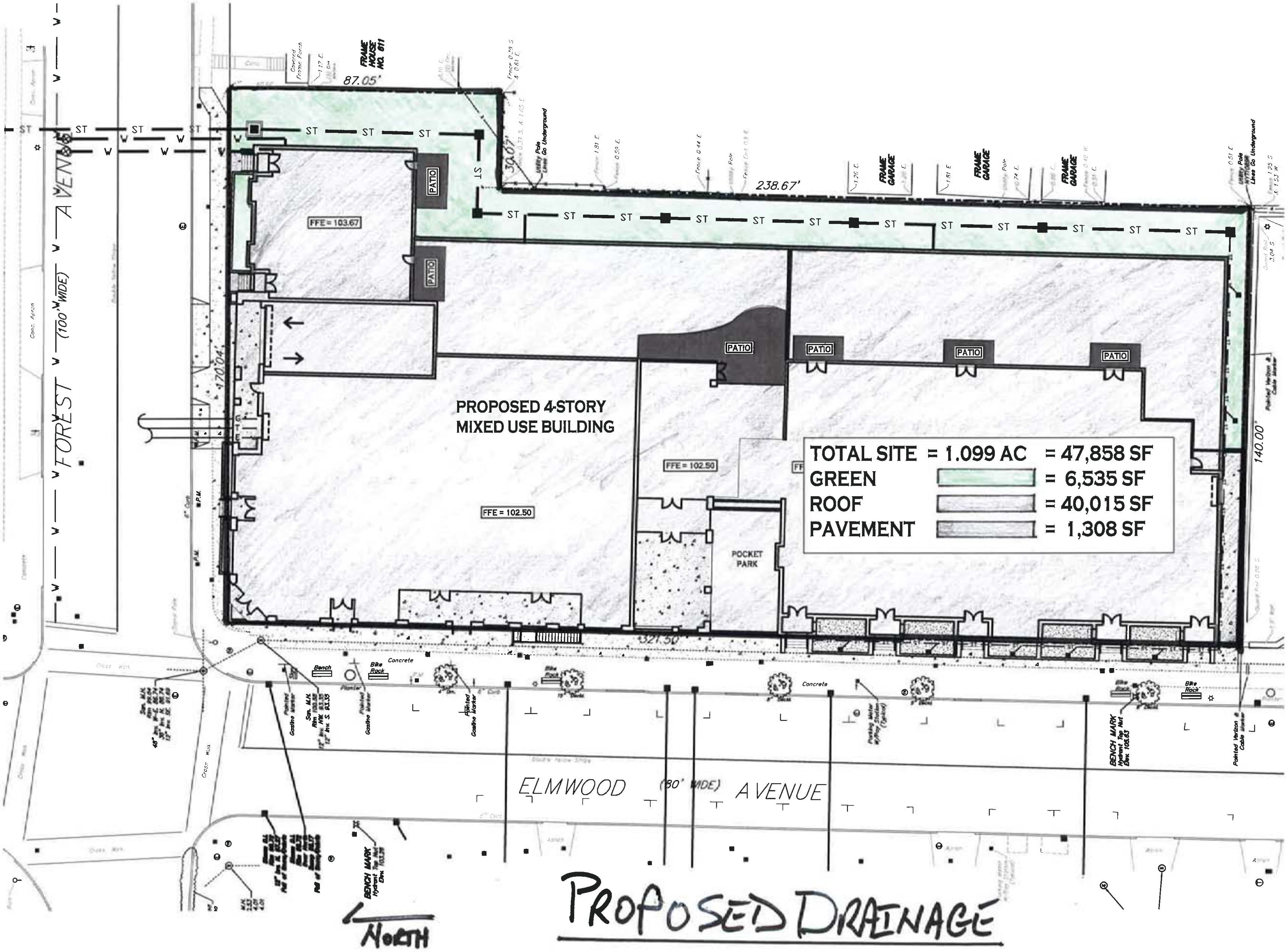
NOT TO SCALE

Appendix M

Drainage Delineation Maps

EXISTING
TOTAL SITE = 1.099 AC = 47,858 SF
GREEN = 11,751 SF 🟩
ROOFS/PAVEMENT = 36,107 SF ▨

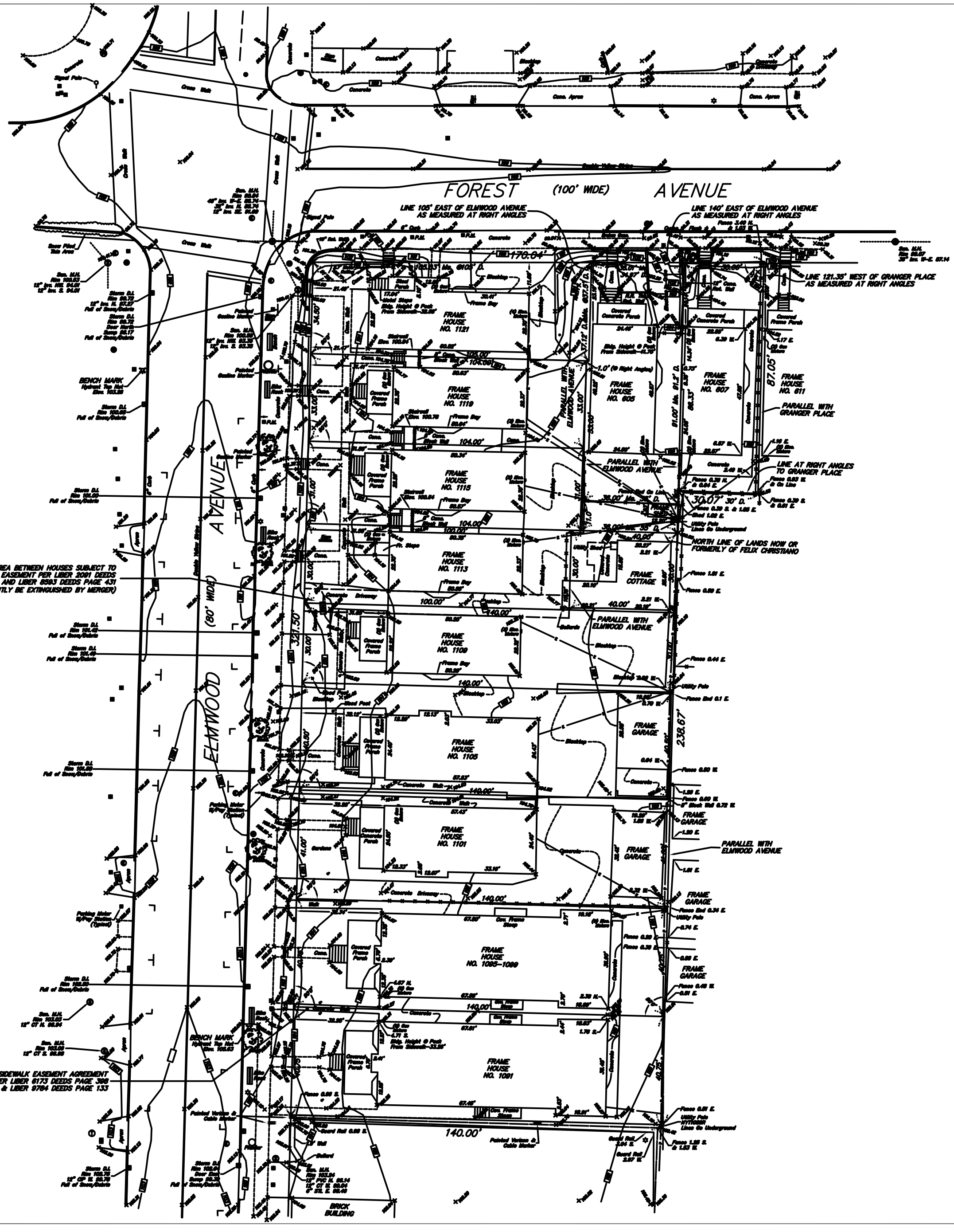
EXISTING DRAINAGE

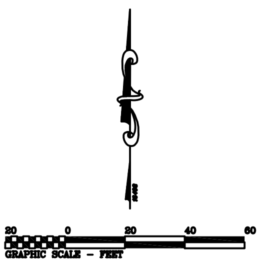


PROPOSED DRAINAGE

Appendix N

Topographical Survey





LEGEND

Ø	UTILITY / SERVICE POLE	R.O.W.	RIGHT OF WAY
⊠	WATER LINE VALVE	CONC.	CONCRETE
✡	FIRE HYDRANT	INV.	INVERT
⊞	D.I. (DROP INLET – STORM)	M.H.	MANHOLE
Ⓓ	MANHOLE (STORM)	—G—	GAS LINE
Ⓔ	MANHOLE (ELECTRIC)	—W—	WATER LINE
Ⓣ	MANHOLE (TRAFFIC)	—T—	TELEPHONE LINE
Ⓢ	MANHOLE (SANITARY)	—E—	ELECTRIC LINE
Ⓣ	MANHOLE (TELEPHONE)	—P—	UTILITY LINES
●	GASLINE MARKER	—C—	CABLE LINES
⊠	GAS LINE VALVE	D.	DEED
☼	LIGHT STANDARD	M.	MEASURED
—o—	SIGN	L.	LIBER
H.C.	HANDICAP	P.	PAGE

UTILITIES

The underground utilities shown have been located from field survey information & existing drawings. The surveyor makes no guarantee that the underground utilities shown comprise all such utilities