UPLAND SITE CHARACTERIZATION WORK PLAN

Newtown Creek – Site #241117
Maspeth, Queens County, New York

Prepared For:

Contract# D009808-25
New York State Department of Environmental Conservation
Division of Environmental Remediation
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TABLE OF CONTENTS

1.0 INTRODUCTION....1
- 1.1 Purpose and Objectives.... 1
- 1.2 Site Description and Background Information.... 1
- 1.3 Site Geology and Hydrogeology.... 2
- 1.4 Upland Properties.... 3

2.0 SITE CHARACTERIZATION (SC) SCOPE OF WORK....4
- 2.1 Preliminary Activities.... 4
  - 2.1.1 Work Plan.... 4
  - 2.1.2 Health and Safety Plan.... 4
  - 2.1.3 Quality Assurance Project Plan.... 4
- 2.2 Data Compilation, Environmental Sampling, and Implementation.... 5
  - 2.2.1 Data Compilation.... 5
  - 2.2.2 Shoreline Survey and Potential Seep Sampling.... 5
    - 2.2.2.1. Sample Collection and Handling Procedures.... 6
    - 2.2.2.2. Analytical Data Quality Evaluation.... 7
    - 2.2.2.3. Disposal of Investigation Derived Waste (IDW).... 7
- 2.3 Site Characterization Report.... 7
  - 2.3.1 Electronic Data Delivery.... 7
  - 2.3.2 Site Characterization Report.... 8

3.0 SITE SPECIFIC QUALITY ASSURANCE PROJECT PLAN....9
- 3.1 Sample Handling.... 9
- 3.2 Data Quality Assessment and Usability.... 9

4.0 PROJECT MANAGEMENT....11
- 4.1 Project Schedule and Key Milestones....11
- 4.2 Project Personnel....11

5.0 REFERENCES....13

Figures

Figure 1	Site Location Map
Figure 2	Tributary Map
Figure 3	Upland Properties of Interest
Figure 4	Upland Properties of Interest, Adjacent to Newtown Creek

Tables

Table 1	Upland Properties of Interest
Table 2	Upland Site Characterization Sample Summary
Table 3	Analytical Methods/Quality Assurance Summary
Table 4	Analytical Limits

Appendices

Appendix A	Approved Plans
Appendix B	Site-Specific Health and Safety Plan
Appendix C	Standard Operating Procedures (SOPs)
Appendix D	Resumes of Key Project Personnel

1.0 INTRODUCTION

The objective of this New York State Department of Environmental Conservation (NYSDEC) Work Assignment (WA) is to conduct an Upland Site Characterization (SC) on Newtown Creek (the Site), located in the City of New York (Figure 1). Newtown Creek is a waterbody separating Kings and Queens counties which includes the tributaries Dutch Kills, Whale Creek, Maspeth Creek, East Branch, and English Kills (herein referred to collectively as Newtown Creek; Figure 2). The United States Environmental Protection Agency (USEPA) requested NYSDEC's assistance in assessing how upland properties (facilities) of interest may impact the Newtown Creek estuary and future remedy. The scope of work to be performed as part of this SC was developed with NYSDEC, and our review of information provided with the WA. This Upland SC Work Plan outlines tasks necessary to collect and compile data from a variety of sources for use evaluating whether upland properties are a potential source of contamination to Newtown Creek, and whether additional assessment of those properties is recommended.

1.1 Purpose and Objectives

This site-specific Work Plan has been prepared to describe the details of the scope of work, including all proposed field and data compilation activities, laboratory analyses, and data QA/QC evaluation that will be associated with the Upland SC of Newtown Creek. This document is intended to supplement information provided in the NYSDEC-approved *Generic Field Activities Plan for Work Assignments,* completed by HRP Associates (HRP) on August 8, 2019 (Appendix A)*.*

The purpose of the SC is to evaluate whether upland properties are a potential source of contamination to Newtown Creek. The primary tasks of the SC's scope of work include:

- Data Compilation – Compile publicly available environmental data, data provided by NYSDEC, and data collected by HRP for use in evaluating upland properties of interest.

- Environmental Survey and Sampling – Complete a visual survey of Newtown Creek's shoreline area around low-tide to document shoreline conditions and observations of potential seeps. Potential seeps may appear as sheens on the water surface, nonaqueous phase liquid (NAPL) or discolorations in the water; environmental samples will be collected for characterization of the potential seeps.

- Reporting – Complete reports summarizing upland properties of interest and their respective potential impact to Newtown Creek. These reports will be attached to the Site Characterization Report (SCR) to be completed documenting the upland properties assessment.

1.2 Site Description and Background Information

Newtown Creek is an estuarine waterbody that forms a portion of the border between the boroughs of Brooklyn and Queens in New York City, New York (NYC, NY). Newtown Creek is approximately 3.8 miles from the head of English Kills to where it enters the East River. It is a part of the New York State Coastal Zone (NYCDCP 2021) and one of six NYC Significant Maritime and Industrial Areas (SMIAs; NYCDCP 2021).

Newtown Creek is both a New York State Superfund and a Federal Superfund Site. Newtown Creek was nominated to the national priorities list (NPL) in January 2009, and formally added on September 29, 2010 when published in the U.S. Federal Register. The USEPA, as the lead agency, negotiated an Order of Consent with the respondents. The respondents are made up of the City of New York and the Newtown Creek Group, which includes the following five companies: Phelps Dodge Refining Corporation, Texaco, Inc., BP Products North America, Inc., The Brooklyn Union Gas Company d/b/a National Grid, NY, and ExxonMobil Oil Corporation (USEPA 2011). Currently, a remedial investigation/feasibility study (RI/FS) is underway as outlined in the RI/FS Work Plan (AECOM 2011) that was included as Appendix A to the Order of Consent.

1.3 Site Geology and Hydrogeology

The regional hydrogeologic setting in northern Kings County and southern Queens, Long Island, New York, consists of impermeable Precambrian and Paleozoic crystalline bedrock overlain by the Upper Cretaceous Raritan formation, Magothy formation and Matawan Group (undifferentiated), unconsolidated Pleistocene deposits and upper Pleistocene glacial deposits and Holocene shore, beach salt-marsh deposits and alluvium along with local occurrences of artificial fill (Buxton et al. 1981; Soren and Simmons 1987). The bedrock outcrops in northwestern Queens County (Buxton et al. 1981; Soren and Simmons 1987) and dips towards the southeast. The overlying unconsolidated deposits, from the Cretaceous period through the Upper Pleistocene and Holocene, also dip to the south. The Cretaceous sediments found immediately above the crystalline bedrock are continental in origin, deltaic deposits that were repeatedly eroded during later Pleistocene glacial events (Buxton et al. 1981).

Groundwater flow in both the Upper Glacial or surface and Magothy Aquifers is generally to the north and south, away from the central, east-west trending morainal ridge in Kings and Queens Counties. Closer to Newtown Creek, groundwater flows generally towards the Creek but begins to have a westerly component with closer proximity to the East River (Misut and Monti, 1999). Groundwater flow is generally impacted by surficial features, such as watershed boundaries, groundwater withdrawal and recharge basins, the presence of buried utilities, and tunnel dewatering.

The original Newtown Creek watershed has been permanently altered by urbanization such that there is little freshwater flow to Newtown Creek other than stormwater and municipal combined sewer overflows (CSOs) during wet weather. There are thirty (30) CSO outfalls and over 100 stormwater discharges to Newtown Creek with large outfalls located primarily in the tributaries.

Newtown Creek is classified by New York State as a Class SD saline surface water body and was first listed on the Section 303(d) List in 1998 of impaired waterways. It is included on the New York State 2018 Section 303(d) List of Impaired Waters due to oxygen demand, fecal coliform, and garbage and refuse (NYSDEC 2020).

1.4 Upland Properties

NYSDEC developed a list of properties to assess during the Upland SC based on information from a variety of sources and their proximity to Newtown Creek. Information sources include, but are not limited to, property histories, existing data in NYSDEC remedial programs and information collected by the EPA as part of the NPL remedial investigation. In addition to properties identified by NYSDEC, upland properties of interest identified by EPA have been incorporated into the Upland SC for evaluation. Upland properties identified are listed in Table 1 and shown in Figure 3. Properties not along the shoreline are included on Figure 3 and no environmental sampling is planned for these properties as part of this work plan. Upland properties located on the Newtown Creek shoreline are shown on Figure 4. These properties will be targeted as part of the environmental survey and sampling fieldwork described in this SC Work Plan.

2.0 SITE CHARACTERIZATION (SC) SCOPE OF WORK

This scope of work has been designed to gather data to evaluate each project objective listed in Section 1.1. The following sections provide specifics regarding the scope of work developed under this NYSDEC-approved Work Assignment (D009808-25).

2.1 Preliminary Activities

As part of the scope of work, the following documents have been prepared under this Work Assignment:

- Project-specific Work Plan (this document) to accompany the generic Field Activities Plan (FAP; Appendix A);
- Site-specific Health and Safety Plan (HASP) (included as Appendix B of this Work Plan), to accompany the generic HASP (Appendix A);
- Project-specific standard operating procedures included as Appendix C of this work plan; and
- Project-specific Quality Assurance Project Plan (QAPP) (included as Section 3 of this Work Plan) to accompany the generic QAPP (Appendix A).

These NYSDEC-approved generic FAP, HASP, and QAPP are on file with the NYSDEC. The site-specific elements are provided below.

2.1.1 Work Plan

This SC Work Plan has been prepared for use in performing the Site Characterization and will serve as the "site-specific FAP". This SC Work Plan identifies the components of the Site Characterization and a description of the tasks to be performed including the specific methods or procedures that will be used to conduct the field sampling. A proposed project schedule is included in Section 4.1 of this SC Work Plan.

2.1.2 Health and Safety Plan

A site-specific Health and Safety Plan (HASP) is provided in Appendix B. The site-specific HASP provides guidance to maximize health and safety of on-site workers during SC-specific tasks including shoreline survey, as well as sheen-net and surface water sampling. The generic HASP has guidelines for health and safety supervision, air monitoring, medical monitoring, personal protective equipment, site controls, safe work practices and decontamination, etc.

2.1.3 Quality Assurance Project Plan

A site-specific Quality Assurance Project Plan (QAPP) has been prepared and is included in Section 3 of this SC Work Plan. The site-specific QAPP was prepared as a supplement to the Generic QAPP with necessary site-specific information. Deviations from the protocols specified in the QAPP will be subject to the NYSDEC approval.

The Generic QAPP (Appendix A) provides general information related to QA/QC procedures associated with the collection and analysis of samples of environmental media and includes specific representative standard operating procedures (SOPs) applicable to sample handling and field instrumentation use. Information provided in the Generic QAPP includes definitions and generic goals for data quality and required types and quantities of QA/QC samples. The procedures address field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA/QC reporting specific to the analyses performed by the laboratories that are used for analysis of environmental media collected under Standby Contract No. D009808.

All laboratory analytical work will be performed by a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) approved laboratory certified in all categories of Contract Laboratory Protocol (CLP) and Solid and Hazardous Waste analytical testing. A Data Usability Summary Report (DUSR) will be included in the Site Characterization Report for analytical data generated. Category B deliverables will be retained in the project files and available for full data validation by a qualified, independent third party.

2.2 Data Compilation, Environmental Sampling, and Implementation

The data compilation and environmental sampling tasks will include the components described below.

2.2.1 Data Compilation

Environmental data will be compiled for upland properties identified on Table 1 for use in identifying properties which may adversely impact Newtown Creek. Summaries of environmental data previously compiled will be used and combined with recent data from NYSDEC programs. Data to be reviewed will include:

- Available data from NYSDEC’s EQuIS (Environmental Quality Information System) database for upland properties of interest;
- Reports submitted to NYSDEC or other regulatory agencies; and
- Available historical information.

Environmental data will be compiled in a project-specific geographic information system (GIS) for use by NYSDEC in review, and ultimately included in the SC Report.

2.2.2 Shoreline Survey and Potential Seep Sampling

A visual survey will be completed of the shoreline and shoreline structures of Newtown Creek. The visual survey will be conducted around low-tide when more of the shoreline area is exposed in an effort to identify potential seeps flowing into Newtown Creek. The visual survey will seek to cover the entirety of the Newtown Creek shoreline while focusing on shoreline areas of the identified uplands properties of interest (Table 1 and Figure 3). Observations of potential seeps will be documented following SOP 01 *Shoreline Observation for Potential Seeps* included in Appendix C.

Potential seeps that appear to be emanating from the Newtown Creek shoreline or from behind shoreline structures will be documented and the location noted (SOP 01). Potential seeps will generally be observations of water emanating from the shoreline into Newtown Creek or an observation on the water's surface that may be indicative of such a discharge. Potential seeps may be colored differently than Newtown Creek surface water, appear more/less turbid, and/or may exhibit a sheen. Potential seeps may also be nonaqueous phase liquid (NAPL).

Once identified, a potential seep will be documented following procedures outlined in the SOP 01 included in Appendix C. Documentation will include:

- Completing an observation form for each potential seep;
- Recording the potential seep location; and
- Collecting photographs and videos of the potential seep.

A potential seep location will be recorded so that an additional observation(s) may be attempted on a separate tide-cycle. Potential seeps observed a second time will be reviewed and locations selected for environmental sample collection. Field teams completing the visual survey will have discretion to collect environmental samples of potential seeps, which appear potentially significant after a single observation with approval of the project manager. Collected samples will be submitted for analytical tests listed in Table 2.

Photographs will be collected with a high-resolution camera and include a mixture of "close-up" and "general-area" photographs; general-area photographs should include at least one distinguishing landmark. Photographs will be collected with a camera capable of encoding geographical coordinates. The encoded coordinates will be used to link the collected images in the project GIS for ease of review. In addition to standard color images, thermal images will also be collected of the Newtown Creek shoreline. Thermal images will be collected and reviewed to potentially identify any preferential pathways within the Newtown Creek shoreline. Thermal images will be collected at the discretion of the field team to cover the area where a potential seep is believed to be emanating.

2.2.2.1 Sample Collection and Handling Procedures

Surface water samples will be collected from locations where potential seeps were observed at least twice. Surface water samples will be collected by lowering laboratory provided container(s) below the water's surface, allowing them to fill and then using to fill other containers for the analytical tests required. In addition to the surface water samples, a sheen-net sample will be collected as well. Sheen-nets are made of TFE-fluorocarbon polymer net that captures the observed sheen as it passes through the water's surface. The SOP 02 *Sheen-Net and Surface Water Sampling* included in Appendix C and outlines the steps for collecting samples as well as the appropriate sampling form for record keeping.

All equipment used for sampling will be dedicated and discarded after use (Section 2.2.2.3). Collected samples will be collected using clean laboratory-supplied appropriate containers (as listed in Table 3 of this work plan) and will be preserved on ice in coolers during field sampling activities. All samples will be analyzed by EuroFins Test America Inc., an NYSDOH ELAP and NYSDEC approved laboratory using extraction and analytical methods listed in Table 3.

2.2.2.2 Analytical Data Quality Evaluation

This Work Plan and the associated site-specific QAPP detail the data quality objectives and analytical requirements needed for this WA. All quality assurance protocols are provided in the generic QAPP (Appendix A) and Table 4 lists the method detection and reporting limits for analytes included in the analytical tests identified in Table 2.

The selected laboratory will supply all required data deliverables (USEPA CLP and NYSDEC ASP deliverable format) to enable the data to be validated. The analytical data will also be submitted electronically in the NYSDEC format from the laboratory to the validators to minimize the chances of errors in Transcribing the data. All environmental data will be submitted electronically in a specified format named 'NYSDEC' in accordance with the data submission procedures outlined on the NYSDEC's web site (http://www.dec.ny.gov/chemical/62440.html).

Upon receipt of the sample data, the validation contractor will quantitatively and qualitatively validate the laboratory data. The validation of the analytical data will be performed according to the protocols and QC requirements of the analytical methods, the USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Superfund and Inorganic Superfund Methods Data Review (USEPA 2020a and USEPA 2020b), high resolution Superfund methods data review (USEPA 2020c), the USEPA Region II CLP Data Review SOP, and the reviewer's professional judgment.

2.2.2.3 Disposal of Investigation Derived Waste (IDW)

Investigation derived waste (IDW) that is generated from the shoreline survey and potential seep sampling shall be handled in accordance with NYSDEC DER-10. Handling and storage of IDW will include use of DOT-approved 55-gallon drums and all containers will be labeled and stored properly.

IDW is expected to primarily consist of used personal protective equipment (PPE) and dedicated sampling equipment. IDW shall be handled and disposed of in a manner that does not pose a threat to health and the environment. If off-site disposal of the derived waste is required, it will be disposed of or treated according to applicable local, state and federal regulations.

A small amount of liquid waste may be generated from decontamination of non-dedicated equipment. Any generated liquid waste will be containerized for disposal and labeled similar to the used PPE.

2.3 Site Characterization Report

2.3.1 Electronic Data Delivery

In addition to appropriate data summary tables included in the report, all environmental data will be submitted electronically in a specified Electronic Data Deliverable (EDD) format named in accordance with the data submission procedures outlined on the NYSDEC's web site (http://www.dec.ny.gov/chemical/62440.html).

2.3.2 Site Characterization Report

A Upland Site Characterization (SC) Report will be prepared as part of this work assignment following completion of the field activities and data compilation. The Upland SC Report will provide a description of the field activities completed and present data collected. Additionally, the SC Report will present a physical description of the properties assessed, summarize the information gathered (if collected), and provide a summary of the data compiled. The report will include tabulated laboratory analytical results, site maps and a discussion of contaminant concentrations, including a comparison to applicable Standards, Criteria, and Guidelines (SCGs). Based on the Upland Site Characterization, a recommendation to further investigate upland properties will be included, if necessary.

3.0 SITE SPECIFIC QUALITY ASSURANCE PROJECT PLAN

This site-specific Quality Assurance Project Plan (QAPP) has been prepared as a companion section to accompany the Generic QAPP for the standby subcontract prepared by HRP for the New York State Department of Conservation (NYSDEC) under Standby Contract No. D009808. The purpose of the QAPP is to specify QA/QC procedures for the collection, analysis, and evaluation of data that will be legally and scientifically defensible.

All laboratory analytical work will be performed by a NYSDOH Environmental Laboratory Approval Program (ELAP)-approved laboratory certified in all categories of Contract Laboratory Protocol (CLP) and Solid and Hazardous Waste analytical testing. A Data Usability Summary Report will be included in the SC Report for all analytical results. Category B deliverables will be retained in the project files and available for full data validation by a qualified independent third party.

3.1 Sample Handling

Sheen-net and surface water samples will be collected during this SC. Detailed sampling procedures are outlined in the SOP 02 *Sheen-Net and Surface Water Sampling* included in Appendix C of this Work Plan. The SOP 01 *Shoreline Observation for Potential Seeps* included in Appendix C presents the shoreline survey procedures for documentation of potential seeps. For each potential seep targeted for environmental sampling, it is assumed that one sheen-net sample and one surface water sample will be collected.

Table 3 summarizes the analytical samples to be collected and frequency of QA/QC sample collection. Field duplicate, matrix spike/matrix spike duplicate, and equipment blank samples will be collected at a frequency of one per every 20 environmental samples. In addition, one baseline sample will be collected from each tributary where potential seeps are identified. Baseline sample(s) will be collected away from the shoreline, in areas where there are no visible sheen, discoloration on the water's surface and upstream of observed potential seep(s). Background results will be used as a comparison to environmental potential seep samples collected close to the shoreline. If more than 20 environmental samples are collected field teams will collect two background samples and ensure that samples are collected from different Newtown Creek tributaries.

3.2 Data Quality Assessment and Usability

Data quality objectives for the Newtown Creek SC are focused towards 1) the characterization of potential seeps and 2) the evaluation of potential impacts from uplands properties of interest.

To achieve these objectives, QA/QC measures will be implemented throughout the SC fieldwork to provide input as to the validity and usability of data generated through sheen-net and surface water sampling. The procedures for data QA/QC management includes field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA reporting specific to the analyses performed by the laboratory. Table 3 lists the sample containers, preservation, and holding time requirements for the parameters specific to this Site. This table will be referenced by field personnel.

For all data generated during the SC, a Category B Data package and DUSR will be prepared to provide a thorough evaluation of analytical data utilizing third-party data validation. Analytical Quality Associates, Inc. will be the third-party data validator for this project.

4.0 PROJECT MANAGEMENT

HRP has the responsibility of the overall management of this project and will respond to any NYSDEC requests. This section discusses project milestone, schedules, key personnel, and intended subcontractors and roles for this project.

4.1 Project Schedule and Key Milestones

The proposed project schedule for this work assignment is outlined below. Key milestones are identified to monitor work progress. The following milestones will be applicable for this project:

Est. Latest Completion Date

Milestone 1:	Notice to Proceed	Completed
Milestone 2:	NYSDEC review of all site-specific plans	August 2021
Milestone 3:	Shoreline survey and sampling	October 2021
Milestone 4:	Data compilation	February 2022
Milestone 5:	SC Report	May 2022

Data compilation activities have begun and will continue through the end of 2021. The shoreline survey and sampling (Milestone 3) is currently targeting September 2021 for completion. Any investigation derived waste generated during the SC will be characterized and scheduled for disposal within 3 weeks of completion of Milestone 3. The SC Report (Milestone 5) will be submitted with summary reports for upland properties attached. The SC Report will be submitted as a draft report and finalized within two weeks receipt of the NYSDEC project manager’s comments

4.2 Project Personnel

A list of the project personnel of the prime consultant for performance of the site investigation has been submitted to the NYSDEC for approval. Primary project staffs are listed below:

Personnel	*Company*	*Title for this Work Assignment*	*Responsibility*
Jessica Kruczek, PE, LEP (Project Manager)	HRP Associates, Inc. (Prime Consultant)	Contract Manager	Overall management of the WA
Matthew Cavas, PG (Project Manager)	HRP Associates, Inc.	Project Manager	Responsible for overall completion of the WA
Alisa Werst, CSP (Project Manager)	HRP Associates, Inc.	Health & Safety Manager	Approval of HASP and responsible for overall health and safety issues with the WA

Personnel	*Company*	*Title for this Work Assignment*	*Responsibility*
Michael Varni, P.G. (Senior Consultant)	HRP Associates, Inc.	Corporate QA/QC Officer	Responsible for QA/QC on the WA
Vincent DeLeone. (Senior Consultant)	HRP Associates, Inc.	Field Manager and Site Health & Safety Officer	Responsible for the on-site field survey and investigative tasks

Subcontractors for this project will include:

- Vessel support – All Pro Marine Contracting Corp.;
- Analytical Laboratory – Eurofins Test America, Inc.;
- Data Validation – Analytical Quality Associates; and
- Company to dispose of any investigation derived waste (not yet selected).

5.0 REFERENCES

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Anchor QEA 2012. *Draft Data Applicability Report, Remedial Investigation/Feasibility Study, Newtown Creek*. Prepared by Anchor QEA, LLC. May 2012.

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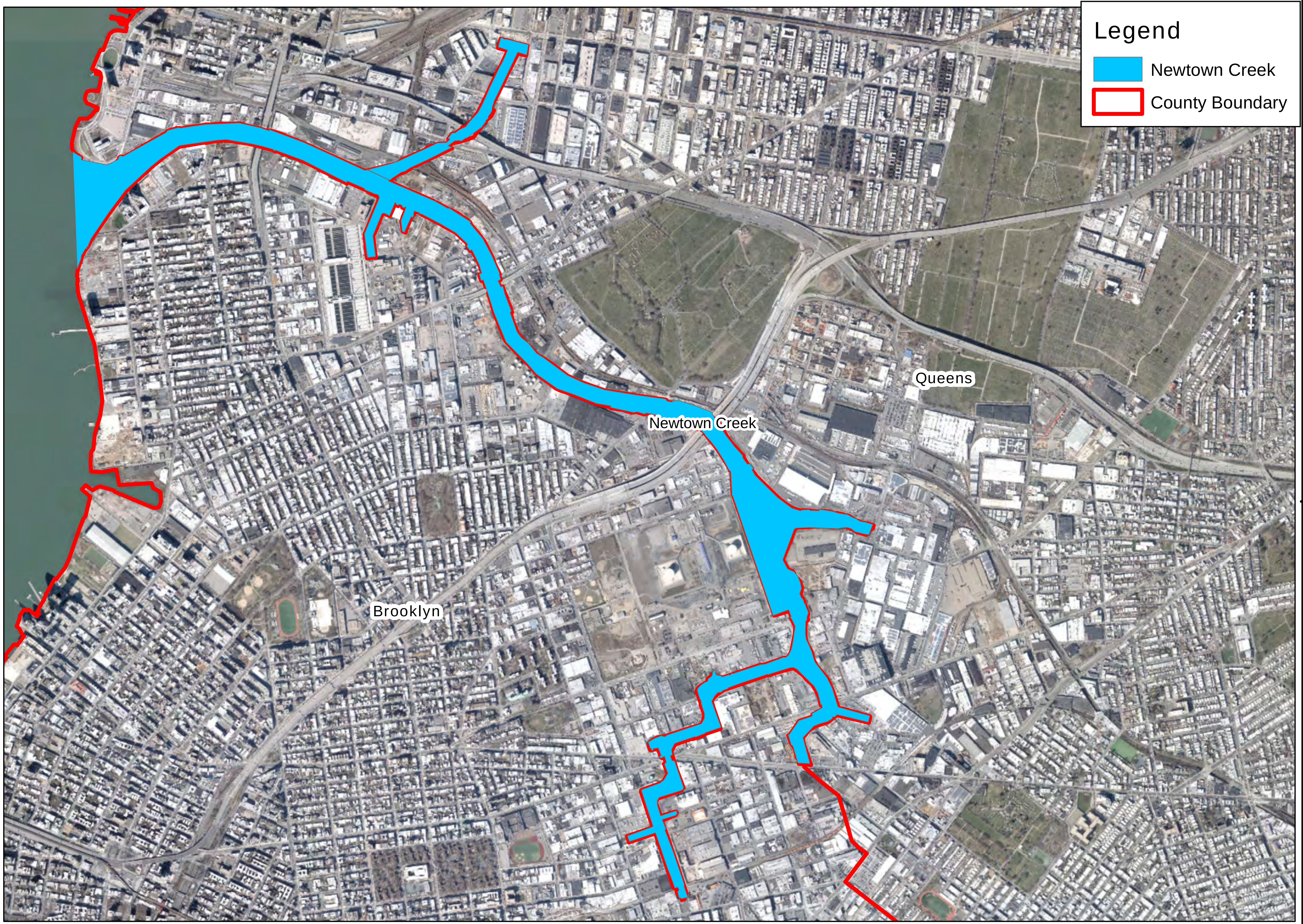
FIGURES



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North

0 1,400 Feet

Revisions				
No.	Date			

Designed By: CMS

Drawn By: CMS

Reviewed By: MPC

Issue Date: 07/16/2021

Project No: DEC1025.P3

Sheet Size: 11x17

Area Map
Newtown Creek

SITE #241117

Newtown Creek,
New York, NY 11378

FIGURE NO.

1

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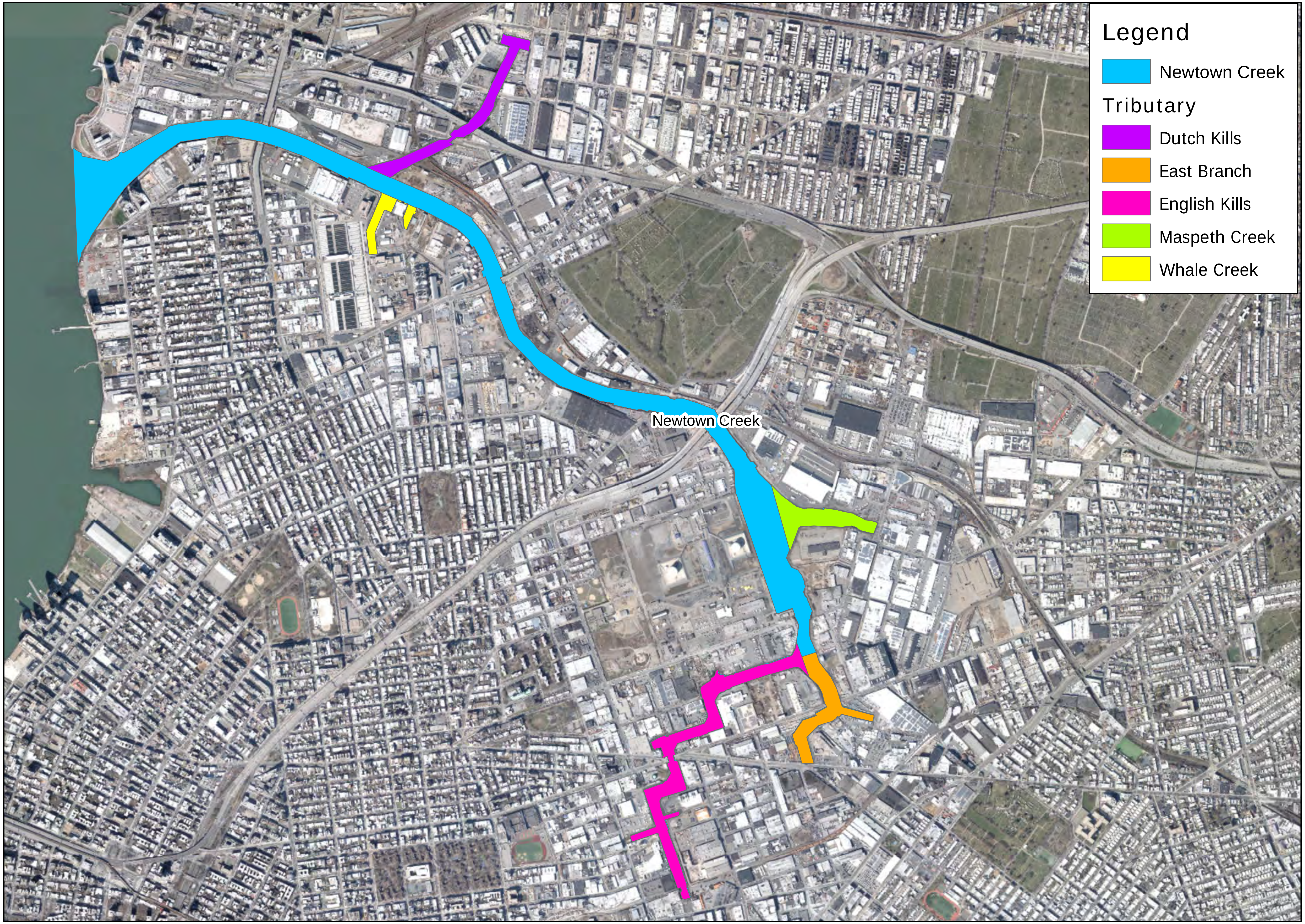

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Designed By: CMS

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Sheet Size: 11x17

Tributary Map
Newtown Creek

SITE #241117

Newtown Creek,
New York, NY 11378

FIGURE NO.

2

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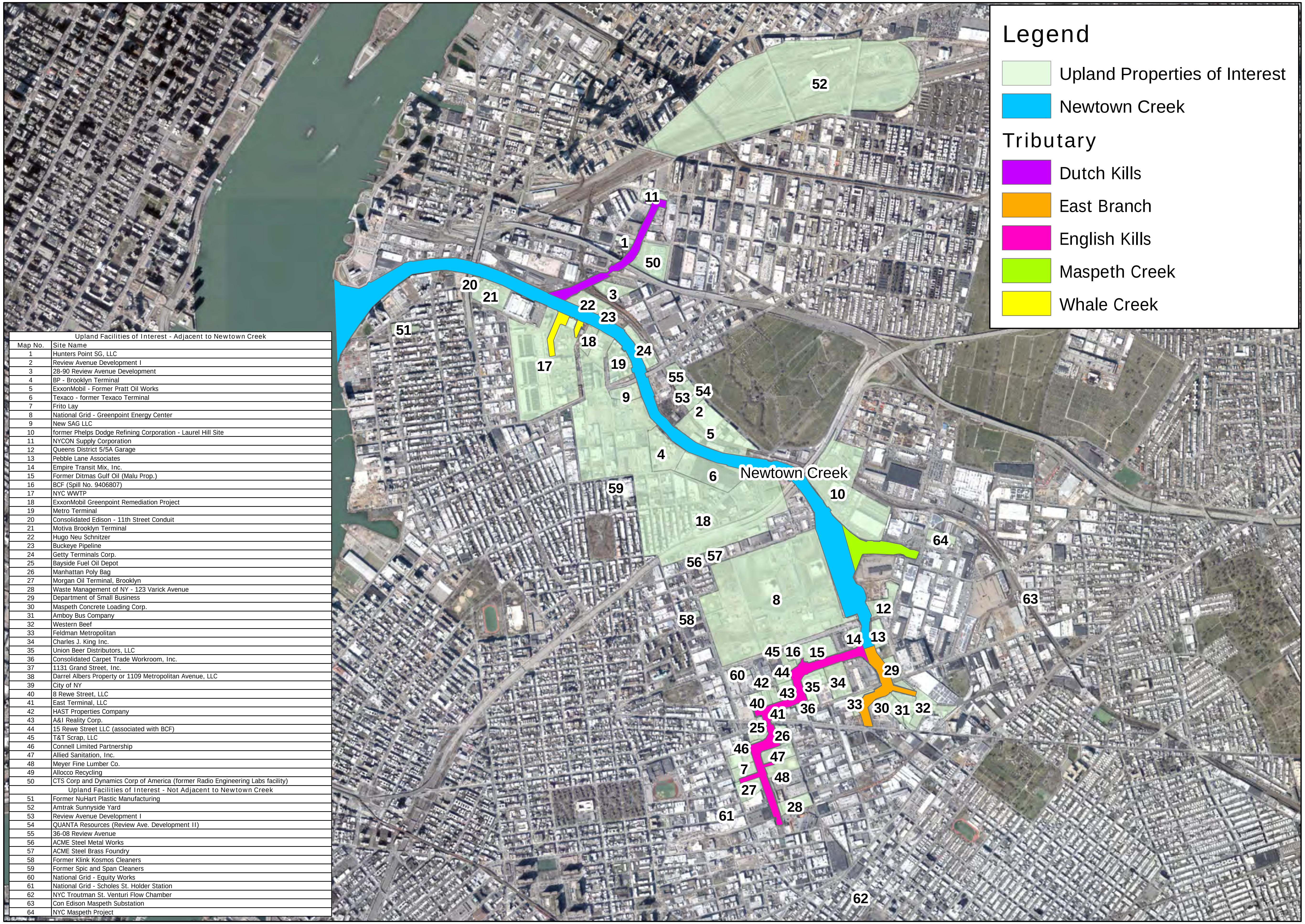

Legend

🟩 Upland Properties of Interest

🟦 Newtown Creek

Tributary

🟪 Dutch Kills

🟧 East Branch

🟥 English Kills

🟩 Maspeth Creek

🟨 Whale Creek

Map No.	Site Name
Upland Facilities of Interest - Adjacent to Newtown Creek	
1	Hunters Point SG, LLC
2	Review Avenue Development I
3	28-90 Review Avenue Development
4	BP - Brooklyn Terminal
5	ExxonMobil - Former Pratt Oil Works
6	Texaco - former Texaco Terminal
7	Frito Lay
8	National Grid - Greenpoint Energy Center
9	New SAG LLC
10	former Phelps Dodge Refining Corporation - Laurel Hill Site
11	NYCON Supply Corporation
12	Queens District 5/5A Garage
13	Pebble Lane Associates
14	Empire Transit Mix, Inc.
15	Former Ditmas Gulf Oil (Malu Prop.)
16	BCF (Spill No. 9406807)
17	NYC WWTP
18	ExxonMobil Greenpoint Remediation Project
19	Metro Terminal
20	Consolidated Edison - 11th Street Conduit
21	Motiva Brooklyn Terminal
22	Hugo Neu Schnitzer
23	Buckeye Pipeline
24	Getty Terminals Corp.
25	Bayside Fuel Oil Depot
26	Manhattan Poly Bag
27	Morgan Oil Terminal, Brooklyn
28	Waste Management of NY - 123 Varick Avenue
29	Department of Small Business
30	Maspeth Concrete Loading Corp.
31	Amboy Bus Company
32	Western Beef
33	Feldman Metropolitan
34	Charles J. King Inc.
35	Union Beer Distributors, LLC
36	Consolidated Carpet Trade Workroom, Inc.
37	1131 Grand Street, Inc.
38	Darrel Albers Property or 1109 Metropolitan Avenue, LLC
39	City of NY
40	8 Rewe Street, LLC
41	East Terminal, LLC
42	HAST Properties Company
43	A&I Reality Corp.
44	15 Rewe Street LLC (associated with BCF)
45	T&T Scrap, LLC
46	Connell Limited Partnership
47	Allied Sanitation, Inc.
48	Meyer Fine Lumber Co.
49	Allocco Recycling
50	CTS Corp and Dynamics Corp of America (former Radio Engineering Labs facility)
Upland Facilities of Interest - Not Adjacent to Newtown Creek	
51	Former NuHart Plastic Manufacturing
52	Amtrak Sunnyside Yard
53	Review Avenue Development I
54	QUANTA Resources (Review Ave. Development II)
55	36-08 Review Avenue
56	ACME Steel Metal Works
57	ACME Steel Brass Foundry
58	Former Klink Kosmos Cleaners
59	Former Spic and Span Cleaners
60	National Grid - Equity Works
61	National Grid - Scholes St. Holder Station
62	NYC Troutman St. Venturi Flow Chamber
63	Con Edison Maspeth Substation
64	NYC Maspeth Project

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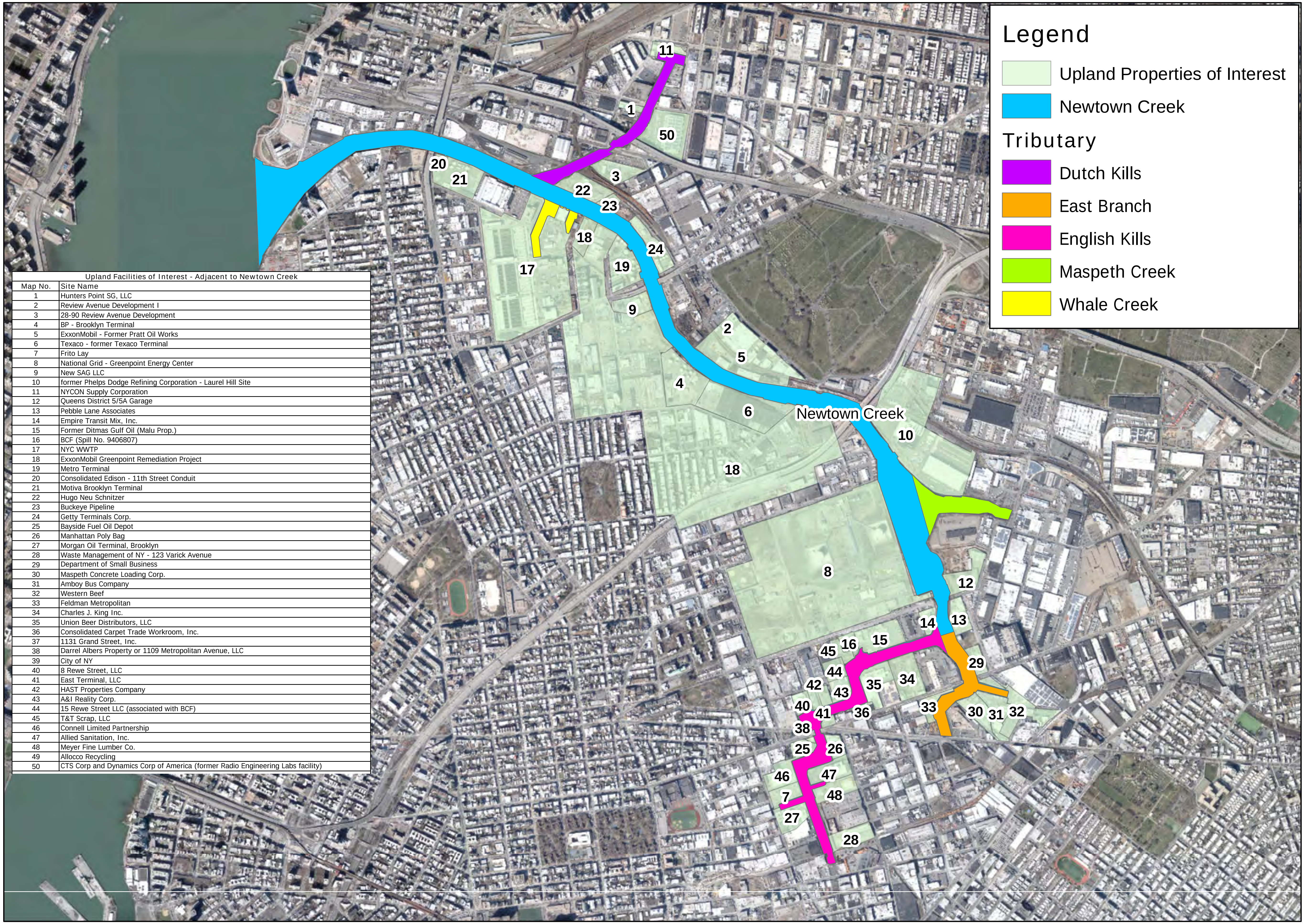
Upland Properties of Interest
Newtown Creek

SITE #241117

Newtown Creek, New York, NY 11378

FIGURE NO.

3



Upland Facilities of Interest - Adjacent to Newtown Creek	
Map No.	Site Name
1	Hunters Point SG, LLC
2	Review Avenue Development I
3	28-90 Review Avenue Development
4	BP - Brooklyn Terminal
5	ExxonMobil - Former Pratt Oil Works
6	Texaco - former Texaco Terminal
7	Frito Lay
8	National Grid - Greenpoint Energy Center
9	New SAG LLC
10	former Phelps Dodge Refining Corporation - Laurel Hill Site
11	NYCON Supply Corporation
12	Queens District 5/5A Garage
13	Pebble Lane Associates
14	Empire Transit Mix, Inc.
15	Former Ditmas Gulf Oil (Malu Prop.)
16	BCF (Spill No. 9406807)
17	NYC WWTP
18	ExxonMobil Greenpoint Remediation Project
19	Metro Terminal
20	Consolidated Edison - 11th Street Conduit
21	Motiva Brooklyn Terminal
22	Hugo Neu Schnitzer
23	Buckeye Pipeline
24	Getty Terminals Corp.
25	Bayside Fuel Oil Depot
26	Manhattan Poly Bag
27	Morgan Oil Terminal, Brooklyn
28	Waste Management of NY - 123 Varick Avenue
29	Department of Small Business
30	Maspeth Concrete Loading Corp.
31	Amboy Bus Company
32	Western Beef
33	Feldman Metropolitan
34	Charles J. King Inc.
35	Union Beer Distributors, LLC
36	Consolidated Carpet Trade Workroom, Inc.
37	1131 Grand Street, Inc.
38	Darrel Albers Property or 1109 Metropolitan Avenue, LLC
39	City of NY
40	8 Rewe Street, LLC
41	East Terminal, LLC
42	HAST Properties Company
43	A&I Reality Corp.
44	15 Rewe Street LLC (associated with BCF)
45	T&T Scrap, LLC
46	Connell Limited Partnership
47	Allied Sanitation, Inc.
48	Meyer Fine Lumber Co.
49	Allocco Recycling
50	CTS Corp and Dynamics Corp of America (former Radio Engineering Labs facility)

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Upland Properties of Interest, Adjacent to Newtown Creek

SITE #241117

Newtown Creek, New York, NY 11378

FIGURE NO.

4

TABLES

Table 1
Upland Properties of Interest
Newtown Creek Site # 241117
City of New York, New York

Upland Facilities of Interest - Adjacent to Newtown Creek

Map No.	Site Name	Borough	Property Address	DAR No.[1]	State of New York Program	Site Code (s)
1	Hunters Point SG, LLC	Queens	27-10 49th Avenue, Long Island City, NY 11101	NA	State of NY Brownfield	C241219
2	Review Avenue Development I	Queens	37-88 Review Avenue, Long Island City, NY 10111	41	State of NY Brownfield	C241203
3	28-90 Review Avenue Development	Queens	28-90 Review Avenue, LLC C/O Innovo Property Group, 1370 Avenue of the Americas, 19th Floor, New York, NY 10019	NA	State of NY Brownfield	C241236
4	BP - Brooklyn Terminal	Brooklyn	125 Apollo Street, Greenpoint, Brooklyn, NY	48	State of NY Superfund Program	S224083
5	ExxonMobil - Former Pratt Oil Works	Queens	3820 - 3914 Review Ave, Long Island City, NY 11101	56	State of NY Superfund Program	S241115
6	Texaco - former Texaco Terminal	Brooklyn	16, 42, 50 Bridgewater Street, Brooklyn, NY 11222	200	State of NY Superfund Program	S224083
7	Frito Lay	Brooklyn	202 - 218 Morgan Ave, Brooklyn, NY 11237	31	State of NY Brownfield	C224133
8	National Grid - Greenpoint Energy Center	Brooklyn	287 Maspeth Ave., Brooklyn, NY 11211	32, 34	State of NY Superfund Program	224052
9	New SAG LLC	Brooklyn	460 Kingsland Avenue, Brooklyn, NY 11222	NA	State of NY Superfund Program	224135
10	Former Phelps Dodge Refining Corporation - Laurel Hill Sit	Queens	44-02 56th Road, Maspeth NY 11378	16	State of NY Superfund Program	241002
11	NYCON Supply Corporation	Queens	47 - 17 27th Street, Long Island City, NY 11101	58	CBS, SPDES	2-000181(inactive), NYR00D706
12	Queens District 5/5A Garage	Queens	47-01 48th Street, Maspeth, NY 11378	NA	None	NA
13	Pebble Lane Associates	Queens	57 - 00 47th Street, Maspeth, NY 11378	134	None	NA
14	Empire Transit Mix, Inc.	Brooklyn	430 Maspeth Ave., Brooklyn, NY 11211	59	None	NA
15	Former Ditmas Gulf Oil (Malu Prop.)	Brooklyn	364 Maspeth Ave., Brooklyn, NY 11211	123	State of NY Spill	Prior closed spills

Table 1
Upland Properties of Interest
Newtown Creek Site # 241117
City of New York, New York

Map No.	Site Name	Borough	Property Address	DAR No.[1]	State of New York Program	Site Code (s)
16	BCF	Brooklyn	360 - 362 Maspeth Avenue, Brooklyn, NY 11211	27	State of NY Superfund Program	224034; Class N; Prior closed spills
17	NYC WWTP	Queens	329 Greenpoint Ave Brooklyn NY 11222	11a, 11b	None	NA
18	ExxonMobil Greenpoint Remediation Project	Brooklyn	400 Kingsland Ave, Greenpoint, Brooklyn, NY	53	State of NY Superfund Program	S224150
19	Metro Terminal	Brooklyn	498 Kingsland Ave., Brooklyn, NY 11222	52	MOSF and CBS	2-1380 and 2-000275
20	Consolidated Edison - 11th Street Conduit	Brooklyn	Ash St and McGuiness Blvd, Brooklyn, NY	110	None	NA
21	Motiva Brooklyn Terminal	Brooklyn	25 Paidge Avenue, Brooklyn, NY 11222	50	MOSF and CBS	2-000209 and 2-1540
22	Hugo Neu Schnitzer	Queens	30-27 Greenpoint Avenue, Long Island City, NY 11101	125	State of NY Spill	1200318
23	Buckeye Pipeline	Queens	355 Railroad Avenue, Long Island City, NY	106	State of NY Spill	9813881
24	Getty Terminals Corp.	Queens	30-23 Greenpoint Avenue, Long Island City, NY 11101	47	CBS	2-000268
25	Bayside Fuel Oil Depot	Brooklyn	1100 Grand Street, Brooklyn, NY 11211	51	MOSF	2-1280; Prior closed spills
26	Manhattan Poly Bag	Brooklyn	1150 Metropolitan Ave, Brooklyn, NY 11237	130	State of NY Spill	1609627
27	Morgan Oil Terminal, Brooklyn	Brooklyn	200 Morgan Avenue, Brooklyn, NY 11211	60	State of NY Spill	9209135
28	Waste Management of NY - 123 Varick Avenue	Brooklyn	123 Varick Ave, Brooklyn, NY 11211	46	None	NA
29	Department of Small Business	Queens	58-38 47th Street, Maspeth, NY 11378	NA	None	NA
30	Maspeth Concrete Loading Corp.	Queens	46 - 73 Metropolitan Ave., Ridgewood, NY 11385	NA	SPDES	NYR00D669
31	Amboy Bus Company	Queens	46-81 Metropolitan Ave., Queens, NY 11385	NA	None	Prior closed spills

Table 1
Upland Properties of Interest
Newtown Creek Site # 241117
City of New York, New York

Map No.	Site Name	Borough	Property Address	DAR No.[1]	State of New York Program	Site Code (s)
32	Western Beef	Queens	47-05 Metropolitan Ave., Queens, NY 11385	NA	None	Prior closed spills
33	Feldman Metropolitan	Brooklyn	1281 Metropolitan Ave., Brooklyn, NY 11237	NA	None	NA
34	Charles J. King Inc.	Brooklyn	1283R Grand Street, Brooklyn, NY 11211	NA	SPDES	NYR00A895
35	Union Beer Distributors, LLC	Brooklyn	1217 and 1245 Grand Street, Brooklyn, NY 11211	NA	None	NA
36	Consolidated Carpet Trade Workroom, Inc.	Brooklyn	1181 Grand Street, Brooklyn, NY 11211	NA	None	Prior closed spills
37	1131 Grand Street, Inc.	Brooklyn	1131 Grand Street, Brooklyn, NY 11211	NA	None	NA
38	Darrel Albers Property or 1109 Metropolitan Avenue, LLC	Brooklyn	1109 Metropolitan Ave., Brooklyn, NY 11211	NA	None	NA
39	City of NY	Brooklyn	1106 Grand Street, Brooklyn, NY 11211	NA	None	NA
40	8 Rewe Street, LLC	Brooklyn	8 Rewe St., Brooklyn, NY 11211	NA	None	NA
41	East Terminal, LLC	Brooklyn	12 Rewe Street, Brooklyn, NY 11211	NA	None	Prior closed spills
42	HAST Properties Company	Brooklyn	16 Rewe Street, Brooklyn, NY 11211	NA	None	NA
43	A&I Reality Corp.	Brooklyn	20 Rewe Street, Brooklyn, NY 11211	NA	None	NA
44	15 Rewe Street LLC	Brooklyn	15 Rewe Street, Brooklyn, NY 11211	NA	None	11-07229
45	T&T Scrap, LLC	Brooklyn	340 Maspeth Ave., Brooklyn, NY 11211	NA	SPDES	NYR00E223
46	Connell Limited Partnership	Brooklyn	222 Morgan Avenue, Brooklyn, NY 11222	NA	None	NA

Table 1
Upland Properties of Interest
Newtown Creek Site # 241117
City of New York, New York

Map No.	Site Name	Borough	Property Address	DAR No.[1]	State of New York Program	Site Code (s)
47	Allied Sanitation, Inc.	Brooklyn	221 Varick Ave., Brooklyn, NY 11237	NA	ICIS-SPDES	NYR00D145
48	Meyer Fine Lumber Co.	Brooklyn	175 Varick Ave., Brooklyn, NY	NA	None	NA
49	Allocco Recycling	Brooklyn	540 Kingsland Avenue, Brooklyn, NY 11222	NA	SPDES	NYR00E401
50	CTS Corp and Dynamics Corp of America (former Radio Engineering Labs facility)	Queens	2901 Borden Avenue, Long Island City, NY 11101	NA		
Upland Facilities of Interest - Not Adjacent to Newtown Creek						
51	Former NuHart Plastic Manufacturing	Brooklyn	49 Dupont Street, Brooklyn, NY 11222	29	State of NY Superfund Program	224136
52	Amtrak Sunnyside Yard	Queens	39-29 Honeywell Street, Long Island City, NY 11101	102	State of NY Superfund Program	241006
53	Review Avenue Development I	Queens	37-30 Review Avenue, Long Island City, NY 11101		State of NY Brownfield	C241089
54	QUANTA Resources (Review Ave. Development II)	Queens	37-80 Review Avenue, Long Island City, NY 1	39	State of NY Brownfield	C241005
55	36-08 Review Avenue	Queens	36-04 Review Avenue, Long Island City, NY 1	NA	State of NY Brownfield	C241218
56	ACME Steel Metal Works	Kings	95 Lombardy Street, Brooklyn, NY 11222	100	State of NY Superfund Program	224131
57	ACME Steel Brass Foundry	Kings	72 Anthony Street, Brooklyn, NY 11222	25	State of NY Superfund Program	224132
58	Former Klink Kosmos Cleaners	Kings	364 Richardson Street, Brooklyn, NY 11222	101	State of NY Superfund Program	224130
59	Former Spic and Span Cleaners	Kings	315 Kingsland Avenue, Brooklyn, NY 11222	115	State of NY Superfund Program	224129
60	National Grid - Equity Works	Kings	Maspeth and Vandervort Avenues, Brooklyn, NY 11222	33	State of NY Superfund Program	224050
61	National Grid - Scholes St. Holder Station	Kings	Scholes St., 7 Bogart Sts, Messerole & Morgan Ave, Brooklyn, NY 11206	NA	State of NY Superfund Program	224067
62	NYC Troutman St. Venturi Flow Chamber	Queens	Troutman Street and Irving Avenue, Brooklyn, NY	NA	State of NY Spill	05-12607 (closed)
63	Con Edison Maspeth Substation	Queens	57-77 Rust Street, Maspeth, NY 11378	NA	State of NY Voluntary Cleanup Program	V00326
64	NYC Maspeth Project	Queens	57-15 49th Street, NYC, NY 11378	NA	Environmental Restoration Program	B00152

Notes:

[1] - DAR. Anchor QEA 2012. *Draft Data Applicability Report, Remedial Investigation/Feasibility Study, Newtown Creek* . Prepared by Anchor QEA, LLC. May 2012.

Table 2
Upland Site Characterization Sample Summary
Newtown Creek Site # 241117
Maspeth, New York

Activity/ Matrix	Number of Sample Locations	Location	Samples to be Collected	Analysis
Surface Water	TBD[1]	Throughout Newtown Creek	TBD[1]	EPH by MAEPH Method PCB Congeners by USEPA Method 1668A Dioxins and Furans by USEPA Method 1613B Metals by USEPA Method 6010D DRO by USEPA Method 8015D TPH by USEPA Method 8015D PAH and Alkyl PAH by USEPA Method 8270E SIM Total suspended solids SM 2540D
Sheen-Net	TBD[1]	Throughout Newtown Creek	TBD[1,2]	PAH and Alkyl PAH by USEPA Method 8270E SIM n-alkanes and isoprenoids, DRO, and TPH by USEPA Method 8015D EPH by MAEPH Oil and grease by USEPA Method 9071B PCB Congeners by USEPA Method 1668A

Notes and Acronym List:
[1] – Final number of samples will be based upon the number of potential seeps observed.
[2] – Collected samples will be analyzed in order of priority 1) PAH and Alkyl PAHs, 2) n-alkanes and isoprenoids, DRO and TPH, 3) EPH, 4) PCB congeners, and 5) oil and grease should insufficient volume be provided to the lab.
TBD – To Be Determined
EPH: Extractable Petroleum Hydrocarbons
MAEPH: Massachusetts Extractable Petroleum Hydrocarbons
USEPA: United States Environmental Protection Agency
PAH: Polycyclic Aromatic Hydrocarbons
PCB: Polychlorinated Biphenyls
DRO: Diesel Range Organics
TPH: Total Petroleum Hydrocarbons

Table 3
Analytical Methods/Quality Assurance Summary
Newtown Creek - Site # 241117
Maspeth, New York

				Field Quality Control			Containers per Sample			Preservation Requirements			
Parameter	**Matrix**	**Number of Samples (including Field QC)**	**Analytical Method***	**Field Duplicate**	**Matrix Spike/Matrix Spike Duplicate**	**Equipment Blank**	**No.**	**Size**	**Type**	**Temp.^{3}**	**Light Sensitive**	**Chemical**	**Maximum Holding Time^4**
Surface Water													
EPH	Aqueous	TBD^1	MAEPH	1:20	1:20	1:20	2	1 liter	Amber bottle	0-6º C	Yes	HCl	14 days
PAH and Alkyl PAH	Aqueous	TBD^1	SW-846 Method 8270C SIM	1:20	1:20	1:20	2	1 liter	Amber bottle	0-6º C	Yes	NA	7 days
Metals by ICP	Aqueous	TBD^1	SW-846 Method 6010B	1:20	1:20	1:20	1	250 ml	Plastic bottle	0-6º C	No	Nitric Acid	6 months
Diesel Range Organics (DRO) by GC	Aqueous	TBD^1	SW-846 Method 8015D	1:20	1:20	1:20	2	250 ml	Amber bottle	0-6º C	Yes	NA	7 days
Total Petroleum Hydrocarbons (TPH) by GC	Aqueous	TBD^1	SW-846 Method 8015D	1:20	1:20	1:20	2	1 liter	Amber bottle	0-6º C	No	NA	7 days
Dioxins and Furans (HRGC/HRMS)	Aqueous	TBD^1	SW-846 Method 1613B	1:20	1:20	1:20	2	1 liter	Amber bottle	0-6º C	No	NA	1 year
PCB Congeners (HRGC/HRMS)	Aqueous	TBD^1	SW-846 Method 1668A	1:20	1:20	1:20	2	1 liter	Amber bottle	0-6º C	No	NA	1 year
Total Suspended Solids (TSS)	Aqueous	TBD^1	SM 2540D	1:20	NA	NA	1	1 Liter	Plastic bottle	0-6º C	No	NA	7 days
Sheen-Net													
EPH	Solid	TBD^1	MAEPH	1:20	1:20	1:20	2	1 liter	Clear or amber bottle with Teflon line cap/lid	0-6º C	No	NA	40 days
n-alkanes and isoprenoids, DRO, and TPH	Solid	TBD^1	SW-846 Method 8015D	1:20	1:20	1:20							40 days
PAH and Alkyl PAH	Solid	TBD^1	SW-846 Method 8270C SIM	1:20	1:20	1:20							40 days
Oil and Grease	Solid	TBD^1	SW-846 Method 9071B	1:20	1:20	1:20							40 days
PCB Congeners (HRGC/HRMS)	Solid	TBD^1	SW-846 Method 1668A	1:20	1:20	1:20							40 days

Notes and Acronym List:

[1] – Final number of samples will be based upon the number of potential seeps observed. Field QC will be collected at a rate of one duplicate and matrix spike/matrix spike duplicate for every 20 samples.

[2] – Background sample will be collected from Newtown Creek in an area away from the shoreline and visibly free of sheen.

[3] – Samples may be held and shipped at 0° C but not frozen.

[4] – Holding times presented are from time of collection until extraction.

TBD: To Be Determined
NA: Not Applicable
EPH: Extractable Petroleum Hydrocarbons
MAEPH: Massachusetts Extractable Petroleum Hydrocarbons
USEPA: United States Environmental Protection Agency
PAH: Polycyclic Aromatic Hydrocarbons
PCB: Polychlorinated Biphenyls
DRO: Diesel Range Organics
TPH: Total Petroleum Hydrocarbons
GC: Gas Chromatography

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
Massachusetts - Extractable Petroleum Hydrocarbons	Aqueous	C11-C22 Aromatics (unadjusted)	STL00058	40.0	ug/L	40.0	ug/L
		C11-C22 Aromatics (Adjusted)	STL00203	40.0	ug/L	40.0	ug/L
		C19-C36 Aliphatics	STL00087	50.0	ug/L	50.0	ug/L
		C9-C18 Aliphatics	STL00306	30.0	ug/L	30.0	ug/L
PCB Congeners (HRGC/HRMS)	Aqueous	PCB-1	2051-60-7	50.5	pg/L	200	pg/L
		PCB-2	2051-61-8	74.0	pg/L	200	pg/L
		PCB-3	2051-62-9	41.6	pg/L	200	pg/L
		PCB-4	13029-08-8	5.00	pg/L	40.0	pg/L
		PCB-5	16605-91-7	7.83	pg/L	40.0	pg/L
		PCB-6	25569-80-6	14.0	pg/L	40.0	pg/L
		PCB-7	33284-50-3	8.28	pg/L	40.0	pg/L
		PCB-8	34883-43-7	10.5	pg/L	40.0	pg/L
		PCB-9	34883-39-1	8.77	pg/L	40.0	pg/L
		PCB-10	33146-45-1	5.41	pg/L	40.0	pg/L
		PCB-11	2050-67-1	136	pg/L	300	pg/L
		PCB-12/13	STL01797	22.1	pg/L	80.0	pg/L
		PCB-14	34883-41-5	5.00	pg/L	40.0	pg/L
		PCB-15	2050-68-2	8.49	pg/L	40.0	pg/L
		PCB-16	38444-78-9	5.32	pg/L	40.0	pg/L
		PCB-17	37680-66-3	6.13	pg/L	40.0	pg/L
		PCB-18/30	STL01798	10.0	pg/L	80.0	pg/L
		PCB-19	38444-73-4	5.00	pg/L	40.0	pg/L
		PCB-20/28	STL01799	16.3	pg/L	80.0	pg/L
		PCB-21/33	STL01800	10.0	pg/L	80.0	pg/L
		PCB-22	38444-85-8	5.93	pg/L	40.0	pg/L
		PCB-23	55720-44-0	5.04	pg/L	40.0	pg/L
		PCB-24	55702-45-9	5.00	pg/L	40.0	pg/L
		PCB-25	55712-37-3	5.00	pg/L	40.0	pg/L
		PCB-26/29	STL01801	29.4	pg/L	80.0	pg/L
		PCB-27	38444-76-7	5.00	pg/L	40.0	pg/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Aqueous	PCB-31	16606-02-3	11.7	pg/L	40.0	pg/L
		PCB-32	38444-77-8	5.07	pg/L	40.0	pg/L
		PCB-34	37680-68-5	5.83	pg/L	40.0	pg/L
		PCB-35	37680-69-6	5.00	pg/L	40.0	pg/L
		PCB-36	38444-87-0	7.16	pg/L	40.0	pg/L
		PCB-37	38444-90-5	5.76	pg/L	40.0	pg/L
		PCB-38	53555-66-1	5.00	pg/L	40.0	pg/L
		PCB-39	38444-88-1	6.20	pg/L	40.0	pg/L
		PCB-40/71	STL01802	20.1	pg/L	160	pg/L
		PCB-41	52663-59-9	13.2	pg/L	80.0	pg/L
		PCB-42	36559-22-5	14.2	pg/L	80.0	pg/L
		PCB-43	70362-46-8	10.0	pg/L	80.0	pg/L
		PCB-44/47/65	STL01803	38.9	pg/L	240	pg/L
		PCB-45	70362-45-7	11.6	pg/L	80.0	pg/L
		PCB-46	41464-47-5	10.0	pg/L	80.0	pg/L
		PCB-48	70362-47-9	12.6	pg/L	80.0	pg/L
		PCB-49/69	STL01805	25.2	pg/L	160	pg/L
		PCB-50/53	STL01806	94.7	pg/L	300	pg/L
		PCB-51	68194-04-7	31.6	pg/L	80.0	pg/L
		PCB-52	35693-99-3	21.1	pg/L	80.0	pg/L
		PCB-54	15968-05-5	10.0	pg/L	80.0	pg/L
		PCB-55	74338-24-2	12.3	pg/L	80.0	pg/L
		PCB-56	41464-43-1	10.8	pg/L	80.0	pg/L
		PCB-57	70424-67-8	13.7	pg/L	80.0	pg/L
		PCB-58	41464-49-7	13.0	pg/L	80.0	pg/L
		PCB-59/62/75	STL01807	41.7	pg/L	240	pg/L
		PCB-60	33025-41-1	12.6	pg/L	80.0	pg/L
		PCB-61/70/74/76	STL01808	47.9	pg/L	320	pg/L
		PCB-63	74472-34-7	12.9	pg/L	80.0	pg/L
		PCB-64	52663-58-8	11.0	pg/L	80.0	pg/L
		PCB-66	32598-10-0	11.0	pg/L	80.0	pg/L
		PCB-67	73575-53-8	12.3	pg/L	80.0	pg/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Aqueous	PCB-68	73575-52-7	15.3	pg/L	80.0	pg/L
		PCB-72	41464-42-0	15.7	pg/L	80.0	pg/L
		PCB-73	74338-23-1	20.8	pg/L	80.0	pg/L
		PCB-77	32598-13-3	10.5	pg/L	80.0	pg/L
		PCB-78	70362-49-1	14.1	pg/L	80.0	pg/L
		PCB-79	41464-48-6	14.2	pg/L	80.0	pg/L
		PCB-80	33284-52-5	16.6	pg/L	80.0	pg/L
		PCB-81	70362-50-4	10.0	pg/L	80.0	pg/L
		PCB-82	52663-62-4	12.3	pg/L	80.0	pg/L
		PCB-83	60145-20-2	12.6	pg/L	80.0	pg/L
		PCB-84	52663-60-2	11.9	pg/L	80.0	pg/L
		PCB-85/116/117	STL01810	68.0	pg/L	240	pg/L
		PCB-86/87/97/109/119/125	STL02295	128	pg/L	480	pg/L
		PCB-88	55215-17-3	14.9	pg/L	80.0	pg/L
		PCB-89	73575-57-2	14.9	pg/L	80.0	pg/L
		PCB-90/101/113	STL01813	41.3	pg/L	240	pg/L
		PCB-91	68194-05-8	11.9	pg/L	80.0	pg/L
		PCB-92	52663-61-3	15.6	pg/L	80.0	pg/L
		PCB-93/100	STL01814	30.8	pg/L	160	pg/L
		PCB-94	73575-55-0	13.9	pg/L	80.0	pg/L
		PCB-95	38379-99-6	15.4	pg/L	80.0	pg/L
		PCB-96	73575-54-9	12.9	pg/L	80.0	pg/L
		PCB-98/102	STL01843	41.3	pg/L	200	pg/L
		PCB-99	38380-01-7	14.6	pg/L	80.0	pg/L
		PCB-103	60145-21-3	18.3	pg/L	80.0	pg/L
		PCB-104	56558-16-8	12.7	pg/L	80.0	pg/L
		PCB-105	32598-14-4	12.9	pg/L	80.0	pg/L
		PCB-106	70424-69-0	15.6	pg/L	80.0	pg/L
		PCB-107	70424-68-9	16.2	pg/L	80.0	pg/L
		PCB-108/124	STL02294	31.8	pg/L	160	pg/L
		PCB-110/115	STL01826	61.1	pg/L	160	pg/L
		PCB-111	39635-32-0	17.1	pg/L	80.0	pg/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Aqueous	PCB-112	74472-36-9	17.6	pg/L	80.0	pg/L
		PCB-114	74472-37-0	15.4	pg/L	80.0	pg/L
		PCB-118	31508-00-6	13.5	pg/L	80.0	pg/L
		PCB-120	68194-12-7	16.7	pg/L	80.0	pg/L
		PCB-121	56558-18-0	14.4	pg/L	80.0	pg/L
		PCB-122	76842-07-4	13.5	pg/L	80.0	pg/L
		PCB-123	65510-44-3	13.1	pg/L	80.0	pg/L
		PCB-126	57465-28-8	16.6	pg/L	80.0	pg/L
		PCB-127	39635-33-1	18.7	pg/L	80.0	pg/L
		PCB-128/166	STL01816	39.8	pg/L	160	pg/L
		PCB-129/138/163	STL01817	52.3	pg/L	240	pg/L
		PCB-130	52663-66-8	18.5	pg/L	80.0	pg/L
		PCB-131	61798-70-7	15.9	pg/L	80.0	pg/L
		PCB-132	38380-05-1	15.2	pg/L	80.0	pg/L
		PCB-133	35694-04-3	18.3	pg/L	80.0	pg/L
		PCB-134	52704-70-8	15.5	pg/L	80.0	pg/L
		PCB-135/151	STL01819	43.1	pg/L	160	pg/L
		PCB-136	38411-22-2	15.0	pg/L	80.0	pg/L
		PCB-137	35694-06-5	19.3	pg/L	80.0	pg/L
		PCB-139/140	STL01820	32.9	pg/L	160	pg/L
		PCB-141	52712-04-6	22.5	pg/L	80.0	pg/L
		PCB-142	41411-61-4	17.8	pg/L	80.0	pg/L
		PCB-143	68194-15-0	17.1	pg/L	80.0	pg/L
		PCB-144	68194-14-9	16.7	pg/L	80.0	pg/L
		PCB-145	74472-40-5	15.4	pg/L	80.0	pg/L
		PCB-146	51908-16-8	15.6	pg/L	80.0	pg/L
		PCB-147/149	STL01821	28.7	pg/L	160	pg/L
		PCB-148	74472-41-6	15.9	pg/L	80.0	pg/L
		PCB-150	68194-08-1	16.7	pg/L	80.0	pg/L
		PCB-152	68194-09-2	14.6	pg/L	80.0	pg/L
		PCB-153/168	STL01822	30.6	pg/L	160	pg/L
		PCB-154	60145-22-4	46.8	pg/L	200	pg/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Aqueous	PCB-155	33979-03-2	15.7	pg/L	80.0	pg/L
		PCB-156/157	STL01792	34.9	pg/L	160	pg/L
		PCB-158	74472-42-7	18.7	pg/L	80.0	pg/L
		PCB-159	39635-35-3	20.1	pg/L	80.0	pg/L
		PCB-160	41411-62-5	19.8	pg/L	80.0	pg/L
		PCB-161	74472-43-8	17.3	pg/L	80.0	pg/L
		PCB-162	39635-34-2	19.6	pg/L	80.0	pg/L
		PCB-164	74472-45-0	17.6	pg/L	80.0	pg/L
		PCB-165	74472-46-1	17.3	pg/L	80.0	pg/L
		PCB-167	52663-72-6	17.0	pg/L	80.0	pg/L
		PCB-169	32774-16-6	18.6	pg/L	80.0	pg/L
		PCB-170	35065-30-6	17.7	pg/L	80.0	pg/L
		PCB-171/173	STL01823	37.6	pg/L	160	pg/L
		PCB-172	52663-74-8	15.8	pg/L	80.0	pg/L
		PCB-174	38411-25-5	17.6	pg/L	80.0	pg/L
		PCB-175	40186-70-7	20.9	pg/L	80.0	pg/L
		PCB-176	52663-65-7	16.1	pg/L	80.0	pg/L
		PCB-177	52663-70-4	17.9	pg/L	80.0	pg/L
		PCB-178	52663-67-9	26.5	pg/L	80.0	pg/L
		PCB-179	52663-64-6	14.1	pg/L	80.0	pg/L
		PCB-180/193	STL01824	29.1	pg/L	160	pg/L
		PCB-181	74472-47-2	20.8	pg/L	80.0	pg/L
		PCB-182	60145-23-5	23.7	pg/L	80.0	pg/L
		PCB-183/185	STL02297	51.9	pg/L	160	pg/L
		PCB-184	74472-48-3	16.2	pg/L	80.0	pg/L
		PCB-186	74472-49-4	17.1	pg/L	80.0	pg/L
		PCB-187	52663-68-0	20.4	pg/L	80.0	pg/L
		PCB-188	74487-85-7	81.2	pg/L	200	pg/L
		PCB-189	39635-31-9	17.6	pg/L	80.0	pg/L
		PCB-190	41411-64-7	19.8	pg/L	80.0	pg/L
		PCB-191	74472-50-7	16.0	pg/L	80.0	pg/L
		PCB-192	74472-51-8	18.0	pg/L	80.0	pg/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Aqueous	PCB-194	35694-08-7	28.7	pg/L	120	pg/L
		PCB-195	52663-78-2	27.9	pg/L	120	pg/L
		PCB-196	42740-50-1	23.8	pg/L	120	pg/L
		PCB-197/200	STL02692	79.4	pg/L	240	pg/L
		PCB-198/199	STL01825	49.7	pg/L	240	pg/L
		PCB-201	40186-71-8	99.6	pg/L	400	pg/L
		PCB-202	2136-99-4	28.1	pg/L	120	pg/L
		PCB-203	52663-76-0	21.3	pg/L	120	pg/L
		PCB-204	74472-52-9	22.8	pg/L	120	pg/L
		PCB-205	74472-53-0	27.8	pg/L	120	pg/L
		PCB-206	40186-72-9	25.2	pg/L	120	pg/L
		PCB-207	52663-79-3	24.5	pg/L	120	pg/L
		PCB(C) 208	52663-77-1	26.4	pg/L	120	pg/L
		DCB Decachlorobiphenyl	2051-24-3	364	pg/L	1000	pg/L
Dioxins and Furans (HRGC/HRMS)	Aqueous	1,2,3,4,6,7,8-HpCDD	35822-46-9	4.53	pg/L	25.0	pg/L
		1,2,3,4,6,7,8-HpCDF	67562-39-4	2.50	pg/L	25.0	pg/L
		1,2,3,4,7,8-HxCDD	39227-28-6	2.50	pg/L	25.0	pg/L
		1,2,3,4,7,8-HxCDF	70648-26-9	2.50	pg/L	25.0	pg/L
		1,2,3,4,7,8,9-HpCDF	55673-89-7	2.50	pg/L	25.0	pg/L
		1,2,3,6,7,8-HxCDD	57653-85-7	2.50	pg/L	25.0	pg/L
		1,2,3,6,7,8-HxCDF	57117-44-9	2.50	pg/L	25.0	pg/L
		1,2,3,7,8-PeCDD	40321-76-4	3.16	pg/L	25.0	pg/L
		1,2,3,7,8-PeCDF	57117-41-6	2.76	pg/L	25.0	pg/L
		1,2,3,7,8,9-HxCDD	19408-74-3	2.50	pg/L	25.0	pg/L
		1,2,3,7,8,9-HxCDF	72918-21-9	2.50	pg/L	25.0	pg/L
		2,3,4,6,7,8-HxCDF	60851-34-5	2.50	pg/L	25.0	pg/L
		2,3,4,7,8-PeCDF	57117-31-4	2.50	pg/L	25.0	pg/L
		2,3,7,8-TCDD	1746-01-6	0.873	pg/L	5.00	pg/L
		2,3,7,8-TCDF	51207-31-9	0.812	pg/L	5.00	pg/L
		OCDD	3268-87-9	36.2	pg/L	110	pg/L
		OCDF	39001-02-0	6.15	pg/L	50.0	pg/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
Dioxins and Furans (HRGC/HRMS)	Aqueous	Total HpCDD	37871-00-4	2.50	pg/L	25.0	pg/L
		Total HpCDF	38998-75-3	2.50	pg/L	25.0	pg/L
		Total HxCDD	34465-46-8	2.50	pg/L	25.0	pg/L
		Total HxCDF	55684-94-1	2.50	pg/L	25.0	pg/L
		Total PeCDD	36088-22-9	3.16	pg/L	25.0	pg/L
		Total PeCDF	30402-15-4	2.50	pg/L	25.0	pg/L
		Total TCDD	41903-57-5	0.873	pg/L	5.00	pg/L
		Total TCDF	30402-14-3	0.812	pg/L	5.00	pg/L
		Total PCDD	STL02731	2.50	pg/L	25.0	pg/L
		Total PCDF	STL02732	2.50	pg/L	25.0	pg/L
		Total PCDD/PCDF	STL02693	2.50	pg/L	25.0	pg/L
Metals	Aqueous	Copper	7440-50-8	6.94	ug/L	25.0	ug/L
		Lead	7439-92-1	2.35	ug/L	10.0	ug/L
Diesel Range Organics (DRO)	Aqueous	C10-C28	STL00816	45.00	ug/L	100	ug/L
Total Petroleum Hydrocarbons	Aqueous	C9-C40	STL00303	0.074	mg/L	0.2	mg/L
Total Suspended Solids (TSS)	Aqueous	Total Suspended Solids (TSS)	STL00161	1.00	mg/L	3	mg/L
PAH and Alkyl PAH	Aqueous	1-Methylnaphthalene	90-12-0	0.0100	ug/L	0.0500	ug/L
		2-Methylnaphthalene	91-57-6	0.0300	ug/L	0.0700	ug/L
		Acenaphthene	83-32-9	0.0100	ug/L	0.0500	ug/L
		Acenaphthylene	208-96-8	0.0100	ug/L	0.0500	ug/L
		Anthracene	120-12-7	0.0100	ug/L	0.0500	ug/L
		Benzo[a]anthracene	56-55-3	0.0100	ug/L	0.0500	ug/L
		Benzo[a]pyrene	50-32-8	0.0100	ug/L	0.0500	ug/L
		Benzo[b]fluoranthene	205-99-2	0.0400	ug/L	0.0900	ug/L
		Benzo[e]pyrene	192-97-2	0.0100	ug/L	0.0500	ug/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PAH and Alkyl PAH	Aqueous	Benzo[g,h,i]perylene	191-24-2	0.0300	ug/L	0.0700	ug/L
		Benzo(k)fluoranthene	207-08-9	0.01	ug/L	0.0500	ug/L
		Biphenyl	92-52-4	0.0200	ug/L	0.0500	ug/L
		C1-Benzo(a)anthracenes/Chrysenes	STL02218	0.0100	ug/L	0.0500	ug/L
		C1-Dibenzothiophenes	STL00909	0.0200	ug/L	0.0500	ug/L
		C1-Fluoranthene/Pyrenes	STL00912	0.0100	ug/L	0.0500	ug/L
		C1-Fluorenes	STL00913	0.0100	ug/L	0.0500	ug/L
		C1-Naphthalenes	STL00916	0.0300	ug/L	0.0800	ug/L
		C1-Phenanthrenes/Anthracenes	STL00901	0.0300	ug/L	0.0800	ug/L
		C2-Benzo(a)anthracenes/Chrysenes	STL02219	0.0100	ug/L	0.0500	ug/L
		C2-Dibenzothiophenes	STL00910	0.0200	ug/L	0.0500	ug/L
		C2-Fluorenes	STL00914	0.0100	ug/L	0.0500	ug/L
		C2-Naphthalenes	STL00917	0.0300	ug/L	0.0800	ug/L
		C2-Phenanthrenes/Anthracenes	STL00902	0.0300	ug/L	0.0800	ug/L
		C3-Benzo(a)Anthracenes/Chrysenes	STL02220	0.0100	ug/L	0.0500	ug/L
		C3-Dibenzothiophenes	STL00911	0.0200	ug/L	0.0500	ug/L
		C3-Fluorenes	STL00915	0.0100	ug/L	0.0500	ug/L
		C3-Naphthalenes	STL00918	0.0300	ug/L	0.0800	ug/L
		C3-Naphthobenzothiophenes	STL01785	0.0200	ug/L	0.0500	ug/L
		C4-Benzo(a)anthracenes/Chrysenes	STL02221	0.0100	ug/L	0.0500	ug/L
		C4-Dibenzothiophenes	STL00967	0.0200	ug/L	0.0500	ug/L
		C4-Naphthalenes	STL00919	0.0300	ug/L	0.0800	ug/L
		C4-Phenanthrenes/Anthracenes	STL00904	0.0300	ug/L	0.0800	ug/L
		Chrysene	218-01-9	0.0100	ug/L	0.0500	ug/L
		Dibenz(a,h)anthracene	53-70-3	0.0100	ug/L	0.0500	ug/L
		Dibenzothiophene	132-65-0	0.0200	ug/L	0.0500	ug/L
		Fluoranthene	206-44-0	0.0100	ug/L	0.0500	ug/L
		Fluorene	86-73-7	0.0100	ug/L	0.0500	ug/L
		Indeno[1,2,3-cd]pyrene	193-39-5	0.0400	ug/L	0.0900	ug/L
		Naphthalene	91-20-3	0.0300	ug/L	0.0800	ug/L
		Perylene	198-55-0	0.0200	ug/L	0.0500	ug/L
		Phenanthrene	85-01-8	0.0300	ug/L	0.0800	ug/L

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PAH and Alkyl PAH	Aqueous	Pyrene	129-00-0	0.0200	ug/L	0.0500	ug/L
		Retene	483-65-8	0.0200	ug/L	0.0500	ug/L
PAH and Alkyl PAH	Soild	1-Methylnaphthalene	90-12-0	0.019998	ug/Sample	0.049995	ug/Sample
		2-Methylnaphthalene	91-57-6	0.029997	ug/Sample	0.049995	ug/Sample
		Acenaphthene	83-32-9	0.019998	ug/Sample	0.049995	ug/Sample
		Acenaphthylene	208-96-8	0.009999	ug/Sample	0.049995	ug/Sample
		Anthracene	120-12-7	0.009999	ug/Sample	0.049995	ug/Sample
		Benzo[a]anthracene	56-55-3	0.019998	ug/Sample	0.049995	ug/Sample
		Benzo[a]pyrene	50-32-8	0.019998	ug/Sample	0.049995	ug/Sample
		Benzo[b]fluoranthene	205-99-2	0.019998	ug/Sample	0.049995	ug/Sample
		Benzo[e]pyrene	192-97-2	0.019998	ug/Sample	0.049995	ug/Sample
		Benzo[g,h,i]perylene	191-24-2	0.019998	ug/Sample	0.049995	ug/Sample
		Benzo[k]fluoranthene	207-08-9	0.019998	ug/Sample	0.049995	ug/Sample
		1,1'-Biphenyl	92-52-4	0.019998	ug/Sample	0.049995	ug/Sample
		C1-Chrysenes/Benz(a)anthracenes	STL02218	0.019998	ug/Sample	0.049995	ug/Sample
		C1-Dibenzothiophenes	STL00909	0.019998	ug/Sample	0.049995	ug/Sample
		C1-Fluoranthenes/pyrene	STL00912	0.019998	ug/Sample	0.049995	ug/Sample
		C1-Fluorenes	STL00913	0.019998	ug/Sample	0.049995	ug/Sample
		C1-Naphthalenes	STL00916	0.039996	ug/Sample	0.069993	ug/Sample
		C1-Naphthobenzothiophenes	STL01783	0.019998	ug/Sample	0.049995	ug/Sample
		C1-Phenanthrenes/Anthracenes	STL00901	0.019998	ug/Sample	0.049995	ug/Sample
		C2-Chrysenes/Benz(a)anthracenes	STL02219	0.019998	ug/Sample	0.049995	ug/Sample
		C2-Dibenzothiophenes	STL00910	0.019998	ug/Sample	0.049995	ug/Sample
		C2-Fluoranthenes/Pyrene	STL00968	0.019998	ug/Sample	0.049995	ug/Sample
		C2-Fluorenes	STL00914	0.019998	ug/Sample	0.049995	ug/Sample
		C2-Naphthalenes	STL00917	0.039996	ug/Sample	0.069993	ug/Sample
		C2-Naphthobenzothiophenes	STL01784	0.019998	ug/Sample	0.049995	ug/Sample
		C2-Phenanthrenes/Anthracenes	STL00902	0.019998	ug/Sample	0.049995	ug/Sample
		C3-Chrysenes/Benz(a)anthracenes	STL02220	0.019998	ug/Sample	0.049995	ug/Sample
		C3-Dibenzothiophenes	STL00911	0.019998	ug/Sample	0.049995	ug/Sample
		C3-Fluoranthenes/Pyrene	STL00969	0.019998	ug/Sample	0.049995	ug/Sample

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PAH and Alkyl PAH	Solid	C3-Fluorenes	STL00915	0.019998	ug/Sample	0.049995	ug/Sample
		C3-Naphthalenes	STL00918	0.039996	ug/Sample	0.069993	ug/Sample
		C3-Naphthobenzothiophenes	STL01785	0.019998	ug/Sample	0.049995	ug/Sample
		C3-Phenanthrenes/Anthracenes	STL00903	0.019998	ug/Sample	0.049995	ug/Sample
		C4-Chrysenes/Benz(a)anthracenes	STL02221	0.019998	ug/Sample	0.049995	ug/Sample
		C4-Dibenzothiophenes	STL00967	0.019998	ug/Sample	0.049995	ug/Sample
		C4-Fluoranthenes/Pyrene	STL01791	0.019998	ug/Sample	0.049995	ug/Sample
		C4-Naphthalenes	STL00919	0.039996	ug/Sample	0.069993	ug/Sample
		C4-Phenanthrenes/Anthracenes	STL00904	0.019998	ug/Sample	0.049995	ug/Sample
		Chrysene	218-01-9	0.009999	ug/Sample	0.049995	ug/Sample
		Dibenz(a,h)anthracene	53-70-3	0.019998	ug/Sample	0.049995	ug/Sample
		Dibenzofuran	132-64-9	0.019998	ug/Sample	0.049995	ug/Sample
		Dibenzothiophene	132-65-0	0.019998	ug/Sample	0.049995	ug/Sample
		Fluoranthene	206-44-0	0.019998	ug/Sample	0.049995	ug/Sample
		Fluorene	86-73-7	0.019998	ug/Sample	0.049995	ug/Sample
		Indeno[1,2,3-cd]pyrene	193-39-5	0.019998	ug/Sample	0.049995	ug/Sample
		Naphthalene	91-20-3	0.039996	ug/Sample	0.069993	ug/Sample
		C3-Phenanthrenes/Anthracenes	STL009063	0.019998	ug/Sample	0.049995	ug/Sample
		Naphthobenzothiophene	239-35-0	0.019998	ug/Sample	0.049995	ug/Sample
		Perylene	198-55-0	0.019998	ug/Sample	0.049995	ug/Sample
		Phenanthrene	85-01-8	0.019998	ug/Sample	0.049995	ug/Sample
		Pyrene	129-00-0	0.019998	ug/Sample	0.049995	ug/Sample
		Retene	483-65-8	0.019998	ug/Sample	0.049995	ug/Sample
n-Alkanes and Isoprenoids	Soild	Diesel Fuel 2-FID	STL02781	0.0110	mg/Sample	0.0330	mg/Sample
		DRO (C10-C28)	STL00143	4.00	mg/Sample	12.0	mg/Sample
		Isoprenoid RRT 1380	STL01394	0.0110	mg/Sample	0.0330	mg/Sample
		Isoprenoid RRT 1470	STL01395	0.0110	mg/Sample	0.0330	mg/Sample
		n-Decane	124-18-5	0.0148	mg/Sample	0.0445	mg/Sample
		n-Docosane	629-97-0	0.0110	mg/Sample	0.0330	mg/Sample
		n-Dodecane	112-40-3	0.0120	mg/Sample	0.0330	mg/Sample
		n-Dotriacontane	544-85-4	0.0130	mg/Sample	0.0330	mg/Sample

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
n-Alkanes and Isoprenoids	Solid	n-Eicosane	112-95-8	0.0120	mg/Sample	0.0330	mg/Sample
		n-Heneicosane	629-94-7	0.0110	mg/Sample	0.0330	mg/Sample
		n-Hentriacontane	630-04-6	0.0162	mg/Sample	0.0486	mg/Sample
		n-Heptacosane	593-49-7	0.0320	mg/Sample	0.0950	mg/Sample
		n-Heptadecane	629-78-7	0.0180	mg/Sample	0.0330	mg/Sample
		n-Heptatriacontane	7194-84-5	0.0110	mg/Sample	0.0330	mg/Sample
		n-Hexacosane	630-01-3	0.0190	mg/Sample	0.0330	mg/Sample
		n-Hexadecane	544-76-3	0.0110	mg/Sample	0.0330	mg/Sample
		n-Hexatriacontane	630-06-8	0.0390	mg/Sample	0.0500	mg/Sample
		n-Nonacosane	630-03-5	0.0110	mg/Sample	0.0330	mg/Sample
		n-Nonadecane	629-92-5	0.0390	mg/Sample	0.500	mg/Sample
		n-Nonane	111-84-2	0.011	mg/Sample	0.033	mg/Sample
		N-Nonatriacontane	7194-86-7	0.0200	mg/Sample	0.0330	mg/Sample
		n-Octacosane	630-02-4	0.0110	mg/Sample	0.0330	mg/Sample
		n-Octadecane	593-45-3	0.0150	mg/Sample	0.0330	mg/Sample
		n-Octatriacontane	7194-85-6	0.0150	mg/Sample	0.0600	mg/Sample
		Norpristane (1650)	STL01396	0.0110	mg/Sample	0.0330	mg/Sample
		n-Pentacosane	629-99-2	0.0110	mg/Sample	0.0330	mg/Sample
		n-Pentadecane	629-62-9	0.0110	mg/Sample	0.0330	mg/Sample
		n-Pentatriacontane	630-07-9	0.0110	mg/Sample	0.0330	mg/Sample
		n-Tetracontane	4181-95-7	0.0110	mg/Sample	0.0330	mg/Sample
		n-Tetracosane	646-31-1	0.0110	mg/Sample	0.0330	mg/Sample
		n-Tetradecane	629-59-4	0.0140	mg/Sample	0.0330	mg/Sample
		n-Tetratriacontane	14167-59-0	0.0130	mg/Sample	0.0330	mg/Sample
		n-Triacontane	638-68-6	0.0202	mg/Sample	0.606	mg/Sample
		n-Tricosane	638-67-5	0.0140	mg/Sample	0.0330	mg/Sample
		n-Tridecane	629-50-5	0.0110	mg/Sample	0.0330	mg/Sample
		n-Tritriacontane	630-05-7	0.0220	mg/Sample	0.0330	mg/Sample
		n-Undecane	1120-21-4	0.0202	mg/Sample	0.0607	mg/Sample
		Phytane	638-36-8	0.0240	mg/Sample	0.0330	mg/Sample
		Pristane	1921-70-6	0.0170	mg/Sample	0.0330	mg/Sample

Table 4
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Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
n-Alkanes and Isoprenoids	Solid	Total SHC	STL01398	N/A	mg/Sample	N/A	mg/Sample
		TPH (Total hydrocarbon range) C9-C40	STL00695	4.00	mg/Sample	12.0	mg/Sample
Extractable Petroleum Hydrocarbons	Solid	C11-C22 Aromatics (Unadjusted)	STL00058	0.12	mg/Sample	0.12	mg/Sample
		C11-C22 Aromatics (Adjusted)	STL00203	0.12	mg/Sample	0.12	mg/Sample
		C19-C36 Aliphatics	STL00087	0.12	mg/Sample	0.12	mg/Sample
		C9-C18 Aliphatics	STL00306	0.06	mg/Sample	0.06	mg/Sample
PCB Congeners (HRGC/HRMS)	Solid	PCB-1	2051-60-7	2.39	ng/Sample	8	ng/Sample
		PCB-10	33146-45-1	1.52	ng/Sample	8	ng/Sample
		PCB-103	60145-21-3	2.74	ng/Sample	16	ng/Sample
		PCB-104	56558-16-8	2	ng/Sample	16	ng/Sample
		PCB-105	32598-14-4	2	ng/Sample	16	ng/Sample
		PCB-106	70424-69-0	2	ng/Sample	16	ng/Sample
		PCB-107	70424-68-9	2	ng/Sample	16	ng/Sample
		PCB-108/124	STL02294	4	ng/Sample	32	ng/Sample
		PCB-11	2050-67-1	12.9	ng/Sample	30	ng/Sample
		PCB-110/115	STL01826	4	ng/Sample	32	ng/Sample
		PCB-111	39635-32-0	2	ng/Sample	16	ng/Sample
		PCB-112	74472-36-9	2	ng/Sample	16	ng/Sample
		PCB-114	74472-37-0	2	ng/Sample	16	ng/Sample
		PCB-118	31508-00-6	2	ng/Sample	16	ng/Sample
		PCB-12/13	STL01797	4.52	ng/Sample	16	ng/Sample
		PCB-120	68194-12-7	2	ng/Sample	16	ng/Sample
		PCB-121	56558-18-0	2.4	ng/Sample	16	ng/Sample
		PCB-122	76842-07-4	2.35	ng/Sample	16	ng/Sample
		PCB-123	65510-44-3	2	ng/Sample	16	ng/Sample
		PCB-126	57465-28-8	2	ng/Sample	16	ng/Sample
		PCB-127	39635-33-1	2	ng/Sample	16	ng/Sample
		PCB-128/166	STL01816	4	ng/Sample	32	ng/Sample
		PCB-129/138/163	STL01817	6	ng/Sample	48	ng/Sample

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Solid	PCB-130	52663-66-8	2	ng/Sample	16	ng/Sample
		PCB-131	61798-70-7	2	ng/Sample	16	ng/Sample
		PCB-132	38380-05-1	2	ng/Sample	16	ng/Sample
		PCB-133	35694-04-3	2	ng/Sample	16	ng/Sample
		PCB-134	52704-70-8	2	ng/Sample	16	ng/Sample
		PCB-135/151	STL01819	9.07	ng/Sample	32	ng/Sample
		PCB-136	38411-22-2	4.51	ng/Sample	16	ng/Sample
		PCB-137	35694-06-5	2	ng/Sample	16	ng/Sample
		PCB-139/140	STL01820	4	ng/Sample	32	ng/Sample
		PCB-14	34883-41-5	1.16	ng/Sample	8	ng/Sample
		PCB-141	52712-04-6	2	ng/Sample	16	ng/Sample
		PCB-142	41411-61-4	2	ng/Sample	16	ng/Sample
		PCB-143	68194-15-0	2	ng/Sample	16	ng/Sample
		PCB-144	68194-14-9	3.63	ng/Sample	16	ng/Sample
		PCB-145	74472-40-5	4.23	ng/Sample	16	ng/Sample
		PCB-146	51908-16-8	2	ng/Sample	16	ng/Sample
		PCB-147/149	STL01821	4	ng/Sample	32	ng/Sample
		PCB-148	74472-41-6	2.72	ng/Sample	16	ng/Sample
		PCB-15	2050-68-2	1.84	ng/Sample	8	ng/Sample
		PCB-150	68194-08-1	4.47	ng/Sample	16	ng/Sample
		PCB-152	68194-09-2	4.35	ng/Sample	16	ng/Sample
		PCB-153/168	STL01822	4	ng/Sample	32	ng/Sample
		PCB-154	60145-22-4	2.25	ng/Sample	16	ng/Sample
		PCB-155	33979-03-2	2	ng/Sample	16	ng/Sample
		PCB-156/157	STL01792	4	ng/Sample	32	ng/Sample
		PCB-158	74472-42-7	2	ng/Sample	16	ng/Sample
		PCB-159	39635-35-3	2	ng/Sample	16	ng/Sample
		PCB-16	38444-78-9	2.35	ng/Sample	8	ng/Sample
		PCB-160	41411-62-5	2	ng/Sample	16	ng/Sample
		PCB-161	74472-43-8	2	ng/Sample	16	ng/Sample
		PCB-162	39635-34-2	2	ng/Sample	16	ng/Sample
		PCB-164	74472-45-0	2	ng/Sample	16	ng/Sample