in the area, either in service or abandoned. The surveyor further does not warrant that the underground utilities shown are in the exact location indicated although he does certify that they are located as accurately as possible from the information available. This surveyor has not physically located the underground utilities.

Note: Underground Utility information has been ordered from the respecvtive utility companies. As the information is received, this map will be amended to reflect said information.

National Fuel
Attn: Ed Kulpa
(716) 857-7000

Time Warner Cable
Attn: Thomas Triglio
(716) 558-8615

City of Buffalo Water Div.
Attn: James Campolong
(716) 851-4782

Buffalo Sewer Authority
Attn: James Eagan
(716) 851-4664

Verizon
Attn: Robert McCarthy
(716) 840-8748

National Grid
Attn: Lawrence Bernas
(716) 857-4220

INSTRUMENT(S) UTILIZED IN DETERMINING LOCATION OF BOUNDARY LINES:
THIS SURVEY WAS PREPARED WITHOUT THE BENEFIT OF A CURRENT ABSTRACT OF TITLE AND IS SUBJECT TO ANY STATE OF FACTS THAT MAY BE REVEALED IN SAID ABSTRACT.
NOTE: PROPERTY CORNER MONUMENTS WERE NOT PLACED AS PART OF THIS SURVEY.   NOTE: THIS SURVEY WAS PERFORMED UNDER SEVERE SNOW AND ICE CONDITIONS.

THIS SURVEY MAP WAS PREPARED IN ACCORDANCE WITH THE CURRENT STANDARDS FOR LAND SURVEYS ADOPTED BY THE BAR ASSOCIATION OF ERIE COUNTY AT THE REQUEST OF
Affinity Realty Partners

Fr. C. Delles
FRANCIS C. DELLES   NYSPLS No. 050477

Millard, MacKay & Delles
LAND SURVEYORS, LLP
150 AERO DRIVE
BUFFALO, NEW YORK 14225
PHONE (716) 631-5140 ~ FAX 631-3811

AMEND:
SURVEY DATE: 2-24-16
©DRAWING DATE: 2-29-16
SCALE: 1" = 20'

THIS MAP VOID UNLESS EMBOSSED WITH NEW YORK STATE LICENSED LAND SURVEYOR'S SEAL. ALTERING ANY ITEM ON THIS MAP IS A VIOLATION OF THE LAW EXCEPT AS PROVIDED IN SECTION 7209, PART 2, OF THE NEW YORK STATE EDUCATION LAW.

PART OF LOT 48 SECTION ____ TOWNSHIP 11 RANGE 8 OF THE:
Holland Land Company's SURVEY– Erie COUNTY, N.Y.

SURVEY OF: 1091–1121 Elmwood Avenue & 605–607 Forest Avenue, City of Buffalo

SBL No. 89.62-1-1.1,1.21,2,31-39