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Solid	PCB-165	74472-46-1	2	ng/Sample	16	ng/Sample
		PCB-167	52663-72-6	2	ng/Sample	16	ng/Sample
		PCB-169	32774-16-6	2	ng/Sample	16	ng/Sample
		PCB-17	37680-66-3	1.97	ng/Sample	8	ng/Sample
		PCB-170	35065-30-6	2	ng/Sample	16	ng/Sample
		PCB-171/173	STL01823	4	ng/Sample	32	ng/Sample
		PCB-172	52663-74-8	2	ng/Sample	16	ng/Sample
		PCB-174	38411-25-5	2	ng/Sample	16	ng/Sample
		PCB-175	40186-70-7	2	ng/Sample	16	ng/Sample
		PCB-176	52663-65-7	2	ng/Sample	16	ng/Sample
		PCB-177	52663-70-4	2	ng/Sample	16	ng/Sample
		PCB-178	52663-67-9	2	ng/Sample	16	ng/Sample
		PCB-179	52663-64-6	2	ng/Sample	16	ng/Sample
		PCB-18/30	STL01798	2.79	ng/Sample	16	ng/Sample
		PCB-180/193	STL01824	4	ng/Sample	32	ng/Sample
		PCB-181	74472-47-2	2	ng/Sample	16	ng/Sample
		PCB-182	60145-23-5	2	ng/Sample	16	ng/Sample
		PCB-183/185	STL02297	4	ng/Sample	32	ng/Sample
		PCB-184	74472-48-3	2	ng/Sample	16	ng/Sample
		PCB-186	74472-49-4	2	ng/Sample	16	ng/Sample
		PCB-187	52663-68-0	3.07	ng/Sample	16	ng/Sample
		PCB-188	74487-85-7	2	ng/Sample	16	ng/Sample
		PCB-189	39635-31-9	2	ng/Sample	16	ng/Sample
		PCB-19	38444-73-4	1.17	ng/Sample	8	ng/Sample
		PCB-190	41411-64-7	2	ng/Sample	16	ng/Sample
		PCB-191	74472-50-7	2.21	ng/Sample	16	ng/Sample
		PCB-192	74472-51-8	2.17	ng/Sample	16	ng/Sample
		PCB-194	35694-08-7	3	ng/Sample	24	ng/Sample
		PCB-195	52663-78-2	3	ng/Sample	24	ng/Sample
		PCB-196	42740-50-1	3	ng/Sample	24	ng/Sample
		PCB-197/200	STL02692	6	ng/Sample	48	ng/Sample
		PCB-198/199	STL01825	6	ng/Sample	48	ng/Sample

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Solid	PCB-2	2051-61-8	2.03	ng/Sample	8	ng/Sample
		PCB-20/28	STL01799	2	ng/Sample	16	ng/Sample
		PCB-201	40186-71-8	3	ng/Sample	24	ng/Sample
		PCB-202	2136-99-4	3	ng/Sample	24	ng/Sample
		PCB-203	52663-76-0	3	ng/Sample	24	ng/Sample
		PCB-204	74472-52-9	3	ng/Sample	24	ng/Sample
		PCB-205	74472-53-0	3	ng/Sample	24	ng/Sample
		PCB-206	40186-72-9	3	ng/Sample	24	ng/Sample
		PCB-207	52663-79-3	3	ng/Sample	24	ng/Sample
		PCB-21/33	STL01800	2.05	ng/Sample	16	ng/Sample
		PCB-22	38444-85-8	1.36	ng/Sample	8	ng/Sample
		PCB-23	55720-44-0	1.34	ng/Sample	8	ng/Sample
		PCB-24	55702-45-9	1.09	ng/Sample	8	ng/Sample
		PCB-25	55712-37-3	1	ng/Sample	8	ng/Sample
		PCB-26/29	STL01801	2	ng/Sample	16	ng/Sample
		PCB-27	38444-76-7	1.55	ng/Sample	8	ng/Sample
		PCB-3	2051-62-9	2.53	ng/Sample	8	ng/Sample
		PCB-31	16606-02-3	1.42	ng/Sample	8	ng/Sample
		PCB-32	38444-77-8	1.34	ng/Sample	8	ng/Sample
		PCB-34	37680-68-5	1	ng/Sample	8	ng/Sample
		PCB-35	37680-69-6	3.17	ng/Sample	8	ng/Sample
		PCB-36	38444-87-0	1.37	ng/Sample	8	ng/Sample
		PCB-37	38444-90-5	1	ng/Sample	8	ng/Sample
		PCB-38	53555-66-1	1.64	ng/Sample	8	ng/Sample
		PCB-39	38444-88-1	1.73	ng/Sample	8	ng/Sample
		PCB-4	13029-08-8	2.09	ng/Sample	8	ng/Sample
		PCB-40/71	STL01802	4	ng/Sample	32	ng/Sample
		PCB-41	52663-59-9	2	ng/Sample	16	ng/Sample
		PCB-42	36559-22-5	2	ng/Sample	16	ng/Sample
		PCB-43	70362-46-8	2.5	ng/Sample	16	ng/Sample
		PCB-44/47/65	STL01803	6	ng/Sample	48	ng/Sample
		PCB-45	70362-45-7	2.9	ng/Sample	16	ng/Sample

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Solid	PCB-46	41464-47-5	2.93	ng/Sample	16	ng/Sample
		PCB-48	70362-47-9	2.33	ng/Sample	16	ng/Sample
		PCB-49/69	STL01805	4	ng/Sample	32	ng/Sample
		PCB-5	16605-91-7	1.93	ng/Sample	8	ng/Sample
		PCB-50/53	STL01806	6.17	ng/Sample	32	ng/Sample
		PCB-51	68194-04-7	3.04	ng/Sample	16	ng/Sample
		PCB-52	35693-99-3	2.18	ng/Sample	16	ng/Sample
		PCB-54	15968-05-5	3.11	ng/Sample	16	ng/Sample
		PCB-55	74338-24-2	2.05	ng/Sample	16	ng/Sample
		PCB-56	41464-43-1	2	ng/Sample	16	ng/Sample
		PCB-57	70424-67-8	2	ng/Sample	16	ng/Sample
		PCB-58	41464-49-7	2	ng/Sample	16	ng/Sample
		PCB-59/62/75	STL01807	6	ng/Sample	48	ng/Sample
		PCB-6	25569-80-6	1.86	ng/Sample	8	ng/Sample
		PCB-60	33025-41-1	2	ng/Sample	16	ng/Sample
		PCB-61/70/74/76	STL01808	8	ng/Sample	64	ng/Sample
		PCB-63	74472-34-7	2	ng/Sample	16	ng/Sample
		PCB-64	52663-58-8	2	ng/Sample	16	ng/Sample
		PCB-66	32598-10-0	2	ng/Sample	16	ng/Sample
		PCB-67	73575-53-8	2	ng/Sample	16	ng/Sample
		PCB-68	73575-52-7	2	ng/Sample	16	ng/Sample
		PCB-7	33284-50-3	1.55	ng/Sample	8	ng/Sample
		PCB-72	41464-42-0	2	ng/Sample	16	ng/Sample
		PCB-73	74338-23-1	2.69	ng/Sample	16	ng/Sample
		PCB-77	32598-13-3	2	ng/Sample	16	ng/Sample
		PCB-78	70362-49-1	3.34	ng/Sample	16	ng/Sample
		PCB-79	41464-48-6	2.29	ng/Sample	16	ng/Sample
		PCB-8	34883-43-7	2.56	ng/Sample	8	ng/Sample
		PCB-80	33284-52-5	2.53	ng/Sample	16	ng/Sample
		PCB-81	70362-50-4	2	ng/Sample	16	ng/Sample
		PCB-82	52663-62-4	2	ng/Sample	16	ng/Sample
		PCB-83	60145-20-2	2	ng/Sample	16	ng/Sample

Table 4
Analytical Limits
Newtown Creek Site # 241117
City of New York, New York

Group	Matrix	Analyte Description	CAS Number	MDL	Units	RL	Units
PCB Congeners (HRGC/HRMS)	Solid	PCB-84	52663-60-2	2	ng/Sample	16	ng/Sample
		PCB-85/116/117	STL01810	6	ng/Sample	48	ng/Sample
		PCB-86/87/97/109/119/125	STL02295	12	ng/Sample	96	ng/Sample
		PCB-88	55215-17-3	2.36	ng/Sample	16	ng/Sample
		PCB-89	73575-57-2	2	ng/Sample	16	ng/Sample
		PCB-9	34883-39-1	2.22	ng/Sample	8	ng/Sample
		PCB-90/101/113	STL01813	6.26	ng/Sample	48	ng/Sample
		PCB-91	68194-05-8	2.55	ng/Sample	16	ng/Sample
		PCB-92	52663-61-3	2	ng/Sample	16	ng/Sample
		PCB-93/100	STL01814	4.55	ng/Sample	32	ng/Sample
		PCB-94	73575-55-0	2.55	ng/Sample	16	ng/Sample
		PCB-95	38379-99-6	2	ng/Sample	16	ng/Sample
		PCB-96	73575-54-9	4.25	ng/Sample	16	ng/Sample
		PCB-98/102	STL01843	4.42	ng/Sample	32	ng/Sample
		PCB-99	38380-01-7	2.65	ng/Sample	16	ng/Sample
		PCB© 208	52663-77-1	3	ng/Sample	24	ng/Sample
		DCB Decachlorobiphenyl	2051-24-3	3.22	ng/Sample	24	ng/Sample
Oil and Grease	Solid	HEM	STL00181	4.00	mg/Sample	12	mg/Sample
		SGT-HEM	STL00240	2.00	mg/Sample	6	mg/Sample

APPENDIX A

Approved Plans

MOVE YOUR ENVIRONMENT FORWARD

GENERIC FIELD ACTIVITIES PLAN FOR WORK ASSIGNMENTS

Prepared For:

New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233
Contract No. D009808

Prepared By:

HRP Associates, Inc.
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Issued On: August 9, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
1/5/2009	Original document preparation	Jeffrey R. Sotek
8/1/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

TABLE OF CONTENTS

1.0 PURPOSE AND OBJECTIVES 1
    1.1 Purpose 1
    1.2 Objectives of a Field Activity Plan 1
    1.3 Responsibilities of the Consultant 1

2.0 BRIEF DESCRIPTION AND RATIONALE FOR FIELD ACTIVITIES 3

3.0 DIRECT-PUSH/GEOPROBE® DRILLING AND SAMPLING 7

4.0 MONITORING WELL INSTALLATION AND CONSTRUCTION 9
    4.1 Types of Monitoring Wells 9
    4.2 Temporary Monitoring Well/Sampling Point Construction 9
    4.3 Permanent Monitoring Well Construction 10
        4.3.1 Overburden Wells Using Direct-push Drilling, Hollow-stem Augers, or Mud Rotary 10
        4.3.2 Bedrock Monitoring Wells 11
    4.4 Monitoring Well Decommissioning 11

5.0 MONITORING WELL DEVELOPMENT 12

6.0 GROUNDWATER MONITORING AND SAMPLING 13
    6.1 General Groundwater Monitoring and Sampling Procedures 13
    6.2 Groundwater Sampling from Temporary Wells or Screen-point Samplers 13
    6.3 Groundwater Sampling from Permanent Monitoring Wells 14
        6.3.1 Purging and Sampling Equipment 14
        6.3.2 Field Analytical Equipment 14
        6.3.3 Sampling Procedures 15

7.0 EXPLORATORY TEST PITS EXCAVATION AND SAMPLING/TRENCHES 18

8.0 SURFACE WATER SAMPLING 19

9.0 SEDIMENT SAMPLING 21

10.0 SOIL VAPOR POINT INSTALLATION AND SAMPLING 23
    10.1 Soil Vapor Point Installation 23
    10.2 Soil Vapor Point Sampling 24

11.0 INDOOR AIR MONITORING 26
    11.1 Indoor Air Sample Collection 26
        11.1.1 Sub-Slab Sample Procedures 26
        11.1.2 Termination of Sample Collection 27
    11.2 Outdoor Air Sample Collection 28

11.3 Laboratory Analysis of Air Samples 28

12.0 COMMUNITY AIR MONITORING PROGRAMS 29

12.1 Monitoring 29
12.1.1 Continuous Air Monitoring 29
12.1.2 Periodic or “As-Needed” Air Monitoring 30
12.2 Action Levels and Response 30
12.2.1 Volatile Organic Compounds 30
12.2.2 Particulates 30

13.0 PRIVATE WELL/TAP WATER SAMPLING 32

14.0 PFAS SAMPLING AND ANALYSIS AND 1,4-DIOXANE ANALYSIS 34

14.1 Per- and Polyfluoroalkyl Substances 34
14.2 1,4-Dioxane Sampling and Analysis 36

15.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE 37

16.0 SITE SURVEY AND BASE MAP PREPARATION 40

17.0 REFERENCES 42

Appendices

Appendix A	HRP Standard Operating Procedures
Appendix B	Field Forms

1.0 PURPOSE AND OBJECTIVES

1.1 Purpose

This Generic Field Activities Plan has been prepared as a generic document to describe potential field activities that HRP Associates, Inc. (HRP) will perform or oversee for standby subcontract work assignments issued by the New York State Department of Environmental Conservation (NYSDEC) under Superfund Standby Contracts No. D009808. The principal purpose of this document is to describe and provide rationale for potential field activities that will be performed in association with projects Work Assignments under the contract. Specific details related to field activities for any given Work Assignment will be provided in the site-specific Work Plans developed for each project (hereinafter referred to as “Project-specific Work Plans”).

1.2 Objectives of a Field Activity Plan

An initial step in every work assignment is the development of a project-specific Work Plan, which includes the preparation of a Field Activities Plan (FAP). The project-specific FAP is prepared to identify and describe anticipated field activities on a project-specific basis. This generic FAP provides detailed information about field activities that HRP, NYSDEC, and/or subcontractor personnel could potentially perform on or adjacent to a site associated with a Work Assignment. Such information includes the definition, rationale, protocol, and any construction details or operation and maintenance of field activities on a general basis. Specific activities and details associated with a specific Work Assignment that may not have been included in this generic FAP will be provided in the project-specific FAP that is included as an appendix to the project-specific Work Plan.

The elements of this Generic FAP have been prepared in accordance with the most recent and applicable guidelines and requirements of the NYSDEC Division of Environmental Remediation (DER) and the New York State Department of Health (NYSDOH), as well as other applicable guidance, as appropriate. Site-specific work plans, which include the field activities plan, will be developed separately under each individual work assignment or as requested by the NYSDEC or NYSDOH.

1.3 Responsibilities of the Consultant

HRP will be responsible for performing each Work Assignment in accordance with generally accepted processional practices and regulatory guidance to achieve the project goals as established by the NYSDEC. Examples of regulatory guidance documents that are likely to be applicable to projects performed under the contract include DER-10 *Technical Guidance for Site Investigation and Remediation* and the *Spill Guidance Manual*, published by NYSDEC, as well as *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, published by the NYS Department of Health (DOH).

HRP will prepare project-specific Work Plans for each Work Assignment that describe the approach to achieving the project goals, the methodologies and techniques that will be used during the performance of project activities, and responsibilities for each task under the individual projects. Each project-specific Work Plan will include a project-specific FAP and Quality Assurance Project

Plan (QAPP). HRP will be responsible for ensuring that the activities performed during the course of the Work Assignment adhere to the procedures described in those documents, as well as applicable federal, state, and local statutes, regulations, policies, and protocols.

2.0 BRIEF DESCRIPTION AND RATIONALE FOR FIELD ACTIVITIES

The primary focus of a Work Assignment is to evaluate existing conditions on the site, groundwater flow direction, the nature and extent of the contamination, and possible human exposure to the contaminants through a systematic site characterization or remedial investigation.

The following tasks are among those that are anticipated as potential activities that may be completed by HRP as part of a site investigation/characterization and/or a remedial investigation. Details of each of these field activities, which have been developed in accordance with applicable NYSDEC guidance (e.g. *DER-10*, *Spill Guidance Manual*, etc.), as well as other applicable and relevant guidance, as appropriate, are provided in indicated sections of this generic FAP. Additional information on procedures used during site characterization and/or remedial investigations is provided in HRP's Standard Operating Procedures (SOPs), which are provided in Appendix A of this generic FAP.

Section	Field Activity and Objective
3	***Direct-Push Drilling and Sampling*** – The objective for this activity is to advance soil borings and collect soil samples during the course of a subsurface investigation. During direct-push/Macro-Core® drilling, the subsurface soils are extracted, screened, and classified to identify soil types, and collect representative soil samples from selected depth intervals. Soil borings advanced using direct-push drilling techniques may also be used for subsequent installation of monitoring wells, and direct-push methods may also be used to collect "grab" groundwater samples using specific equipment designed for that purpose. Results of soil and "grab" groundwater samples will be used to identify possible source areas, characterize the overall concentration and distribution of contaminants in the subsurface, delineate the three-dimensional extent of contaminants of concern, whether remedial action will be necessary, and determine whether the site should or should not remain part of Inactive Hazardous Waste Site listing.
4	***Monitoring Well Installation*** – Monitoring wells will be installed to measure water levels in the wells, collect samples of groundwater from specific depths and locations in relevant zones of the aquifer(s), and evaluate hydraulic characteristics of the aquifer(s) using slug tests, and/or pumping tests at a site. Such information will be used to identify hydrogeologic considerations that could affect contaminant fate and transport and distribution of contamination in groundwater, which will, in turn, be used to evaluate plume migration potential and whether remedial action is necessary.
5	***Monitoring Well Development*** – Well development is important component of the monitoring well installation process because it helps ensure that water withdrawn from the well has been in good communication with the surrounding aquifer and that groundwater chemistry is representative of chemistry in the aquifer in the vicinity of screened interval of the well. All monitoring wells will

be developed at an appropriate time interval following installation using surging and pumping techniques. During well development, temperature, conductivity, pH, and turbidity will be monitored to demonstrate that values have stabilized and that values are within acceptable limits.

6 ***Groundwater Monitoring and Sampling*** – Monitoring water levels in monitoring wells is conducted to obtain water-level information that will be used to calculate water-level elevations, which are subsequently used to evaluate groundwater flow directions, as well as horizontal and vertical gradients across a site. Groundwater samples are collected to evaluate water quality at various locations and depths within an aquifer. Water-level monitoring and groundwater sampling will be conducted at periodic intervals identified in project-specific Work Plans to delineate the extent of contaminants of concern within a groundwater monitoring well network, temporary well installation, or direct-push sampling point.

7 ***Exploratory Test Pit Excavation and Sampling/Trenching*** – Excavation of exploratory test pits or trenches may performed as an appropriate subsurface exploration activity to observe in-situ conditions over a broader area than can be achieved from soil samples collected from one or more boreholes. Data collected from test pits and trenches can include both geologic and hydrogeologic information as well as chemical data from soil samples collected during, or following, excavation activities. Test pits and trenching may also be appropriate to better identify areas of fill or subsurface disposal.

8 ***Surface Water Sampling*** – Depending on site-specific conditions with respect to physical characteristics and contaminant distribution and transport at a site, collection of surface water samples from surface water bodies on or adjacent to the site might be necessary to evaluate whether impacts to surface water are present as a results of contamination present on a site and whether human or ecological receptors could be at risk. In some cases, surface water may act to convey contaminants of concern from the site, and in other cases, surface water bodies may represent potential receptors to contamination originating on a site. Surface water bodies may include streams, ponds, storm sewers, ditches, etc.

9 ***Sediment Sampling*** – Similar to the objectives for surface water sampling, collection of sediment samples from surface water bodies on or adjacent to a site is necessary to evaluate potential risk to ecological receptors or to evaluate the extent and distribution of contamination on or emanating from a site. Often, sediment sampling is conducted in conjunction with surface water sampling, but depending on the conceptual model for contaminant distribution at a site, sediment sampling alone may be deemed appropriate.

10 ***Soil Vapor Point Installation and Sampling*** – Soil vapor sampling may be conducted for two primary purposes – 1) identification of potential source areas for VOC contamination in the subsurface or evaluation of plume extent in the shallow zone of an aquifer and 2) evaluation of the potential for vapor intrusion into building. Although both applications involve the installation of soil vapor

points into the subsurface for the purpose of collecting representative soil vapor samples for laboratory analysis, the techniques used and specifics of soil vapor point construction and sampling will be different depending on the purpose for the sampling. Specifics related to soil vapor point installation and sampling will be conducted in accordance with DOH soil vapor intrusion guidance (2006 *Guidance for Evaluating Soil Vapor Intrusion in New York State* and subsequent updates) and as determined by NYSDEC and in consultation with the NYSDOH.

11 ***Indoor Air Monitoring*** – Evaluating the quality of indoor air can be an important component of a vapor intrusion evaluation, depending on the results of sub-slab vapor sampling or if indicated as appropriate based on the 2006 DOH *Guidance for Evaluating Soil Vapor Intrusion in New York State* and subsequent updates. Sampling and analysis of indoor air will be conducted in accordance that guidance.

12 ***Community Air Monitoring*** – Monitoring concentrations of volatile organic compounds (VOCs) and particulate levels at the perimeter of the work area in real-time is an important component of any project for which the public could be at risk due to the release of VOCs or particulates into ambient air during the performance of investigation and/or remedial activities. Such monitoring may include a combination of continuous and periodic monitoring and design of such a monitoring program will be contingent upon site-specific field and construction activities.

13 ***Private Well/Tap Water Sampling*** – Sampling private water supplies may be an important task in certain contaminant characterization and remedial investigations. Objectives for such sampling can include the need to evaluate the extent of contamination in groundwater, as well as the need to evaluate potential risk to receptors of water from private water supply wells. Specific considerations related to sampling design and sample collection protocols will be dependent on project-specific objectives and the nature of contaminants and potential migration pathways.

14 ***PFAS Sampling and Analysis and 1.4-Dioxane Analysis*** – Since per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane and have become recognized as emerging contaminants, NYSDEC is requiring that all environmental media be sampled and analyzed for these contaminants in accordance with the most recent guidance. Sampling for PFAS requires specific sampling protocols due to the ubiquitous nature of PFAS compounds in many types of consumer products and generally acceptable materials used for collection of soil and groundwater samples. Laboratory analysis for PFAS and 1,4-dioxane also requires use of specific analytical methods due to the low detection limits necessary to evaluate potential risk.

15 ***Storage and Disposal of Waste*** – Management of investigation-derived waste is an important consideration in any subsurface investigation program. HRP will provide storage, handling, management, and disposal of investigative-derived

waste in a manner consistent with applicable statutes, regulations, guidance and policies.

16 ***Site Survey and Base Map Preparation*** – Accurate plotting of all investigation/characterization locations on site plans is a critical component of a site investigation/remedial action program. HRP will locate all field sampling locations using a high-precision GPS unit, survey equipment, and/or licensed surveyor, as directed by the NYSDEC project manager or as indicated in DER-10. Monitoring wells will be surveyed with respect to elevation to an accuracy of 0.01 feet relative to a known site datum. A topographic survey and preparation of a site base map will be performed by a licensed professional land surveyor, if required by the NYSDEC project manager.

3.0 DIRECT-PUSH/GEOPROBE® DRILLING AND SAMPLING

The primary purpose of direct-push/Geoprobe® drilling and sampling is to evaluate the nature and quality of soil at depths less than approximately 100 feet from the ground surface and the quality of groundwater from the shallow overburden aquifer at a site to assess the nature and extent of contamination during site characterization and remedial investigations. Direct-push drilling techniques can also be used, often in conjunction with special tooling, for other applications during the site characterization process. Site-specific applications for direct-push drilling and sampling techniques will be provided in project-specific Work Plans. A description of the techniques used for the most common application, borehole advancement and soil sample collection, is provided below.

Direct-Push Borehole Advancement using Macro-Core® Sampling Techniques

Direct-push drilling techniques will be used to advance boreholes in unconsolidated materials whenever possible, primarily due to the limited amount soil removed from the subsurface per borehole and the speed with which boreholes can be advanced. During a direct-push drilling program, a Macro-Core® or similar sampling device will be used to collect soil samples from the subsurface during borehole advancement. Soil samples are collected continuously from each soil boring until a unit of low permeability (e.g., clay, bedrock) is encountered. Soil borings are commonly used to classify shallow overburden soils, collect soil samples, delineate the limits and extent of constituents of concern, install temporary monitoring wells/piezometers, install soil vapor points, and to allow the use of such direct-push equipment as temporary groundwater sampling devices and membrane interface probes.

During direct-push drilling using a Macro-Core® sampling device, the subsurface soils are extracted, screened, and classified to identify soil types, visualize potential contaminants, assess volatile organic carbon vapors within the soil, and collect representative soil samples from selected depth intervals. Photoionization detector (PID) measurements, as well as visual and olfactory observations and other field screening techniques will be used when selecting soil samples for potential laboratory analysis. Procedures for field screening are described in HRP SOP #108 *Field Screening*. More detailed procedures for soil boring advancement are provided in HRP SOP #101 *Soil Boring Advancement*.

The selection of subsurface soils for laboratory analysis is made in consultation with a NYSDEC field representative, when present onsite, and are based the following parameters:

1. Subsurface soil materials that exhibit visual signs of contamination.
2. Subsurface soil materials that cause a sustained response above the measured background response on a calibrated flame or photo ionization screening instrument.
3. A combination of Items 1 and 2.
4. Knowing the history of the site, if possible.

Soil samples selected for analysis will be submitted to an approved NYSDOH Laboratories Approval Program (ELAP)-certified laboratory for analysis in accordance with NYSDEC Analytical Service Protocol (ASP) and U.S. Environmental Protection Agency (USEPA) methods. Specific analyses to be performed and the methodologies that will be used will be identified in the project-specific Work Plan and QAPP.

At a minimum, soil samples collected from the most contaminated interval at each soil boring location, based on instrumental, visual, and/or olfactory evidence (i.e. high PID reading, visually stained, or strong odor), will be sent to a certified laboratory for analysis. If no contamination is detected or observed, a subsurface soil sample collected at the water table interface or directly above the low permeability unit, whichever occurs first will be submitted for analysis. Soil samples may also be selected for laboratory analysis based on the conceptual site model for the site or area concern based on the suspected release mechanism and the depth at which contamination is most likely to be encountered. Soil sampling will be conducted in accordance HRP SOP #104 *Soil Sampling*. Soil samples to be submitted for laboratory analysis for VOCs will be collected in accordance with HRP SOP #105 *Soil Sample Collection for VOC Analysis*, which describes the methods used to collect and preserve soil samples in accordance with USEPA Method 5035.

All soil borings will be classified and logged, at a minimum, according to the Unified Soil Classification System (ASTM Standard D2487-17, *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System*), as indicated in DER-10. Soils may also be classified according to ASTM Standard D2488-17, *Practice for Description and Identification of Soils (Visual-Manual Procedure)* and/or HRP SOP# 103 *Soil Logging Using a Modified Burmister Classification System*, as requested for each Work Assignment and as appropriate based on project-specific data quality objectives (DQOs). A field record of the soil classifications for each soil boring, sampling interval, PID readings, and other field observations/field-screening results will be recorded on a soil boring log form provided in Appendix B.

Any soil brought to the surface during borehole advancement will be managed in accordance with procedures described in DER-10 Section 3.3 (e), as described in Section 15.

4.0 MONITORING WELL INSTALLATION AND CONSTRUCTION

Monitoring wells are installed and constructed to identify hydrogeologic characteristics, groundwater constituents, contaminant transport, extent of groundwater contamination in the horizontal and vertical dimensions, and the hydraulic relationship between the site and localized groundwater flow direction. The exact location of monitoring wells are based upon the information collected during the field investigation activities, knowledge of the existing distribution of contaminants, historical data and preliminary site assessment results. If there are existing monitoring wells at a site, all new monitoring wells will be constructed similar to the construction of the existing monitoring well network, if feasible and appropriate. Specific information related to monitoring well location and construction will be provided in the project-specific Work Plan.

4.1 Types of Monitoring Wells

Permanent (shallow, intermediate, deep) or temporary monitoring wells will be installed depending on project-specific DQOs. The actual depth to which permanent wells will be installed will vary depending on groundwater monitoring objectives and site geology/hydrogeology. Temporary monitoring wells or sampling points will be used for short-term monitoring events when consistent with project=specific objectives.

Monitoring well identification will start with “MW-#” notation. Shallow, intermediate, or deep depth wells will be identified with an “S”, “I”, or “D” that is immediately preceded by the well number (e.g., “MW-#I”).

Shallow depth monitoring wells will be used for monitoring water-table elevations or collecting analytical data that is not sensitive to significant fluctuations in the water table. Monitoring wells screened below the water table at intermediate to deeper depths within an aquifer are use used to evaluate the vertical extent of contamination in an aquifer or in a particular hydrogeologic zone and to evaluate vertical hydraulic gradients in an aquifer. The drilling and installation of monitoring wells will be supervised and documented by a field geologist according to the procedures described in Sections 4.2 and 4.3.

4.2 Temporary Monitoring Well/Sampling Point Construction

All wells will be installed in accordance with the approved project-specific Work Plan. Temporary groundwater monitoring wells or sampling points will be installed using direct-push techniques to the appropriate depth. A temporary 1- to 2-inch diameter well will be installed into an open borehole. The temporary monitoring wells will be constructed with an appropriate length of 0.010-slot screen and an appropriate length of Schedule 40 PVC riser to the ground surface. The annulus space will be backfilled with sand to approximately 2 feet above the screened interval. A bentonite seal will be placed from the top of the sand to the ground surface to and a well cap will be installed at the top of the riser to eliminate potential run-off from rain events or spills into the temporary monitoring well.

In some cases screen-point groundwater samples will be collected using direct-push drilling techniques and a screen-point sampling device designed to be used in conjunction with direct-push drilling rigs. Sample collection using such devices will be in accordance manufacturer's instructions and groundwater sampling procedures described in Section 6.

4.3 Permanent Monitoring Well Construction

4.3.1 Overburden Wells Using Direct-push Drilling, Hollow-stem Augers, or Mud Rotary

All overburden monitoring wells will typically be installed using direct-push or hollow-stem auger drilling techniques. To install 4 1/4-inch (ID) hollow-stem augers will be used to install 2-inch wells, and 6 1/4-inch (ID) hollow-stem augers will be used to install 4-inch diameter wells. Macro-Core® sampling techniques (direct-push drilling) or split spoons (hollow-stem auger and mud-rotary drilling) will be used to collect soil samples for classification and laboratory analysis. Procedures for collection of soil samples are described in HRP SOP #'s 104, *Soil Sampling* and 105 *Soil Sample Collection for Volatile Organic Compound Analysis*. Additional information related to installation of monitoring wells in overburden materials is provided HRP SOP #102 *Overburden Monitoring Well Installation*. HRP SOPs are provided in Appendix A.

For wells designed to sample the shallow groundwater at and just below the water table (identified as "shallow wells"), monitoring wells will be constructed as indicated in the following paragraph. For wells screened at deeper depths in the aquifer, similar well construction techniques will be used, but the borehole depth will be dependent on the desired depth of the screened interval.

Once groundwater is encountered, the borehole will be extended an additional 5 to 7 feet into the saturated zone, depending on site-specific considerations such as amount of water-table fluctuation and timing of well installation relative to typical water levels in the aquifer, or to a depth as directed by the NYSDEC. Once the desired depth is reached, the inner bit will be removed, and the well material will be placed within the augers.

Monitoring wells will be constructed with a ten-foot section of 10-slot (0.01-inch) well screen, and the appropriate length of schedule 40 polyvinyl chloride flush-joint casing to ground surface. Once the well material has been set, the annulus space between the augers and the well screen will be backfilled with #0 Morie Sand or equivalent. Simultaneously with the installation of the sandpack, the augers will be retracted. The sandpack will be brought to 2 feet above the top of the screened interval. A two-foot-thick layer of bentonite chips will be placed on top of the sandpack and hydrated. The remaining annulus space will be backfilled with a cement/bentonite grout mixture. The augers will then be withdrawn and the grout within the borehole will be topped off as necessary.

Monitoring wells will be completed with a protective steel casing installed flush with the ground surface, or with a steel riser casing, depending on well location /or as directed by the NYSDEC representative. Each well will have a vented cap and a locking cover. A cement pad will be installed to channel surface water away from the well. A small hole will be drilled in the protective casing to allow any water between the inner and outer casing to drain. Well construction and installation will be completed in accordance with the specific well installation and construction procedures as described in the project-specific Work Plan.

For deeper overburden wells located in a geologic formation where hollow-stem augers would not be ideal, mud-rotary drilling techniques may be used. Mud-rotary uses a circulation fluid (typically drilling mud) which is pumped through the drill stem, out the bit, and up the annulus between the drill stem and the borehole wall. The mud runs through a de-sander at the ground surface, and then recirculated back down the drill stem. Soil samples can be collected at desired intervals using split-spoons sampling devices. Once the well is drilled to depth, the well casing will be placed in the open borehole. A tremie pipe will be placed at the bottom of the borehole and clean potable water will be circulated to thin out the mud. Once it is determined that there is no longer a presence of mud in the borehole, the monitoring well will be constructed as described above. All drilling fluids will be containerized and managed in accordance with applicable procedures described in DER-10 Section 3.3 (e) and applicable laws and regulations.

4.3.2 Bedrock Monitoring Wells

Drilling techniques and well construction details for bedrock wells must be addressed on a project-specific basis based on project-specific objectives, DQOs, and site-specific geologic and hydrogeologic characteristics. Specific procedures for the installation of bedrock monitoring wells will be described in detail in the project-specific Work Plan and as required to meet the specific objectives of the Work Assignment. However, a general example of the approach for drilling procedures used to advance boreholes for the construction of bedrock monitoring wells is provided in the following paragraph. Monitoring wells in bedrock will generally be constructed in a similar manner to those described for overburden wells, although project-specific considerations will be addressed in the project-specific Work Plan.

The installation of bedrock monitoring wells will use a combination of hollow-stem augering and rock coring/air-rotary drilling. The overburden material will be drilled to bedrock using 6-1/4 inch inside diameter (I.D.) hollow-stem augers. Split-spoon or Macro-Core® samplers will be used to collect soil samples for classification and sampling in the unconsolidated materials. Once bedrock is encountered, the inner bit will be removed and the hollow- stem augers will act as a temporary casing. If rock cores are to be collected, the bedrock will be NX or HQ cored to a site-specific depth below ground surface. Rock cores will be logged according to standard procedures that will be described in the project-specific Work Plan. If no rock cores are to be collected, a 3 5/8 inch-diameter air-rotary hammer will be used to advance the borehole to the desired depth.

4.4 Monitoring Well Decommissioning

Once it has been determined that monitoring wells are no longer needed at a site and there is no potential for re-use by another regulatory program, monitoring wells should be decommissioned. Decommissioning is also appropriate if the integrity of a monitoring well is known or suspected to be compromised. Since monitoring well construction varies considerably depending on the intended purpose and the local geologic and hydrogeologic conditions, decisions regarding the appropriate method to be used for decommissioning are site-specific in nature and must be made for each individual monitoring well. All decisions regarding the appropriate method for decommissioning of monitoring wells will be made in accordance with NYSDEC guidance CP-43, *Groundwater Monitoring Well Decommissioning Policy,* dated November 3, 2009, and the associated addendum, *Groundwater Monitoring Well Decommissioning Procedures,* dated August 2009.

5.0 MONITORING WELL DEVELOPMENT

All monitoring wells install at a site will be developed to purge any drilling fluids or sediment that may have entered the well through the filter pack and well screen during installation. Monitoring wells will be developed no sooner than 48 hours following installation. Monitoring wells will be developed using surging and pumping techniques to force the existing water and sediment back and forth through the screen and filter pack. Well development will be considered complete when temperature, conductivity, and pH have stabilized and a turbidity of less than 50 nephelometric turbidity units (NTUs) has been achieved. A well development/purge log will be used to record well development parameters and water-quality measurements. A copy of a well development/purge log is provided in Appendix B. Development water will be managed in accordance with provisions described in Section 3.3 (e) of DER-10, as described in Section 15 of this FAP, unless otherwise directed by the NYSDEC. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the development water will be containerized, handled, and disposed of as described in Section 15.

6.0 GROUNDWATER MONITORING AND SAMPLING

Water levels and groundwater samples will be collected from temporary wells or screen-point sampling devices and permanent monitoring wells. Specific information regarding the groundwater monitoring and sampling program are provided in the project-specific Work Plan.

6.1 General Groundwater Monitoring and Sampling Procedures

Groundwater monitoring well sampling procedures will include water-level measurements, well purging, field measurements, and sample collection at each monitoring well location. A copy of the purging and sampling log form used to record well purging, water quality measurements, and sampling flow rates is provided in Appendix B. The objective of the groundwater sampling protocol is to obtain samples that are representative of the aquifer in the well vicinity so that analytical results reflect the composition of the groundwater as accurately as possible. Wells will be allowed to stabilize at least three days after development prior to collecting samples for analysis, depending on such conditions as the nature of the aquifer materials and turbidity at the conclusion of well development, unless directed otherwise by NYSDEC personnel. Specific details related to timing of groundwater sampling after well development will be provided in the project-specific Work Plan.

Prior to the start of a groundwater sampling event, water levels will be collected from the entire monitoring well network to prepare a groundwater contour map and evaluate groundwater flow patterns. If applicable, an oil/water interface probe will be used to measure product thickness (if any) in the groundwater monitoring wells.

Rapid and significant changes can occur in groundwater samples upon exposure to sunlight, temperature, and pressure changes at ground surface. Therefore, groundwater sampling will be conducted in a manner that will minimize interaction of the sample and the surface environment. The equipment and protocol for collecting groundwater samples by each method are described in Sections 6.2 through 6.4.

Groundwater samples will be analyzed by USEPA methods in accordance with the ASP for each sampling events.

6.2 Groundwater Sampling from Temporary Wells or Screen-point Samplers

In some cases, project-specific objectives may include the collection of screening-level groundwater data from temporary monitoring wells or sampling points or from direct-push screen-point sampling devices. Such screening-level groundwater samples will typically be collected from temporary sampling devices as grab samples using a bailer or similar grab-sample collection device or using a peristaltic pump and section of polyethylene tubing, in general accordance with procedures described in HRP SOP #107 Low-flow Groundwater Sampling, which is provided in Appendix A. Decisions regarding the specific groundwater sampling technique to be used for temporary wells or sampling points will be based on the project-specific DQOs and the selected methodology will be described in the project-specific Work Plan. Unlike sampling of permanent monitoring wells, screening-level groundwater samples may be collected immediately following installation of the well/sampling point or screen-point device.

Upon completion of sampling, boreholes associated with temporary groundwater sampling locations will be backfilled with bentonite and marked with a stake/flag that will be labeled with the proper location identification, and will be illustrated on the site map so it can be located at a later date. Borings performed in paved or concrete areas will be backfilled and refinished at the ground surface with concrete or cold patch.

6.3 Groundwater Sampling from Permanent Monitoring Wells

Unless otherwise specified or appropriate based on previous groundwater sampling events, HRP's default procedure for groundwater sampling will be to use low-flow groundwater sampling methods. HRP SOP #107 *Low-flow Groundwater Sampling*, which is provided in Appendix A, describes the low-flow sampling techniques that will be used for the majority of sites where groundwater sampling is performed. However, HRP recognizes that there may be circumstances for which other groundwater sampling techniques may be appropriate, for example, when groundwater monitoring at a site has already been conducted for a period of time using a different purging and sampling strategy. Example purging and sampling procedures for an alternative to low-flow groundwater sampling are provided in the following subsections.

6.3.1 Purging and Sampling Equipment

Well purging and sampling may be performed using the following:

- Submersible pumps, peristaltic pumps, and or dedicated polyethylene bailers to be used for well purging
- Electronic water-level measurement unit with accuracy of 0.01 foot
- Flow-measurement device (containers graduated in milliliters) and stop watch

PID instrument to monitor vapor concentrations during purging and sampling as required by the project-specific Health and Safety Plan (HASP).

6.3.2 Field Analytical Equipment

Field equipment to be used at the site will include individual or combination water-quality meters to measure pH, temperature, specific conductance, oxidation-reduction potential (ORP), dissolved oxygen, and turbidity or using a flow-through cell that includes probes for measurement of pH, temperature, specific conductance, and ORP. Measurements of turbidity must be made on aliquots of the groundwater collected before water enters the flow-through cell; therefore, a separate turbidity meter will be necessary when a flow-cell is used for the other parameters. Additionally, a PID will be used to obtain a headspace reading at the well head upon opening the well. Each piece of field analytical equipment will be checked by HRP personnel to be in proper working order before its use and calibrated as required by the manufacturer. Field instruments used for groundwater sampling will be calibrated at the beginning of each day of groundwater sampling in accordance with the project-specific QAPP and as described in the HRP SOP #108 *Field Screening*, which is included in Appendix A.

Prior to use at each sampling location, field analytical equipment probe(s) will be decontaminated. After each use, the instrument will be checked and stored in an area shielded from weather conditions.

6.3.3 Sampling Procedures

As indicated in Section 6.3.1, groundwater samples will typically be collected from each well no sooner than three days following monitoring well installation and development, unless sampling within a shorter period would still meet project-specific DQOs, and such a time-frame for sampling is specified in the project-specific Work Plan and project-specific FAP, and has been approved by the NYSDEC Project Manager. Sampling will not be conducted less than 24 hours after well installation and development unless samples are intended to be used for screening purposes only.

The following procedures will be used for monitoring well groundwater sampling:

- Wear appropriate personal protective equipment as specified in the project-specific Health and Safety Plan (HASP) and the project-specific HASP Addendum. In addition, samplers will use new sampling gloves for the collection of each sample.

- Unlock and remove the well cap.

- Obtain PID readings and record them in the field logbook and well sampling log.

- Measure the static water level in the well with an electronic water-level indicator at least 15 minutes after the well has been opened to allow for stabilization of water levels. The water-level indicator will be washed with a solution of Alconox® or Liquinox® detergent and water, then rinsed with deionized water between individual wells to prevent cross-examination. Decontamination fluids will be containerized. Liquinox® will not be used if samples are to be collected for 1,4-dioxane analysis, since Liquinox® contains a small amount of the 1,4-dioxane.

- Calculate the volume of water in the well.

- Place sampling equipment on polyethylene sheeting or other clean surface (such as inside a plastic container) near the well casing to prevent potential contamination of sampling equipment due to contact with the ground surface. Special considerations for potential contact with the ground surface or inappropriate materials will need to be taken when sampling for per- and polyfluoroalkyl substances (PFAS), as described in Section 14 of this FAP.

The following procedures describe groundwater sampling procedures used when sample collection will be performed following the purging of three to five well volumes from the well. Procedures for low-flow groundwater sampling are described in HRP SOP #107 *Low-flow Groundwater Sampling*, which is included in Appendix A.

- Purge 3 to 5 well volumes of water from the well, using one of three methods described below. Purged water will be containerized separately from decontamination fluids.

- ⇒ Bail with a dedicated, disposable polyethylene bailer.
- ⇒ Pump with a centrifugal pump using new polyethylene tubing dedicated to each well. Set intake slightly below the surface level of the groundwater and start pump; continue to lower the intake line through the well to just above screen depth ensuring that all standing water in the well has been purged.
- ⇒ Pump with a submersible pump equipped with: (1) a check valve to avoid backflush and (2) new polyethylene tubing dedicated to each well. Set intake at the surface level of the groundwater and start pump; continue to lower the intake line ensuring that all standing water in the well has been purged.

- Allow field parameters of pH, temperature, specific conductance, ORP, dissolved oxygen, to stabilize before sampling. Purging will be complete if the following conditions are met for three consecutive instrument readings:

  - ⇒ pH readings within ±0.2 pH units of each other
  - ⇒ water temperatures within ±0.5°C of each other
  - ⇒ Specific conductance within ±10 percent of each other.
  - ⇒ ORP is within ±20 millivolts
  - ⇒ Dissolved oxygen is within 10% of each other for values greater than 0.5 mg/l or if three consecutive readings are less 0.5 mg/l.
  - ⇒ Turbidity is less than 50 NTUs.

If these parameters (with the exception of ORP and dissolved oxygen when purging is conducted using a bailer) are not met after purging a volume equal to 5 times the volume of standing water in the well, the HRP Project Manager will be contacted to determine the appropriate action(s). Due to the nature of sampling groundwater using a bailer, it is possible than ORP and dissolved oxygen measurements could be affected by the sampling procedure, and therefore, the above values should be considered a goal, but not a requirement that would preclude sampling after 5 well volumes have been removed from the well using a bailer.

- If the well goes dry before the required volumes are removed, the well may be sampled when it recovers (recovery period up to 24 hours).

- Obtain sample from well with a bailer suspended on new, clean nylon twine. The sampling will be performed with a new bailer dedicated to each individual well.

- Collect the sample aliquot for VOC analysis first by lowering and raising the bailer slowly to avoid agitation and degassing, and then collect sample aliquots for the semi-volatile organic compounds analysis and carefully pour directly into the appropriate sample bottles. Sample bottles containing appropriate preservative for the parameter to be analyzed will be obtained from the laboratory.

- Obtain field measurements of pH, temperature, and specific conductance, ORP, and dissolved oxygen, and record measurements on the purging and sampling form. The instruments will be decontaminated between wells to prevent cross-contamination.

- Place analytical samples in cooler and chill to 4°C. Samples will be shipped to the analytical laboratories within 24 hours.

- If a centrifugal or submersible pump is used, it will be decontaminated between wells, and the polyethylene suction/discharge line will be properly discarded.

- Re-lock well cap.

- Fill out field logbook, sample log sheet, labels, custody seals, and chain-of-custody forms. Copies of applicable field forms are provided in Appendix B.

Groundwater samples will be placed in appropriate sample containers, sealed, and submitted to the laboratory for analysis. For each groundwater sampling event, groundwater samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC Analytical Services Protocol. The samples will be labeled, handled, and packaged following the procedures described in Generic Quality Assurance Project Plan (QAPP) and project-specific QAPP. Sample management procedures are further described in HRP SOP #106 *Sample Handling*, which is provided in Appendix A, and is included as an attachment to the QAPP. Quality assurance/quality control samples will be collected at the frequency detailed in the QAPP and project-specific QAPP, as well as the project-specific Work Plan.

Purge water will be managed in accordance with provisions described in Section 3.3 (e) of DER-10, as described in Section 15 of this FAP, unless otherwise directed by the NYSDEC. If non-aqueous phase liquid or an odor is observed, or if directed by NYSDEC, the purge water will be containerized, handled, and disposed of as described in Section 15.

7.0 EXPLORATORY TEST PITS EXCAVATION AND SAMPLING/TRENCHES

Based on data quality objects for a project, it may be determined that excavation of test pits is an appropriate subsurface exploration activity to observe in-situ conditions over a broader area than can be achieved from soil samples collected from one or more borehole. Test pits and trenching may also be appropriate to better identify areas of fill or subsurface disposal.

Appropriate locations and depths for test pits or trenches will be based on previous knowledge of contaminant distribution, as well as data gaps in understanding the distribution of geologic/hydrogeologic characteristics of the subsurface or contaminant distribution. Test pits/trenches will be excavated to appropriate depths and with various planar footprints, depending on objectives for observations and/or soil sampling.

Groundwater levels and leaching may be monitored to determine the actual location of the water table or if a perched water table is present, as well as approximate hydraulic conductivity of unsaturated zone soils. Head-space screening techniques, performed in accordance with procedures described in HRP SOP #108 *Field Screening*, will be used to identify the depths and locations to collect soil samples. Proposed trenching locations and specifications will be provided in the project-specific Work Plan. As indicated in the project-specific Work Plan, soil samples collected from each test pit/trench will be submitted for analytical testing.

Excavated soil will be managed in accordance with provisions described in Section 3.3 (e) of DER-10, as indicated in Section 15 of this FAP, unless otherwise directed by NYSDEC. If non-aqueous phase liquid is present or an odor is observed, or if directed by NYSDEC, the excavated soil will be containerized, handled, and disposed of as described in Section 15. Under most circumstances, it is anticipated that soil will be placed onto plastic sheeting on the site as excavation proceeds, and following soil sampling and any other data collection from the test pits, the excavated soil will be used to backfill the test pits/trenches (in more or less the same stratigraphic order as the in-place soils) or will be otherwise managed in accordance with procedures described in Section 3.3 (e) of DER-10.

Selected soil samples from the test pits/trenches will be analyzed by an approved ELAP-certified laboratory in accordance with the NYSDEC Analytical Service Protocol. All samples collected will be labeled, handled, and packaged following the procedures described in the Generic QAPP and project-specific QAPP, as well as HRP SOP #106 *Sample Handling*, which is provided in Appendix A. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP, project-specific QAPP, and the project-specific Work Plan.

If the test pits/trenches are to remain open, they will be secured with fencing when personnel are not on the site. In addition, if water is encountered during the test pit/trench excavation, then a decision by the NYSDEC project manager will be made to cease the operation, fill in the test pit/trench, or possibly dewater the test pits/trenches. If the test pit/trench is dewatered, appropriate measures will be taken to ensure that the water will either be containerized or treated on-site before being disposed of with proper permits.

8.0 SURFACE WATER SAMPLING

Local surface water may or may not be affected by site hydrology or hydrogeology. If sampling of surface water is deemed appropriate for a site, such sampling will be designed and conducted in accordance with Section 3.8 of DER-10 and other applicable guidance to meet project-specific DQOs and to accomplish the overall project objectives.

Should surface water sampling deemed necessary, surface water sampling locations will be identified in the field prior to sampling using flagging or other suitable method to help ensure that field personnel perform sampling at the appropriate location. Should sampling at the planned location not be possible at the time of sampling, the sample location should be corrected with flagging to facilitate subsequently locating the actual sampling locations with a high-precision global positioning system (GPS) unit.

The names and addresses of property owners where the offsite surface water sampling is anticipated to occur will be provided to the NYSDEC Project Manager prior to sampling. The NYSDEC Project Manager will contact the property owners consistent with NYSDEC DER guidance to discuss the sampling program and schedule the sampling. The NYSDEC Project Manager will provide HRP with a copy of the correspondence and surface water sampling schedule.

Following identification of the surface water sampling locations, the appropriate approach for sample collection will be determined based on such factors as nature of the surface water body (width, depth, current, etc.) and viable sampling techniques to collect a sample that will meet project-specific DQOs. If the appropriate location for sample collection is determined to be from within the water body itself, field personnel will collect the sample by entering the surface water from a downstream direction to reach the desired sample location. Samples will be collected in successive order from most downgradient to most upgradient locations.

Surface water samples will be collected with a dipper, beaker, or pond sampler or other acceptable surface water sampling device that will collect samples in a manner that will accomplish project objectives in accordance with the DQOs. The number of samples collected and sampling locations, as well as any specific details regarding sample collection techniques or depth, will be provided in the project-specific Work Plan.

The approximate locations of each sample will be noted in the field logbook. To the extent practicable to meet project-specific DQOs, field measurements of pH, dissolved oxygen, temperature, and specific conductivity will be obtained and recorded in the field logbook. The field sampling crew will record visual observations (sample color, any unusual characteristics [odor, turbidity, etc.]) in the field notebook and on the field record of the surface water sampling. All instruments used in sample collection will be decontaminated between locations to prevent cross-contamination.

Surface water samples will be placed in appropriate sample containers, sealed, and submitted to the laboratory analysis. The samples will be labeled, handled, and packaged following the procedures described in the Generic QAPP and project-specific QAPP and HRP SOP #106 *Sample Handling*. Surface water samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC Analytical Services Protocol for the parameters indicated in the project-specific Work Plan. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP, project-specific QAPP, and the project-specific Work Plan.

9.0 SEDIMENT SAMPLING

Sediment sampling is may be conducted in conjunction with surface water sampling, and many of the sampling procedure in this section are similar to those described in Section 8 (Surface Water Sampling). If sediment sampling is deemed appropriate for a site, such sampling will be designed and conducted in accordance with Section 3.8 of DER-10 and other applicable guidance to meet project-specific DQOs and to accomplish the overall project objectives.

Should sediment sampling be deemed necessary, sediment sampling locations will be identified in the field prior to sampling using flagging or other suitable method to help ensure that field personnel perform sampling at the appropriate location. Should sampling at the planned location not be possible at the time of sampling, the sample location should be corrected with flagging to facilitate subsequently locating the actual sampling locations with a high-precision global positioning system (GPS) unit.

The names and addresses of property owners where the offsite sediment water sampling is anticipated to occur will be provided to the NYSDEC Project Manager prior to sampling. The NYSDEC Project Manager will contact the property owners consistent with NYSDEC DER guidance to discuss the sampling program and schedule the sampling. The NYSDEC Project Manager will provide HRP with a copy of the correspondence and sediment sampling schedule.

The field sampling crew will examine the sediment samples and record visual observations (sample color, texture, any unusual characteristics [odor, staining, etc.]) in the field notebook and on the field record of sediment sampling. The instruments will be decontaminated between locations to prevent cross-contamination. As for surface water sampling, sediment sample collection will proceed from most downstream to most upstream location prevent potential disturbance of sediment at each sample location.

Surficial sediment samples (0 to 6 inches) will be collected using a clean, stainless steel coring device, a stainless steel hand auger, or a stainless steel scoop, as appropriate for the sediment conditions. Dedicated sampling equipment will be used to prevent cross-contamination and to minimize decontamination requirements.

Sediment samples will be collected using the following procedures:

1. Identify the proposed sample location in the field notebook along with other appropriate information collected during sediment sampling activities.
2. Don personal protective equipment (as required by the HASP).
3. At each sample location, deploy the sampling device as specified according to manufacturer’s directions.
4. Once the sampling device has reached the appropriate depth for sediment sample collection, retrieve the device.
5. Open the sampling device to allow the sediments to empty onto a stainless steel tray.
7. Describe and record sample descriptions.
8. Package sediments in the appropriate containers.

Sediment samples will be placed in appropriate sample containers, sealed, and submitted to the laboratory analysis. The samples will be labeled, handled, and packaged following the procedures described in the Generic QAPP and project-specific QAPP and HRP SOP #106 Sample Handling. Sediment samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC Analytical Services Protocol for the parameters indicated in the project-specific Work Plan. Quality assurance/quality control samples will be collected at the frequency detailed in the Generic QAPP, project-specific QAPP, and the project-specific Work Plan.

10.0 SOIL VAPOR POINT INSTALLATION AND SAMPLING

The primary purpose of the soil vapor investigation is to further characterize and quantify the lateral and longitudinal extents of soil vapor contamination within the vadose zone. This information, in turn, provides a line of evidence with respect to potential source zones in soil and/or groundwater and footprints of VOC plumes in groundwater. The soil vapor data will also be used to evaluate the potential for vapor intrusion in structures located onsite, downgradient of the site, or adjacent to the sampling locations. Soil vapor investigations will follow the NYSDOH *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, October 2006, including any subsequently published updates.

Vadose zone monitoring can be used to develop subsequent site characterization activities such as installation of groundwater monitoring points. The vadose zone monitoring will be completed using an acceptable soil vapor methodology and will include the collection of quality assurance and quality control samples.

All soil vapor point locations will be flagged and labeled with the relevant sample location identification information that can be used by NYSDEC staff during a subsequent high-precision GPS survey.

10.1 Soil Vapor Point Installation

Soil vapor points will be installed using either hand-drilling techniques or Geoprobe®/direct-push drilling techniques to install soil vapor points.

Direct-push Installation Techniques

Stainless steel drive-points will be installed to a pre-determined depth appropriate for site-specific conditions. More than one depth per sampling location may be appropriate, depending on the DQOs for the soil vapor investigation. Soil vapor points will be installed no deeper than 1 foot above the water-table interface or the bedrock surface. Once the sampling depth is reached, the 6-inch stainless steel sampling screen is attached to a dedicated section of 0.25-inch diameter Teflon™ or Teflon™-lined tubing that is identified as laboratory- or food-grade will be installed and used to collect the soil vapor samples. For soil vapor sampling points that are to be left in place, the borehole will then be backfilled with sand to a minimum of 6 inches above the screened interval. Granular bentonite pellets will then be placed from approximately 6 inches above the screen to the ground surface, while concurrently hydrating with potable or distilled water during placement. Sufficient time will then be provided for the bentonite to set. Soil boring spoils will be managed as investigation-derived waste, as described in Section 15 and in Section 3.3 (e) of DER-10.

Hand-drilling Installation Techniques

Hand drills may be used to penetrate through a concrete (or other) surface to install soil vapor screen-point sampling devices. The soil vapor sampling screen-point will be attached to a dedicated section of Teflon™ or Teflon™-lined tubing that is identified as laboratory- or food-grade and will be used to collect the soil vapor samples. The vapor point will be filled with sand beads to a level that is less than one inch below the top of the floor surface. Modeling clay will then be placed around and into the soil vapor point at the ground surface. Any debris from the drilling cuttings will be swept up with a hand broom and disposed of in accordance with procedures described in Section 15.

Laboratory Analysis

Soil vapor samples will be analyzed by a laboratory certified by Environmental Lead Proficiency Analytical Testing (ELPAT) for VOC analysis of air samples using USEPA Method TO-15 (Table 1) or another appropriate analytical method based on project-specific DQOs, and specific in the project-specific Work Plan and QAPP. The proposed ELPAT-certified laboratory must be certified by the Environmental Laboratory Approval Program (ELAP) to perform USEPA Method TO-15 analysis. A minimum reporting limit of 1 microgram per liter (µg/m3) must be achieved for all VOCs.

10.2 Soil Vapor Point Sampling

Soil vapor samples will be collected in the same manner at all locations to minimize possible discrepancies. The following procedures will be strictly adhered to when sampling soil vapor:

- At least 24 hours after the installation of the temporary soil vapor points, 2 to 3 volumes of the sample probe and tube) will be purged prior to collecting the samples to ensure that representative samples are collected.
- Flow rates for both purging and collecting will not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling.
- Samples will be collected using conventional sampling methods and appropriate containers, which meet the objectives of the Work Assignment (e.g., investigation of areas where low or high concentrations of volatile chemicals are expected; to minimize losses of volatile chemicals that are susceptible to photo degradation), and meet the requirements of the sampling and analytical methods (e.g., low flow rate; SUMMA canisters, which are certified clean by the laboratory, using an appropriate USEPA method). The sample duration for these samples will be 2 hours or as designated in the Work Assignment.
- A tracer gas (e.g., helium, butane, or sulfur hexafluoride) will be used at each location before collecting soil vapor samples to verify that adequate sampling techniques are being implemented (i.e., to verify infiltration of outdoor air is not occurring).

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

- Sample location will be noted, including the site, area streets, neighboring commercial or industrial facilities (with estimated distance to the site), outdoor ambient air sample locations (if applicable), and compass orientation (north).
- Weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed, and direction) will be noted for the past 24 to 48 hours.
- Any pertinent observations will be recorded, such as odors and readings from field instrumentation.

The field sampling team will maintain a sample log sheet (Appendix B) summarizing the following:

- Sample identification
- Date and time of sample collection
- Sampling depth
- Identity of samplers
- Sampling methods and devices
- Purge volumes
- Volume of soil vapor extracted
- Canister and associated regulator identification
- Helium leak test results
- Vacuum before and after samples collected
- Apparent moisture content (dry, moist, saturated, etc.) of the sampling zone
- Chain-of-custody protocols and records used to track samples.

After the sample collection period, the SUMMA Canisters will be sent for subsequent laboratory analysis. The soil vapor samples will then be analyzed for target constituents. The soil vapor samples will be analyzed by an approved ELAP-certified laboratory in accordance with NYSDEC Analytical Services Protocol. A minimum reporting limit of 1 microgram per cubic meter (µg/m3) will be achieved for all analytes unless otherwise directed by the NYSDEC or NYSDOH. Specific information related to sample collection and analysis will be in accordance with the project-specific QAPP and will be described in the project-specific Work Plan.

Upon completion of the sampling, the sample tubing will be removed and the temporary soil vapor point location will be backfilled with bentonite and marked with a stake/flag that will be labeled with the proper sample identification and illustrated on the site map so it can be located by the site surveyor. Borings performed in paved or concrete areas will be backfilled and refinished at the ground surface with concrete or cold patch.

11.0 INDOOR AIR MONITORING

Indoor air sampling programs will be conducted within structures and at locations within structures identified by NYSDEC and/or NYSDOH personnel. Protocols and methods used will be in accordance with the 2006 NYSDOH guidance (*Guidance for Evaluating Soil Vapor Intrusion in New York State* and subsequent updates) and discussion with NYSDEC and NYSDOH personnel, as appropriate. The overall goal of an indoor air sampling program is to evaluate the potential for vapor intrusion into these structures, and if vapor intrusion is identified, to evaluate appropriate remedial strategies to address the presence of contaminants in indoor air.

Notices of solicitation to participate in the indoor air monitoring program and scheduling appointments will be conducted by the NYSDEC and NYSDOH. Prior to initiating the air sampling, property owners will be contacted by NYSDEC consistent with NYSDEC guidance. The NYSDEC Project Manager will contact the property owners, discuss the sampling program and schedule the sampling. The NYSDEC Project Manager will provide HRP with a copy of the correspondence and indoor air sampling schedule.

11.1 Indoor Air Sample Collection

An inspection of general site conditions will be performed at each property location as part of the air sampling. The inspection will include the following activities:

- Completion of the NYSDOH Indoor Air Quality Questionnaire and Building Inventory included in *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. A sample of the questionnaire will be provided in the project-specific Work Plan.
- Documentation of weather conditions outside and temperature inside.
- Ambient air (indoor and outdoor) screening using field equipment (i.e., photoionization detector with detection potential in parts per billion).
- Selection of air sampling locations.

At each location, air samples will be collected for laboratory analysis using an appropriate USEPA method, which will be identified in the project-specific QAPP and Work Plan. Air samples will be collected from three locations per structure including the first floor, basement, and the sub-slab environment. A section of Teflon™ or Teflon™-lined tubing that is identified as laboratory- or food-grade will be extended from the SUMMA canister to collect the ambient air sample from the breathing zone at approximately 3 to 5 feet above ground surface. An active approach, using laboratory batch-certified SUMMA canisters, regulated for a 24-hour sample collection, will be used to evaluate the indoor air and sub-slab soil vapor conditions.

11.1.1 Sub-Slab Sample Procedures

The following procedures will be used for all sub-slab sampling:

- Visually assess the condition of the floor. Select an area for sampling that is out of the line of traffic and away from major cracks and other floor penetrations (sumps, pipes, etc.).

- Drill a 3/8-in. diameter hole completely through the concrete floor slab using an electric hammer drill.
- Sweep concrete dust away from the drill hole and wipe the floor with a dampened towel.
- Insert the Teflon™-lined polyethylene tubing (1/4-inch inside diameter × 3/8-inch outside diameter, approximately 3 feet long) into the hole drilled in the floor, extending no further than 2 inches below the bottom of the floor slab.
- Pour inert backfill material (i.e., glass beads or clean sand) around the tubing, packing it around the tubing to fill the hole to the top of the ground surface.
- Place modeling clay around the soil vapor point at the ground surface to seal it, overlapping the borehole sufficiently to prevent ambient air from entering the borehole
- Attach a syringe to the sample tube and purge approximately 100 ml of air/vapor. The syringe will be capped and the air released outside the building so it does not interfere with the indoor air sample collection.
- Place a canister on the floor adjacent to the sample tube. The canister will be either a 6-L or 1-L canister (provided by an independent laboratory) with a vacuum gauge and flow controller. The canister must be certified clean in accordance with USEPA Method TO-15 and under a vacuum pressure of no more than -30 inches of mercury in HG. Flow controllers must be set for a 24-hour collection period.
- Record the serial number of the canister and associated regulator on the chain-of-custody form and field notebook/sample form. Assign sample identification on the canister identification tag and record this on the chain-of-custody form and field notebook/sample form. For the property owner’s privacy, do not use a sample identifier containing the name of the property owner or the address of the property.
- Record the gauge pressure; the vacuum gauge pressure must read -25 inches Hg or less, or the canister cannot be used.
- Record the start time on the chain-of-custody form and on the air sampling form (provided in Appendix B), and take a digital photograph of canister setup and the surrounding area.

11.1.2 Termination of Sample Collection

- Close the canister valve; record the stop time on the chain-of-custody form and in the field notebook/sample form.
- Record the final gauge pressure and disconnect the sample tubing and the pressure gauge/flow controller from the canister, if applicable.
- Install the plug on the canister inlet fitting and place the sample container in the original box.
- Complete the sample collection log with the appropriate information, and log each sample on the chain-of-custody form.
- Remove the temporary subsurface probe and properly seal the hole in the slab with hydraulic cement.

Field quality control samples will include duplicates and trip blanks. Field duplicates will be collected at the rate of 1 duplicate per 20 original samples (5 percent). Field duplicates will be collected by installing an in-line “T” connection, which will essentially split the flow coming from the sample tubing penetrating the floor to 2 canisters set up adjacent to each other and each collecting vapors at identical flow rates. One trip blank will be analyzed and shipped to the laboratory with the final set of sample canisters.

11.2 Outdoor Air Sample Collection

In addition to the indoor air samples, outdoor ambient air samples will be collected. Ambient air samples will be collected during the same 24-hour period as the indoor air samples, which represent outdoor air conditions for the entire sampling area. The ambient air samples will be collected in a laboratory batch-certified SUMMA canister, regulated for a 24-hour sample collection. A section of Teflon™ or Teflon™-lined tubing that is identified as laboratory- or food-grade will be extended from the SUMMA canister to collect the ambient air sample from the breathing zone at approximately 3 to 5 feet above ground surface. Consistent with the indoor and sub-slab vapor sampling, the collecting rate of the outdoor air sample will be less than 0.2 L per minute. Outdoor ambient air samples will be collected at a minimum of one per day during the indoor air monitoring program. Based on scheduling and overall distribution of indoor air sampling locations, HRP and NYSDEC staff will determine if more than one ambient air sample is needed per day.

11.3 Laboratory Analysis of Air Samples

Air samples will be analyzed by an ELAP-certified laboratory. Detection limits for the analyzed compound list will be defined by the NYSDEC and NYSDOH prior to sample submittal and will be indicated in the project-specific Work Plan. For specific parameters identified by NYSDOH, where the selected parameters may have a higher detection limit (e.g., acetone), the higher detection limits will be designated by NYSDOH.

12.0 COMMUNITY AIR MONITORING PROGRAMS

12.1 Monitoring

Monitoring concentrations of volatile organic compounds (VOCs) and particulate levels at the perimeter of the work area in real-time is an important component of any project for which the public could be at risk due to the release of VOCs or particulates into ambient air during the performance of investigation and/or remedial activities. Such monitoring may include a combination of continuous and periodic monitoring, and design of such a monitoring program will be contingent upon site-specific field and construction activities. The monitoring program will be described in a project-specific Community Air Monitoring Plan (CAMP) that is developed for each site or project. Community air monitoring programs and procedures for VOCs and particulates will be conducted in accordance with procedures described in Appendix 1A (*New York State Department of Health Generic Community Air Monitoring Plan*) and Appendix 1B (*Fugitive Dust and Particulate Monitoring*) of DER-10.

12.1.1 Continuous Air Monitoring

Continuous monitoring for VOCs and particulates may be required for all intrusive activities associated with the site for which the ground is disturbed. Such ground-intrusive activities include soil/waste excavation and handling, excavation of test pits, and advancement of soil borings.

Monitoring of VOCs should be conducted at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified in the project-specific Work Plan and/or HASP. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a photoionization detector (PID) that is appropriate to measure the types and concentration range of VOC known or suspected to be present at the site. The PID shall be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The PID must be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified in Section 12.2. Should other contaminants not detectable using a PID, be present as a potential risk for air-borne dispersion, appropriate instrumentation to measure those contaminants will be specified in the project-specific Work Plan and HASP.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the work area at temporary particulate monitoring stations. The particulate monitoring will be performed using a real-time particulate air monitoring instrument that is capable of measuring particulate matter less than 10 micrometers in size [PM-10] and capable of integrating over a period of 15 minutes for comparison to the airborne particulate action level. The particulate air monitoring instrument will be equipped with an audible alarm to indicate exceedance of the action level. In addition to using the particulate air monitoring instrument, fugitive dust migration will be visually assessed during all work activities. If particulate concentrations are recorded at higher or equivalent concentrations at the upwind station during investigation activities then continuous air monitoring will be discontinued, as approved by NYSDEC representative.

12.1.2 Periodic or "As-Needed" Air Monitoring

Periodic or as-needed air monitoring for VOCs may be required during non-intrusive activities associated with the project-specific Work Plan. Non-intrusive activities are anticipated to include the collection of soil and sediment samples, the collection of groundwater samples from existing monitoring wells, and the collection of indoor air and soil vapor samples. Periodic air monitoring during sample collection will consist of taking a measurement upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location.

12.2 Action Levels and Response

This subsection identifies the typical action levels and corresponding responses for concentrations of VOCs and particulates detected during the field activities associated with a site. Project-specific monitoring procedures and action levels will be identified in the project-specific HASP, as well as the project-specific Work Plan and Community Air Monitoring Plan.

12.2.1 Volatile Organic Compounds

If the concentration of total VOCs at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring will continue. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.

If total VOC concentrations 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 will be stopped, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the work 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 will be shut down.

All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. Instantaneous readings (if any) used for decision purposes will also be recorded.

12.2.2 Particulates

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 will be employed. Work will 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, the downwind PM-10 particulate levels are greater than 150 µg/m^3 above the upwind level, work will be stopped, and a re-evaluation of activities initiated. Work will 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.

Similar to the VOC readings, all particulate readings will be recorded and be available for NYSDEC and NYSDOH personnel to review.

13.0 PRIVATE WELL/TAP WATER SAMPLING

During the course of a site characterization or remedial investigation, it may be necessary or appropriate to conduct sampling of private water supplies to evaluate the extent of a contaminant plume and to evaluate the potential risk to public health due to the presence of contamination in an aquifer that supplies water to private water supplies. In such cases, a strategic sampling and analysis plan would be developed in coordination with NYSDEC and NYSDOH to accomplish the project-specific DQOs that are developed for the sampling effort and that take into account the conceptual site model for contaminant distribution in the aquifer and exposure pathways to the potential receptors through their private water supplies.

The approach for sampling private water supplies would include the activities described below that are applicable to most situations. Project-specific considerations and procedures would be described in a project-specific sampling and analysis plan for private water supply sampling, which would be presented in the project-specific Work Plan or project-specific Work Plan Addendum. Typical information that would be included in the project-specific sampling and analysis plan would include rationale and objectives for the sampling program, sampling locations, the numbers and types of samples that would be collected, sampling strategy, and QA/QC sampling that would be performed as part of the sampling program.

One item to be identified in the project-specific sampling plan would be the specific objective for the sampling of private water supplies. Generally, the objective would be to identify the presence and concentration of the specific contaminant(s) in the aquifer. In such cases, the intent would be to collect samples as close as possible to the entry of water into the house from the private well, since collection of samples from the well itself is generally not feasible. Occasionally, the objective could be to evaluate the quality of water that was actually being consumed, in which case, the samples would be collected at a commonly used tap (such as a kitchen tap) after passing through the water supply system for the house, including holding tanks, pipes and filtration systems. The purpose of such sampling would be to obtain a more realistic value of risk to the occupants of the dwelling. For the purpose of this section of the FAP, it is procedures to address the former objective that are described.

The following activities describe a general approach to sampling of private water supplies.

1. All private water supplies within the initially defined study area, as determined based on the conceptual site model, should be identified based on public records, and if, necessary, door-to-door or drive-by surveys. Determination of the initial study area should be made in coordination with appropriate NYSDEC and NYSDOH personnel.

2. Locations where sampling of private water supplies is to be conducted should be identified (if the initial sampling is to be a subset of all available private water supplies)

3. Available information related to well characteristics should be obtained from potential sources, such as local health departments, state records, local drillers, and homeowners.

4. The location where the water source first enters the structure should be examined for the possible presence of a pressure/holding tank and/or treatment system. Collection of a

sample prior to entry of water into a pressure tank is preferable to avoid contact with as much of the water distribution system as possible.

5. If sample collection is to be from an outside or basement tap or faucet, the sampling area should be free of excessive dust, rain, snow or other sources of contamination.

6. If collection of the water sample must be at a faucet, the space under the sink should first be examined to determine if a treatment system is present. If a system is present, then an alternative faucet without an “under-sink” treatment system should be located.

7. A cold water faucet will be used for sample collection. The faucet should be free of such features as aeration or purification devices (which, if present, must be removed prior to sample collection).

8. When collecting samples, care will be taken to ensure that the mouth of the sample container does not come into contact with the faucet.

9. Prior to sample collection, the faucet will be opened and the system flushed for a minimum of 5 to 15 minutes depending on the location of the sample-collection point relative to the entry point of water into the water system. For interior faucets, a longer flushing time may be appropriate if an expansion/holding tank is present. Depending on the objectives for the sampling effort, it may be appropriate to measure typical sampling parameters, such as pH and temperature to evaluate stabilization prior to sample collection. Such an approach would be included in the project-specific sampling and analysis plan.

10. After flushing, the rate of flow will be reduced to minimize agitation of the water sample during collection.

11. Samples will be collected into appropriate containers and preserved based on the analyses to be conducted, as described in the generic QAPP and project-specific QAPP.

12. Collection of QA/QC samples for each sampling event will be described in the sampling and analysis plan that is included as a component of the project-specific Work Plan. At a minimum, QA/QC sampling will include one duplicate sample for every 20 samples collected and one trip blank per cooler per day if analysis for VOCs is included in the sampling and analysis plan.

13. Sample management following collection will be in accordance with procedures described in the generic QAPP and project-specific QAPP, and as described in HRP SOP # 106 *Sample Handling* (provided in Appendix A).

14.0 PFAS SAMPLING AND ANALYSIS AND 1,4-DIOXANE ANALYSIS

14.1 Per- and Polyfluoroalkyl Substances

Protocols for the collection and analysis of water samples for per- and polyfluoroalkyl substances (PFAS) will be in accordance with the most recent NYSDEC and NYSDOH guidance. Knowledge of PFAS is rapidly evolving, which will require HRP to stay current with respect to sampling and analysis of these compounds, so the general procedures identified in this FAP will be reviewed and updated on a regular basis. Specific procedures to be used for any Work Assignment will be provided in the associated project-specific Work Plan.

In general, sampling procedures will in accordance with appropriate protocols for the type of sample being collected, i.e., groundwater from monitoring wells (as described in Section 6 of this FAP) or water from private water supplies (as described in Section 13), unless otherwise directed by NYSDEC and/or NYSDOH. Low-flow groundwater sampling methodology will be used for sample collection from monitoring wells. However, certain procedures must be modified due to the presence of PFAS in multiple types of products that could result in contamination of water samples collected without taking precautions to eliminate or minimize the presence of outside influences on concentrations found in the samples collected. The following paragraphs provide a general summary of prohibited and acceptable materials for use during sampling for PFAS.

Sampling Considerations

Specific materials that are prohibited for use when sampling for PFAS include pumps and tubing containing Teflon® and other fluoropolymer-containing materials. Acceptable materials for pumps, tubing, and other sampling equipment include: peristaltic or stainless steel pumps and high-density polyethylene (HDPE) or silicone tubing. Additional materials for sampling equipment may be acceptable, but such requests must be preapproved by NYSDEC, and requests to use alternate equipment will include results from equipment blanks indicating that PFAS were not detected.

Equipment blanks will be generated at a rate of at least once per day. Decontamination, if needed for sampling equipment, will be performed using solutions of Alconox® or Liquinox® in potable water, followed by rinsing with deionized water (Liquinox® will not be used if sampling for 1,4-dioxane is to occur, since Liquinox® contains a small amount of 1,4-dioxane).

For sample collection and equipment storage, containers and equipment will not contain or come in contact with aluminum foil, low-density polyethylene (LDPE), glass, polytetrafluoroethylene (PTFE) (including PTFE- or Teflon™-lined caps for sampling containers). Chemical ice packs will not be used. Pre-cleaned sample bottles with closures, coolers, ice, sample labels, and a chain of custody form will be provided by the laboratory. Deionized water for QA/QC blanks will also be supplied by the laboratory, and natural ice will be used to maintain a temperature of 4^0 C ± 2^0 prior to delivery to the laboratory.

Clothing or boots made of or with PTFE material (including GORE-TEX® or other synthetic water resistant and/or stain resistant materials, or Tyvek® material or that have been waterproofed with PFAS materials) will not be worn on the day of sampling. All clothing worn by sampling personnel must have been laundered multiple times.

Because some personal care products are known to contain PFAS, cosmetics, moisturizers, hand cream and other related products will not be used on the day of sampling. However, if it can be demonstrated that a product does not contain PFAS, use of those products will be acceptable for use if approved by the NYSDEC project manager.

Some products typically used for field documentation will not be used for field documentation during PFAS sampling events due to the potential for PFAS in the materials. Such materials include waterproof/treated paper or field books, plastic clipboards, non-Sharpie® markers, Post-It® notes, and other adhesive paper products. Plain paper, metal clipboards, Sharpies®, and pens will be used for field documentation. The laboratory will be responsible for supplying chain-of-custody forms that meet acceptable criteria for PFAS sampling.

Since many food and drink packaging materials contain PFAS, pre-packaged food and fast food wrappers or containers will be prohibited from the site and the field vehicle. However, bottled water or hydration drinks will be allowed.

Sampling Activities

Samples will be collected for PFAS analysis in a similar manner to samples collected for analysis for other types of constituents in accordance with the sampling procedures identified below.

- The sampler must wear nitrile gloves while filling and sealing the sample bottles. New nitrile gloves must be used for each sampling location.
- Samples for PFAS analysis will be collected first, prior to collecting samples for any other parameters into any other containers to avoid contact with any other types of sample containers, bottles, or package materials, and sampler should not handle other sampling equipment or bottles after donning the nitrile gloves until after the sample for PFAS analysis has been collected and stored for transport.
- As for all other samples, the sample bottle cap will not be placed on any surface when collecting the sample and the sampler will avoid all contact with the inside of the sample bottle or its cap.
- Once the sample is collected and capped with an acceptable cap and liner closure system, the sample bottle(s) will be labeled and placed in the shipping container/cooler packed only with ice to be maintained at 4 ± 2° Celsius until delivery to the laboratory.
- One equipment blank and one field duplicate sample will be collected for every sample batch at a rate of no less than one equipment blank and one field blank for every 20 samples. In addition, one matrix spike/matrix spike duplicate (MS/MSD) sample will be collected for analysis for every sample batch with the same sample collection frequency of one per 20 field samples, or more frequently if the sampling batch contains samples with significantly different characteristics.

Laboratory Analysis

Based on currently available information and the need to achieve low reporting limits for PFAS, Modified USEPA Method 537 will be used to analyze for PFAS in groundwater. Expectations are that using this method, a reporting limit of 2 ng/L can be achieved for each of the compounds on the target analyte list indicated in the following table. Laboratories will be required to provide the appropriate data deliverable (Category A or B) for the site in the specified electronic data deliverable format.

PFAS Target Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonates	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanessulfonic acid	PFOS	1763-23-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
Perfluoroalkyl carboxylates	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUAlPFUdA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTriAlPFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTAlPFTeDA	376-06-7
Fluorinated Telomer Sulfonates	6:2 Fluorotelomer sulfonate	6:2 FTS	27619-97-2
	8:2 Fluorotelomer sulfonate	8:2 FTS	39108-34-4
Perfluorooctanesulfonamides	Perfluroroctanesulfonamide	FOSA	754-91-6
Perfluorooctane-sulfonamidbacetic acids	N-methyl perfluorooctanesulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethyl perfluorooctanesulfonamidoacetic acid	N-EtFOSAA	2991-50-6

14.2 1,4-Dioxane Sampling and Analysis

Analysis for 1,4-dioxane will be conducted at least once for all sites where chlorinated solvents are constituents of concern, unless otherwise directed by DER personnel. Sample collection for 1,4-dioxane analysis will be in accordance with standard sample collection procedures depending on the type of sample collected (e.g., groundwater from monitoring wells or drinking water from private wells). Standard QA/QC samples will be collected specifically to ensure that DQOs for QA/QC sampling are met for 1,4-dioxane analysis.

Both USEPA Methods 8260 and 8270 can be used to detect 1,4-dioxane, but the methods must be run using the "selective ion monitoring" (SIM) mode to achieve the required reporting limits. In accordance with DER guidance, the method detection limit for 1,4-dioxane will be no higher than 0.28 µg/l. DER has recommended use of USEPA Method 8270, because, among other reasons, that method is generally less likely to be affected by interference from chlorinated solvents. Therefore, all samples collected for 1,4-dioxane analysis will be analyzed using Method 8270 in SIM mode, unless otherwise instructed by DER personnel.

15.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

HRP is responsible for the proper storage, handling, and disposal of investigative-derived waste; including personal protective equipment, and solids and liquids generated during the well drilling, well development, and well sampling activities. All drummed materials will be clearly labeled as to their contents and origin. All investigative-derived waste will be managed in accordance with NYSDEC-DER-10 Section 3.3(e). As indicated in that section, transport, storage and disposal of investigation-derived waste is generally subject to one or more solid or hazardous waste regulations (e.g., 6 NYCRR Parts 360, 364 and the 370 series), unless specific regulatory exemptions are applicable.

The following summary of procedures that will be used by HRP for handling and disposal of investigation-derived waste for investigation and remediation projects has been developed based on the information provided in DER-10 Section 3.3 (e). The summary is not intended to be a reiteration of the information provided in that section of DER-10, rather it provides an overview of the considerations that will be taken into account in the storage, handling, and disposal of investigation-derived waste during the performance of investigation and remediation activities. In all cases, management of investigation-derived waste will be in accordance with DER-10 Section 3.3 (e), or as otherwise directed by NYSDEC personnel, and applicable laws and regulations.

As indicated in DER-10, Section 3.3(e), soil generated during the advancement of soil borings from on-site locations is presumed to be contaminated. Therefore, such soil will initially be stored on protective sheeting as boreholes are advanced during a drilling program. At the end of the day, any soil remaining on the plastic sheeting (i.e., not otherwise managed in accordance with provisions indicated below) will be covered with plastic sheeting that is secured from wind and precipitation pending subsequent disposition in accordance with DER-10 guidelines.

Soil that is not obviously contaminated based on visual, olfactory, or instrumental evidence or contain separate-phase NAPL may be returned to the borehole from which it originated, unless 1) the borehole is to be used for installation of a monitoring well or other monitoring device, 2) has penetrated an aquitard or confining layer, or 2) has extended into bedrock. If soil is returned to the borehole, it may not extend to within 12 inches of the ground surface (or within 24 inches at a residential site), and the borehole area must be restored to ground surface level as indicated in DER-10. If backfilling into the borehole could create a preferential pathway for vertical migration of contaminants, the backfilled soil will be mixed with bentonite to reduce permeability. Any soil that cannot be returned to the borehole for any of the reasons indicated above will be containerized, properly labeled, and sampled for disposal characterization and managed in accordance with DER-10 Section 3.3(e) 3.

Soil brought to the surface from off-site locations not known to be contaminated will be staged on plastic sheeting during borehole advancement, but will be containerized and returned to a pre-determined drum storage are on the site at the end of each day of drilling activities. Obviously contaminated soil generated during borehole advancement will be containerized as soon as possible after generation, but no later than completion of the borehole to the intended depth. As indicated in DER-10 Section 3.3(e), soil generated from borehole advancement at off-site locations is considered to be “non-contaminated” unless visual, olfactory, or instrumental evidence indicates otherwise or if such soil contains separate-phase NAPL. Therefore, “non-contaminated” soil will be backfilled into the boring from which it was generated, as indicated above for soil from on-site borings. Any non-contaminated soil that does not fit into the borehole as backfill will be containerized at the end of the day's activities and returned to the site. Containerized soil will be managed on the site as indicated in DER-10 Section 3.3(e) 3.

Soil removed from the subsurface during the excavation of test pits will generally be handled in the same manner as soil removed from a borehole. As the test pit is being excavated, removed soil will be placed on plastic sheeting. If no drums, NAPL, or other obvious contamination is observed, the soil will be placed back into the excavation after activities associated with the test pit have been completed (i.e., visual observation and logging, soil sampling, etc.). As soil is being placed back into the test pit, efforts will be made to replicate the general location and vertical distribution of the soil prior to removal from the test pit. Drums or containers encountered in the test pit will be containerized or over-packed, and obviously contaminated soil, including NAPL-contaminated soil or NAPL liquid will be containerized and managed as indicated above for soil from boreholes.

Any investigation-derived waste that is liquid will be managed as described in DER-10 Section 3.3(e) 5, and in accordance with all applicable laws and regulations. All such water and/or other liquid will be will be containerized as it is produced. Containers of water or other fluid generated as a result of well development or well purging prior to sampling will be properly labeled and securely staged in a designated area on the site pending appropriate disposition on the site or at an off-site disposal facility consistent with applicable guidance and regulations depending on contents of each container of liquid. With approval by DER personnel, containerized water may be discharged to unpaved ground surface within the source area and groundwater unit. If a remedial treatment system is operating on the site, the containerized water may be added to the treatment system.

In some cases, sediment entrained in containerized liquid may settle out of the liquid and accumulate in the containers of liquid investigation-derived waste. Such sediment will be managed as described in DER-10 Section 3.3(e) for solid material.

Investigation-derived waste soil and liquid that is generated from known areas of contamination must be characterized to ensure that the materials are properly labeled upon generation and must be classified with respect to the type of waste, so appropriate treatment and disposal options can be determined. All investigation-derived waste that is classified as either a solid or hazardous waste will be managed in accordance with applicable waste management regulations. Specific locations and procedures for storage and management of wastes will be identified in the project-specific Work Plan.

In addition to subsurface media, additional investigation-derived waste includes the generation of such wastes as 1) liquids as a result of equipment decontamination, 2) concrete dust from interior investigation activities and concrete chip sampling, 3) personnel protective equipment and clothing, and 4) general trash and debris. Those materials will be managed and disposed of as indicated below.

- Liquids generated from contaminated equipment decontamination procedures that exhibit visual staining, sheen, or discernible odors will be collected in drums or other containers at the point of generation. The containers will be properly labeled and securely stored in the designated waste-container staging area. Following sampling and waste characterization, a licensed waste disposal company will be contracted to remove the drums for disposal at an offsite disposal facility. Decontamination liquids that do not exhibit evidence of contamination will be containerized separately from those exhibiting evidence of contamination.

- Concrete dust generated during penetration through concrete floors or pads for the subsequent advancement of soil borings or other sampling activities, including collection of concrete chip samples, will be collected in shop vacuums and disposed of as non-regulated solid waste, unless photoionization detector readings or visual indications of contamination are noted during field operations, in which case disposal will be based on the results of sampling and analysis for waste characterization.
- Used protective clothing and equipment that is suspected to be contaminated with hazardous waste will be placed in plastic bags, packed in 55-gallon ring-top drums, and transported to the drum staging area for subsequent disposal as appropriate based on the nature of the contaminants present. Non-contaminated protective clothing will be packed in plastic bags and placed in a trash dumpster for disposal by a local waste removal company.

All drums containing investigation-derived waste, as well as used protective clothing and equipment, will be properly secured and staged in an appropriate location on the site. Coordination of the handling, labeling, and on-site storage of such drums, including sampling for characterization of contents and making arrangements for off-site disposal, will be the responsibility of HRP field personnel.

16.0 SITE SURVEY AND BASE MAP PREPARATION

For any site investigation or remedial action program, accurate plotting of key site features and sampling locations on site plans is an important component of the data evaluation and decision-making process. Therefore, HRP will conduct an instrument survey of site features that will include providing locational data for all soil boring locations, monitoring well locations, test pit locations, soil vapor point locations, and surface water/sediment sampling locations; performing a topographic survey and preparing a site map (typically based upon a previous base map or site control markers). To ensure the collection of consistent elevation data, each of the existing monitoring wells or other pertinent locations will be included in the site survey.

HRP will locate all field sampling locations using a high-precision GPS unit, survey equipment, and/or licensed surveyor, as directed by the NYSDEC project manager or as indicated in DER-10. In addition to providing the data for monitoring well locations, each monitoring wells will be surveyed with respect to elevation to an accuracy of 0.01 feet relative to a known site datum. A topographic survey and preparation of a site base map will be performed by a licensed professional land surveyor, if required by the NYSDEC project manager.

A detailed topographic base map of the site and immediate vicinity will be developed using the site survey data and applicable available mapping. All relevant features of the site and adjacent areas will be surveyed and included on the site plan. As previously noted, HRP will be responsible for placing either survey flags or survey stakes at each of the pertinent locations. The base map will be used to accurately plot all sampling locations, including soil borings, monitoring wells, and all other sample/monitoring locations on the site plan.

The site map will also include site-specific features associated with the characterization/investigation (i.e., surface water drainage, above and underground storage tanks, buildings, drywells, septic systems). Additionally, engineering controls implemented or to be implemented at the site must be clearly labeled. Contours will be plotted at 1-foot intervals. The location and elevation of each survey point will be surveyed by a New York State licensed surveyor. The elevations of all monitoring well casings will be established to within 0.01 feet based on the North American Vertical Datum (NAVD) of 1988. A permanent reference point will be placed in all interior polyvinyl chloride casings to provide a point to collect future groundwater elevation measurements.

All data collection for the site survey and details regarding base map preparation, as well as the preparation of other maps and plans prepared for the site, will be in accordance with the expectations presented in DER-10 guidance or as directed by the NYSDEC Project Manager.

For each site, the tax maps will be reviewed, and the property lines of the parcels will be plotted on the base map. The site tax map number will also be identified.

With respect to the site survey and base map preparation, the following assumptions have been made:

- The estimated survey area should include the whole site boundary. All elevations will be referenced to the NAVD 88. All horizontal locations will be referenced to the North

American Datum of 1983 (NAD83).

- Three blueline copies of the site base maps with topography (1-foot contour intervals), and three blueline copies of the site basemap, without topography, will be submitted to NYSDEC.
- The site map will be provided in AutoCAD® and ArcMap using versions of the software approved by NYSDEC.

17.0 REFERENCES

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APPENDIX A

HRP Standard Operating Procedures

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Soil Boring Advancement

SOP #101

Revision Date: August 8, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

<u>Reviewed by:</u>

Technical Director/
HRP Quality Assurance Officer

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August 8, 2019
Date

Vice President/
Practice Leader - Environmental

Scot Kuhn, P.G., L.E.P.

August 8, 2019
Date

1.0 Introduction

This Standard Operating Procedure (SOP) discusses procedures and techniques for advancing soil borings either for exploration, soil sampling, or the installation of monitoring wells. The HRP representative should be aware that the drillers are responsible for the operation and safety of the drilling rig itself, but it is the responsibility of the HRP representative to ensure that proper procedures are used with respect to sampling and decontamination of equipment. This document was prepared in general accordance with ASTM methods D6282 / D6282M-14, *Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations*; D1452-16, *Practice for Soil Investigation and Sampling by Auger Borings*; and D1586-14, *Test Method for Penetration Test and Split-Barrel Sampling of Soils*. Procedures used to collect soil samples for chemical screening and/or subsequent laboratory analysis are provided in HRP SOP # 104*, Soil Sampling*.

2.0 Equipment - General

Equipment supplied by HRP for activities associated with the advancement of soil borings using hollow-stem auger or direct-push drilling techniques typically includes:

- Stainless steel spatula or alternative for splitting samples
- Portable Photoionization Detector (PID) instrument for sites where volatile organic compounds (VOCs) are a concern
- Polyethylene plastic sheeting or alternative technique
- Sample collection containers (glass jars, etc.)
- Indelible marker
- Two 5-gallon buckets
- Decontamination brushes
- Decontamination solutions/equipment
- Cooler with ice and/or cold packs
- Sample labels
- Field logbook and appropriate field forms
- Personal Protective Equipment, including clean disposable gloves, hard hat, steel toe shoes, hearing protection, and other equipment required by the site-specific Health & Safety Plan
- Clipboard
- Water-level tape with audible alarm
- Chain-of-Custody forms
- Paper towels

2.1. Drilling Rig

Unless otherwise specified, all soil borings will be installed using hollow-stem auger equipment or a Geoprobe® Macro-Core® sampler or similar device powered by an appropriate rig.

2.2. Water

Water is occasionally required to maintain the stability of the boring or specific drilling procedures. If water is used, the source(s) and estimated quantity will be recorded in the drilling log. Only a potable water supply may be used for drilling purposes.

2.3. Central Auger Bit Plug

In order to maintain clean, accurate samples, no hollow-stem auger drilling may be conducted without the use of a central auger bit plug. The driller should be made aware of this prior to entering the site, as is necessary.

3.0 Cleaning and Decontamination

Prior to advancing a soil boring, the HRP representative will ensure that all necessary equipment is clean and decontaminated, including the rig, all augers, rods and bits and other downhole equipment, samplers, brushes, and any other tools or equipment. Decontamination procedures may vary slightly from those presented below, dependent upon the particular types of contaminants encountered.

a. Decontamination supplies:

- solution of Alconox™ or Liquinox™ and water prepared in a 5-gallon bucket (approximately 2.5 gallons). Another 5-gallon bucket will contain potable water (approximate 2.5 gallons).
- Deionized water
- 5-gallon buckets
- Spray bottles
- Brushes
- Paper towels
- isopropyl alcohol/water solution (as appropriate based on contaminants and analyses to be performed)
- <10% nitric acid/water solution (as appropriate based on contaminants and analyses to be performed)

b. Sampling devices (typically split spoons or Macro-Core®-type sampling devices) will be decontaminated between each sample. The order of decontamination solutions and procedures for split-spoon and other multi-use sampling devices is as follows:

Decontamination in the following order:

- Wipe or scrub excess dirt from equipment, as needed, using brush or paper towels
- Rinse/scrub in potable water (in a 5-gallon bucket) to remove additional loose debris, as necessary

- Wash in a solution of Alconox™ or Liquinox™ and potable water (in a 5-gallon bucket)
- Rinse with potable water
- Rinse with analyte-free water
- *The following steps may be required by the QAPP, by regulatory agency, or necessary due to the nature of the contaminants*
- Spray with <10% isopropyl/water solution when organics are potential constituents of concern
- Rinse with potable water
- Rinse with <10% nitric acid/water solution when metals are potential constituents of concern
- Rinse with potable water
- Rinse with deionized water
- Wipe with a clean paper towel (optional, depending on weather conditions)
- Air Dry (as appropriate)

Alternative methods of cleaning may more appropriate (or necessary) for an individual pieces of equipment, based on site conditions, site contaminants, Quality Assurance Project Plan (QAPP), or site-specific work plan requirements, Alternative decontamination solutions must be consistent with overall objectives for the project, and use of alternative decontamination solutions or decontamination procedures must be made after consultation with the HRP project manager and must be documented in field paperwork as to rationale and appropriateness. Decisions regarding alternative decontamination procedures or solutions must be made in coordination with the HRP Project Manager and/or Quality Assurance Officer for the project.

c. At the end of the project day, all HRP equipment which is used on the site shall be decontaminated. Disposal of all spent decontamination solutions shall be in accordance with the requirements of the site work plan and state and federal requirements.

4.0 OSHA

The Foreman or Supervisor of the drilling crew shall be the "Competent Person" as required by OSHA for all work. However, to the best of his or her ability, the HRP representative should bring to the “Competent Person’s” attention conditions which may be unsafe or present a hazard to the drilling crew, the general public, or other workers on the site.

The HRP representative has stop-work authorization to be exercised upon determination of an imminent health or safety hazard. The project manager will be contacted immediately after a stop-work order is executed.

5.0 VOC Monitoring

If the potential exists for VOCs to be a concern at the site, a portable PID shall be available on site and shall be used to screen all cuttings and fluids (if any) removed from the borehole, and to screen the breathing zone in the working area for VOC levels.

6.0 Soil Boring Advancement

6.1. Rig Operation

a. Rig operation is the responsibility of the drilling crew Foreman or Supervisor.

b. The HRP representative will review utility locations with the drilling foreman prior to drilling and will bring to the attention of the drilling foreman and rig operator the requirements for sampling, health and safety, identified utility restrictions, decontamination procedures, and well construction specifications, as appropriate.

c. It is the responsibility of the drilling Foreman or Supervisor to ensure that the rig, upon arrival on-site, is in good working order; that all required equipment and supplies are present; and that the rig is free of loose debris, oil leaks, or defective equipment.

6.2. Field Screening

The procedure to obtain a PID reading for a soil sample is described in an attachment to HRP's SOP # 104, *Soil Sampling*.

6.3. Disposal of Potentially Contaminated Materials

Potentially contaminated cuttings or fluids, as indicated by knowledge of the site, discoloration, PID readings, or other evidence shall be disposed of in accordance with the requirements of the HRP site-specific Work Plan, QAPP, and applicable state and federal regulations.

6.4. Refusal

When drilling through unconsolidated materials using a hollow-stem auger drilling rig, the term "refusal" is generally defined as the failure of an approximate 2-inch diameter split-spoon sampler to penetrate more than one-tenth of a foot with 100 blows using a 140-pound hammer dropped from a height of 30 inches. However, refusal can also be designated at the discretion of the HRP representative if the Macro-Core® or similar sampler cannot advance using the standard operating procedures for the direct-push drilling rig by the rig's manufacturer.

6.5. Bedrock

a. The term "bedrock" will not be used in a boring log or other description unless a minimum of three (3) feet of bedrock core is recovered using an appropriate core drill, and in the opinion of a competent geologist, the core exhibits the characteristics of known bedrock in the region.

b. The terms "apparent bedrock" or "possible bedrock" may be used in a boring log at the judgment of the HRP representative, even if 3 feet of bedrock has not been cored, provided there is reasonable justification for such a conclusion.

6.6. Other

Depending on the specific site, other considerations may be applicable. Consult the site-specific work plan and health and safety plan (HASP) for details.

7.0 Logging Procedures for Soil Borings

a. The following information shall be recorded on the boring log:

- Project name, site location, and HRP job number.

- Boring identification number, borehole diameter, boring location on the site, drilling method, contractor, groundwater observations, the logger's name and the date.

- Depth below grade, sample I.D. number, identification numbers for duplicate samples, PID reading, number of blows required for each six-inch penetration of a 2-inch split spoon using a 140-pound hammer, rig behavior (i.e. drilling effort, etc.).

- A complete sample description, including at a minimum: depth of the sampling interval, depth of significant changes in lithology, material size and gradation, color, moisture, density, physical evidence of contamination, and any unusual odors. Procedures for describing subsurface materials may vary depending on the purpose of the sampling effort (i.e., hydrogeologic properties, lithologic description, geotechnical characteristics). In addition to HRP SOP #103 *Soil Logging and Description Using a Modified Burmister Classification System*, ASTM Standard D2488-90 "Practice for Description and Identification of Soils (Visual-Manual Procedure) and ASTM Standard D2487-92 "Classification of Soils for Engineering Purposes (Unified Soil Classification System)" may be consulted for additional information on describing soils, especially the latter if soil description for engineering purposes is needed.

- The use of water for drilling purposes, if any, including source(s) and estimated quantities.

8.0 Soil Sample Retrieval

8.1. Split-Spoon Sampling

a. Samples of unconsolidated materials are collected with a split-spoon sample device operating inside of and in advance of hollow-stem augers. However, if split-spoon sampling is not possible for an interval, other methods for collecting a sample may be employed based on the discretion of the HRP representative.

b. In general, the hollow-stem augers and the central auger bit plug shall be advanced to the depth of the sampling interval.

c. After removing the central auger bit plug, the split-spoon sampler will be lowered into the augers. It will then be driven up to 24 inches into the soil using a 140-pound hammer with a fall of 30 inches. The HRP representative will record the blows for each six-inch increment.

d. The spoon shall be opened by the driller. The HRP representative may assist in opening the split spoons, at his or her discretion.

e. At a minimum, the HRP representative will record on the boring log a description of the material in the sampler (material gradation, lithology, color), blow counts, depth of penetration below grade, PID instrument reading, percent or amount of recovery, moisture, density, physical evidence of contamination, and odor (if any).

f. Prior to reuse, the sampler shall be decontaminated.

g. Soil samples collected for archival purposes shall be placed into clean soil jars and labeled with the boring number, sample collection depth, date and job number. Additional labeling requirements may be specified in the site-specific work plan and/or QAPP.

h. The procedures for collection of soil samples for chemical analysis are described in HRP SOP for Soil Sampling.

8.2. Soil Sampling from a Macro-Core®

a. In general, the Macro-Core® cutting shoe and sampling tube shall be advanced by applying the static weight of the rig and/or a hydraulically-powered rotary hammer.

b. The stainless steel sampling tube shall be opened by the driller by unscrewing the cutting shoe and removing the 48" or 60"- liner of suitably inert material. The HRP representative may assist in opening the sampling tubes, at his or her discretion.

c. The HRP representative will record on the boring log a description of the material in the sampler (material gradation, lithology, color), percent or amount of recovery, depth of penetration of sampler below grade, PID instrument reading, moisture, density, physical evidence of contamination, and odor (if any) in accordance with

HRP SOP # 103, *Soil Logging and Description Using a Modified Burmister Classification System*.

d. Prior to reuse, the Macro-Core® sampler shall be decontaminated. The liners are not suitable for re-use and must be disposed of properly after samples have been collected.

e. Soil samples collected for archival purposes shall be placed into clean soil jars and labeled with the boring number, sample collection depth, date and job number. Additional labeling requirements may be specified in the site-specific work plan and/or QAPP.

f. The procedures for collection of soil samples for chemical analysis are described in the HRP SOP for Soil Sampling.

8.3. Sampling from Auger Flights

In cases where an insufficient amount of sample is available from the split spoon, collection of a sample from an auger flight may be appropriate. However, the utility of this sample is limited because an accurate measurement of the depth where the soil originated and the degree of mixing with other soil are not known. Samples taken from an auger flight may not be used for VOC analysis, except for screening purposes. The limitations of this type of sample should be carefully considered before submitting an auger flight sample for laboratory analysis. Auger flight samples can be collected using two methods.

1. A sample of the drill cuttings can be collected as the soil is extruded onto the ground (after rotation of the drill stem has stopped); or

2. A sample can be collected directly off the augers (after rotation of the drill stem has stopped) by removing a portion or all of the drill stem from the ground.

Typically, the closer the sample can be collected to the cutting bit when using Method 2, the greater the ability to estimate the depth of sample origin.

9.0 Abandonment of Soil Borings

a. If the boring is not to be used for other purposes (i.e., monitoring well, soil vapor probe, soil vapor extraction well, etc.), it shall be abandoned following completion and collection of samples for screening and/or laboratory analysis.

b. In general, the procedure for boring abandonment is as follows:
For most borings, bentonite chips or drilling tailings (spoils) should be used for backfill, either of which should be compacted during the backfilling operation. If drilling spoils are used, then they should be free from any evidence of contamination, unless site-specific work instructions specify otherwise based on project-specific data quality objectives. In all cases, backfilling of boreholes must be consistent with state and federal regulations and guidelines and specific

details regarding backfilling will be provided in site-specific work plans or work instructions.

If there are confining layers present in a boring and the presence of DNAPL is suspected, the boring shall be filled and sealed as the augers are withdrawn with cement-bentonite grout. If no confining layers were noted in a boring and the presence of DNAPL is not suspected, bentonite pellets or chips may be used, preferably as the augers are withdrawn. The pellets or chips should be compacted during the backfilling operation.

Well abandonment regulations vary from state to state. All monitoring wells will be abandoned if no longer needed in accordance with the regulatory requirements of the state where the work is performed.

c. In paved areas, when bentonite chips or grout is being used, the upper one to two feet of the borehole shall be filled, up to two inches below the existing grade, with sand to allow for repair of the pavement, concrete, or other surface material.

d. Asphalt pavement shall be repaired using cold-patch asphalt filler, unless otherwise specified in the site-specific work plan; concrete surface will be repaired with concrete; all other surfaces will be repaired as appropriate to be consistent with the surrounding surface.

10.0 Soil Boring Location Records

Following completion of the soil boring, its location in relation to known mapped features should be recorded for future reference using either taped measurements from two identified locations or surveyed relative to site features.

11.0 References

ASTM International. 2014. Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations, ASTM D6282 / D6282M-14.

ASTM International. 2016. Standard Practice for Practice for Soil Investigation and Sampling by Auger Borings, ASTM D 1452-16.

ASTM International. 2018. Standard Practice for Test Method for Penetration Test and Split-Barrel Sampling of Soils, ASTM D1586-18.

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

U.S. Environmental Protection Agency (US EPA), Region 4. 2015. Operating Procedure: Field Equipment Cleaning and Decontamination. SESDPROC-205-R3. Science and Ecosystem Support Division. Athens, GA.

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Overburden Monitoring Well Installation

SOP #102

Revision Date: August 8, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

<u>Reviewed by:</u>

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August 8, 2019
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August 8, 2019
Date

1.0 INTRODUCTION

The purpose of this document is to describe methods for installing monitoring wells and piezometers within an overburden aquifer. Additional guidance for monitoring well installation includes ASTM Standard D5092/D5092M-16 *Standard Practice for Design and Installation of Ground Water Monitoring Wells*.

2.0 EQUIPMENT AND MATERIALS

2.1 Equipment Supplied by Driller

2.1.1 Drilling Rig

- Well Casing
- Bottom Cap
- PVC Well Cap
- Sand
- Bentonite
- Cement-Bentonite Grout
- Protective Casing

2.1.2 Above-grade well completion

- Steel pipe with locking cover, diameter at least 2 inches greater than well casing, painted with epoxy paint for rust protection,
- Heavy duty lock;
- Protective posts, if appropriate

2.1.3 Flush-mount well completion

- Steel road box with a cover and drain, diameter at least 4 inches greater than the well casing,
- rubber seal to prevent leakage

3.0 WELL CONSTRUCTION

While determining the desired depth of a monitor well, the stratigraphy of the location and the nature of the contaminants should be considered. Completion of a well screened across aquifer materials of varying hydraulic properties should generally be avoided if possible.

This section provides general practices for monitoring well construction when no other state or federal guidance exists that requires more stringent procedures. However, in all cases, monitoring well construction should be in accordance with applicable state and federal regulations and guidelines applicable to the location where the well is installed. Alternative well construction procedures and specifications should be described in the site-specific work plan or work instructions.

Monitoring wells will be constructed in the borehole, once the borehole has been advanced to the desired depth. If the borehole has been drilled to a depth greater than that at which the well is to be set, the borehole will be backfilled with bentonite pellets or a bentonite-cement slurry to a depth approximately 1 foot below the intended well depth. Calculating the depth to which the grout should be placed must take into account the amount of swelling by bentonite pellets once they have absorbed water within the saturated zone. Approximately 1 foot of clean sand will be placed on top of the bentonite to return the borehole to the proper depth for well installation after sufficient time has elapsed for the grout to set (generally overnight) or the bentonite pellets to absorb water. Measurements should be made of the depth to bentonite before calculating the amount of sand to add to the borehole and to better assess an accurate depth to which the well screen will be set.

All well construction materials should be delivered to the site wrapped in plastic. If not, such materials should not be used.

The appropriate lengths of well screen (with bottom cap) and casing will be joined watertight and lowered inside the augers to the bottom of the borehole. If centering guides are used, they will be placed at intervals around the well casing, beginning no lower than 5 feet above the top of the well screen.

Selection of the filter pack and well screen for the permanent shallow monitoring wells are based upon the gradation and grain size of site aquifer materials. Unless the sand pack and well screen slot size is determined using well design methods such as those described in ASTM Standard D5092M-16-a No. 0 or No. 1 sand (or similar) and a 10-slot well screen should be used. For wells screened in low-permeability formations, a No. 0 sand is more appropriate to avoid difficulties with turbidity during well development and subsequent groundwater sampling. It is also appropriate to use pre-packed well screens with No. 0 or a mixture of No. 0 and No. 00 sand, especially with finer silt and clay aquifers.

A sand pack consisting of clean silica sand will be placed around the well screen. The sand will be placed into the borehole at a uniform rate, in a manner that will allow even placement of the sand pack. The augers will be raised gradually during sand pack installation to avoid caving of the borehole wall; at no time will the augers be raised higher than the top of the sand pack during installation. During placement of the sand, the position of the top of the sand will be periodically sounded using a stainless steel weight attached to a fiberglass tape measure. The sand pack will be extended from the bottom of the borehole to a minimum height of 1 to 2 feet above the top of the well screen. Heights of the sand pack and bentonite seal may be modified slightly in the field to account for either a shallow water table and/or a limited saturated aquifer thickness.

A bentonite pellet seal at least 2 feet thick will be placed above the sand pack. The pellets will be placed into the borehole in a manner that will prevent bridging. The position of the top of the bentonite seal will be verified using a weighted tape measure. If all or a portion of the bentonite seal is above the water table, clean water will be added to hydrate the bentonite. Above the bentonite seal, a sand pack will be placed. At the discretion of the project manager, and if there is sufficient room, a second bentonite seal can be placed approximately 3’-5’ below grade. The sand pack is extended to the appropriate depth for proper completion of the well.

For monitoring wells completed deep below the water table, or in a lower distinct aquifer separated from a shallow aquifer by an aquitard, an annular seal of cement-bentonite grout must be placed above the bentonite seal above the screened interval. If this option is selected, the cement-bentonite grout will be installed continuously in one operation from the bottom of the space to be grouted to the ground surface through a tremie pipe. The tremie pipe must be plugged at the bottom and have small openings along the sides of the bottom 1-foot length of pipe. This will allow the grout to diffuse laterally into the borehole.

For monitoring wells that will be completed above-grade, a locking steel protective casing set in a concrete pad will be installed. The steel protective casing will extend at least 3 feet into the ground and 2 feet above the ground. The concrete pad will be square, approximately 2 feet per side and should extend to a minimum of 6 inches below grade. The concrete pad will be sloped away from the protective casing.

Guard posts may be installed in high-traffic areas for additional protection. Four steel guard posts would be installed around the protective casing, within the edges of the concrete pad. Guard posts would be concrete-filled, at least 3 inches in diameter, and would extend at least 2 feet into the ground and 3 feet above the ground.

For monitoring wells completed flush with the ground surface, a steel road box with a rubber-sealed cover and drain will be installed. The top of the road box cover will be positioned approximately ½ to 1 inch above grade to allow for installation of the concrete pad. A square concrete pad, approximately 2 feet per side, will be installed as a concrete collar surrounding the road box cover, flush with surrounding grade and will slope uniformly downward in the same direction as the adjacent grade. The road box and installation thereof will be of sufficient strength to withstand normal vehicular traffic.

Concrete pads installed at all wells will extend to a minimum of 6 inches below grade. Protective casing, guard posts, and flush mounts will be installed into similar concrete pads, or one large concrete pad.

Each well will be properly labeled on the exterior of the locking cap or protective casing with a metal stamp indicating the permanent well number.

4.0 WELL DEVELOPMENT

For newly installed wells, the wells must be developed or a minimum of six well volumes should be removed prior to sampling. Well development is intended to remove excess sediment in the new well that may interfere with analytical results for groundwater samples. Development consists of pumping the well or surging and pumping the well until the water removed appears clear.

For removal of 6 times the standing volume in a 2-inch diameter well, 1 gallon of water should be bailed or pumped for every 1 foot of water column. A bucket of known volume can be used to collect and record the amount of groundwater purged by the bailer or pump method. When a mechanical pump is used for purging, the purging device should withdraw groundwater from mid-screen level, either by placing the pump intake at a depth equivalent to the middle of the wetted screen section, or by extending enough dedicated tubing such that the end of tubing is at a depth equivalent to the middle of the wetted screen section. Evacuation should continue until:

- the column of water in the well is free of visible sediment, and pH, temperature, turbidity, and specific conductivity have stabilized.
- A minimum of six well volumes are removed; or
- If well is purged dry, the water table should be allowed to sufficiently recover (to the static water level) before the next development period is initiated, and a minimum of six well volumes have been removed

The volume of water purged from the well can be determined using the following equation:

$$V = [(0.041)d^2](h)$$

Where:

V = Volume in gallons
d = Diameter of well in inches
h = Depth of water in feet (i.e., height of the standing water column)

The volume determined from this equation is the volume of water in the well. For a 2-inch diameter well, a general rule is that 1 gallon of water removed per foot for 6 times the volume of water in the well).

5.0 REFERENCES

ASTM International. 2016. Standard Practice for Design and Installation of Ground Water Monitoring Wells. D5092/D5092M-16.

ASTM International. 2018. Standard Guide for Development of Groundwater Monitoring Wells in Granular Aquifers. ASTM D5521/5521M-18.

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

USEPA. 2013. *Design and Installation of Monitoring Wells,* USEPA Region 4, Science and Ecosystem Support Division, SESDGUID-101-R1, January 29, 2013.

HRP Associates, Inc.

STANDARD OPERATING Procedure
for

Soil Logging Using a Modified Burmister System

SOP #103

Revision Date: August 8, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by:

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August 8, 2019
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August 8, 2019
Date

The Modified Burmister Soil Classification System (Burmister System) was developed as a rapid field method for identifying and classifying soil and sediment. The system is based upon visual identification of the generalized grain-size distribution and description of the physical characteristics of the sample.

1.0 General Guidelines for Soil Description

The modified Burmister System to be used for describing soil is comprised of three parts: a color descriptor; a grain-size descriptor; and modifier(s). The color descriptor indicates the overall color or colors of the wet sample. The descriptor consists of a color name or names and (if possible) the color code from a standard color reference (for example, a Munsell Color Chart for soil). The grain-size description indicates the predominant grain size in the sample, as well as the relative percentages of other grain sizes present.

Modifiers are used to further describe the geologic character of the sample. Modifiers may include descriptions of moisture content, sorting, sphericity, angularity, sedimentary structures or other pertinent information. Additional information on soil classification is provided in ASTM Standard D2488-17, *Practice for Description and Identification of Soils (Visual-Manual Procedure)* and ASTM Standard D2487-17*, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)*.

1.1 Color Descriptor

The color of the wet soil or sediment should be determined with reference to a standard color comparator (a Munsell Color Chart, for example) for rocks or sediment. The color descriptor should contain both the color name and, when a color comparator is used, the appropriate hue-chroma value code, for example "Reddish brown (5YR 4/4)". The color of a sample should always be gauged when the sample is wet, or it should be noted otherwise.

1.2 Predominant Grain-size Descriptor

The second part of the soil description consists of a visual estimate of the range of grain sizes resent and the percentage of various grain sizes in the sample, with particular attention paid to the dominant grain size, since the primary grain-size descriptor indicates the predominant grain size, as judged visually, of the sample. The predominant grain size is always capitalized and underlined. Possible descriptors include: CLAY, SILT, SAND, and GRAVEL (GRANULES, PEBBLES, COBBLES, and BOULDERS). These correspond to the standard Wentworth size-classification scheme that is used for describing soil and sediments for geological purposes. If soil samples are to be described for geotechnical purposes, the Unified Soil Classification System should be used. Classification of soil under the Unified Soil Classification System is described in ASTM Standard D2487-17, *Classification of Soils for Engineering Purposes (Unified Soil Classification System)*. Additional information on soil classification is provided in ASTM Standard D2488-17, *Practice for Description and Identification of Soils (Visual-Manual Procedure)*. A comparison of common grain-size scales is provided in Attachment A-1.

Size classifications using a modified Burmister system for grain sizes ranging from clay through boulders are provided in the chart entitled, “Wentworth Scale for Grain-size Classification” and “Grain-size Scales and Characteristics” (Attachments A-2 and A-3). The descriptor should also include an indication of the relative size range of the sample within the predominant grain size (for example, "fine-to-medium sand", "coarse sand", etc.). Although the chart includes divisions of the silt category, this is applicable only to soil samples analyzed by pipette or hydrometer and therefore, such distinctions cannot be used for field descriptions.

The presence of other grain sizes, in addition to the predominant grain size is also included in the grain-size descriptor. Grain sizes used are the same as for the predominant grain size of the soil or sediment sample (clay, silt, etc.); however, only the initial letter of the word is capitalized. The description should also include an indication of the relative amount of the minor components. Appropriate indicators to describe the relative percentages are provided in the table entitled, “Grain-size Percentage Descriptors for Modified Burmister Soil Classification System” (Attachment B-1).

It is generally not considered possible to visually distinguish between clay and silt. Estimation of the silt/clay content of a sample should be based upon the plastic properties of the sample. The plastic properties of the sample may be estimated by taking an approximately 1 cubic centimeter ball of the sediment and attempting to roll a thread of the material between the palms of the hand. The minimum size of the thread that can be rolled may be compared to the values presented in table entitled, “Plasticity of Soil Samples” (Attachment B-2) and the degree of plasticity can be estimated. A comparison of the minimum thread diameter which may be formed with the information presented in that table provides an approximate estimate of the silt/clay content for sand-silt-clay soil and sediments and composite clay sediments.

1.3 Modifiers

Various modifiers may be added to the basic sediment description to further describe the geologic character of the sample.

For sand or coarser-sized material, the relative degree of sorting, the sphericity, and angularity should also be recorded. Sorting may be visually estimated. However, sphericity and angularity should be estimated with reference to an accepted comparator. Two charts illustrating various degrees of sphericity and angularity are provided in the figure entitled, “Roundness and Sphericity” (Attachment B-1).

The mineralogy of the sample should also be recorded. Reference should be made to the relative percentages, grain size(s), and sphericity of the mineral particles (especially where it differs significantly from that of the predominant grain-size material).

Other information that should be recorded for each sample includes an estimate of the density and cohesiveness of the sample (estimated from blow counts or other specific instrumentation, as appropriate), the relative moisture content of the sample, visible sedimentary structures, and any odors or staining noticeable during logging. Appropriate terms for describing the density and cohesiveness of soil samples are provided in the table entitled, “Density and Cohesiveness of Soil Samples” (Attachment B-1), and terms for plasticity are provided in the table entitled, “Plasticity of Soil Samples” (Attachment B-2).

Especially important to include in any description is an indication that a specific portion of the material may represent “sluff” or material collapsed from the borehole walls.

Also important to include in the description on the boring log is an indication as to moisture content. Although this can be subjective and not always obvious in certain types of soil, simply an indication of “dry”, “moist”, or “wet”, with such qualifiers as “very” or “slightly” or gradational descriptions such as “moist (top 10’’) to wet” should be noted on the boring log.

2.0 Written Soil Descriptions for Boring Logs

The written sediment description may be made as either an unabbreviated or an abbreviated description. Both methods should relate the same information. However, the abbreviated description may be easier for some people to use in the field.

In an unabbreviated description, all of the words used in the description should be written out in their entirety. The descriptor should include pertinent information regarding the grain-size distribution, color, consistency, etc., as described previously. The color descriptor should precede the name of the primary soil component and then additional components, while such details as plasticity, mineralogy, visible sedimentary structure, etc., should follow the soil component name.

Below is an example of an unabbreviated description:

- red-brown (5YR 4/4), fine-to-coarse SAND, little fine Gravel, little Silt, moist, moderately well sorted, low sphericity, Sand subangular, micaceous, moist
- Note: If a Munsell color chart is not available, the specific, numeric color descriptor would not be included.

The Burmister system is intended to provide a means for describing uniform soils and sediments; therefore, three "special" cases should be addressed.

1) The Burmister system is intended only to <u>describe</u> soil and sediment. When a genetic classification with respect to the origin of the material is significant and may aid in distinguishing specific changes in the subsurface that might be relevant to overall interpretations for the project, such an interpretation should be added as a separate statement at the end of the description and should ***only be used when the origin of the material is very clear*** and not simply a field interpretation of possible depositional environment. Including such a genetic interpretation can create significant problems at a later date if the field interpretation is not correct.

   It is standard practice not to include such an interpretation, with the exception that the word “Fill” may be added to a description if it is clear in field samples that the soil is not native, in-place material.

2) In the case where the soil sample is heterogeneous (for example, a varved silt and clay), each component should be described individually, and the nature of the heterogeneity and any interlayering should also be described. Reference should be made to the relative percentages of each component. An example of such a description is provided below.

Soft, reddish-brown (5YR 3/4), CLAY and SILT, alternately layered, medium to high overall plasticity. Layers: CLAY layers, 3/8" to 5/8" thick, comprise 60%" of sample. SILT layers, 1/8" to 3/8" thick, comprise 40%" of sample. VARVED CLAY and SILT

This in another example for which a genetic interpretation may be added to the description, provided that the person logging the soil is familiar with what constitutes “varved silt and clay”, such as that found in Glacial Lake Hitchcock sediments.

3) When one material grades uniformly into another distinct soil type or grain size, the individual components should be described separately and the gradation noted. An example is provide below:

- reddish-brown (5YR 3/4), CLAY, medium overall plasticity, grading into soft,
- reddish-brown (5YR 4/4), SILT, trace Clay, low overall plasticity, soft, wet.

In the abbreviated sediment descriptions, the sample information is presented in a manner analogous to that for the unabbreviated description, but standard abbreviations are substituted for specific portions of the text. Abbreviations for the identifying terms in the Burmister system are presented in the associated tables. Mineralogic and geologic abbreviations may be found in standard geologic and mineralogic texts and field manuals. Except for the use of abbreviations, the abbreviated description is completely analogous to the unabbreviated description.

To maintain consistency in the way soils are described on boring logs, the various elements included in a soil sample description should follow the order in which those elements are presented in the table entitled, “Description of Soil Properties” (Attachment C). That table also provides specific information as to what each element of the soil description should include and how it should be presented.

3.0 References

ASTM International. 2017. *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).* ASTM D2487-17.

ASTM International. 2017. *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*. ASTM D2488-17.

Burmister, Donald M. 1950. *Principles and Techniques of Soil Identification*, Proceedings of the Twenty-Ninth Annual Meeting of the Highway Research Board Held at Washington, D.C. December 13-16, 1949, Highway Research Board Proceedings, Volume 29, December 1950.

Scientific Engineering Response and Analytical Services. 2004. *Description and Identification of Soils, Standard Operating Procedure #2074*. February 23, 2004.

ATTACHMENT A

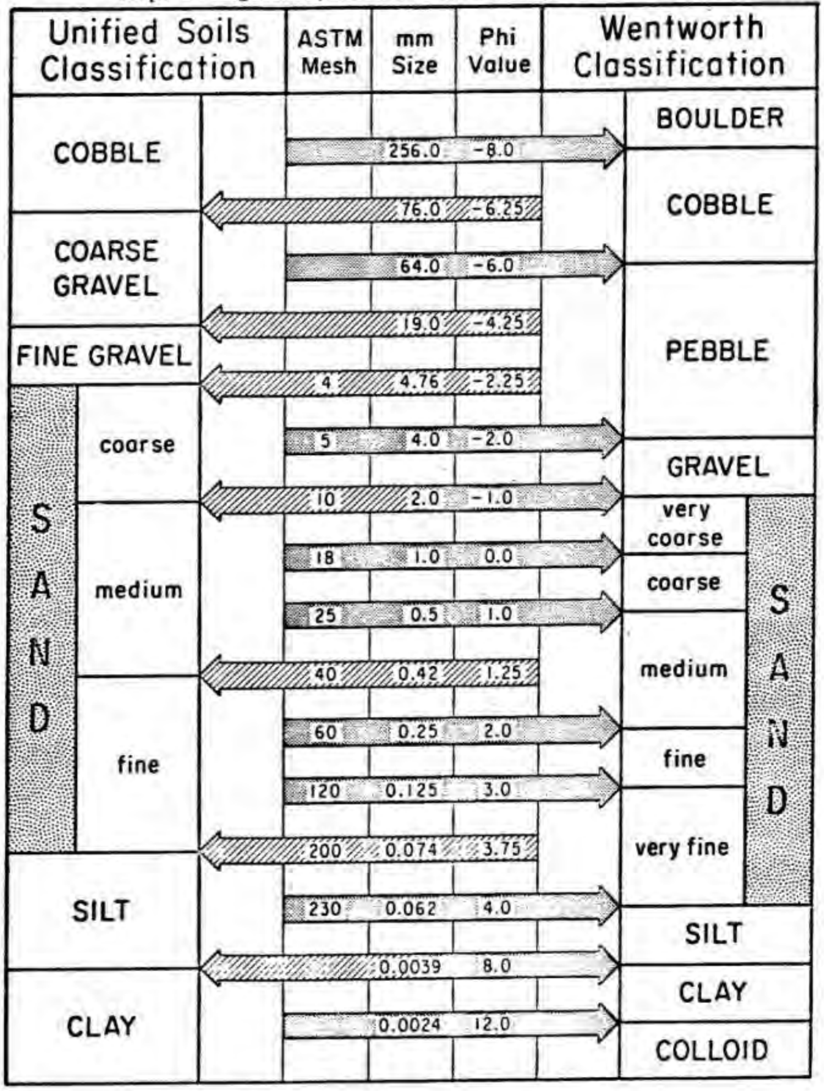
A-1 Comparison of Grain-size Scales for
Unified Soil Classification System
and Wentworth System

A-2 Wentworth Scale for
Grain-size Classification

A-3 Grain-size Scales and Characteristics

Comparison of Grain-size Scales for Unified Soil Classification System and Wentworth System

Grain-size scales--soil classification (modified from U.S. Army, Corps of Engineers, Coastal Engineering Research Center, 1977).



Unified Soils Classification	ASTM Mesh	mm Size	Phi Value	Wentworth Classification
COBBLE				BOULDER
		256.0	-8.0	→
				COBBLE
←		76.0	-6.25	
COARSE GRAVEL				
		64.0	-6.0	→
				PEBBLE
←		19.0	-4.25	
FINE GRAVEL				
←	4	4.76	-2.25	
SAND coarse				
	5	4.0	-2.0	→
				GRAVEL
←	10	2.0	-1.0	→
SAND medium				SAND very coarse
	18	1.0	0.0	→
				SAND coarse
	25	0.5	1.0	→
				SAND medium
←	40	0.42	1.25	
SAND fine				
	60	0.25	2.0	→
				SAND fine
	120	0.125	3.0	→
				SAND very fine
←	200	0.074	3.75	
SILT				
	230	0.062	4.0	→
				SILT
←		0.0039	8.0	→
CLAY				CLAY
		0.0024	12.0	→
				COLLOID

Wentworth Scale for Gain-size Classification

		U.S. standard sieve mesh	millimetres		phi (φ) units	Wentworth size class
Gravel			4,096		−12	boulder
			1,024		−10	
			256	256	−8	
			64	64	−6	cobble
		5	4	4	−2	pebble
		6	3.36		−1.75	
		7	2.83		−1.5	granule
		8	2.38		−1.25	
		10	2.00	2	−1.0	
Sand		12	1.68		−0.75	
		14	1.41		− 0.5	very coarse sand
		16	1.19		−0.25	
		18	1.00	1	0	
		20	0.84		0.25	
		25	0.71		0.5	coarse sand
		30	0.59		0.75	
		35	0.50	1/2	1.0	
		40	0.42		1.25	
		45	0.35		1.5	medium sand
		50	0.30		1.75	
		60	0.25	1/4	2.0	
		70	0.210		2.25	
		80	0.177		2.5	fine sand
		100	0.149		2.75	
		120	0.125	1/8	3.0	
		140	0.105		3.25	
		170	0.088		3.5	very fine sand
		200	0.074		3.75	
		230	0.0625	1/16	4.0	
Mud	Silt	270	0.053		4.25	
		325	0.044		4.5	coarse silt
			0.037		4.75	
			0.031	1/32	5.0	
			0.0156	1/64	6.0	medium silt
			0.0078	1/128	7.0	fine silt
			0.0039	1/256	8.0	very fine silt
	Clay		0.0020		9.0	
			0.00098		10.0	
			0.00049		11.0	clay
			0.00024		12.0	
			0.00012		13.0	
			0.00006		14.0	

Grain-size Scales and Characteristics

PHI - mm COVERSION $\phi = \log_2$ (d in mm) 1µm = 0.001mm				SIZE TERMS (after Wentworth,1922)		SIEVE SIZES			Number of grains per mg		Settling Velocity (Quartz, 20°C)		Threshold Velocity for traction cm/sec	
ϕ	mm		Fractional mm and Decimal inches			ASTM No. (U.S. Standard)	Tyler Mesh No.	Intermediate diameters of natural grains equivalent to sieve size	Quartz spheres	Natural sand	Spheres (Gibbs, 1971) cm/sec	Crushed	(Nevin,1946)	(modified from Hjuistrom,1939)
-8		256	10.1"	BOULDERS (≥ -8ϕ)										
	200													
-7		128	5.04"	COBBLES										
	100													
													200	1 m above bottom
-6		64.0	2.52"	PEBBLES	very coarse	2 1/2"								
		53.9				2.12"	2"							
	50	45.3												
	40												150	
		33.1				1 1/2"	1 1/2"							
-5	30	32.0	1.26"			1 1/4"								
		26.9				1.06"	1.05"							
		22.6			coarse							50		
	20										100			
		17.0				3/4"	.742"							
-4		16.0	0.63"			5/8"					90	40	100	
		13.4				1/2"	.525"				80			
		11.3			medium	7/16"							90	
	10	9.52				3/8"	.371"				70	30		
-3		8.00	0.32"			5/16"							80	
		6.73				.265"	3				60			
		5.66			fine								70	
	5	4.76				4	4				50			
-2	4	4.00	0.16"			5	5					20	60	100
		3.36			very fine	6	6				40			
	3	2.83				7	7							
		2.38			Granules	8	8				30		50	
-1	2	2.00	0.08"			10	9							
		1.63	inches	SAND	very coarse	12	10							
		1.41				14	12				20		40	50
		1.19	mm			16	14					10		
0	1	1.00	1			18	16	1.2	.72	.6		9		40
		.840			coarse	20	20					8		
		.707				25	24	.86	2.0	1.5	10	7	30	
		.545				30	28				8	6		
1	.5	.500	1/2			35	32	.59	5.6	4.5	7	5		30
	.4	.420			medium	40	35				6			
		.354				45	42	.42	15	13	5	4		
	.3	.297				50	48				4	3		
2		.250	1/4			60	60	.30	43	35	3			
	.2	.210				70	65						20	26
		.177			fine	80	80	.215	120	91	2	2	Minimum (Inman,1949)	
		.149				100	100							
3		.125	1/8			120	115	.155	350	240	1	1.0		
	.1	.105			very fine	140	150							
		.088				170	170	.115	1000	580	0.5			
		.074				200	200					0.5		
4		.062	1/16	SILT	coarse	230	250	.080	2900	1700	0.329			
	.05	.053				270	270							
	.04	.044				325	325							
		.037				400					0.1			
5	.03	.031	1/32								0.085			
	.02				medium									
6		.016	1/64								0.023			
					fine						0.01			
	.01													
7		.008	1/128								0.0057			
	.005				very fine									
8	.004	.004	1/256	CLAY	Clay/Silt boundary for mineral analysis						0.0014			
	.003										0.001			
9	.002	.002	1/512								0.00036			
-10	.001	.001	1/1024								0.0001			
						Note: Some sieve openings differ slightly from phi mm scale	Note: Sieve openings differ by as much as 2% from phi mm scale	Note: Applies to subangular to subrounded quartz sand (in mm)		Note: Applies to subangular to subrounded quartz sand		Stokes Law (R = 6πrηv)	Note: The relation between the beginning of traction transport and the velocity depends on the height above the bottom that the velocity is measured, and on other factors.	

-- from U.S. Geological Survey

ATTACHMENT B

B-1 Descriptors for Modified Burmister Soil Classification System

B-2 Plasticity of Soil Samples

Descriptors for Modified Burmister Soil Classification System

Grain-size Percentage Descriptors for Modified Burmister Soil Classification System

Fractions		**Proportion Descriptors**		
(+)	Major Fraction	**Quantity**	**Descriptor**	**Abbreviation**
(-)	Minor Fraction	35%-50%	and	a.
e.g., a medium- to- coarse SAND which is predominantly medium-grained would be written as: m(+)-c SAND		20%-35%	some	s.
		10%-20%	little	l.
		1%-10%	trace	t.
		Modifiers: (+)Upper end of the range (-) Lower end of the range		

Density and Cohesiveness of Soil Samples

Density of Cohesionless Soils		**Consistency of Cohesive Soils**	
Blow Counts	**Relative Density[1]**	**Blow Counts**	**Consistency[1]**
0 to 4	Very Loose (v.l.)	0 to 2	Very Soft (v.s.)
5 to 9	Loose (l.)	2 to 4	Soft (sf.)
10 to 29	Medium Dense (m.d.)	4 to 8	Medium (m.)
30 to 49	Dense (d.)	8 to 15	Stiff (stf.)
50 to 79	Very Dense (v.d.)	15 to 30	Very Stiff (vst.)
80 or more	Extremely Dense (e.d.)	30 or more	Hard (h.)

[1] Abbreviations indicated in parentheses

Plasticity of Soil Samples						
Material	**Symbol**	**Feel**	**Ease of Rolling Thread**	**Minimum Thread Diameter (inches)**	**Plasticity Index**	**Plasticity[1]**
Clayey SILT	CyM	Rough	Difficult	1/4	1 to 5	Slight (Sl)
SILT&CLAY	M&C	Rough	Less Difficult	1/8	5 to 10	Low (L)
CLAY &SILT	C&M	Smooth, dull	Readily	1/16	10 to 20	Medium(M)
Silty CLAY	MyC	"Shiny"	Easy	1/32	20 to 40	High (H)
CLAY	c	Waxy, very shiny	Easy	1/64	40+	Very High (VH)

[1] Abbreviations indicated in parentheses

ATTACHMENT C

Description of Soil Properties

Description of Soil Properties	
Color	The color of the sample should be described for wet soil. If possible, the color should be referenced to a standard color chart, such as a Munsell Color Chart.
Primary Grain Size	Primary grain size refers to the size of the predominant sedimentary size class within the material (as judged visually). The grain size divisions should conform to the standard Wentworth Scale divisions, as shown on the "Wentworth Size Classification" table.
Secondary Grain Size(s)	Secondary grain size(s) refers to material which, as a grain-size group, comprises less than the majority of the soil sample. Aside from stating the size classification, the relative percentage of the material must be stated. The grain-size divisions should conform to the standard Wentworth Scale divisions as shown on the Wentworth Size Classification table. To describe the approximate percentage of the secondary grain size(s) present, qualifiers shown in the table entitled, "Descriptors for Modified Burmister Soil Classification System".
Moisture Content	The moisture content of the sample should be described as dry, slightly moist, moist, or wet. Gradation from one state to another should be recorded as, for example, moist to wet.
Sorting	The relative degree of sorting of the sediment should be indicated as poor, moderate, good, or very good. The degree of sorting is a function of the number of grain-size classes present in the sample. The greater the number of classes present, the poorer the sorting. In addition, for samples composed only of sand, the relative degree of sorting is a function of the number of sand-size subclasses present.
Sphericity	Sphericity is a measure of how well the individual grains, on average, approximate a sphere. The average sphericity of the sand and larger size fractions should be described as low, moderate, or high. A chart illustrating varying degrees of sphericity is attached.
Angularity	Angularity, or roundness, refers to the sharpness of the edges and comers of a grain (or the majority of the grains). Five degrees of angularity are shown in the attached chart illustrating varying degrees of roundness: *Angular* (sharp edges and comers, little evidence of wear); *Subangular* (edges and comers rounded, faces untouched by wear); *Subrounded* (edges and comers rounded to smooth curves, original faces show some areas of wear); *Rounded* (edges and comers rounded to broad curves, original faces worn away); and, *Well-rounded* (no original edges, faces, or curves, no flat surfaces remain on grains).
Sedimentary Structures	Sedimentary structures are such things as varved layers, distinct bedding, or stratification.
Density or Cohesiveness	The density or cohesion of a sample (for the purposes of this application) refer to the sample's resistance to penetration by a sampling device. Density is used in reference to sediments primarily silt-size and coarser while cohesiveness is used in reference to primarily clay-sized sediments. Density or cohesiveness can be assessed from the number of blows from "standard" split-spoon sampling (i.e., 140# hammer, 30" fall, 2" X 2" (O.D., 1 3/8" I.D.)) split-spoon samplers according to the scale in the table entitled "Density and Cohesiveness of Soil Samples".

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Soil Sampling

SOP #104

Revision Date: August 8, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by:

Technical Director/
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Gail L. Batchelder

Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 8, 2019
Date

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Scot Kuhn, P.G., L.E.P.

August 8, 2019
Date

This Standard Operating Procedure (SOP) provides the general procedures for Soil Sampling for environmental investigation- and remediation-related activities. The SOP was developed based on a number of sources that represent prevailing standards and guidelines typically used in the field of environmental investigation and remediation. However, the procedures described herein are not intended to supersede any applicable local, State or Federal regulations. Nor can the procedures described in this SOP take into account every condition that might be encountered in the field or every project-specific data quality objective. An important component of this SOP is the need to document those instances where the procedures described herein are not followed for a specific project, the rationale for not following the procedures described in the SOP, and a description of the alternative procedures that were used instead.

1.0 Introduction

Sampling of unconsolidated materials at a site may require the collection of those materials from the surface and/or subsurface. Although the term "soil" can have a specific definition based on the depth of unconsolidated materials to which the reference is being made, for the purposes of this Standard Operating Procedure (SOP), the term "soil" will be used regardless of the depth from which the samples are collected. Soil samples may be collected from the vadose zone (i.e., above the water table) or from the saturated zone (i.e., below the water table). Evaluation of such saturated soil samples should take into consideration the possibility that the detected contamination may be present due to groundwater transport versus a direct contaminant release at a given location.

The soil sampling procedure must also consider the potential for loss of volatile organic compounds (VOCs) during sample retrieval and handling and be designed accordingly. Procedures for sampling soils for subsequent laboratory analysis for VOCs are provided in the HRP SOP # 105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds*.

Depending on project-specific data quality objectives and/or the project-specific work plan, field screening for various constituents may be indicated as a part of a soil sample collection effort. Because field screening for total volatile organic compounds (VOCs) using a photoionization detector (PID) is the most commonly performed field screening activity, procedures for such screening are described in Attachment A of this *Soil Sampling* SOP. In addition to field screening for total VOCs, screening of soil samples for the presence of non-aqueous-phase liquid (NAPL) or for metals may be important components of soil sampling at a site depending on the project-specific data quality objectives and the project-specific work plan. Procedures for such field screening will be provided in the individual project-specific work plan, since specifics of such screening procedures are more likely to be developed to meet the project-specific data quality.

Visual observation and characterization of soil samples is an important component of the soil sampling process. Procedures for geologic logging and characterization of soil samples are provided in HRP SOP # 103 entitled, *Soil Logging and Description Using a Modified Burmister Classification System.* When regulatory requirements or guidelines, or project-specific objectives require that the Unified Soil Classification System or other accepted soil classification system be used for a project, that classification system may be used in lieu of the Modified Burmister Classification System when such rationale is provided.

2.0 Specific Equipment List (not all items are required for a given sampling event)

- Personal protection equipment
- Stainless steel, Teflon, or polypropylene spatulas or scoops
- Stainless steel hand augers

- Stainless steel split spoons for soil sampling using a hollow-stem auger drilling rig

- Disposable acetate, lexan, or clear polyvinyl chloride (PVC) liners for direct-push soil sampling
- Stainless steel/glass pan
- Distilled water
- Plastic (polyethylene) sheeting
- Sample containers with labels
- Sample preservation materials and equipment
- Decontamination solutions/equipment
- Photoionization detector (PID) (preferred for most applications) and/or Flame Ionization Detector (FID)
- Coolers with ice (preferred) or ice packs

3.0 Documentation

- Site Plan/Activity Sheet
- Notebook/sketch pad
- Chain-of-custody record
- Instrument calibration logs (if required)
- Boring or test pit logs (as applicable)
- Applicable Soil Screening form(s)

4.0 Soil Sampling Precautions

1. Prior to conducting sampling, ensure that all necessary sampling equipment is clean and decontaminated in accordance with the site-specific work plan and/or decontamination procedures specified in Section 3.0 of HRP SOP # 101, *Advancement of Soil Borings in Unconsolidated Materials*.

2. Soil sampling for volatile or semivolatile analysis should be conducted using only stainless steel equipment or other chemically inert material that will not have the potential to contaminate the soil samples.

3. Soil samples collected for VOC analyses should never be mixed or composited. Sample collection for VOC analysis should be performed immediately after opening the sample collection device for each interval, before description of the soil sample or core and collection of samples for other analytes, to limit loss of VOCs from the sample due to volatilization. Soil sample collection techniques for VOCs are described in HRP SOP # 105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds*. Procedures identified in that SOP are designed to ensure that soil samples are preserved in accordance with U.S. EPA Method 5035.

4. Generally, compositing of samples for any analysis should be performed only after careful consideration of sampling goals. In general, compositing is an acceptable and often required methodology only for waste characterization sampling.

5. Collection of samples for laboratory analysis at a single specified location should proceed in the order of greatest to least volatilization potential. As indicated above, sample

collection for VOC analysis must be conducted first, followed by collection of samples into sample containers in order of volatility (e.g. petroleum hydrocarbons, semivolatile organic compounds (SVOCs), PCBs, metals, etc.).

6. The QAPP, site-specific work plan, and/or work instructions should describe the management of excess soil (i.e., soil not placed into containers for laboratory analysis) generated during soil sampling activities. In the absence of a specific soil management policy, excess soil collected during sampling should be handled in accordance with HRP's policy for management of investigation-derived waste. In all cases, disposal of excess soil must be in accordance with applicable federal, state, and local regulations. Depending on federal, state, and local regulations and the project-specific QAPP, work plan, and/or work instructions, soil exhibiting evidence of contamination may be returned to the borehole if the project-specific goal is to remediate the soil in the area where the contaminated soil will be returned.

7. Decontamination of field sampling equipment should be performed in accordance with Section 3.0 of HRP SOP 101, *Advancement of Soil Borings in Unconsolidated Materials.* Any sampling equipment that is reused during the sampling activities must be decontaminated between collection of every sample.

In addition to decontamination between samples, all equipment used for sampling shall be cleaned and decontaminated and/or appropriately disposed of upon completion of all sampling requirements and prior to leaving the site. If more thorough decontamination is necessary than can be adequately performed in the field, such equipment should be wrapped in plastic and returned to the office for more complete decontamination.

Ideally, the project-specific QAPP, work plan, and/or work instructions should specify how decontamination fluids will be managed at the site. Any fluids generated during decontamination must be containerized for subsequent disposal in accordance with federal, state, and local regulations, and as specified in the site-specific QAPP, work plan, and/or work instructions. All decontamination fluids generated at the site shall be subsequently disposed of in accordance with federal, state, and local regulations, as well as procedures specified in the site-specific QAPP, work plan, and/or work instructions.

5.0 Soil Sample Collection from Split Spoons, Direct-push Samplers, and Similar Devices

1. Personal protective equipment (PPE) should be donned and maintained in accordance with the site-specific work plan and/or health and safety plan during all sampling procedures. In the event that no PPE has been specified for a particular sampling event, disposable nitrile gloves should be donned, at a minimum, during all sampling procedures. Gloves must be changed after sampling from each individual sampling interval.

2. Soil sample retrieval from the subsurface shall be performed using an appropriate sample retrieval device (i.e., split spoon, Macro-core®, etc.) based on project-specific objectives and as designated in the project-specific QAPP, work plan, and/or work instructions. After collecting soil from each designated sampling interval using the soil retrieval device, the device shall be placed on polyethylene sheeting. Under no circumstances should the sampling device be allowed to touch the ground surface or other sampling surface until after the soil sample(s) have been collected from the device. Sample collection using hand

augering techniques require special consideration, as indicated below in Section 6.0 of this SOP.

3. Collect soil samples for VOC analysis from the designated sampling interval(s) or sub-interval(s) as indicated in the site-specific QAPP, work plan, or work instructions as soon as possible after opening the soil sample retrieval device and prior to conducting other sampling activities. Methodologies for soil sample collection and preservation for VOC analysis is described in HRP SOP # 105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds.* Collection of soil samples for VOC analysis from hand-augered sampling intervals requires special consideration, as indicated below in Section 6.0 of this SOP.

4. Following collection of soil samples for VOCs analysis, examine the soil core or soil sample to record color, texture, consistency, moisture content, and other pertinent characteristics in the field notebook or HRP boring log/field data sheet, as described in HRP SOP # 103, *Soil Logging and Description Using a Modified Burmister Classification System.*

5. Collect aliquots of soil from designated sampling intervals into appropriate sampling containers using a stainless steel or Teflon® sampling implement, such as a sampling spatula or spoon. In no instance should samples be placed into the sampling container using a sampling implement that is not made of inert material or a sampling glove.

   To ensure that the laboratory has sufficient sample volume to complete all analyses requested, fill sampling jars as completely as possible. Once filled, wipe rim and threads of sampling jar with a paper towel dampened with distilled water to remove excess soil particles that could interfere with proper closure of the jar lid.

6. If required, and if a sufficient sample is available after filling all jars, vials, etc., then soil from a given sample can be collected in a re-sealable plastic bag, or similar container, and screened in the field with a (PID) for total VOCs in accordance with the procedures described in Attachment A. Aliquots of soil may also be collected for screening purposes at this time.

7. Label the sample container(s) in accordance with procedures described in project-specific QAPP, work plan, and/or work instructions. Alternatively, sampling jars may be pre-labeled; in which case, the sample label should be double-checked prior to placing soil into the container.

8. Although compositing of samples is not generally appropriate, there may be circumstances when compositing of soil aliquots from two or more sampling intervals may meet project-specific Data Quality Objectives. Under no circumstances may samples be composited for subsequent analysis for VOCs.

   When samples are to be composited, the following approach should be used. Using decontaminated sampling equipment, collect and carefully place soil into a stainless steel bowl or pan to thoroughly mix or composite, if necessary. All soil samples must be thoroughly mixed to ensure that the sample is as representative as possible of the soil being sampled. One method used to effectively homogenize samples is described below:

   - the material in the sample pan should be divided into quarters

- each quarter should be mixed individually
- two quarters should then be mixed to form halves
- the two halves should be mixed to form a homogenous matrix
- procedure should be repeated several times until the sample is adequately mixed

Place aliquots of the homogenized sample into an appropriate, labeled container(s). If more than one sample container must be filled, place a spoonful of soil in each container in sequence and repeat until all containers are full or the sample volume has been exhausted.

Fill containers in the order of greatest volatilization potential to least potential for volatilization. As noted above in Section 3, sampling for VOC analysis should be performed first and should be conducted using the procedures described in HRP SOP #105, *Collection of Soil Samples for Analysis for Volatile Organic Compounds*.

9. Place sample(s) in cooler with ice (preferred to meet and maintain cooler temperature at 4ºC ± 2ºC) or ice packs as soon as possible following collection into sampling containers. Samples of waste or highly-contaminated media must not be placed in the same cooler as samples expected to contain low concentrations of contaminants.

10. Deliver, or arrange for delivery of, selected samples to the analytical laboratory or to be returned to the HRP office for subsequent delivery to the laboratory or to be maintained on hold pending the need to analyze the samples at a later date, unless such storage at the HRP office would not be in accordance with regional office sample storage and management procedures.

11. Follow field-specific sample handling procedures described in the project-specific QAPP, work plan, and/or work instructions.

12. Following sample collection and field-management of the collected sample(s), and before re-use, thoroughly decontaminate any reusable sampling collection devices (split-spoon sampler, direct-push samplers, hand auger, stainless steel spatula or spoon) after each sampling interval using appropriate decontamination procedures, as described in Section 3.0 of HRP SOP # 101, *Advancement of Soil Borings in Unconsolidated Materials*.

6.0 Soil Sample Collection from Hand Augers

1. Follow all procedures for soil sample collection described in Section 5.0 of this SOP, with the exceptions noted below.

2. Use a stainless steel hand auger to sample 0" to 6" or 0” to 12”, or other sampling intervals, as specified in the project-specific work plan. Generally, the hand auger can only collect a sample from intervals that are no more than approximately 6 inches at one time.

3. With the exception of sample collection for VOC analysis (which is described below) and when the objective for a sample collection interval is greater than the depth that can be achieved during a single retrieval of a hand auger from the subsurface, place each aliquot of soil retrieved by the hand auger from the specified sampling interval into a stainless

steel bowl or pan to be composited with additional soil from that sampling interval. Once soil retrieval from the full sampling interval is complete, homogenize the soil in the bowl using an appropriate technique (such as that described in Section 7), then collect soil samples into individual sampling containers to ensure that samples submitted for laboratory analysis are representative of the specified sampling interval.

4. When soil samples are to be collected from a hand auger for subsequent laboratory analysis for VOCs, the aliquot of soil collected for VOCs must be collected directly from the material inside the hand auger if at all possible. As a result, the site-specific work plan and/or work instructions should specify the specific 6-inch depth interval(s) from which the sample(s) for VOC analysis should be collected. If it not possible to collect the aliquot of soil for VOC analysis directly from the hand auger, the material in the hand auger may be placed into a large, zippered, polyethylene bag, which is tightly closed before the sample can be collected. The sample should then be collected from the polyethylene bag within no more than 5 minutes of removal from the subsurface.

7.0 Compositing of Soil Samples

Although compositing of samples is not generally appropriate, there may be circumstances when compositing of soil aliquots from two or more sampling intervals or locations may meet project-specific Data Quality Objectives. Under no circumstances may samples be composited for subsequent analysis for VOCs. When samples are to be composited, the following approach should be used.

- Following collection from the subsurface, place soil samples intended for compositing into a stainless steel bowl or pan to thoroughly mix or composite. Thorough mixing of the samples is important to ensure that the sample is as representative as possible of soil from the locations being sampled. One method used to effectively homogenize samples is described below:

    - the material in the sample pan should be divided into quarters
    - each quarter should be mixed individually
    - two quarters should then be mixed to form halves
    - the two halves should be mixed to form a homogenous matrix
    - procedure should be repeated several times until the sample is adequately mixed

- Place aliquots of the homogenized sample into an appropriate, labeled container(s). If more than one sample container must be filled, place a spoonful of soil in each container in sequence and repeat until all containers are full or the sample volume has been exhausted.

- Fill containers in the order of greatest volatilization potential to least potential for volatilization. As noted above in Section 3, sampling for VOC analysis should be performed first and should be conducted using the procedures described in HRP's SOP for *Collection of Soil Samples for Analysis for Volatile Organic Compounds*.

8.0 References for Soil Sampling Procedures

ASTM International. 2016. Standard Practice for Soil Investigation and Sampling by Auger Borings. ASTM D1452/D1452M-16.

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

U.S. Environmental Protection Agency (U.S. EPA) (2014). Soil Sampling, SESD Operating Procedure, SESDPROC-300-R3 (rev. 3), U.S. EPA Science and Ecosystem Support Division, August 21, 2014.

ATTACHMENT A

Attachment A

Field Screening of Soil Using a Photoionization Detector

Photoionization detectors (PIDs) are used in general screening of soil, water, or air for the presence of volatile organic compounds (VOCs). The instrument is used only to screen for the presence of total concentrations of VOCs, not for the presence of individual constituents, and not all constituents of interest may be detected by the instrument. It is also possible to screen soil samples for the presence of VOCs using a flame ionization detector (FID), but use of this instrument is far less frequent than a PID. Procedures for field screening of soil samples using an FID are provided in HRP SOP # 2-005, *Field Screening Procedures for Soil Samples.*

Because PIDs can only ionize molecules in air, no liquids or solids should be introduced into the sample line. A PID can have limited use in higher humidity or in the presence of methane due to potential fouling of the lamp, although performance may be improved by using a vapor trap in those PID models that may be equipped with one.

Users should refer to the operation manual for the instrument being used to ensure that the electron voltage for the bulb used is appropriate for compounds of interest. For example, use of higher electron volt (ev) bulbs (generally 11.7 ev) are needed for halogenated alkanes, such as 1,1,1-trichloroethane, or higher molecular weight aromatic compounds due to the increased strength of the bonding force of these chemicals. For general screening purposes, use of a 10.6 ev bulb as an "all purpose" bulb is recommended. However, predetermination of compounds of interest is helpful before deciding which bulb to use for a specific project.

Generally, short-chain, alkane hydrocarbons, such as octane or those compounds generally found in mineral spirits, do not exhibit a high response factor to a PID, and therefore, the presence of those compounds may not be detected by the instrument. In such cases, an FID may be appropriate to use in conjunction with the PID if such compounds are of specific concern.

Specific Equipment List

- PID (Photovac^{tm} Microtip, Photovac^{tm} 2020, MIniRae^{tm} 3000, or equivalent)
- Re-sealable plastic/polyethylene bags
- Personal protection equipment
- Calibration gas

Documentation

- Site plan
- Activity log/Sample log
- Notebook/Sketch pad
- PID calibration Guide

Procedure – For Soil/Solid Matrix Samples

Following calibration of instrument per manufacturer's procedures:

1. Record background reading.
2. Place a small quantity of soil to be tested (between 50 to 150 grams) into a re-sealable plastic/polyethylene bag.
3. Let soil warm to ambient temperature. Care should be taken to ensure that the equilibration temperature is relatively consistent throughout the day (e.g. 50 degrees in the morning compared to 75 degrees in the afternoon). (When the ambient temperature is below approximately 50º F, it is recommended that soil samples be brought into a warmer environment and allowed to equilibrate to the warmer ambient temperature before proceeding with measurement of the sample.)
4. Insert probe tip into bag (do not allow the probe tip to touch the matrix) by puncturing the side of the bag in such a manner so as to avoid the potential loss of volatiles to the atmosphere before the probe tip can be inserted.
5. Record reading.

Samples that are wet may give a false positive reading. This effect may be present if readings gradually increase with no discernable leveling off. If this effect is observed, the instrument bulb should be cleaned, and the instrument should be recalibrated prior to re-testing the sample. If the response persists, the screening results should be noted as suspect. However, to help minimize the effect of moisture on screening results, some PID models may be equipped with a moisture trap to remove at least some of the moisture as the air enters the instrument.

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Collection of Soil Samples for Analysis for Volatile Organic Compounds

SOP #105

Revision Date: August 8, 2019

LIST OF REVISIONS

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	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

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August 8, 2019
Date

Preamble

This Standard Operating Procedure (SOP) provides the general procedures for collecting and preserving soil samples for analysis for volatile organic compounds in accordance with EPA Method 5035 during environmental investigation- and remediation-related activities. The SOP was developed based on sources that represent prevailing standards and guidelines typically used in the field of environmental investigation and remediation. However, the procedures described herein are not intended to supersede any applicable local, State or Federal regulations. Nor can the procedures described in this SOP take into account every condition that might be encountered in the field or every project-specific data quality objective. An important component of this SOP is the need to document those instances where the procedures described herein are not followed for a specific project, the rationale for not following the procedures described in the SOP, and a description of the alternative procedures that were used instead. In such situations, state-specific protocols should be explicitly cited as part of the document of procedures.

(Note: The text of this Standard Operating Procedure has been taken in large part from the guidance document published by the Connecticut Department of Energy and Environmental Protection entitled, *GUIDANCE FOR COLLECTING AND PRESERVING SOIL AND SEDIMENT SAMPLES FOR LABORATORY DETERMINATION OF VOLATILE ORGANIC COMPOUNDS,* Final, February 28, 2006, because that document provides a thorough discussion of sampling procedures that may be used to be consistent with U.S. EPA protocols, preservation methods, and other applicable guidance on the subject.)

1.0 INTRODUCTION

Soil and sediment samples collected for laboratory analysis for volatile organic compounds (VOCs) require special handling to prevent loss of VOCs leading to low-biased results. This Standard Operating Procedure (SOP) describes soil sample collection and preservation techniques designed to minimize losses from soil and sediment samples (hereinafter referred to as soil samples) due to volatilization and biodegradation during collection, storage and analysis. This procedure does not allow for the compositing of soil samples for VOC analysis because of the potential for loss of VOCs during the compositing process.

The procedure described herein refers only to the collection and preservation of sub-samples of soil in accordance with EPA Method 5035 for subsequent laboratory analysis for VOCs. HRP SOP #2-002, *Soil Sampling*, describes more general procedures associated with soil sample collection for environmental purposes and laboratory analysis for other constituents.

2.0 SOIL SAMPLING TECHNIQUES FOR LABORATORY ANALYSIS FOR VOCS

2.1 Overview of Sampling Approach

The soil sample collection procedure for determination of VOCs is a two-step process:

> Step 1 – Collect an undisturbed soil sample, as defined below, from the subsurface, or expose the targeted area from where a sub-sample for laboratory analysis will be collected,
>
> Step 2 – Collect a representative sub-sample from the undisturbed sample or directly from the exposed subsurface.

2.2 Collection of Undisturbed Samples

Undisturbed samples are those for which the sampling device minimizes break-up of the structure of the soil to the extent practicable. Undisturbed samples can be collected using such techniques as:

- Coring, such as the methods utilizing split-spoon sampling devices, MacroCores®, and large-bore direct-push samplers;
- Bulk sampling, for example, undisturbed soil volumes collected using a backhoe bucket from sidewalls of trenches and excavations where direct access to the sampling location (sidewall or bottom) is not safe; and
- Direct collection of samples from the surface or subsurface using a device such as a hand auger.

When collecting samples for laboratory determination of VOCs, the device used to collect the undisturbed soil sample must be removed as soon as possible from the subsurface; and most importantly, the sub-samples that are intended for VOC determination must be collected as soon as possible to reduce loss of VOCs due to volatilization (Ideally, sub-samples should be collected within five minutes of opening the soil sample collection device and prior to any disturbance of the soil core other than slicing open the soil core itself. Aliquots of soil for laboratory analysis must be collected from the interior of the core, without including any portion of the core that has been in contact with the sampling device).

Attempts must be made to further minimize loss of VOCs by managing the sample collection environment (i.e., limiting sun, wind, heat, etc.).

Planning and careful preparation are critical for a successful sampling event. Checklists should be used to ensure that all necessary equipment and supplies are present and in proper working order and that the following conditions are achieved:

- Undisturbed soil to be collected for sub-sampling for VOCs should be collected in a manner that controls the acquisition of the samples such that they do not “stack up” awaiting logging and sub-sampling;
- Soil cores should not be stored in large-diameter sample collection equipment, orsmaller-diameter sampling devices or capped liners (brass, acetate, lexan, polycarbonate etc.) for longer than 10 to 15 minutes prior to collection of sub-samples

for VOC analysis. In all cases following collection of soil cores or samples from the sub-subsurface and prior to collection of the sub-samples for VOC analysis, soil retrieved from the sub-surface must be tightly capped or covered to minimize the potential for volatilizations of VOCs from the retrieved soil before the sub-samples for VOC analysis can be collected;

- Cores should not be exposed to extreme weather conditions, such as direct sunlight, rain and wind, and sub-sample collection should occur in an area that minimizes exposure to the elements (e.g., under cover, shady areas); and

- Undisturbed soil samples cannot be transferred from the core sampler to a secondary container (empty sample bottle, plastic bag, aluminum foil, or sampling bowls) for future sample collection.

To the extent practicable, undisturbed samples should always be collected. However, in some cases, collection of a disturbed sample may be necessary to characterize source areas or other critical locations. If disturbed soil samples must be collected, the rationale for collecting such disturbed samples must be provided. However, under no circumstances should a sub-sample be collected from a disturbed sample that was previously used for field-screening purposes.

2.3 Collection of the Soil Sub-Samples for Analysis for VOCs

Sub-samples are those samples that are submitted to the laboratory for analysis for VOCs. Sub-sampling of the undisturbed soil sample must be performed using a dedicated or decontaminated, small-diameter sampler. Sub-samples must be collected as soon as possible from the undisturbed sample after the undisturbed soil sample is collected.

3.0 OVERVIEW OF SUB-SAMPLING DEVICES

Sub-sampling of the large-diameter or bulk sampling device for VOCs must be performed with the use of a dedicated or decontaminated small-diameter core sampler. The small-diameter core sampler must be capable of collecting the required amount of sample from the large-diameter sampling device (e.g., split-spoon or soil corer) or from freshly exposed subsurface soils. The small-diameter core sampler must be capable of delivering the sample quickly and directly into the sample container without disturbing the native soil structure.

Small-diameter core samplers used in the collection of samples for VOCs must be constructed of non-reactive materials that will not sorb, leach or alter the concentration of VOCs in the sample. Examples of these materials are stainless steel, glass and brass. Other materials, such as Viton®, PTFE and some rigid plastics, which have demonstrated limited absorptive or diffusive passage of VOCs, can be used as long as the contact time between the sample and the sampler is minimized, or the materials are used for an airtight seal of the sampler. It is important to note that some syringes may be coated with glycerin and should not be used.

There are many acceptable small-diameter core samplers. Product names are included in this SOP for illustrative purposes and do not indicate that a specific sampling device be used as long as the data quality objective for sample collection can be met by a specific device and the suitability of the selected small-diameter core sampler not otherwise indicated in this SOP is explained.. Currently available small-diameter core samplers include a modified 10-milliliter (ml) disposable plastic syringe, a Purge and Trap Soil Sampler®, En Core® samplers, Easy Draw Syringe® or other small-diameter tube/plunger sampler.

The small-diameter core sampler should fit inside the mouth of the sample container to avoid loss of sample, prevent damage to the sealing surfaces or container threads and ease the soil transfer process.

3.1 Procedure for Obtaining Test Samples to Determine Sub-Sample Volume

The procedures used by the analytical laboratories to determine VOC concentrations in soil require approximately equal amounts of soil and liquid to be used in the procedure. If the ratio of soil to liquid is too high, the soil will not be adequately dispersed in the liquid, leading to poor results. If the amount of soil is too low, the detection limits will be raised, which could potentially affect the usability of the results.

The small-diameter core sampler must be able to deliver a minimum of 5 grams of sample (≈ 3 cm^3 of sample, assuming a density of 1.7 g/cm^3) into a 40-ml VOA vial. While most small-diameter core samplers can only be used for sampling and placement into the appropriate sample containers, only the En Core®-type samplers can be used for sampling, storage, and transportation of the sample to the laboratory. Small-diameter core samplers should be selected based upon the properties of the matrix, the type of preservation method (field vs. lab), and personal preferences.

It is important that the small-diameter core sampler provide the required mass of sample material. Consequently, it is often valuable to perform a test of sample collection procedures using the small-diameter core sampler by collecting a test sample (of similar matrix to that being sampled) and weighing that sample to determine the amount of soil needed to obtain the required mass of sample material for each type of small-diameter core sampler and analytical method.

The procedure for obtaining a test sample is as follows:

1. Using a small electronic portable scale with an accuracy of 0.1 grams, weigh the empty small-diameter core sampler (e.g., disposable syringe) to the nearest 0.1 grams. The scale must be calibrated before use and intermittently checked during the day to ensure accurate weight measurement. Calibration information must be recorded in the field logbook. A translucent cover can be placed over the scale during the weighing process to negate variations caused by wind.

2. Push the small-diameter core sampler test sample into the matrix to collect the required mass of material (3 cm^3 should yield approximately 5 grams of sample [wet weight]).

3. Wipe clean any soil adhering to the outside of the small-diameter core sampler before weighing.

4. If the weight is above the required amount, remove excessive soil by extruding a small portion of the core and cutting it away with a decontaminated trowel or spatula. If the weight is below the weight limit, obtain additional soil by reinserting the small-diameter core sampler into the soil core. Re-weigh after each addition or removal of sample from the small-diameter core sampler until the target weight is attained. Note the sample volume and amount in the small-diameter core sampler.

5. Discard the test sample appropriately.

6. Use the volume of the test sample as a guide in collecting the appropriately sized sub-sample of a similar matrix. Additional test samples should be weighed whenever a change in the matrix is observed.

3.2 Overview of Procedure for Collection of Sub-Samples

The goal of soil sampling for the purposes of evaluating concentrations of VOCs in soil is to obtain a representative soil sample in accordance with the data quality objectives for the project. Often, this is accomplished using an appropriate small-diameter core sampler.

Different sample matrices (e.g., sand, gravel, clay, fill) may warrant slightly different sub-sampling field techniques. The goal for all techniques is to collect the sub-sample as quickly as possible while minimizing disruption. For sub-samples that do not fit into the samplers, the rationale for any deviations from this guidance must be documented.

The procedure for obtaining soil sub-samples is noted below. It is important to remember that collection of sub-samples from a soil core or other sampling device must be performed first, as soon as the device is opened, in order to minimize losses of VOCs from the soil. Geologic logging of the soil core, collection of an aliquot of soil for field screening, and collection of soil samples for submittal to the laboratory for other analysis must be performed after collection of the sub-sample(s) for VOC analysis from that soil core or sampling device has been performed.

Sub-sampling procedures for collection of soil for VOC analysis are as follows:

1. Once the sampling interval has been selected, expose a fresh surface of the soil for collection of a sub-sample for VOC analysis. A loss of VOCs from the surface of the soil will occur even if the soil has been exposed for a short period of time (during screening, etc.). Removal of the unwanted surficial material can be accomplished by scraping the soil surface with a decontaminated spatula or trowel. Soil sampling must commence immediately once a fresh surface has been exposed.

2. Using the test sample as a guide, push the small-diameter core sampler into the matrix to collect a volume of material that will yield the required mass of sample (wet weight) as determined by the analytical method.

3. Depending upon the texture, depth or moisture content, insert the small-diameter core sampler straight into the matrix, on an angle. Multiple insertions can be made to obtain the required sample weight or to provide a more representative sub-sample from the desired sampling interval.

4. After sample collection, wipe the outside of the small-diameter core sampler to remove any excess material adhering to the barrel using a paper towel dampened with distilled water.

5. Immediately open the sample container and extrude the soil core into the sample container that will be submitted to the laboratory. Avoid splashing any preservative, if present, out of the sample container by holding the container at an angle while slowly extruding the soil core into the sample container. Do not immerse the small-diameter core sampler into the preservative. If an En Core®-type sampler is to be used for storage and shipment, prepare the sampler for shipment according to manufacturer’s instructions.

6. Collect the required number of sample containers or En Core®-type samplers based on the chosen preservation and analytical methods, as discussed in the subsequent section on soil preservation methods.

7. Collect an additional aliquot of soil from the sampling interval into a separate sample container for determination of soil moisture content. A two-ounce jar is usually sufficient for this purpose or it should be indicated on the chain-of-custody that an aliquot may be extracted for this purpose from the sampling jar submitted for laboratory analysis. Collect an additional 50- to 150- gram aliquot of soil from the sampling interval to be used for field screening for total VOCs using a PID and/or FID in accordance with procedures described in Attachment A of HRP SOP # 2-002, S*oil Sampling*.

8. As noted above, ensure the threads and cap of the sample container or En Core®-type sampler are free of soil particles by wiping with a clean paper towel, dampened with distilled water to remove soil particles from the threads and sealing surface of the sample container or En Core®-type sampler.

9. Record the laboratory and field identification numbers in the field notes and on the chain of custody. Record the sample identification information on the sample container using a suitable marker. Container labels with wire or rubber band attachments can be used, provided they can be removed easily for sample weighing. Do not attach any additional adhesive-backed labels or tape to the sample containers unless requested by laboratory or specified in manufacturer instructions. This will increase the weight of the sample container and the laboratory will not be able to determine the sample weight.

10. After sample collection, immediately return the containers to an iced cooler. Sample containers from different locations should be placed in separate ziplock bags to help avoid cross-contamination. The laboratory sample number or field sample identification number may be placed on the bag and cross-referenced on the chain of custody. Proper sample management and chain-of-custody procedures should be maintained at all times from sample collection to transfer of samples to the laboratory. The laboratory performing the analysis will determine the sample weight.

4.0 PRESERVATION OF SOIL SAMPLES

4.1 Overview of the Soil Preservation Procedure

The preservation of samples for VOC analysis can be initiated either at the time of sample collection or in the laboratory. This section deals with the preservation of soil samples in the field using chemical and physical preservation methods.

It is important that the laboratory analytical methods, field preservation methods, appropriate sample containers and sample holding times are determined prior to mobilizing to the field. It is also necessary to consider that additional sample containers maybe required for various quality assurance/ quality control (QA/QC) samples such as matrix-spike and matrix-spike duplicates (MS/MSD). The number of extra containers required varies by laboratory and analytical procedure.

In addition to the various chemical preservation methods, samples must be physically preserved (e.g., iced or frozen) in the field immediately upon sample collection. It is important to match up the correct physical preservation method with the appropriate sample container and field chemical preservation method. According to U.S. EPA Contract Laboratory Protocol (CLP) Guidance for Field Samplers, the physical preservation methods are described as:

Iced – soil and sample containers are cooled to 4º ± 2ºC.

Frozen – soil and sample containers are cooled to between -7º to -15º C.

Sample containers that will be frozen should be placed on their side prior to freezing process to prevent breakage. Additional aliquots for screening and moisture determination need only be iced and kept cooled at 4º ± 2ºC; these sample containers should not be frozen. Sample containers and En Core®-type samplers should not be frozen below -20º C, as the integrity of the container seals, o-rings and septum may be compromised by the freezing, resulting in the loss of VOCs upon thawing of the sample.

En Core®-type samplers with soil containing greater than approximately 20% moisture should not be frozen. Greater than 20% moisture is extremely moist and is easy to spot with visible pooling of liquid on the sample surface. In most cases involving soil sampling, greater than 20% moisture is unusual.

In addition, the use of dry ice to freeze samples immediately upon sample collection or for use during shipment is not recommended. Dry ice, which is at a temperature of -78.5ºC, will lower the temperature of the sample container below the design specifications, causing damage to the glass, septum, seals, o-rings, and cap. In addition, dry ice has specific handling, storage and shipping requirements that outweigh its usefulness to the field sampling team.

4.2 Sub-Soil Sample Collection Procedures

When collecting soil sub-samples for determination of volatile organic compounds, up to four types of samples may be required:

- A high-concentration-level sample
- A low-concentration-level sample
- An SPLP/TCLP sample
- A sample for percent solids determination

Samples for both high-concentration level and low-concentration levels are necessary for each subsample, since the actual concentration in the soil retrieved from the subsurface is not known prior to analysis. Additional samples may be necessary for matrix spikes and matrix spike duplicates. Field and trip blanks also may be required.

An overview of the various options for sample collection procedures is attached as Figure 1.

4.3 High-Concentration Sub-sample Collection Procedures

There are two options for collection of the high-concentration sample: collection of the sample in a methanol preserved VOA vial or using En Core®-type samplers.

4.3.1 High-Concentration Sample Option 1, Methanol Preservation

Supplies:

Electronic field balance accurate to 0.1 grams

Minimum of one VOA vial (40 ml), pre-weighed and containing 5 or 10 mls of methanol

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.
2. Weigh the vials to confirm the recorded vial weight.
3. Select the area to be sampled as soon as possible after the soil is exposed.
4. Obtain a test sample, using the coring device and field balance, to determine approximately how much volume of soil will yield equal grams of soil to methanol (5 or 10 ± 1 grams). This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.
5. Scrape away the surface material from the area to be sampled to expose fresh soil.
6. Rapidly insert the syringe into the soil to obtain the sample. Quickly extrude the sample into the vial containing the methanol. Wipe off the threads and cap; seal the vial.
7. Using the field balance, weigh and record the weight of the vial. A record of the weight must be submitted with the samples to the laboratory.
8. Place sample in cooler with ice.
9. Collect separate sample for percent solids, if necessary.

4.3.2 High-Concentration Sample 2, Use of En Core®-Type Samplers

Supplies:

One 5 or 10 -gram En Core®-type Sampler

1. Label the sample as appropriate.
2. Select the area to be sampled as soon as possible after the soil is exposed.
3. Scrape away the surface material from the area to be sampled to expose fresh soil.
4. Rapidly insert the sampler into the soil to obtain the sample. Quickly wipe the contact areas to remove any soil particles, close and seal the device.
5. Place devices in resealable pouch, place in cooler on ice.
6. Collect separate sample for percent solids, if necessary.
7. Samples must be frozen, preserved, or analyzed within 48 hours of collection.

4.4 Low-Concentration Sub-Sample Collection Procedures

There are four options for collecting low-concentration soil samples:

- collection in VOA vials containing water
- collection in empty VOA vials
- collection using En Core®-type devices
- collection in VOA vials containing sodium bisulfate.

All of the procedures using VOA vials are essentially the same, with the exception that there are specific limitations associated with preservation using sodium bisulfate, including formation of acetone in samples containing high amount of humic material, and certain analytes, such as styrene, vinyl chloride, trichloroethene (TCE), may be decomposed by the bisulfate, leading to low-biased results, and carbonate-rich soils may effervesce, which will result in significant losses of VOCs. Due to these limitations, use of sodium bisulfate as a preservative is discouraged unless there is a compelling reason why it is necessary for a specific project or because it is a regulatory requirement.

4.4.1 Low-Concentration Sample Option 1, Collection in VOA Vials Containing Water

Supplies:

Electronic field balance accurate to 0.1 grams

Two VOA vials (40 ml), pre-weighed and containing 5 mls of water and a magnetic stir bar

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.
2. Select the area to be sampled as soon as possible after the soil is exposed.
3. Obtain a test sample, using the coring device and field balance, to determine approximately how much volume of soil will yield 5 grams of soil. Note that the sample weight should be within 1 gram of the nominal weight, e.g. 5± 1 gram. This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.
4. Scrape away the surface material from the area to be sampled to expose fresh soil.
5. Rapidly insert the syringe into the soil to obtain the first 5-gram sample. Quickly extrude the sample into one of the two vials containing the water. Wipe off the threads and cap; seal the vial.
6. Repeat steps 4 and 5 for the second vial containing water.
7. Using the field balance, weigh and record the weight of each vial. A record of the weight must be submitted with the samples to the laboratory. Often, the laboratories will supply pre-weighed vials, so weighing the vials in the field would not be necessary in such cases.
8. Place all samples in cooler with ice.
9. Collect separate sample for percent solids, if necessary.
10. Samples must be frozen or analyzed within 48 hours of collection.

4.4.2 Low-Concentration Sample Option 2, Collection in Empty VOA Vials

Supplies:

Electronic field balance accurate to 0.1 grams

Two VOA vials (40 ml), pre-weighed containing a magnetic stir bar

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.
2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Obtain a test sample using the coring device and field balance, to determine approximately how much volume of soil will yield 5 grams of soil. Note that the sample weight should be within 1 gram of the nominal weight, e.g. 5± 1 gram. This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.

4. Scrape away the surface material from the area to be sampled to expose fresh soil.

5. Rapidly insert the syringe into the soil to obtain the first 5-gram sample. Quickly extrude the sample into one of the two vials. Wipe off the threads and cap; seal the vial.

6. Repeat steps 4 and 5 for the second vial.

7. Using the field balance, weigh and record the weight of each vial. A record of the weight must be submitted with the samples to the laboratory. As noted above, this step is not necessary of the laboratory supplies pre-weighed vials.

8. Place all samples in cooler with ice.

9. Collect separate sample for percent solids, if necessary.

10. Samples must be frozen or analyzed within 48 hours of collection.

4.4.3 Low-Concentration Sample Option 3, Collection Using En Core®-Type Devices

Supplies:

Two 5-gram En Core®-type sampling devices

1. Label the sample as appropriate.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Scrape away the surface material from the area to be sampled to expose fresh soil.

4. Rapidly insert the sampler into the soil to obtain the first sample. Quickly wipe the contact areas to remove any soil particles, close and seal the device. Place device in re-sealable pouch

5. Repeat steps 3 and 4 for the second En Core®-type device.

6. Place both devices in resealable pouches, place in cooler on ice.

7. Collect separate sample for percent solids, if necessary.

8. Samples must be frozen, preserved or analyzed within 48 hours of collection.

4.4.4 Low-Concentration Sample Option 4, Collection in VOA Vials Containing Sodium Bisulfate

Supplies:

Electronic field balance accurate to 0.1 grams

Two VOA vials (40 ml), pre-weighed containing 5 ml sodium bisulfate solution and a magnetic stir bar

Sub-sampling device

1. Label the vials as appropriate. Do not add more weight (e.g., excessive labels) to the pre-weighed vials.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Obtain a test sample using the coring device and field balance to determine approximately how much volume of soil will yield 5 grams of soil. Note that the sample weight should be within 1 gram of the nominal weight, e.g. 5 ± 1 gram. This step may be skipped when the amount of soil needed for a particular matrix at a site has been determined.

4. Scrape away the surface material from the area to be sampled to expose fresh soil.

5. Rapidly insert the syringe into the soil to obtain the first 5-gram sample. Quickly extrude the sample into one of the two vials containing the bisulfate solution. Wipe off the threads and cap; seal the vial.

6. Repeat steps 4 and 5 for the second vial.

7. Using the field balance, weigh and record the weight of each vial. A record of the weight must be submitted with the samples to the laboratory.

8. Place all samples in cooler with ice.

9. Collect separate sample for percent solids, if necessary.

4.5 Collection of Soil Samples for TCLP or SPLP Extraction and VOC Analysis

The holding time for soil samples to begin the leaching procedure for Toxicity Characteristic Leaching Procedure (TCLP) or Synthetic Precipitation Leaching Procedure (SPLP) extraction for VOC analysis is 14 days from collection. Therefore, any samples collected for TCLP or SPLP extraction and placed on "hold" pending results of total analysis for VOCs for a given sampling interval, must be analyzed within the 14-day holding time.

Supplies:

25-gram En Core®-Type Sampler

1. Label the sampler as appropriate.

2. Select the area to be sampled as soon as possible after the soil is exposed.

3. Scrape away the surface material from the area to be sampled to expose fresh soil.

4. Rapidly insert the sampler into the soil to obtain the sample. Wipe off the threads and cap; seal the sampler.

5. Place sampler in re-sealable pouch and place in cooler with ice.

6. Samples must be frozen or leached within 48 hours of collection.

4.6 Collection of Soil Samples for Percent Solids Determination

A laboratory typically can use any container submitted for analysis to determine the percent solids of a soil, except a container submitted for VOC analysis. If the other laboratory analyses, besides volatile organic compounds (either total or TCLP/SPLP for VOCs), are to be performed on soil for a given sampling interval and location, a separate container(s) will be needed for the other tests. The percent solids determination can then be performed using the soil in the container(s) for the other tests. In the event that only VOCs are to be determined for a given soil sample, an additional sample (no more than 20 grams are needed) must be collected in a separate container and submitted to the laboratory.

5.0 REFERENCES

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HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Sample Handling

SOP #106

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LIST OF REVISIONS

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Date

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August 8, 2019
Date

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 CONTAINERS 2

- 2.1 Soils and Unconsolidated Materials 2
- 2.2 Liquids 2
- 2.3 Gasses 2

3.0 PRESERVATION 3

- 3.1 Refrigeration 3
- 3.2 pH Adjustment and Other Preservatives 3
- 3.3 Holding Times 3

4.0 SAMPLE COLLECTION AND PREPARATION 4

- 4.1 Filtration 4
- 4.2 Compositing 5
- 4.3 Chain-of-Custody Procedures 5
  - 4.3.1 Chain-of-Custody Form 5
  - 4.3.2 Sample Labeling Nomenclature 5
  - 4.3.3 Delivery/Receipt Procedures 6

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) 7

- 5.1 Blanks 7
- 5.2 Duplicates 7

6.0 REFERENCES 8

ATTACHMENT

Attachment A Representative Chain-of-Custody Form

1.0 INTRODUCTION

This SOP identifies the containers, preservatives, sample preparation, chain-of-custody procedures, and QA/QC procedures associated with the various types of samples collected and analyzed by HRP.

Equipment:	This SOP deals primarily with methods requiring no equipment other than sample containers.
Documentation:	Field notebook and map or field work sheets to detail location of sampling points and relevant information related to sample collection. Chain-of-custody form for each sample delivery group.

2.0 CONTAINERS

2.1 Soils and Unconsolidated Materials

Samples of soil and other unconsolidated materials will be collected into wide-mouth glass jars with tightly fitting lids, or other appropriate container based on the analyses to be conducted. Specific information related to the appropriate container can be found in the project-specific Quality Assurance Project Plan (QAPP) and/or work plan. Sample containers to be submitted directly to the laboratory should be filled to the extent possible to eliminate any headspace and to ensure that sufficient sample is available for all analyses to be performed, although filling the jar completely is not required if that amount of soil is not needed to accomplish the project objectives for analyses to be performed.

However, for those samples for which analysis for volatile organic compounds (VOCs) will be conducted, EPA Method 5035A methods for sample collection and preservation will be used. Those methods are described in detail in HRP SOP #105 *Soil Sample Collection for VOC Analysis*. For such samples, 40-milliliter (ml) vials are obtained in advance from the laboratory filled with the appropriate amount of methanol and/or sodium bisulfate, and the vials are filled with the appropriate amount of soil specified by the SOP or the laboratory (if different).

2.2 Liquids

Several types of containers are available for liquid samples. The type(s) of container to be used are determined by the analyses to be performed and the nature and chemical properties of the liquid. Another factor that influences the type of container used for storage and transport of liquids is the sample volume requirements for the specific analyses to be performed. For example, oil samples may be contained in wide-mouth glass jars, similar to containers used for unconsolidated samples. Since samples collected for VOC analysis may undergo a loss of volatile constituents, vials used for water samples collected for subsequent VOC analysis must be fitted with Teflon™ septa and must be overfilled before closing to ensure that no headspace (air) is present in the vial. Other constituents may be subject to photochemical degradation and thus require collection into amber glass containers. Preservatives that must be used for liquid samples are specific to the nature and chemical properties of the specific analytes for which analysis is to be conducted. Information on sample collection requirements are provided in the QAPP and/or project-specific work plan.

2.3 Gasses

Gasses are intrinsically mobile and must be contained in fully-enclosed containers. The following types of container are available: Tedlar™ bags and glass bulbs with Teflon™ septa to allow insertion of hypodermic syringes. Summa® canisters are also typically used, especially for sub-slab soil vapor samples and indoor air samples that are used to evaluate vapor intrusion. Specifications for sample collection devices for gas samples should be selected based on data quality objectives for the project and will be specified in the project-specific QAPP and work plan.

3.0 PRESERVATION

Preservation requirements are provided in the QAPP and/or site-specific work plan that is developed for a project. Should there be any questions regarding preservation of samples, the analytical laboratory should be contacted or the most current update of EPA SW-846 should be consulted.

3.1 Refrigeration

Samples which do not require refrigeration are: oil samples; gaseous samples; and water samples to be analyzed only for metals. All other samples must be kept cool (ideally at 4°C ± 2°C) until delivery to the lab for analysis. Soil samples intended for VOC analysis should be preserved and otherwise managed in accordance with HRP SOP # 105.

Samples must not be allowed to freeze in cold weather. The jars/vials could break and the samples will be lost. Storage and transport containers and modes of transport must take the potential for freezing into account.

3.2 pH Adjustment and Other Preservatives

The pH of water samples should be adjusted in the field, as necessary, using the preservatives which are specified in the QAPP and/or site-specific work plan or the most recent SW-846 promulgated method for the requisite analytical parameter. Questions on preservatives should be directed to the analytical testing laboratory.

Gaseous samples do not require preservatives or pH-adjusting compounds to be added. In general, samples of unconsolidated material (soil, concrete, sediment) or sludge do not require the addition of a preservative. The exception is analysis for VOCs, in which case soil and sediment samples should be collected using EPA Method 5035A. These samples should be collected in vials pre-preserved with methanol and/or sodium bisulfate. The soil/preservative ratio should be indicated on the sampling container prior to sample collection or obtained directly from the testing laboratory. Additional detail on sample collection for subsequent VOC analysis is provided in HRP's SOP #105, as noted in Section 2.1.

3.3 Holding Times

Holding times for various parameters are specifically indicated in the most recent EPA SW-846 promulgated method for the requisite analytical parameter. Questions on holding times should be directed to the analytical laboratory. Additional information regarding sampling containers, preservation, and holding times will be made available in the QAPP and/or site-specific work plan.

4.0 SAMPLE COLLECTION AND PREPARATION

Samples will collected into appropriate, laboratory-supplied containers recommended for the media and analytical methods, as indicated in Section 2.0, and other relevant documents, such as the QAPP and site-specific work plan.

4.1 Filtration

Groundwater samples should not be filtered prior to analysis, except as allowed in accordance with regulatory guidance. The appropriateness of filtration for water samples and filter size is based on a number of factors, including objectives for the sampling effort, data quality objectives for the project, and regulatory considerations related to filtration of water samples. The need for filtration of groundwater samples must be discussed in the project-specific work plan, and the discussion must include the rationale for collection of filtered groundwater samples, as well as the procedures that would be used for collection of the filtered samples. Unless specifically indicated otherwise in a project-specific work plan (and the rationale for such a decision must be provided), an unfiltered sample should always be collected for analysis in addition to the filtered sample.

Whenever possible, an in-line filter should be used to filter groundwater samples as the water is withdrawn from the well. The selection of which, if any, filter should be used depends on the data quality objectives for the project and will be specified in the QAPP and/or site-specific work plan. A 0.45-micron filter is used for samples for which the objective is to obtain results for dissolved constituents (usually metals). A 10-micron filter is used to distinguish analytical results for dissolved plus colloidal constituents vs. analytical results that include constituents that might be absorbed onto fine-grained particles that are present in the water sample.

In some cases, water samples other than groundwater samples must be filtered in the field prior to sample collection into appropriate sampling bottles. To accomplish this, a sample of the water to be filtered is collected into a clean container with sufficient volume to fill all sampling containers for which a filtered sample is necessary. If electric power is unavailable, battery packs are required to operate the peristaltic pump. A ring stand with clamp to hold the in-line filter is optional but may be useful.

The procedure for filtration of water samples from a source other than a monitoring well is as follows:

- A sufficient length of new Tygon™ tubing (or tubing of other appropriate inert material) is inserted into a peristaltic pump.
- The input end of the tubing is then inserted into the unfiltered water sample, and an in-line filter (0.45-micron or 10-micron filter, as appropriate, depending on the objective for the sampling event) is inserted into the output end of the tubing.
- An additional length of tubing is connected to the other end of the in-line filter to better direct the filtered water into the sample bottle(s). The flow direction shown on the filter must match the actual flow direction.
- Once the in-line filter is placed over the sample container, the pump is then turned on and run until sample collection is complete.

As noted above for filtration of groundwater samples from monitoring wells, the selection of which, if any, filter should be used depends on the data quality objectives for the project and will be specified in the QAPP and/or site-specific work plan.

4.2 Compositing

Compositing of samples for investigation purposes is strongly discouraged. Therefore, compositing of soil or water should only be performed if specifically indicated in the project-specific work plan, and the specific rationale and approach to compositing should be clearly described in that document.

However, compositing of similar materials for the purposes of obtaining waste disposition approvals is generally acceptable, and often required. Careful consideration should be given to the objectives of the sampling before collection of any composite sample is performed.

Those soil samples to be analyzed for non-volatile parameters may be mixed in any convenient, clean container. Soil samples to be analyzed for volatile organic compounds should not be composited.

For waste oil and other wastes, only those of similar appearance (color, viscosity, suspended material, odor if determined) should be composited. Liquid samples may be composited by pouring the appropriate percentages into the sample container to be sent to the laboratory.

4.3 Chain-of-Custody Procedures

4.3.1 Chain-of-Custody Form

A copy of a representative chain-of-custody form is provided in Attachment A. The sampler must fill in all relevant information as indicated on the form, including the "laboratory preparation" section. Any preparation required should be indicated on the form. The sampler must sign the form in the space indicated, including data and time of transfer, when relinquishing samples to another individual or to the laboratory. Each successive handler of the samples must also sign the form with data and time when relinquishing samples, and the receiving entity must acknowledge receipt.

4.3.2 Sample Labeling Nomenclature

Samples shall be labeled with the following information:

- Date
- HRP
- HRP Job #
- Sample identification. Samples from test borings must have, in addition to the test boring identification, the depth from which the sample was retrieved.
- Special labeling requirements may also be required for certain jobs. These requirements should be detailed in the QAPP and/or project-specific work plan.

4.3.3 Delivery/Receipt Procedures

As noted above, the chain-of-custody forms must be signed by both the person delivering the samples and the person receiving them. The time and date of transfer must be indicated.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

5.1 Blanks

Field, trip, and equipment blanks are slightly different from one another. For preparation of an equipment blank, an appropriate blank material (deionized water) is brought in contact with the pre-cleaned sampling tools used for "real" samples. Equipment blanks, in theory, indicate whether the sampling equipment has been properly decontaminated. Field blanks are prepared by carrying the blank material to the sampling site and placing it in appropriate containers. Field blanks are used to determine whether airborne contamination is present at the sampling site. Field blanks are collected only when airborne contamination is suspected. Trip blanks are prepared at the analytical laboratory and transported to the site in sealed containers. They are used to evaluate the potential for contamination that may be attributed to shipping and handling procedures. Temperature blanks are prepared prior to sampling. They document the temperature preservation of samples upon receipt at the laboratory.

Blank samples are typically used for quality control and quality assurance. They provide qualitative information concerning contamination, handling and shipping procedures which may affect the quality of data that is collected. The rate at which blank samples are collected depends on the DQOs established for the project, but are typically prepared at a rate of 5% (i.e., 1 per 20 samples). For VOC analyses, trip blanks are prepared at a rate of 1 per shipping container in which samples for VOC analysis are transported. In some cases, blank samples may be collected at a rate of 1 per day if less than 20 samples have been collected. A group of samples that are transported together generally constitutes the sample delivery group (SDG). Specific requirements for collection of blank samples should be provided in the project-specific QAPP and work plan.

Water: Water for blanks shall consist of analyte-free water. The blank sample should be collected in the same kind of container used for the other water samples. Blank samples should be given plausible "well" identifications such as "MW-28". Trip blanks are typically analyzed only for VOCs. Analysis of equipment and field blanks are generally determined on a site-by-site basis or as specified in a site-specific work plan or QAPP.

Soil: Due to difficulties in preparing representative samples, blanks comprised of soil are uncommon.

5.2 Duplicates

True duplicates of samples cannot really be obtained, but replicate samples (which are commonly referred to as “duplicates”) should be collected as near as possible, both in time as well as space, to their principal samples. Depending on project objectives, sampling identification may indicate to the laboratory that the sample is a duplicate of another sample or the sample may be submitted to the laboratory as a “blind duplicate,” i.e., with no indication in the sample identifier that the sample is a duplicate or replicate of another sample.

Information regarding the collection of duplicate samples will be specified in the QAPP and/or project-specific work plan.

6.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC). 2010. *DER-10, Technical Guidance for Site Investigation and Remediation*, Division of Environmental Remediation. May 2010.

NYSDEC, Technical Procedure Guidance, Quality Assurance/Quality Control Procedures, *Spill Guidance Manual*, Section 2.4.

USEPA. 2015*. Standard Operating Procedure - Sample Receiving, Handling, and Storage,* SERAS SOP No. 1008, Rev. 2.1, Scientific, Engineering, Response and Analytical Services, December 9, 2015*.*

ATTACHMENT A

Representative Chain-of-Custody Form

con-test ANALYTICAL LABORATORY

Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com

http://www.contestlabs.com

CHAIN OF CUSTODY RECORD

Doc # 381 Rev 1_03242017

39 Spruce Street
East Longmeadow, MA 01028

Page _____ of _____

Company Name:
Address:
Phone:
Project Name:
Project Location:
Project Number:
Project Manager:
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By:

Requested Turnaround Time

7-Day ☐ 10-Day ☐
Due Date:

Rush-Approval Required

1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Data Delivery

Format: PDF ☐ EXCEL ☐
Other:
CLP Like Data Pkg Required: ☐
Email To:
Fax To #:

# of Containers
[2] Preservation Code
[3] Container Code

ANALYSIS REQUESTED

Dissolved Metals Samples

○ Field Filtered
○ Lab to Filter

Orthophosphate Samples

○ Field Filtered
○ Lab to Filter

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	[1]Matrix Code	Conc Code

Comments:

Please use the following codes to indicate possible sample concentration within the **Conc Code** column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Detection Limit Requirements

MA
CT
Other:

Special Requirements

☐ MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ MA State DW Required
PWSID #

con-test ANALYTICAL LABORATORY
www.contestlabs.com

NELAC and AIHA-LAP, LLC Accredited

Project Entity

☐ Government ☐ Municipality ☐ MWRA ☐ WRTA
☐ Federal ☐ 21 J ☐ School
☐ City ☐ Brownfield ☐ MBTA

Other

☐ Chromatogram
☐ *AIHA-LAP,LLC*

PCB ONLY

☐ Soxhlet
☐ Non Soxhlet

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] **Preservation Codes:**
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

[3] **Container Codes:**
A = Amber Glass
G = Glass
P = Plastic
ST = Sterile
V = Vial
S = Summa Canister
T = Tedlar Bag
O = Other (please define)

Recommended Containers, Preservation, Storage, & Holding Times For Water, Drinking Water, and Wastewater

Description	Method	Matrix	Sample container	Preservative	Prep/Analysis Holding Time	Volume
Organic Analyses						
EDB, DBCP	504.1	H_2O	40ml Vial Teflon septa	Cool 4^0C $Na_2S_2O_3$	14 days	40 ml
GCMS - Volatiles	524.2	H_2O	40ml Vial Teflon septa	Cool 4^0C Ascorbic acid & HCL to pH<2	14 days	40 ml
	624, 8260	H_2O	40ml Vial Teflon septa	Cool 4^0C HCL to pH<2	14 days	40 ml
GC-Pesticides & PCBs	608	H_2O	Amber Glass Teflon Cap	Cool 4^0C NaOH or H_2SO_4 to pH 5-9	7/40 days	1 Liter
GC-Pesticides & PCBs	8081, 8082	H_2O	Amber Glass Teflon Cap	Cool 4^0C	7/40 days	1 Liter
GC/MS-Semivolatiles - PAH's Base Neutral/Acid Extractables	625, 8270	H_2O	Amber Glass Teflon Cap	Cool 4^0C	7/40 days	1 Liter
Petroleum Hydrocarbons						
Oil & Grease	1664	H_2O	Amber Glass Teflon Cap	Cool 4^0C H_2SO_4 to pH<2	28 days	1 Liter
Diesel Range Organics (DRO)	Modified 8015B	H_2O	Glass Teflon Cap	Cool 4^0C	7/40 days	1 Liter
Gasoline Range Organics (GRO)	Modified 8015B	H_2O	Glass Teflon Cap	Cool 4^0C HCL to pH<2	14 days	40 ml
Total Petroleum Hydrocarbons (TPH) by GC	Modified 8100	H_2O	Glass Teflon Cap	Cool 4^0C	7/40 days	1 Liter
MA DEP VPH	98-1	H_2O	40ml Vial Teflon septa	Cool 4^0C 3-4 drops of 1:1HCL	14 days	40 ml
MA DEP EPH	97-12	H_2O	Amber Glass Teflon Cap	Cool 4^0C 5 ml of 1:1HCL	14/40 days	1 Liter
CT ETPH	CT ETPH	H_2O	Amber Glass Teflon Cap	Cool 4^0C	14/40 days	1 Liter
Metals						
ICP/ICPMS Metals	200.7/200.8 6010/6020	H_2O	Plastic / Glass	Cool 4^0C HNO_3 to pH<2	6 months	DW-1L WW-250ml
Mercury (Hg)	245.1/7470A	H_2O	Plastic / Glass	Cool 4^0C HNO_3 to pH<2	28 days	DW-1L WW-250ml
Chromium VI (Cr^{+6})	SM 3500 Cr D	H_2O	Plastic / Glass	Cool 4^0C	24 hours	200 ml
Chromium VI (Cr^{+6})	SW-846 7196A	H_2O	Plastic / Glass *	Cool 4^0C	24 hours	200 ml
Inorganic/Wet Chemistry						
Alkalinity	SM 2320B	H_2O	Plastic / Glass *	No Headspace Cool 4^0C	14 days	250 ml
BOD	SM 5210B	H_2O	Plastic / Glass	Cool 4^0C	48 hours	1 Liter
Chloride	SM 4500 Cl B	H_2O	Plastic / Glass	Not Required	28 days	250 ml
Chlorine, Total Residual	SM4500 Cl G	H_2O	Plastic / Glass	Not Required	Analyze immediately	250 ml
COD	410.4/Hach 8000	H_2O	Plastic / Glass	Cool 4^0C H_2SO_4 to pH<2	28 days	250 ml
Coliform, Fecal	SM 9222D	H_2O	Sterile Plastic	Cool 4^0C	6 hours	100 ml
Coliform, Total	SM 9222B	H_2O	Sterile Plastic	Cool 4^0C	30 hours	100 ml
E. Coli confirmation	SM 9222G	H_2O	Sterile Plastic	Cool 4^0C	30 hours	100 ml
Heterotropic Plate Count	SM 9215B	H_2O	Sterile Plastic	Cool 4^0C	8 hours	100 ml

Description	Method	Matrix	Sample container	Preservative	Prep/Analysis Holding Time	Volume
Inorganic/Wet Chemistry (continued)						
Color	SM 2120B	H_2O	Sterile Plastic	Cool 4^0C	48 hours	200 ml
Conductance	SM 2510B	H_2O	Plastic / Glass	Cool 4^0C	28 days	100 ml
Cyanide, Amenable	SM4500 Cn-C,E	H_2O	Amber Glass	Cool 4^0C NaOH to pH>12	14 days	500 ml
Cyanide, Free	SM4500 Cn-C,E	H_2O	Plastic / Glass	Cool 4^0C NaOH to pH>12	14 days	500 ml
Cyanide, Total	SM4500 Cn-C,E	H_2O	Plastic / Glass	Cool 4^0C NaOH to pH>12	14 days	500 ml
Flashpoint	SW 846 1010	H_2O	Plastic / Glass	Cool 4^0C	ASAP	50 ml
Flouride (drinking water)	SM 4500F-C	H_2O	Plastic / Glass	Not Required	28 days	200 ml
Hardness	SM 2340C	H_2O	Plastic / Glass	Cool 4^0C	6 months	250 ml
MBAS (Surfactants)	SM5540C	H_2O	Plastic / Glass	Cool 4^0C	48 hours	250 ml
Nitrogen, Ammonia	SM 4500 NH3C	H_2O	Plastic / Glass	Cool 4^0C H_2SO_4 to pH<2	28 days	250 ml
Nitrogen, Total Kjeldahl	SM 4500-N Org B, C,	H_2O	Plastic / Glass	Cool 4^0C H_2SO_4 to pH<2	28 days	500 ml
Nitrogen, Nitrate	SM 4500 NO3 F	H_2O	Plastic / Glass	Cool 4^0C H_2SO_4 to pH<2	48 hours / 28 days preserved	250 ml
Nitrogen, Nitrite	SM 4500 NO2 B	H_2O	Plastic / Glass	Cool 4^0 C	48 hours	100 ml
Nitrogen, Nitrate + Nitrite	SM 4500 NO3 F	H_2O	Plastic / Glass	Cool 4^0 C H_2SO_4 to pH<2	48 hours / 28 days preserved	100 ml
Odor	SM 2150B	H_2O	Plastic / Glass	Cool 4^0C	24 hours	500 ml
Orthophosphate	SM 4500 P E	H_2O	Plastic / Glass	Cool 4^0C	48 hours	100 ml
Oxygen, Dissolved	SM 4500 O-C1 SM S210B	H_2O	Plastic / Glass with glass top	Cool 4^0C	Analyze immediately	300 ml
pH, Hydrogen ion	SM 4500 H-B	H_2O	Plastic / Glass	Not Required	Analyze immediately	25 ml
Phenolics	420.1	H_2O	Plastic / Glass	Cool 4^0C H_2SO_4 to pH<2	28 days	1 Liter
Phosphorous, Total	SM4500P-E	H_2O	Plastic / Glass	Cool 4^0C H_2SO_4 to pH<2	28 days	500 ml
Total Dissolved Solids (TDS)	SM 2540C	H_2O	Plastic / Glass	Cool 4^0C	7 days	300 ml
Total Suspended Solids (TSS)	SM 2540D	H_2O	Plastic / Glass	Cool 4^0C	7 days	300 ml
Settleable Solids	SM 2540 F	H_2O	Plastic / Glass	Cool 4^0C	48 hours	1 Liter
Sulfate	ASTM DS16-90	H_2O	Plastic / Glass	Cool 4^0C	28 days	300 ml
Sulfide	SM 4500 S2,E	H_2O	Plastic / Glass with Glass top	Cool 4^0C NaOH to pH>9 2N Zn Acetate	Analyze immediately	500 ml
Sulfite	377.1 / SM 4500 SO3	H_2O	Plastic / Glass	Not Required	Analyze immediately	100 ml
Total Organic Carbon (TOC)	SM S310B	H_2O	Amber Glass Teflon Cap	Cool 4^0C HCL to pH<2	28 days	100 ml
Turbidity	180.1 / SM 2130 B	H_2O	Plastic / Glass	Cool 4^0C	48 hours	100 ml

Recommended Containers, Preservation, Storage, & Holding Times For Soil, Solids, and Other Wastes

Description	Method	Matrix	Sample container	Preservative	Prep/Analysis Holding Time	Volume
Organic Analyses						
GCMS - Volatiles	8260B	Soil/Waste	Glass w/ Teflon Septa	Cool 4^0C 15 ml CH_3OH or 5 ml NaHSO4 5 or ml DI H_2O	14 days	15g or 5g or 5g
GC-Pestacides & PCBs	8081A/8082	Soil/Waste	Glass w/ Teflon Septa	Cool 4^0C	14/40 days	100 g or 8oz Jar
GC/MS-Semivolatiles - PAH's Base Neutral/Acid Extractables	8270C	Soil/Waste	Glass w/ Teflon Septa	Cool 4^0C	14/40 days	100 g or 8oz Jar
Petroleum Hydrocarbons						
Diesel Range Organics (DRO)	Modified 8015B	Soil	Glass w/ Teflon Septa	Cool 4^0C	14/40 days	100 g or 8oz Jar
Gasoline Range Organics (GRO)	Modified 8015B	Soil	Glass w/ Teflon Septa	Cool 4^0C 15 ml CH_3OH	14 days	15 grams
Total Petroleum Hydrocarbons (TPH) by GC	Modified 8100	Soil	Glass w/ Teflon Septa	Cool 4^0C	14/40 days	100 g or 8oz Jar
MA DEP VPH	98-1	Soil	40ml Vial Teflon septa	Cool 4^0C 15 ml CH_3OH	14 days	15 grams
MA DEP EPH	97-12	Soil	Amber Glass Teflon Cap	Cool 4^0C	14/40 days	100 g or 8oz Jar
CT ETPH	CT ETPH	Soil	Glass w/ Teflon Septa	Cool 4^0C	14/40 days	100 g or 8oz Jar

* Requires it's own container

Description	Method	Matrix	Sample container	Preservative	Prep/Analysis Holding Time	Volume
Metals						
ICP Metals	6010	Soil	Plastic / Glass	Cool 4^0C	6 months	100 g or 8oz Jar
Chromium VI (Cr^{+6})	SW-846 7196A	Soil	Plastic / Glass *	Cool 4^0C	24 hours	(2) - 2oz Jars
Mercury (Hg)	7471	Soil	Plastic / Glass	Cool 4^0C	28 days	100 g or 8oz Jar
Inorganic/Wet Chemistry						
General Inorganics	9000 Series	Soil	Glass Teflon Cap	Cool 4^0C	See Table 1.	100 g or 8oz Jar
Flashpoint/Ignitibility	1010	Soil	Glass Teflon Cap	Cool 4^0C	ASAP	100 g or 8oz Jar
pH/Corrosivity	9045C	Soil/Waste	Plastic / Glass	Cool 4^0C	ASAP	100 g or 2oz Jar
Reactivity	SW 846 (7.3)	Soil/Waste	Plastic / Glass	Cool 4^0C	ASAP	100 g or 8oz Jar
TCLP/SPLP	1311/1312	Soil/Waste	Glass Teflon Cap	Cool 4^0C	Varied	500g or 32 oz Jar
TCLP/SPLP	1311/1312	Soil/Waste	Glass Teflon Cap	Cool 4^0C	Varied	500g or 32 oz Jar

Revised 04.05.10

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ANALYTICAL LABORATORY

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Low-flow Groundwater Sampling

SOP #107

Revision Date: August 8, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by:

Technical Director/
HRP Quality Assurance Officer

Gail L. Batchelder
Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 8, 2019
Date

Vice President/
Practice Leader - Environmental

Scot Kuhn, P.G., L.E.P.

August 8, 2019
Date

This Standard Operating Procedure (SOP) provides the general procedures for Low-flow Groundwater Sampling for environmental investigation- and remediation-related activities. The SOP was developed based on a number of sources that represent prevailing standards and guidelines typically used in the field of environmental investigation and remediation. However, the procedures described herein are not intended to supersede any applicable local, State or Federal regulations. Nor can the procedures described in this SOP take into account every condition that might be encountered in the field or every project-specific data quality objective. An important component of this SOP is the need to document those instances where the procedures described herein are not followed for a specific project, the rationale for not following the procedures described in the SOP, and a description of the alternative procedures that were used instead.

1.0 INTRODUCTION

This SOP describes a low-flow, low-stress methodology for collecting groundwater samples in a manner that minimizes turbidity during sampling and improves the likelihood of collecting samples that are representative of groundwater quality in the aquifer at ambient flow conditions. The SOP was developed in general accordance with the U.S. EPA Region I SOP #GW 0001 rev. 2: *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitor Wells*, July 30, 1996, as well as other U.S. EPA protocols and guidance. The sampling protocol emphasizes the need to minimize changes to water chemistry by maintaining minimal water-level drawdown and flow rates during the sampling process. The low-flow protocol was originally developed by EPA for the collection of groundwater samples for analysis for total (unfiltered) metals, but can also be applied to samples collected for analysis volatile and semivolatile organic compounds, total petroleum hydrocarbons, herbicides/pesticides, polychlorinated biphenyls (PCBs), inorganic constituents, and other analytes.

This procedure may not be appropriate for collecting samples from wells containing non-aqueous phase liquids (NAPLs) or wells in which drawdown of the water level cannot be controlled under minimal stress conditions.

The applicability of this SOP to meet sampling data quality objectives must be evaluated the project manager prior to initiating sampling activities. Furthermore, the relevance of this sampling methodology must be considered on an individual project-specific basis in careful consideration of the regulatory authority involved (e.g., state agency vs. United States Environmental Protection Agency) and the overall objectives for the sampling effort. As with all standard operating procedures, careful consideration must be given to the equipment used, the field parameters to be measured, and the analyses to be performed to ensure that data quality objectives for the project will be met.

Attached to this SOP is a Monitoring Well Data Sheet, which must be completed for each well at the time of sampling. Also attached to this SOP is a Low-Flow Groundwater Sampling Work Scope Summary form. The purpose of this form and supporting documentation is to specify the equipment, stabilization parameters, and site-specific information necessary to support the decision-making process used during the sampling event(s). This summary is intended to accompany the low-flow sampling SOP and must be completed for each project in which low-flow sampling will be conducted.

1.1 Equipment List

- Extraction Device (pumps)

Groundwater purging and sampling will be conducted using a variable speed pump. The type of pump used will depend on the sampling objectives, target analytes, and depth to water in the well. The types of pumps that might be considered include:

    - Variable speed, positive displacement or submersible pumps - Applicable to wells with shallow or deep groundwater elevations. Includes centrifugal or bladder pumps constructed of stainless steel or Teflon.
    - Variable speed, peristaltic pumps or suction pumps – Applicable to wells in which the measured groundwater elevation is less than approximately 20 to 25 feet from the top of the well.

- Tubing
    - Polyethylene tubing (1/4-inch outer diameter). An equipment blank (which includes the tubing) should be collected for sampling events in which one or more groundwater samples will be analyzed for volatile organic compounds in order to demonstrate that the tubing materials do not add contaminants to the sample.
    - Tygon® tubing (1/4-inch inner diameter) for groundwater sample collection when phthalates are a known constituent of concern. An equipment blank should be collected for analysis for phthalates.

A 12” length of ¼-inch inner diameter pharmaceutical grade CFLEX®, Tygon®, or silicon tubing for the section around the rotor head of a peristaltic pump, to minimize gaseous diffusion.

- Electronic water-level measuring device, capable of measuring to 0.01’ accuracy.
- Flow measurement supplies – 120 milliliter (ml) calibrated plastic beaker, graduated cylinder, or equivalent, and stop watch.
- Power sources (at least one of the following) –
    - available 110V AC electrical source
    - lead/acid automobile battery
    - alternative field battery pack
    - gasoline-fueled generator – must be located >30’ downwind from well(s)
- Compressed air or nitrogen source, if needed to operate the pump selected
- Use of a flow-through cell is strongly recommended to measure specific field parameters (temperature, pH, specific conductance, oxidation-reduction potential, dissolved oxygen) during purging.
- Turbidimeter to measure turbidity in the field
- Meter calibration supplies
- Decontamination supplies
    - solution of Liquinox™ with tap water or Alconox™ for mixing
    - <10% methanol/water solution
    - <10% nitric acid/water solution
    - Deionized water
    - 5-gallon buckets

  - Logbook(s) and Low-Flow Groundwater Sampling form
  - Sample bottles – appropriate for the analyses to be conducted
  - Sample preservation supplies (as required by the analytical methods), if not pre-supplied by laboratory in sampling containers.
    - Nitric acid (metals)
    - Hydrochloric acid (VOCs)
- Container labels
- Well keys
- Personal protection equipment (PPE)
- Tool kit (wrenches, pliers, etc.)
- Cooler with ice (strongly recommended) or ice packs
- Container(s) for purge and decontamination fluids, as applicable

1.2 Documentation

- Site plan
- Health & Safety Plan (HASP)
- Site-specific Work Plan
- Quality Assurance Project Plan (QAPP), as applicable
- Monitoring Well Data Sheet(s)
- Sample Log
- Sample collection sheet
- Notebook - sketch pad
- Chain of custody record

2.0 PROCEDURE

2.1 Preliminary Activities

1. Review information from previous investigations, HASP, and site-specific Work Plan, as well as the project-specific QAPP, as applicable, prior to performing any field activity to understand the site history, possible chemical and physical hazards, anticipated groundwater quality, any potential or known releases, and well development history and previous groundwater sampling records.
2. Pre-label sampling jars, if acceptable, given knowledge of the site, particularly if the site monitoring wells have been previously sampled. Also, the sampling jars can be pre-preserved in advance as appropriate for the requisite analytical parameter(s). Often the laboratory will provide pre-preserved sampling containers.
3. Check well for security damage, evidence of tampering, condition of well casing, condition of surface seal, and/or presence of insects/wasps/spiders, etc. and record pertinent observations.

4. Lay out sheet of clean polyethylene for monitoring and sampling equipment or use other appropriate containment strategy, such as a clean plastic tub, to protect sampling equipment and contain potential releases.
5. Check monitoring wells for the presence of LNAPL before each sampling round if separate-phase product is a potential based on the substances that may have been released at the site or in the vicinity. Checking wells for the presence of DNAPL must only be performed after samples have been collected from the well to minimize disturbance to the water column prior to sampling.
6. Perform a complete round of water-level measurements round (to the nearest 0.01 foot) in the shortest possible time before any purging and sampling activities begin. This complete round of water-level measurements is a separate event from the measurement of water levels associated with the sampling at each well.

   For capped wells, allow at least 15 to 20 minutes between opening the well and recording of the water level to allow for equilibration of water levels after the well is opened. Minimize water column disturbance. Measurement of total well depth (to 0.01 foot) is measured after sampling of the well is complete to minimize disturbance of the water column if the complete round of water-level measurements is performed the same day as groundwater sampling.

   All measurements must be taken from an established reference point marked on top of well casing, usually at the highest point of the case or the north center of the casing. Depth-measuring equipment must be decontaminated after measurement of each well. All measurements that are not consistent with prior data should be immediately recorded a second time in order to confirm and document the accuracy of the measurement.

   For low-flow, low-stress sampling events conducted after the first such sampling event from the monitoring well network, water levels measured during the subsequent water-level measurement rounds should be compared to those from prior events to determine the appropriate sampling depths and sampling rates. Efforts should be made to duplicate, to the extent practicable, the intake depth and extraction rate (using the final pump dial setting information) from previous event(s).
7. Field-calibrate meters per manufacturer's specifications. Calibrate instruments at the beginning of each day and perform calibration checks at the middle and end of each day. If calibration check does not indicate the expected reading (within the range specified by the manufacturer), recalibrate the instrument. If it is determined that the meter will not hold calibration, contact the HRP project manager who should authorize one of the following options: a) sampling with a replacement meter that is calibrated properly; b) ceasing the sampling event; or c) continuing to sample with the meter without recording the parameter(s) that will not properly calibrate.

2.2 Purging and Sampling Procedures

Installing Tubing or In-well Pump

Peristaltic Pump

Prepare the pump by placing the CFLEX®, Tygon®, or silicon tubing around the rotor and connecting the tubing that will be placed into the well to the tubing around the rotor.

Lower the in-well tubing slowly into the well (to minimize disturbance of the water column) until the tubing intake is placed at the depth designated to accomplish the site-specific investigation objectives or any state or region-specific requirements. Measure the depth to which the tubing is lowered carefully, to avoid having the end of the tube hit the bottom of the well and If possible, keep the bottom of the tubing at least two feet above the bottom of the well to minimize mobilization of particulates present in the bottom of the well.

The mid-point of the saturated screen length is often used as the location of the pump intake, *unless otherwise specified in the project-specific Work Plan or QAPP*. Should an alternative location/depth be used for the pump intake, the rationale should be clear and carried through the project unless directions to the contrary are provided by the project manager. If the water column in the well is less than 3 feet, particular care must be taken to keep the end of the tubing from being lowered to less than one foot above the bottom of the well, even if the objective of setting the tubing intake at a the mid-point of the saturated portion of the screen cannot be met.

In-well Pump

Lower pump, safety cable, tubing and/or electrical lines slowly (to minimize disturbance) into the well to the midpoint of the zone to be sampled. The intake point of the pump is placed at a depth capable of accomplishing the site-specific investigation objectives. The mid-point of the saturated screen length is often used as the location of the pump intake, *unless otherwise specified in the project-specific Work Plan or QAPP*. If possible, keep the pump intake or pump bottom, whichever is lower, at least two feet above the bottom of the well to minimize mobilization of particulates present in the bottom of the well.

Measurement of Water Levels

Measure the water level in the well after the level has equilibrated following introduction of equipment into the well. Water levels should be measured in each well just prior to initiating purging using the measurement techniques described in Section 2.1 for the complete water-level measurement round.

Purging Well

1. Start the pump at its lowest speed setting and slowly increase the speed until discharge occurs. Check water level. Adjust pump speed until there is little or no drawdown in water level (i.e., less than 0.3 feet) and the amount of drawdown remains stable If the minimal drawdown that can be achieved at the lowest pump setting exceeds 0.3 feet but remains stable, continue purging until indicator field parameters stabilize. Do not allow the water level to be drawn down below the pump intake.

2. Monitor and record water level and pumping rate every five minutes during purging. Record any pumping rate adjustments (both time and flow rate). Pumping rates should be adjusted to the maximum flow rate that the well can sustain while maintaining drawdown at 0.3' or less. Adjustments are best made in the first fifteen minutes of pumping in order to help minimize purging time. Do not allow the water level to fall to the intake level (if the static water level is above the well screen, avoid lowering the water level into the screened interval).

3. The final purge volume must be greater than the stabilized drawdown volume plus the extraction tubing volume:

$$V_P > 28.32\,((3.14 * r_t^2 l_t) + (3.14 * r_w^2 h_w))$$

Where,

V_P = purge volume (milliliters)
r_t = inner diameter of sampling tube (0.021 feet for ¼” tubing)
l_t = length of sampling tube (feet)
r_w = Radius of the monitor well (0.083 feet for 2” PVC well)
h_w = Change in water level elevation or stabilized depth to water minus the initial depth to water (feet)

Change in Head Volumes			
Well Dia.	Vol./ft (mL)	Vol./ft (L)	Vol./ft (gal)
1"	154	0.15	0.04
2"	620	0.62	0.16
4"	2,471	2.47	0.65
6"	5,560	5.56	1.47
Tubing Volumes			
Tubing ID	Vol./ft (mL)	Vol./ft (L)	Vol./ft (gal)
0.17"	4.5	0.004	0.001
0.19"	5.6	0.006	0.0015
0.25"	9.7	0.010	0.003
0.375"	21.7	0.022	0.006

4. If the drawdown does not stabilize at 0.3 feet or less at the lowest possible flow rate, the well may be sampled as soon as the water level has recovered, provided that the water level has recovered sufficiently to collect the appropriate volume needed for all anticipated samples (ideally the intake should not be moved during this recovery period). Samples may then be collected even though the indicator field parameters have not stabilized. The following table indicates the necessary sample volumes based on the well diameter and volume of the sample container.

Sample Container Vol (ml)	well diam (inch)	Minimum water column height to fill sample container	
		inches	feet
40	2	0.78	0.1
250	2	4.86	0.4
1000	2	19.42	1.6
40	1	3.11	0.3
250	1	19.42	1.6
1000	1	77.70	6.5
40	0.75	5.53	0.5
250	0.75	34.53	2.9
1000	0.75	138.13	11.5

2.3 Monitoring Field Indicator Parameters

Monitor indicator field parameters (turbidity, temperature, specific conductance, pH, oxidation/reduction potential [ORP], dissolved oxygen [DO]) every five minutes during well purging. Should conditions exist at a specific well where such monitoring is not feasible due to low yield of the well, the conditions must be thoroughly documented, and an alternative approach may be used after consultation with the project manager. However, during the very early stage of purging, emphasis should be minimizing and stabilizing pumping stress, and recording those adjustments to document stability of water levels and demonstrating that the pumping rate is within the specified limits. Purging is considered complete and sampling may begin when the indicator field parameters have stabilized. Stabilization is considered to be achieved when at least three consecutive readings, taken at five-minute intervals, are within the following limits for the measured parameters (or other parameters established by state-specific or region-specific requirements):

- pH (± 0.1 unit)
- Temperature (3%)
- Specific conductance (3%)
- DO (10%)
- ORP/Eh (± 10 millivolts)
- Turbidity (10% for values greater than 1 NTU).

The order in which the above parameters will stabilize is dependent on a number of factors including, but not limited to, aquifer matrix, well screen and filter-pack design, and whether the well has been developed. Turbidity is often the last parameter to stabilize.

Use a flow-through cell to obtain measurements of any indicator field parameter, except turbidity. Transparent flow-through cells are preferred, because they allow field personnel to monitor particulate build-up within the cell. This build-up may affect indicator field parameter values measured within the cell. Such build-up may also affect turbidity values if the sample aliquot used to measure turbidity is collected after moving through the flow-through cell. Therefore, aliquots of groundwater used to measure turbidity should be collected from water that has not yet entered the flow-through cell. If the cell needs to be cleaned during purging operations, continue pumping and disconnect cell for cleaning, then reconnect after cleaning and note monitoring activities.

When measuring parameters other than turbidity, a flow-through cell that prevents air bubble entrapment in the cell should be used. When the pump is turned off or cycling on/off (when using a bladder pump), water in the cell must not drain out. Monitoring probes must be submerged in water at all times during operation. If two flow-through cells are used in series, the one containing the dissolved oxygen probe should come first (this parameter is most susceptible to error if air leaks into the system). If there are state-specific or region-specific requirements for measurements of any parameter, such as the use of down-hole equipment, explanations must be provided. The use of any down-hole measurement instruments can be particularly problematic, since the lowering of any instrument, tubing, or measurement device through the water in the well has the potential to disturb the water column, which is counter to the intent of low-flow, low-stress sampling, which is an undisturbed water column. Therefore, if such activity is required, special care must be taken to minimize disturbance of the water column prior to sample collection.

2.4 Collecting Water Samples

1. Collect the water samples for laboratory analyses before water has passed through the flow-through cell (use a by-pass assembly or disconnect cell to obtain sample).
2. Collect VOC samples first and directly into 40-ml sample vials pre-preserved with hydrochloric acid. Fill all sample containers by allowing the pump discharge to flow gently down the inside of the container with minimal turbulence to result in no bubbles in the vial when capped.
3. During purging and sampling, maintain the tubing such that it is filled with water in order to minimize possible changes in water chemistry upon contact with the atmosphere. Use tubing with 1/4" inner diameter to help insure that the sample tubing remains water-filled. If the pump tubing is not completely filled to the sampling point, add a clamp to constrict sampling end of tubing.
4. Label each sample as collected unless samples are pre-labeled. Samples requiring cooling (VOCs, cyanide, etc.) will be placed into a cooler with ice or refrigerant for delivery to the laboratory.

2.5 Post-Sampling Activities

- As determined by the work scope and data quality objectives, the pump and/or tubing may either be dedicated to the well for re-sampling or removed after collection of the samples. Tubing removed from a well after sampling should be properly discarded immediately after use.
- Following sample collection, measure depth to the bottom of the well (to 0.01 foot) and record the well depth on the Monitoring Well Data Sheet.
- Secure the well
- Decontaminate sampling equipment as indicated below in Section 2.6.

2.6 Decontamination Procedures

- The HRP representative will ensure that all necessary non-disposable sampling equipment that is n contact with the well is decontaminated prior to use in the first well and following sampling of each subsequent well in accordance with the following procedures.
- Decontamination procedures may vary slightly from those presented below, dependent upon the particular types of contaminants encountered

- Decontamination Supplies
  - Solution of Alconox™ and water prepared in a 5-gallon bucket (approximately 2.5 gallons). Another 5-gallon bucket will contain potable water (approximate 2.5 gallons).
  - Deionized water
  - 5-gallon buckets
  - Spray bottles
  - Brushes
  - Paper towels
  - Isopropyl alcohol/water solution (as appropriate based on contaminants and analyses to be performed)
  - <10% nitric acid/water solution (as appropriate based on contaminants and analyses to be performed)
- Sampling Devices (typically split spoons or Macro-Core®-type sampling devices) will be decontaminated between each sample. The order of decontamination solutions and procedures for split-spoon and other multi-use sampling devices is as follows:
- Decontamination will be conducted in the following order:
  - Wipe or scrub excess dirt from equipment, as needed, using brush or paper towels
  - Rinse/scrub in potable water (in a 5-gallon bucket) to remove additional loose debris, as necessary
  - Wash in a solution of Alconox™ and potable water (in a 5-gallon bucket)
  - Rinse with potable water
  - Rinse with analyte-free water
- The following steps may be required by a QAPP or project-specific Work Plan, by a regulatory agency, or necessary due to the nature of the contaminants:
  - Spray with <10% isopropyl/water solution when organics are potential constituents of concern
  - Rinse with potable water
  - Rinse with <10% nitric acid/water solution when metals are potential constituents of concern
  - Rinse with potable water
  - Rinse with deionized water
  - Wipe with a clean paper towel (optional, depending on weather conditions)
  - Air Dry (as appropriate)

Alternative methods of cleaning may more appropriate (or necessary) for an individual pieces of equipment, based on site conditions, site contaminants, Quality Assurance Project Plan (QAPP), or site-specific work plan requirements, Alternative decontamination solutions must be consistent with overall objectives for the project, and use of alternative decontamination solutions or decontamination procedures must be made after consultation with the HRP project manager and must be documented in field paperwork as to rationale and appropriateness. Decisions regarding alternative decontamination procedures or solutions must be made in coordination with the HRP Project Manager and/or Quality Assurance Officer for the project.

At the end of the project day, all HRP equipment which is used on the site shall be decontaminated. Disposal of all spent decontamination solutions shall be in accordance with the requirements of the site work plan and state and federal requirements.

3.0 FIELD QUALITY CONTROL

- Collect quality control samples according to the project-specific QAPP or work plan. All field quality control samples must be prepared the same manner as regular investigation samples with respect to sample volume, containers, and preservation. As an additional quality assurance approach, collect samples in order -- from wells with lowest contaminant concentration to those with the highest concentration, if such information is known or can be anticipated. Collect equipment blanks after sampling from contaminated wells and not after background wells.
- Operate all monitoring instruments in accordance with EPA analytical methods and manufacturer's operating instructions. EPA analytical methods are listed in 40 CFR 136, 40 CFR 141, and SW-846 with exception of ORP, for which the manufacturer's instructions are to be followed.
- Where used, instruments shall be calibrated at the beginning of each day and a calibration check should be conducted at the middle and end of each day, or whenever measurements appear anomalous. If a measurement falls outside the calibration range, the instrument should be re-calibrated so that all measurements fall within the calibration range. Instruments used to measure temperature (i.e., thermometers and thermistors) need not be calibrated with the above frequency. They should be checked for accuracy prior to field use according to EPA Methods and the manufacturer's instructions.

4.0 DOCUMENTATION

- Document all groundwater field monitoring activities (see attached matrix) in a field log that includes the following:
    - Job Number
    - Site location
    - Date of sampling
    - Weather conditions
    - Field personnel
    - Objective of visit
    - Well identification
    - Well depth and measurement technique (list any measurement correction factors)
    - Static water-level depth, date, time and measurement technique. Presence and thickness of immiscible liquid (NAPL) layers and detection method

    - Pumping rate, drawdown, indicator parameters values, and clock time, at the appropriate time intervals; calculated or measured total volume pumped
    - Well sampling sequence and time of each sample collection
    - Types of sample bottles used and sample identification numbers
    - Preservatives used
    - Parameters requested for analysis
    - Field observations during sampling event
    - Name of sample collector(s)
    - Equipment cleaning and calibration information
    - QA/QC data for field instruments
    - Description of all sampling equipment used
- Any problems encountered should be identified, and methods taken to minimize or correct problems should be documented.
- All deviations from sampling procedures outlined in the SOP and/or work plan, including rationale for any modifications and potential impact on data quality objectives for the sample(s).
- Complete all data reporting in accordance with the project-specific QAPP and/or work plan.

5.0 REFERENCES FOR LOW-FLOW GROUNDWATER SAMPLING PROCEDURES

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Monitor Well Data Sheet

Page ____ of ____

Well ID:

Site Background Information

Site Location:		**Sampling Dates:**	
Job Number:		**Field Team Leader:**	
Weather:		**Team Personnel:**	

Ground Water Elevation Data

Date	Time	Sampler Name	Equipment Model		Depth to Water (ft)		Depth to Bottom (ft)	
					uncorrected		uncorrected	
			corr. factor		corrected		corrected	

Measurement Point: ______________________________

Well Condition

General Condition	Visible Well ID	Well Cap Present	Well Plumbness	Lock

Concrete Collar	Ponded Water	Comments:

Well Purging Data

Date	Time						Sampler Initials	Instrument Calibration Date
	Equipment Set-up		Purging		Sample Collection			
	Start	Finish	Start	Finish	Start	Finish		

	Instrument Mfg & Model
pH	
Temp.	
Sp. Cond.	
ORP	
DO	
Turbidity	

Initial Water Depth (ft):				Time:				
Time	Water Depth (ft)	Flow Rate (ml/min)	pH (s.u.)	Temp (^{o}C)	Sp Con (uS)	ORP (mV)	DO (mg/l)	Turbidity (ntu)
Req. Limits for Last 3 Readings								

Pump Mfg & Model	Color	Odor	Purge Vol (ml)	Sample Depth (ft.)

Sample Containers

Type & No.	Volume	Preservative

Type & No.	Volume	Preservative

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Monitoring Well Data Sheet

Page ____ of ____

Well ID:

Site Background Information

Site Location:
Job Number:
Weather:
Sampling Dates:
Field Team Leader:
Team Personnel:

Time	Water Depth (ft)	Flow Rate (ml/min)	pH (s.u.)	Temp (°C)	Sp. Cond. (uS)	ORP (mV)	DO (mg/l)	Turbidity (NTUs)
Req. Limits for Last 3 Readings								

Low-Flow Ground Water Sampling Work Scope Summary

Site Name / Location:

Project Manager / Requested By:

Job Number:

Urgency of Project:

Sampling Objectives: ____________________

Pumps

Specify Wells

- ☐ Peristaltic ________
- ☐ Bladder (1 3/4" for 2"pvc) ________
- ☐ Bladder (3/4" for 1"pvc) ________
- ☐ grundfos ________
- ☐ Whale ________
- ☐ Other-specify type: ________

Sample depths

- ☐ Mid - water column / mid - screen
- ☐ Specify well depths/sample collection depth

Well ID - DTW / DTB(ft.)-screen lengths/tubing depth

Tubing type / Dia.

- ☐ **FTS standard 1/4" OD polyethylene / silicone through pumphead**
- ☐ Polyethylene
- ☐ Tygon
- ☐ Silicone
- ☐ 1/4"
- ☐ 3/8"

- ☐ Dedicate tubing to well
- ☐ Remove tubing after sampling

Stabilization / Geochemistry evaluation parameters

	Parameters and/or Stabilization Ranges if Different from those Listed	
☐ pH ($^{+}$/- 0.10)	☐	________
☐ Temp ^{0}C (3%)	☐	________
☐ Spec. Cond. (3%)	☐	________
☐ ORP ($^{+}$/- 10mv)	☐	________
☐ DO (10%)	☐	________
☐ Turbidity (10% > 1ntu)	☐	________

Equipment / Meters

	Specify applicable wells
☐ YSI - 600 XL with flow-cell (pH, Temp.,Spec. Cond., ORP, DO)	________
☐ YSI - 600 XLM with flow-cell (same as above with memory storage)	________
☐ YSI-6920 w/ flow-cell (pH, Temp., Spec. Cond., ORP, DO, Turbidity)	________
☐ HF Scientific (Turbidity meter)	________
☐ Product probe - check if product is expected	

*** Please provide drill logs (for new jobs / new wells)**

Additional information / other specifics:

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Field Screening

SOP #108

Revision Date: August 8, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by:

Technical Director/
HRP Quality Assurance Officer

Gail L. Batchelder

Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 8, 2019
Date

Vice President/
Practice Leader - Environmental

Scot Kuhn, P.G., L.E.P.

August 8, 2019
Date

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 FIELD SCREENING PHYSICAL METHODS 2

- 2.1 Visual Observations 2
- 2.2 Olfactory Observation 2

3.0 NON-AQUEOUS PHASE LIQUID (NAPL) DETERMINATION KITS (SOILS) 3

4.0 FIELD INSTRUMENT SCREENING 4

- 4.1 Photoionization Detector (PID) 4
  - 4.1.1 Specific Equipment List 4
  - 4.1.2 Documentation 4
  - 4.1.3 Procedure 4
- 4.2 Gas Chromatograph 5
  - 4.2.1 Specific Equipment List 5
  - 4.2.2 Documentation 5
  - 4.2.3 Procedure 5
- 4.3 Specific Conductance, pH, Dissolved Oxygen, Oxidation/reduction Potential 7
  - 4.3.1 Specific Conductance 7
    - 4.3.1.1. Specific Equipment List 7
    - 4.3.1.2. Procedure 7
  - 4.3.2 pH 8
    - 4.3.2.1. Specific Equipment List 8
    - 4.3.2.2. Procedure 8
  - 4.3.3 Dissolved Oxygen Meter 8
    - 4.3.3.1. Specific Equipment List 8
    - 4.3.3.2. Procedure 8
  - 4.3.4 Oxidation/reduction Potential 8
    - 4.3.4.1. Specific Equipment List 8
    - 4.3.4.2. Procedure 9
- 4.4 Turbidity 9
  - 4.4.1 Specific Equipment List 9
  - 4.4.2 Procedure 9

5.0 EQUIPMENT CALIBRATION METHODS 10

- 5.1 Photoionization Detector (PID) 10
- 5.2 Temperature/Conductance Meter 10
- 5.3 pH Meter 11
- 5.4 Dissolved Oxygen Meter 11
- 5.5 Equipment Deficiency/Operational Status Reporting 11

6.0 PREVENTATIVE MAINTENANCE 12
    6.1 Routine Maintenance 12
    6.2 Documentation 12
    6.3 Contingency 12
7.0 REFERENCES FOR FIELD SCREENING METHODS 13

1.0 INTRODUCTION

This SOP identifies the general procedures to be used for screening of soil and water samples during the performance of field activities. Field-screening procedures include use of tool, instrument, or technique that results in the collection of real-time or near real-time environmental data.

Equipment:	Equipment used for field screening varies by the type of screening to be performed. The types of equipment needed for each field screening technique are identified in the specific sections of this SOP associated with the individual types of field screening procedures.
Documentation:	Field notebook, map, and/or field work sheets, including geologic boring logs, to detail location of sampling points and relevant information related to sample collection and field screening measurements.

This SOP has been prepared to describe standard procedures that will be used in most cases during the performance of field screening activities. However, nothing in this standard operating procedure is intended to preclude the application of sound professional judgement during the performance of field activities. Should situations arise that require alternative procedures to those described herein in order to accomplish overall project objectives or to meet data quality objectives, field personnel should document the rationale for changes to the standard procedures in the field paperwork and describes the procedures that were followed instead. In some cases, the need for changes to standard protocols may be recognized ahead of time, in which case, the procedures to be followed should be described in project-specific work plans or work instructions.

Similarly, the procedures described herein are not intended to conflict with any specific federal, state, or local statutes, regulations, guidance, protocols, or specific instructions of a regulatory authority. If changes to the SOP are needed, such changes should be identified in project-specific work plans or other similar document that will be maintained in the project record.

2.0 FIELD SCREENING PHYSICAL METHODS

2.1 Visual Observations

Visual observations of samples being collected during environmental investigations can be an important tool in understanding the hydrogeology and/or geochemistry at and in the vicinity of the location where the sample was collected and provide useful information for development of the conceptual site model and selection of individual samples for subsequent laboratory analysis. Therefore, detailed descriptions of soil and water characteristics are considered to be an important component of field screening procedures.

For soil, observations should include such characteristics as color, texture and grain-size distribution, relative moisture content, and relative density. Characterization of soil samples should be recorded in the field on geologic boring logs for soil samples collected from soil borings. Descriptions of soil samples for other collection methods should be recorded on appropriate field paperwork designated for that purpose.

Visual observations should be in accordance with one or more standard protocols for visual identification of soil samples based on grain-size distribution and physical characteristics of the soil sample. Specifically, soil descriptions and classifications should be performed in accordance with ASTM Standard D2488-17, *Practice for Description and Identification of Soils (Visual-Manual Procedure)* and ASTM Standard D2487-17*, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System),* and/or HRP's SOP #103 *Soil Logging Using a Modified Burmister Classification System,* as appropriate based on the data quality objectives for the project and any regulatory requirements or guidance.

For water, the sampler should record such observations as color; turbidity; and amount, nature, and color of any suspended material as settling occurs. If a sheen or separate-phase non-aqueous-phase liquid (NAPL) is observed, that should be noted, and the nature of the observation with respect to color, general appearance, and density relative to the water sample (i.e., whether the separate-phase accumulates at the top of a container of the water or at the bottom), which would indicate whether the separate-phase liquid is light NAPL (LNAPL) or dense NAPL (DNAPL).

2.2 Olfactory Observation

Olfactory observations should be noted only if odors are evident in ambient air conditions. Under <u>no</u> circumstances are personnel allowed to directly smell samples from containers. Only if the nature of the odor is clearly recognizable as attributable to a certain type of chemical (such as petroleum product or chlorinated solvent, for example), is it permissible to record that aspect of the olfactory observation on the field boring log or in field notes.

3.0 NON-AQUEOUS-PHASE LIQUID (NAPL) DETERMINATION KITS (SOILS)

Where NAPL is suspected based upon historical site knowledge or elevated screening levels for volatile organic compounds, project-specific DQOs for data collection may include an evaluation of the presence NAPL in the field. Commercial NAPL detection/screening products will be used by HRP personnel. In all cases, manufacturer's instructions will be followed. Non-Sudan IV based dyes will be preferentially selected as a non-toxic, hydrophobic indicator of the presence NAPL. Sudan IV based dyes should not be selected unless specifically required by a state of federal agency, due to the recent determination that Sudan IV dye is a mutagen. The limitations of the specific products selected should be well understood prior to use, and it should be recognized that any product is more likely to yield a false-negative result than a false-positive result, so information gained during field screening for the presence of NAPL must be reviewed in conjunction with other data available for each sample and for the investigation area as a whole.

Personal protective equipment (PPE) should be donned and maintained in accordance with the site-specific work plan and/or health and safety plan during the sampling and screening procedures. In the event that no PPE has been specified for a particular sampling event, disposable latex gloves should be donned, at a minimum, during all sampling procedures. Gloves must be changed after each individual sample collection event.

Sampling/screening equipment will be largely determined by manufacturer's instructions. Commercial test kits may consist of pre-measured dye packets that are enclosed in clean sampling cups. Specified quantities of soils are emplaced in the sampling cups, taking care not to disturb the dye package. Clean tap water is then added to the container. The container is sealed and shaken vigorously. If NAPL is present at a concentration generally greater than 500 ppm, it will separate from the soils and change color. The color of the NAPL will be dependent on the test kit selected. The sampling kits and soils should be containerized and properly disposed.

4.0 FIELD INSTRUMENT SCREENING

4.1 Photoionization Detector (PID)

PIDs are used during the performance of field activities for general screening of soil, water, or air for the presence of volatile organic compounds (VOCs). The instrument is used only to screen for the presence of total concentrations of VOCs, not for the presence of individual constituents, and not all constituents of interest may be detected by the instrument.

PIDs can only monitor air quality, and no water/soil should be introduced into sample line. This method has limited use in high humidity or in the presence of methane or other compounds that have high ionization potentials. However, performance may be improved by using a vapor trap in PID models that may be equipped with one.

Users should refer to the operation manual for the instrument being used to ensure that electron voltage for the bulb used is appropriate for compounds to be detected. Halogenated alkanes, such as 1,1,1-trichloroethane, or higher molecular weight aromatic compounds traditionally use a higher electron volt bulbs (11.7 ev) due to the increased strength of bonding force of these chemicals. For general screening of matrices, use a 10.6 electron volt bulb as an "all purpose" bulb; but a predetermination of compounds to be detected is helpful before making this decision. Generally, straight-chain hydrocarbon carbons are not ionizable using a PID, and therefore, the presence of those compounds will not be detected by the instrument.

4.1.1 Specific Equipment List

- Photoionization detector
- Sealable plastic/polyethylene bags
- Personal protection equipment
- Calibration gas

4.1.2 Documentation

- Site plan
- Activity log/sample log
- Notebook – sketch pad

4.1.3 Procedure

Following calibration of instrument:

1. Record background reading.
2. Place a small quantity of matrix to be tested into a sealable plastic/polyethylene bag.
3. Let matrix warm to room temperature.
4. Insert probe tip into bag (do not insert probe into matrix).
5. Record reading.

Samples that are wet may give a false positive reading. This effect is present when readings gradually increase with no discernable leveling off. If this effect is observed, the instrument bulb should be cleaned, and the instrument recalibrated, prior to re-testing the sample. If the response persists, the screening results should be noted as suspect. However, to help minimize the effect of moisture on screening results, some PID models may be equipped with a moisture trap to remove at least some of the moisture as the air enters the instrument.

For air monitoring purposes one can either wear the monitor with straps or have monitor in the exclusion zone close and at the breathing zone level. Instrument readings will be recorded through time at intervals specified in the health and safety plan.

For water samples, place approximately 10 milliliters (ml) of water in a non-preserved glass 40 ml VOA vial. Shake vigorously and allow to settle. Open vial and tip cap slightly sideways to allow entrance of instrument probe. Do not insert probe into water, as the instrument pump will draw water into the sample line and to the bulb, which will ruin the instrument and bulb.

4.2 Gas Chromatograph

4.2.1 Specific Equipment List

- Portable gas chromatograph with a pre-column, backflush oven, and PID detector
- Ultra-zero air
- Water standards/blanks
- Syringes

4.2.2 Documentation

- Site plan
- Activity log
- Organic vapor headspace form
- Notebook – sketch pad

4.2.3 Procedure

A portable gas chromatograph with a pre-column, backflush oven, and PID/FID detector is used to analyze the “headspace gas” obtained from each soil sample. The peak amplitudes and retention times obtained from each sample are compared to standard peaks and retention times obtained from prepared in-house standards from a suite of volatile organic compounds expected, or likely, to be present in the media sampled. Based on a comparison of the sample results with the standards, the amounts and types of contaminants in each sample are determined.

The headspace screening is performed on-site in a mobile trailer laboratory, a support vehicle, or in a designated location in a site building. This is an initial semi-quantitative “headspace” screening only and is not a state-certified laboratory analysis performed using standard EPA methods.

“Ultra-zero air” certified to contain less than 0.1 parts per million (ppm) total hydrocarbons is used as the carrier gas. The gas chromatograph’s oven runs isothermally at 40ºC. The total run time for each sample is sufficient to allow analysis of the targeted volatile organics. Both sample and standard injection volumes are recorded to allow direct quantification between standards and unknowns. The carrier gas flow rate is also held constant at approximately 10 cubic centimeters (cc)/minute to assure constant retention times.

During the screening, a Quality Assurance/Quality Control (QA/QC) program is followed. The purpose of the QA/QC program is to assure that any soil contamination detected in the soil samples did not arise from interferences and to provide semi-quantitative basis for sample evaluation.

The QA/QC program consists of a periodic injection of “headspace” gas obtained from water standards and analysis of “blanks”. Calibration standards of specific compounds and a range of concentrations for certain targeted volatile organic compounds will be obtained from a state-certified laboratory or prepared by HRP (determined on a site-specific basis). These standards are injected into the GC, and results for the targeted compounds are then stored in the GC’s “memory” prior to sample collection. Various “blank” analyses were performed to evaluate potential avenues of cross-contamination.

“Blank” analyses consist of:

1. Instrument blanks (no injection) to check the potential for column carry-over and “ultra-zero air” cleanliness;
2. Syringe blanks to check the potential for needle carry-over;
3. Soil sample container blanks to determine container cleanliness (although sample containers are pre-tested for contaminants under a QA/QC program which is completed by the manufacturer of the containers); and
4. Ambient “background” air blanks in both the sample collection and instrument areas to check the potential for cross-contamination from airborne contaminant sources.

All chromatograms are stored on a computer library and are later downloaded to a hard copy. Peak areas are integrated by the GC’s computer by comparison with standards pre-programmed into the library. Preparations containing selected potential site contaminants are generally injected into the GC to “check” retention times on a twice daily basis.

The objectives of the QA/QC program are achieved on the sampling dates when:

1. GC column carry-over is not found to be significantly interfering with any of the analyses;
2. Carry-over syringe contamination is not detected after any sample injection;
3. No interference due to volatile organic contamination is detected in any container blanks (e.g. 40 ml VOA septa soil sampling jar);
4. Ambient air in the sample analysis area and outside the building is not found to be significantly interfering with the soil sample screening results; and
5. The “ultra-zero air” used in the gas chromatograph has no contaminants present before testing.

4.3 Specific Conductance, pH, Dissolved Oxygen, Oxidation/reduction Potential

Screening-level measurements of the standard water-quality parameters of specific conductance, pH, dissolved oxygen (DO), and oxidation/reduction potential (ORP), may be made using stand-alone instruments specific to the parameter being measured, or by combination instruments that measure one or more of the parameters at the same time. The most common type of combination measurement technique currently used is a flow-through cell that is used in conjunction with low-flow groundwater sampling techniques. When using a flow-through cell, measurements are made using specific electrodes within a closed cell as groundwater is pumped from a well at a low flow rate moves through the cell. In contrast, most stand-alone meters require that separate aliquots of water be collected into a container that is exposed to the atmosphere as the electrodes equilibrate in the solution and measurements are recorded.

Although the equipment varies depending on the instrument(s) used, documentation is the same for all types or combinations of instruments. Documentation needs include the following:

- Activity Report
- Notebook
- Monitor Well Data Sheet or field sampling log (for water samples other than groundwater).

In all cases, instruments should be used, calibrated, and maintained in accordance with manufacturer's instructions. Information provided in the following sub-sections is provided as an overview of information related to measurement of specific parameters. Additional, more detailed information can found in the operating manuals for the specific equipment and in the references provided in Section 7.0 of this SOP.

4.3.1 Specific Conductance

Conductivity/salinity meters are used to determine the electrical conductance and salinity of water/wastewater. Values are generally expressed in µmhos/cm or µS/cm (µSiemens/cm).

4.3.1.1. Specific Equipment List

- Instrumentation for measurement of specific conductance (e.g., conductivity/salinity meter, hand-held conductivity meter)
- Calibration solution

4.3.1.2. Procedure

Calibration of the instrument must be performed prior to measurement of specific conductance for individual samples. All calibration procedures and measurements of specific conductance for samples will be conducted in accordance with manufacturer's instructions for the specific instrument being used. Specific conductance readings are affected by temperature, so it is important that the instrument settings are adjusted to take the temperature into account or to ensure that the specific conductance meter uses an automatic temperature compensator.

4.3.2 pH

The pH meter is used for determining the acidity of water and wastewater as expressed in pH units.

4.3.2.1. Specific Equipment List

- Instrumentation used to measure pH (may be a combination meter that measures other parameters or may be a stand-alone, hand-held pH meter).
- Standard pH calibration solutions (pH 4.0, pH 7.0, pH 10.)

4.3.2.2. Procedure

Following calibration procedures, immerse end of probe into liquid sample (an aliquot of sample not used for laboratory analysis). Allow probe to acclimate to sample. Meter will provide digital read-out of pH in standard pH units.

4.3.3 Dissolved Oxygen Meter

The dissolved oxygen (DO) meter is used for determining the dissolved oxygen content in milligrams per liter.

4.3.3.1. Specific Equipment List

- DO Meter
- Potassium chloride (KCl) solution
- Probe membranes

4.3.3.2. Procedure

Following calibration procedures, immerse end of probe into liquid sample (aliquot of sample not used for laboratory analysis). Allow probe to acclimate to sample. Meter will provide a digital read-out in mg/l or %. The probe should be slowly raised and lowered while remaining completely submersed in the sample in order to obtain an accurate reading.

4.3.4 Oxidation/reduction Potential

An oxidation/reduction potential measurement indicates the difference in electric potential between an indicator electrode and an appropriate reference electrode. Oxidation/reduction potential is a useful indicator of the equilibrium oxidation state of a chemical species in the water sample being tested, particularly when evaluated in conjunction with the pH of the solution. ORP is reported in millivolts (mV).

4.3.4.1. Specific Equipment List

- Instrumentation for measurement of ORP (meter, indicator electrode, reference electrode)
- Calibration solution (Zobell solution)

4.3.4.2. Procedure

ORP is temperature dependent, so the meter should have automatic temperature compensation and the probe must be allowed to equilibrate to the ambient temperature of the solution before the measurement is recorded (calibration solution must be at ambient temperature), or a separate temperature measurement must be made and the value measured by the instrument must be corrected based on the recorded temperature of the solution.

In some cases, the instruction manual will indicate that the instrument is calibrated at the factory. If so, the Zobell solution should be used to verify the factory calibration. If the two measurements do not agree, the first step is to use a new Zobell solution. If the measured value still does not agree with the value for the Zobell calibration solution, the instrument will need to be recalibrated by the manufacturer.

4.4 Turbidity

Instruments that measure turbidity measure the difference between the intensity of light scattered by a liquid sample, generally water, compared to the intensity of light scattered by a standard reference suspension. Turbidity measurements indicate the amount of suspended or colloidal material in a water sample, and results may be affected by the color of the water sample. A turbidity meter (turbidimeter) provides results in nephelometric turbidity units (NTUs).

4.4.1 Specific Equipment List

- Turbidimeter
- Calibration solution (for example, a commercially available polymer primary standards (AMCO-AEPA-1)

4.4.2 Procedure

The calibration standard (or standards if the instrument uses more than one standard) should be allowed to equilibrate to the ambient temperature. Initially, a standard with a low turbidity value (0.0 or 0.02 NTU) should be used to calibrate the instrument in accordance with the manufacturer’s instructions. A 0 NTU standard solution can be prepared by filtering distilled water through a 0.45-micron filter. The instrument should read the standard value to within the specifications of the instrument. If the instrument accepts more than one standard, at least one additional standard at a relatively high turbidity value should be used. If the instrument accepts only one standard, the higher standard should be used as a check standard for the instrument to ensure that the instrument identifies the value of the check standard within the specifications of the instrument.

An important consideration when using a turbidimeter is ensuring that the cuvettes in which the water samples and calibration solution are placed for measurement are free from scratches and that the outside surface are dry and the clarity is not affected by such things as fingerprints or dust. If the cuvette cannot be cleaned, it should be discarded. Therefore, it is important to have a number of cuvettes available for each sampling event.

5.0 EQUIPMENT CALIBRATION METHODS

All field equipment will be calibrated immediately prior to use in the field. The calibration procedures will follow standard manufacturer's instructions or routine HRP procedures to assure that the equipment is functioning within tolerances established by the manufacturer and required by the project. Field personnel will document all instrument calibrations in bound field notebooks and on specific calibration forms. All records generated will be maintained by field personnel and are subject to audit by the Task or Project Manager.

The detailed calibration, operation, and maintenance procedures for field instrumentation routinely used by HRP personnel are specific to manufacturer's instructions. The following sections will briefly summarize these procedures.

Calibration standards and pH buffer solutions used for field instrumentation calibration checks will be obtained from scientific products supply companies (e.g., Fisher Scientific; American Scientific Products, etc.). All buffer and calibration standards obtained will be certified and standardized against or traceable to a reliable primary reference standard. All solutions are stored according to manufacturer's suggestion for optimal shelf-life. Chemical container labels must also include the date received, date opened, as well as the initials of the analyst who first opened the container. Stock solutions will be marked with expiration date and replaced with new solutions when the recommended shelf-life is exceeded.

5.1 Photoionization Detector (PID)

HRP uses several types of PIDs made by different manufacturers. Calibration procedures which are specific to each instrument can be found in the manufacturer's operation manual. The PIDs will be calibrated in the field, under the working temperature conditions where it is to be used. The calibration gas typically used is isobutylene at a concentration of 100 ppm. Calibrations should be recorded in the field notebook and on the calibration log of the Health and Safety Plan. Calibration records should note the date, instrument manufacturer and model, calibration gas and concentration, and operator.

5.2 Temperature/Conductance Meter

Calibration is performed at the start of each sampling day using potassium chloride (KCl) standard solutions. Calibrations are recorded in either a bound field notebook or on field calibration forms. Specific conductance standards are selected to bracket the range of values expected in the samples. If the unit has a calibration adjustment, the meter is calibrated in the same manner as the pH meter. Internal automatic adjustments are made on meters which lack a designated calibration knob. The meter must read within 10 percent of the standard to be considered in control and acceptable.

If the calibration indicates the meter is out of calibration, a backup unit should be employed. Readings from conductivity meters lacking calibration adjustments are limited to checks at the beginning and end of the sampling day. All calibrations may be recorded in a bound field notebook along with conclusions as to the acceptability of readings.

Temperature is measured using a glass thermometer. Field thermometers must be periodically checked against a National Institute of Standards Technology (NIST) thermometer. Acceptance criteria are ±1°C. Any thermometers exceeding these limits should not be used to record temperature readings. The calibration frequencies noted above are the minimum requirements. Additional checks should be performed if the unit experiences harsh conditions or if readings become erratic.

5.3 pH Meter

Calibration is performed at the start of each sampling day using at least two standard calibration solutions which bracket the pH range expected in the samples. Standard calibration solutions are available as pH 4, pH 7, and pH 10. Calibration is recorded in either a bound field notebook or on field calibration forms. Calibration knobs are used to set the meter to read the value of the standard. The meter is then checked during the sampling period, using at least one standard, at a frequency which results in little or no calibration adjustment. If the reading varies by more than one-tenth of a unit between calibration checks, the frequency of the checks must be increased. Temperature and pH must be taken on an aliquot of the sample that is not used for laboratory analysis.

5.4 Dissolved Oxygen Meter

Calibration is performed at the start of each sampling day following instructions in the operation manual. The DO probe uses potassium chloride (KCl) solution contained within a membrane. This membrane and solution should be changed as part of daily calibration procedures. If a bubble is present behind the membrane, if the solution is not present, or if the solution has not been recently changed, accurate DO readings will not be obtained, and the membrane and solution will require replacement. For calibration, place the probe in its storage/calibration chamber within the instrument housing. Using the calibration mode, the instrument is self-calibrating. Calibrations should be recorded in a field notebook or on field calibration forms.

5.5 Equipment Deficiency/Operational Status Reporting

All calibrations will be recorded in a field notebook. These calibration records become part of the individual project files as documentation of the attainment of QA objectives.

6.0 PREVENTATIVE MAINTENANCE

6.1 Routine Maintenance

HRP personnel routinely maintain field equipment for optimal results. All maintenance procedures are documented in control logbooks designated for each piece of equipment. Any field activities involving routine maintenance will be recorded in field logbooks by the individual performing the adjustment of the equipment. Maintenance performed at an authorized repair service will be documented in the maintenance log, including service location, specific repair, and method of transport. Methods of routine maintenance depend on the instrument and manufacturer. The manufacturers' operations manuals will be the primary source of information for these procedures.

6.2 Documentation

Field Services Managers maintain all documentation concerning routine maintenance and non-routine repairs. All pertinent information regarding instrument status is recorded in personnel field log books along with calibration documentation.

6.3 Contingency

In the event that the primary field equipment is inoperable as determined by calibration difficulties, back-up field instruments will be obtained from other sources. These instruments will be calibrated prior to recording data. In no event shall instruments be used to record data unless the performance of the equipment has been documented.

7.0 REFERENCES FOR FIELD SCREENING METHODS

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

NYSDEC. Technical Procedural Guidance, Equipment Training, Calibration, and Maintenance, “Spill Guidance Manual” Section 2.2.

USEPA. 2017. “Standard Operating Procedure Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction potential [ORP], and turbidity)”, USEPA, Region 1, Quality Assurance Unit, Revision Number 3, Revised March 23, 2017.

APPENDIX B

FIELD FORMS

HRP Associates, Inc. 1 Fairchild Square, Suite 110 Clifton Park, NY 12065 (518) 877-7101	GROUNDWATER MONITORING WELL PURGING/WELL DEVELOPMENT FORM	DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •
Project:	WAS #:	Field Personnel:
Location:	Well ID.:	Weather:
Sounding Method:	Gauge Date:	Measurement Ref:
Stick Up/Down (ft):	Gauge Time:	Well Diameter (in):

Purge Date:	Purge Time:
Purge Method:	Field Technician:

1) Well Depth (ft):	4) Well Diameter (in):	7) Five Well Volumes (gal):
2) Depth to Water (ft):	5) Well Volume / Foot (gal) (d^2x.0408):	Depth/Height of Top of PVC:
3) Height of H_2O Column (1-2) (ft):	6) Total Well Volume (gal) (3x5):	Pump Type:

Water Quality Parameters

Time (hrs)	DTW (ft btoc)	Volume (liters)	Rate (mL/m)	pH (pH units)	ORP (mV)	remperatur (oC)	Gonductivit: (uS/cm)	DO (ug/L)	Turbidity (ntu)

Total Quantity of Water Removed (gal):		Sampling Time:	
Samplers:		Split Sample With:	
Sampling Date:		Sample Type:	

COMMENTS AND OBSERVATIONS:	

HRP Associates, Inc.

PAGE ______ OF ______

SAMPLE DATE: ____________________

LOW-FLOW SAMPLING LOG

TOTAL # WELLS: ____________________

Client Name: ____

Project Location: ____

Sampler(s):

Sample Pump: ______________________________

Tubing Type: ______________________________

Monitoring Equipment: ______________________

Well I.D. ____

Well Diameter (inches): ______________________________

Total Depth (fbg): ______________________________

Depth to Water (feet from TOC): ____________________

Screened Interval (fbg): ________ to ________

Tubing Intake Depth (fbg): __________________

Comments: ______________________________

Well Condition:

Time (hours)	Depth to Water (from TOC) (feet)	Evacuation Rate (ml/min)	Water Quality Monitoring Parameters					
			Temperature (^oC)	pH	ORP (mv)	Conductivity (ms/cm)	Turbidity (NTU)	Dissolved oxygen (mg/l)

Stabilization of Parameters (stabilization achieved for three consecutive measurements)

Time		Depth to Water (ft btoc)	Evacuation Rate (ml/min)	Temperature (oC)	pH	ORP (mv)	Conductivity (ms/cm)	Turbidity (NTU)	Dissolved oxygen (mg/l)
FROM	TO								
Recommended Stabilization		+/- 0.3	100-500	+/- 3%	+/- 0.1	+/- 10	+/- 3%	+/- 10%	+/- 10%
Stabilization: (Yes/No)									

Sample Time: ______________________________

Reviewed by: ______________________________

ft btoc	feet below top of casing	NTU	Nephelometric Turbidity Units	^oC	degrees Celsius
ml/min	milliliters per minute	mg/l	milligrams per liter	mv	millivolts
µs/cm	microseimons per centimeter				

	HRP Associates, Inc. **Monitoring Well Installation Log**	**WELL NO:**
		PAGE 1 **OF PAGES**

PROJECT:	**SCREEN SIZE & TYPE:**
JOB NUMBER:	**SLOT NO.: SETTING:**
DATE COMPLETED:	**SAND PACK SIZE & TYPE:**
DRILLING COMPANY:	**SETTING:**
RIG TYPE:	**CASING SIZE & TYPE:**
DRILLING METHOD:	**SETTING:**
HAMMER WEIGHT/DROP:	**SEAL TYPE:**
SAMPLING METHOD:	**SETTING:**
OBSERVER:	**BACKFILL TYPE:**
REFERENCE POINT (RP):	**STATIC WATER LEVEL:**
STICK-UP:	**GPS COORDINATES: N:**
SURFACE COMPLETION:	**W:**

REMARKS:

ABBREVIATIONS: SS = split spoon W = wash C = cuttings G = grab ST = shelby tube REC = recovery PPM = parts per million

DEPTH (FEET)		SAMPLE TYPE	BLOW COUNT	REC. (FEET)	MOISTURE	DESCRIPTION	PID READING (PPM)
FROM	TO						

PROJECT: **JOB NUMBER:**

WELL NO.: **PAGE OF**

DEPTH (FEET)		SAMPLE TYPE	BLOW COUNT	REC. (FEET)	MOISTURE	DESCRIPTION	PID READING (PPM)
FROM	TO						

HRP Associates, Inc.

Soil Boring Log for Direct-push Drilling

Project:
Boring I.D.:
Job Number:
Date:
Drilling Company:
Time:
Location:
GPS Coordinates N: **W:**

Sample Interval (fbg)		Sample ID	Recovery (feet)	Description (grain size, color, relative density, moisture, staining, odor)	PID (ppm)
Top	Bottom				

Well Screen:		**Soil Samples Collected:**	**Time**
Water Sample ID	Time		
Sampling Method:			
Description of Water:			

HRP Associates, Inc. 1 Fairchild Square, Suite 110 Clifton Park, NY 12065 (518) 877-7101	FIELD SOIL VAPOR SAMPLING FORM	DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

Project:		Building I.D.	
WAS #:		Vapor I.D. #:	
Date:		Sampler:	
Location:		PID Meter used:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLECTED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test		Depth to sample point	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?			
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:		Additional Info:	

Comments:

HRP Engineering, P.C.
1 Fairchild Square, Suite 110
Clifton Park, NY 12065
(518) 877-7101

FIELD SOIL VAPOR SAMPLING FORM

Project:		Building I.D.	
WAS #:		Vapor I.D. #:	
Date:		Sampler:	
Location:		PID Meter used:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLECTED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test		Depth to sample point	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?			
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:		Additional Info: Heavy rain throughout the day	

Comments:

HRP Engineering, P.C. 1 Fairchild Square, Suite 110 Clifton Park, NY 12065 (518) 877-7101	FIELD SOIL VAPOR SAMPLING FORM	DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

Project:		Building I.D.	
WAS #:		Vapor I.D. #:	
Date:		Sampler:	
Location:		PID Meter used:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLECTED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test		Depth to sample point	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?			
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:		Additional Info: Heavy rain throughout the day	

Comments:

HRP Associates, Inc.
1 Fairchild Square, Suite 110
Clifton Park, NY 12065
(518) 877-7101

FIELD SOIL VAPOR SAMPLING FORM

Project:		Building I.D.	
WAS #:		Vapor I.D. #:	
Date:		Sampler:	
Location:		PID Meter used:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLECTED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test		Depth to sample point	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?			
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:		Additional Info:	

Comments:

HRP Engineering, P.C.
1 Fairchild Square, Suite 110
Clifton Park, NY 12065
(518) 877-7101

FIELD SOIL VAPOR SAMPLING FORM

DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

Project:		Building I.D.	
WAS #:		Vapor I.D. #:	
Date:		Sampler:	
Location:		PID Meter used:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLEC I ED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test		Depth to sample point	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?			
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:		Additional Info: Heavy rain throughout the day	

Comments:

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1 Fairchild Square, Suite 110
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FIELD SOIL VAPOR SAMPLING FORM

DEPARTMENT OF ENVIRONMENTAL CONSERVATION • NEW YORK STATE •

Project:		Building I.D.	
WAS #:		Vapor I.D. #:	
Date:		Sampler:	
Location:		PID Meter used:	

SUMMA Canister Record:

SOIL VAPOR POINT		DUPLICATE SAMPLE (IF COLLECTED)	
Flow Regulator No.:		Flow Regulator No.:	
Canister Serial No.:		Canister Serial No.:	
Start Date/Time:		Start Date/Time:	
Start Pressure: (inches Hg)		Start Pressure: (inches Hg)	
Stop Date/Time:		Stop Date/Time:	
Stop Pressure: (inches Hg)		Stop Pressure: (inches Hg)	
Sample ID:		Sample ID:	

Other Sampling Information:

Helium percentage achieved in enclosure for Tracer Gas Test		Depth to sample point	
Tracer Gas test result (% of Helium):		Nearest Groundwater Elevation:	
Noticeable Odor?			
Purge Volume PID Reading (ppb)			
Duplicate Sample?			
Outdoor Ambient Temperature:			
Wind Direction:		Additional Info: Heavy rain throughout the day	

Comments:

HRP Associates, Inc.	Test Pit Log

Project:	**Test Pit I.D.:**
Job Number:	**Sketch Map:**
Date: **Time:**	
Contractor:	
Location;	
Final Dimensions (L x W x D in feet):	
GPS Coordinates **N :** **W:**	(include approx..north arrow)

Sample Depth or Interval (fbg)		**Sample I.D.**	**Time**	**Location**	**Description (grain size, color, staining, odor, moisture)**	**PID (ppm)**
Upper	**Lower**					

Comments:

MOVE YOUR ENVIRONMENT FORWARD

GENERIC
HEALTH AND SAFETY PLAN (HASP)

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared For:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233
Contract No.009808

Prepared By:

HRP Associates, Inc.
1 Fairchild Square, Suite 110
Clifton Park, NY 12065

Issued On: August 8, 2019

LIST OF REVISIONS

SUMMARY OF REVISIONS MADE	DATE	APPROVAL
Original Document Preparation	1/5/09	JRS, RHL
General update	8/6/19	MEW

Disclaimer

HRP Associates does not guarantee the health or safety of any person entering this site. Due to the potential hazards of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards which may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The health and safety guidelines in this plan were prepared specifically for this site for use and should not be used on any other site.

TABLE OF CONTENTS

1.0 EMERGENCY CONTACTS/PLANNING 1
1.1 Site and Facility Description 2
1.2 Policy Statement 2
1.3 References 2
1.4 Definitions 3

2.0 ROLES AND RESPONSIBILITIES 5
2.1 Personnel 5
2.2 Chief Operating Officer (COO) 6
2.3 Office Health and Safety Manager 6
2.4 Contract Manager 6
2.5 Project Manager 7
2.6 HAZWOPER Operations 7
2.7 Subcontractors 9
2.8 Visitors 9

3.0 HAZARD ANALYSIS 10
3.1 Project Scope of Work 10
3.2 Hazard Communication 12
3.3 Chemical Hazards 13
3.4 Physical Hazards 14
3.5 Biological Hazards 23
3.6 Confined Space 25
3.7 Tools – Hand and Power 25

4.0 GENERAL SAFETY PRACTICES 27
4.1 Safety Procedures 27
4.2 Buddy System 28
4.3 Emergency Equipment 28
4.4 Personal Hygiene and Sanitation 29
4.5 Spill Control Plan 30
4.6 Lockout/Tagout Procedures 30

5.0 PERSONAL PROTECTIVE EQUIPMENT 31
5.1 Respiratory Protection Program 31
5.2 Persponal Protective Equipment 31
5.3 Upgrade or Downgrade of Personal Protective Equipment Level 35
5.4 Hearing Protection 35
5.5 Selection and Use of Personal Protective Equipment 36

6.0 SITE CONTROL 38
6.1 Authorization to Enter 38
6.2 Site Orientation and Hazard Briefing 38
6.3 Certification Documents 38

6.4 Entry Log 38
6.5 Entry Requirements 39
6.6 Emergency Entry and Exit 39

7.0 WORK ZONES AND CECONTAMINATION 40

7.1 Site Work Zones 40
7.2 Posting 40
7.3 Decontamination 40

8.0 SITE MONITORING 42

8.1 Environmental Monitoring and Action Levels 42
8.2 Calibration and Maintenance 42
8.3 Onsite Monitoring Plan and Response Activities 42
8.4 Noise Monitoring 45
8.5 Odor Control 45

9.0 EMPLOYEE TRAINING 46

9.1 Site Workers 46
9.2 Subcontractor Training 47
9.3 Pre-Entry Orientation Session 47

10.0 MEDICAL SURVEILLANCE 48

10.1 Medical Examination 48
10.2 Records 49
10.3 First Aid and Medical Treatment 49

11.0 ACCIDENT PREVENTION AND CONTINGENCY PLAN 50

11.1 Accident Prevention 50
11.2 Contingency Plan 51
11.3 Spill Containment Procedures 56

Tables

Table 1 Chemical Hazards Known or Suspected On Site
Table 2 Minimum Protective Equipment
Table 3 Airborne Constituent Action Levels

CERTIFICATION

This Generic Health and Safety Plan (HASP) has been prepared under the supervision of, and has been reviewed by, a Certified Saftey Proffesional (CSP) certified by the Board of Certified Saftey Profesionals.

Mark E. Wright, CSP
BCSP No. CSP-31277

1.0 EMERGENCY CONTACTS/PLANNING

The objective of this Generic Health and Safety Plan (HASP) is to provide personnel with protection standards and mandatory safety practices, procedures, and contingencies to be followed while performing field activities under the New York State Department of Environmental Conservation (NYSDEC) Standby Contract (D009808). The typical work activities addressed within this Generic HASP include the following onsite field investigations:

- Site assessment reconnaissance
- Surface soil sampling
- Exploratory test pits with subsurface soil sampling
- Soil borings with subsurface soil sampling
- Monitoring well installation and development
- Short duration (slug) testing
- Groundwater gauging and sampling
- Surface water and sediment sampling
- Subsurface structure sediment/debris sampling
- Characterization of investigative-derived waste
- Soil vapor, sub-slab, indoor, and outdoor air sampling
- Remedial construction oversight

Depending on site conditions and/or potential issues which may be present, one or more of the above field investigations may not be applicable for a Standby Contract site. Therefore, a site-specific HASP Addendum will be included with the Work Plan for each Standby Contract site.

The safety organization, procedures, and protective equipment for this Generic HASP have been established based on an analysis of potential physical, chemical, and biological hazards reasonable anticipated that could be encountered during the course of work under this contract. Specific hazard control methodologies have been evaluated and selected to minimize the potential for accident or injury. One copy of this HASP will be maintained by field personnel at the site during the scheduled field sampling effort in addition to any site specific HASP addendum. The copy will be made available for site use/employee review. A copy will also be maintained at HRP's office by the Office Health and Safety Manager.

The HASP describes the procedures that must be followed during referenced site activities. Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval of the Project Manager and the Office Health and Safety Manager (OHSM). This document will be periodically reviewed to ensure that it is current and technically correct. Changes in site conditions and/or the scope of work will involve a review and modification to the HASP. Such changes will be completed in the form of a dated revision.

The provisions of this HASP are mandatory for the personnel and subcontractors assigned to the project through HRP's contract. Visitors to the work site must abide by the requirements of the HASP. It should be acknowledged that the employees of other consulting and/or contracted companies, not under HRP's contract might work in accordance with their own independent HASP. HRP's subcontractor's HASPs must meet the requirements of this HASP and applicable site-specific HASP addendums.

1.1 Site and Facility Description

General site-specific information concerning the layout of the site, site features, and description of items or site features, which specifically may affect site safety will be provided in the site-specific HASP Addendum. A detailed site history and regulatory history for each site will be provided in the site-specific Work Plan.

1.2 Policy Statement

As a responsible member of an industry where potential health and safety risks are inherent due to the nature of services we provide, a clear corporate safety policy is paramount to our success. HRP recognizes that our most important resource is our employees. Therefore, the company is committed to providing a safe and healthful workplace and regards workers' safety and health as a fundamental value within our organization. Through a cooperative effort by management and staff, HRP will strive to achieve and maintain a well-balanced and proactive health and safety program. It is the basic responsibility of each employee, regardless of their position, to make health and safety an integral part of their daily routine. This charge must be accepted by each individual who conducts the affairs of the company. The success of this program is dependent on employee involvement.

HRP will take every reasonable step to provide a safe and healthful work environment and to eliminate or control hazards in order to minimize the possibility of injury, illness, or accident to personnel working onsite. HRP and HRP subcontractor employees will be familiar with the HASP for the project activities that will be conducted in. Prior to entering the site, this HASP and the site-specific HASP Addendum will be reviewed, and the agreement to comply with the requirements will be signed by HRP personnel, subcontractors, and visitors.

Operational changes that could affect the health and safety of personnel, the community, or the environment will not be made without the prior approval from the Project Manager and the OHSM. This document will be periodically reviewed to ensure that it is current and technically correct. Changes in site conditions and/or the scope of work will require a review and modification to the HASP. Such changes will be completed in the form of a revision of the site-specific HASP Addendum.

1.3 References

This HASP addresses the following regulations and guidance documents:

- *HRP Corporate Health and Safety Program (originally developed in 1993, latest revision September 2018).*
- *Standard Operating Safety Guides, U.S. EPA Publication 9285.1-03, June 1992. Safety and Health Program Management Guidelines, 29 CFR 1926 Subpart C*
- *Safety and Health Program Management Guidelines, Issuance of Voluntary Guide- lines, July 15, 1988*
- *NIOSH Pocket Guide to Chemical Hazards, 2010.*

- *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute for Occupational Safety and Health, Occupational Safety and Health Administration (OSHA), U.S. Coast Guard, U.S. Environmental Protection Agency (EPA) (86-116, October 1985)*
- *Threshold Limit Values, American Conference of Governmental Industrial Hygienists, 2019*
- *29 CFR 1910 and 1926*
- *Toxic and Hazardous Industrial Chemicals Safety Manual, The International Technical Information Institute, 1975.*
- *The Merck Index*
- *Guidelines for the Selection of Chemical Protective Clothing, 3rd. ed., American Conference of Governmental Industrial Hygienists, 1987.*
- *Assessing the need for Personal Protective Equipment: A Guide for Small Business, OSHA 3151, 1997.*

1.4 Definitions

The following definitions are applicable to this HASP:

Site – The area where the work is to be performed.

Project - Onsite work performed under the scope of work for each Standby Contract site.

Contract Manager - The HRP individual who will have overall responsibility the management of the Standby Contract.

Project Manager/Site Manager - The HRP individual(s) who will have overall responsibility for a particular Standby Contract site. The Project Manager will provide services associated with the implementation of the site-specific Work Plan.

General Supervisor – The HRP individual who will be responsible for directing day-to- day operations in the field and is responsible for health and safety aspects of the site operation. Depending to the Scope and complexity of the work assignment, this individual may also by the Project Manager.

Office Health and Safety Manager (OHSM) - The role of this individual will be to ensure that corporate health and safety policies and objectives are being implemented at each HRP office location. The OHSM will have the authority to direct day-to-day operations, in respect to health and safety as well as authority to approve site-specific Comprehensive Work Plans (CWPs) and Health and Safety Plans (HASPs) for sites covered under the HAZWOPER Standard.

Subcontractor - Includes third party personnel hired onsite by HRP.

Onsite Personnel - HRP and subcontractor personnel involved with the project.

Visitor - Personnel, except the onsite personnel. Visitors must receive approval to enter the site.

Exclusion Zone - Portion of the site where hazardous substances are, or are reasonably suspected to be, present in the air, water, or soil.

Contamination Reduction Zone - Area between the Exclusion Zone and Clean Zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.

Clean/Support Zone - The rest of the site. Support equipment is located in this zone.

2.0 ROLES AND RESPONSIBILITIES

2.1 Personnel

HRP and subcontractor employees are responsible for reading, understanding, and meeting the health and safety requirements contained in this HASP and additional site- specific plans and addenda. A HASP Review Record sign-off sheet for each site is provided in each site-specific HASP and can be found in Appendix A of that site-specific HASP. Employees are required to implement these procedures when carrying out daily operations. This will include receiving appropriate training and medical monitoring and using HRP provided health and safety equipment (to include personal protective equipment [PPE]) to safely conduct site operations. This may include maintaining appropriate grooming standards (removal or proper trimming of beards, mustaches, and sideburns) to ensure the proper fit of respiratory protection. Employees will review each task prior to commencement to consider the potential health and safety hazards and the measures to be taken in the event of an emergency. Employees will know where safety data sheets (SDS), first aid supplies, and emergency equipment is maintained. The Contract Manager and Office Health and Safety Manager will be notified by the Project Manager of potential health and safety hazards, near-miss conditions, or incidents present on the job site or unusual effects believed to be related to hazardous chemical exposures. Failure to follow established health and safety procedures could result in immediate dismissal from the site and, if repeated, a potential loss of employment.

2.1.1 Responsibilities

Clear lines of authority will be established for enforcing compliance with the safety, health, and contingency procedures consistent with industry policies and procedures. Designated HRP personnel are responsible for implementation of the HASP during field activities. This includes field supervision; implementing and directing emergency operations; coordinating with onsite and offsite emergency responders; enforcing safe work practices and decontamination procedures (if needed); ensuring proper use of PPE; communicating site safety program modifications and requirements to site personnel; proper reporting of injuries, illnesses, and incidents to the appropriate internal and external organizations; and containing and controlling the loss of potentially hazardous materials to soil, air, and surface/groundwater during field operations.

In the event of an onsite injury, occupational illness, near-miss, or environmental contamination incident, the following organizations / individuals will be notified as appropriate (Section 11):

- Office Health and Safety Manager
- Contract Manager
- Chief Operating Officer
- Principal
- Site Health and Safety Officer
- Project Manager
- General Supervisor
- Site Workers
- New York State Department of Environmental Conservation representatives
- Other organizations or persons as appropriate.

2.1.2 Key Project Personnel

A table containing information on key project personnel for each of the Standby Contract sites will be included in each site-specific HASP Addendum.

2.2 Chief Operating Officer (COO)

The COO at HRP will have the overall responsibility and management responsibility at HRP for health and safety at the corporate level. The role of the COO will be to provide leadership and experience, and through the assistance of other management personnel and staff members, provide the resources and commitment to ensure a safe and healthy workplace will be maintained. The COO will provide visible top management support and involvement in the implementation in HRP’s Corporate Health and Safety Program. In addition, the COO will provide leadership, guidance, and the authority to commit the resources necessary to implement health and safety activities at each HRP office.

2.3 Office Health and Safety Manager

Since HRP currently operates multiple offices within different states of the country, it is necessary to ensure employee health and safety at each location. To ensure safe and healthy work and working conditions at each location, HRP has designated an Office Health and Safety Manager (OHSM) at each office. The role of these OHSMs will be to ensure that corporate health and safety policies and objectives are being implemented at each location. These OHSMs will have the authority to direct day-to-day operations, in respect to health and safety as well as authority to approve site-specific Comprehensive Work Plans (CWPs) and Health and Safety Plans (HASPs) for sites covered under the HAZWOPER Standard. Whenever a "qualified person" or OHSM is referenced within HAZWOPER or the Program, it refers to these individuals. In addition, OHSMs will be responsible for identifying local/State specific requirements that need to be addressed at their respective office and conducting accident investigations.

2.4 Contract Manager

The Contract Manager has overall responsibility for health and safety of employees and subcontractors and safe job sites associated with this contract. The Contract Manager will have the authority to manage project teams and direct day-to-day operations and in respect to health and safety, suspend work for unsafe conditions. The Contract Manager will work closely with the OHSM on all and safety matters associated with this contract.

2.5 Project Manager

The Project Manager of site operations will be responsible for all health and safety aspects of the site operation. The primary responsibilities of the Project Manager include:

- Submitting HASP addendum and revisions to the OHSM for approval;
- Reviewing the HASP Addendum and revisions
- Reviewing individual training and medical records prior to work start
- Providing overall supervisory control for health and safety protocols in effect for this project
- Assigning the Site Health and Safety Officer / General Supervisor
- Assuring adequate resources are available for carrying out this HASP
- Preparing and submitting project reports.

2.6 HAZWOPER Operations

The greatest potential for hazards or possible hazards encountered by HRP employees will be during the course of field activities, in particular site work conducted on 29 CFR 1910.120 (HAZWOPER) sites. Therefore, HRP has established several designations of personnel to define roles and responsibilities during these operations. Each of these designations is described below.

2.6.1 General Supervisor

The general supervisor of site operations will be responsible directing day- today operations and the project site. The general Supervisor will be responsible for health and safety aspects of the site operation, including, but not limited to, initial site characterization, analysis of the potential and/or actual risks and hazards which are present on-site, and implementation of the Generic and site-specific Health and Safety Plan addendums. The primary responsibilities of the General Supervisor include:

- Assuring compliance with this HASP;
- Coordinating with the Site Workers;
- Reviewing the HASP Addendum and revisions;
- Providing overall supervisory control for health and safety protocols during project activities;
- Working with the Site Health and Safety Officer; and
- Assuring adequate resources are available for carrying out this HASP.

Depending to the Scope and complexity of the work assignment, this individual may also be the Project Manager.

2.6.2 Site Health and Safety Officer (HSO)

The site Health and Safety Officer (HSO) is responsible for implementing the HASP and verifying compliance on-site. The HSO or his/her alternate must be on-site at all times that operations covered under the Standard are being conducted. The HSO also has the following responsibilities.

- Implementing the use of forms in the site-specific HASP Addendum;
- Conducting the pre-entry briefing to apprise all site workers of the content of the HASP;
- Demarcing the site work zones prior to commencement of work;
- Conducting periodic inspections to determine the effectiveness of the HASP. If a deficiency is noted, it will be reported to the project manager;
- Conducting necessary health and safety monitoring
- Controlling site access;
- Acting as the emergency coordinator for the site workers under his/her supervision in the case of emergency;
- Conducting visual inspections of the work site;
- Stopping work when imminent safety or health risks exist or as outlined in the HASP;
- Authorization for personnel to perform work onsite (i.e., relative to medical examinations and training);
- Identifying, investigating, and preparing incident reports as necessary;
- Consulting with the OHSM or Project Manager for guidance on occupational health and safety and contingency issues affecting this project;
- Providing technical support and guidance in the modification of site-specific HASP requirements;
- Evaluating onsite environmental monitoring results and providing reporting requirements to the General Supervisor; and
- The HSO will be responsible for enforcing the HASP.

In addition, the HSO may have other responsibilities, especially during smaller projects. These tasks could include conducting air monitoring, directing field operations, recordkeeping, equipment calibration, and enforcing personal protective equipment upgrades.

Changes to the Work Plan or HASP due to a change in objective or a noted deficiency are not authorized by the HSO but by the project manager or general supervisor, unless a change is necessary because of a situation immediately dangerous to life or health. However, it should be noted that the HSO might use professional judgment and authorize minor changes provided that these changes do not affect the scope noted in the Generic Work Plan and Site Specific Work Plan. An example of a minor change would be the relocation of a boring to avoid a utility. The HSO has stop-work authorization that will be exercised upon determination of an imminent health or safety hazard. The project manager will be contacted immediately after a stop-work order is executed.

2.6.3 General Site Workers

All other personnel needed for site operations will have their general functions and responsibilities, if any, defined in the Generic Work Plan and Work Assignment.

2.7 Subcontractors

Responsibilities of HRP and subcontractor personnel include:

- Following the HASP and applicable health and safety rules, regulations, and procedures;
- Understanding and complying with 29 CFR 1910 and 29 CFR 1926 rules and regulations applicable to the operations they are conducting to ensure the health and safety of their personnel;
- Using required controls, procedures, and safety devices, including PPE;
- Notifying his/her supervisor of identified or suspected emergencies and safety or health hazards; and
- Complying with training and medical requirements.

2.8 Visitors

Visitors entering the site area will be required to sign the Entry/Exit Log (found in each site-specific HASP) and to read and verify their understanding and willingness to comply with this HASP. Visitors will remain in an observation area and will not be allowed in the Exclusion Zone or Support Zone unless they have met the appropriate OSHA training and medical requirements, and have received clearance by the Project Manager and the Site Health and Safety Officer.

3.0 HAZARD ANALYSIS

3.1 Project Scope of Work

The scopes of work for the field activities covered by this HASP will be presented in the site-specific Work Plan for each Standby Contract site.

Specific field activities may include the following:

- Surface soil sampling;
- Exploratory test pits with subsurface soil sampling;
- Soil borings with subsurface soil sampling or bedrock coring;
- Monitoring well installation and development;
- Geophysical surveys;
- Short duration (slug) testing;
- Groundwater gauging and sampling;
- Surface water and sediment sampling;
- Subsurface structure sediment/debris sampling;
- Characterization of investigative-derived waste;
- Soil vapor, sub-slab, indoor, and outdoor air sampling;
- Remedial Construction oversight; and
- Remediation System evaluation.

Based upon the above field activities, the following potential hazardous conditions may be anticipated.

- The use of mechanical equipment such as drill rigs, backhoes, and powered augers can create a potential for crushing, pinching, and strain hazards due to movement and positioning of the equipment; movement of lever arms and hydraulics; entanglement of clothing and appendages in exposed drives and augers; and impact of steel tools, masts, and cables should equipment rigging fail, or other structural failure occur during drilling mast extension and operation. Heavy equipment work must be conducted only by trained, experienced personnel. If possible, personnel must remain outside the turning radius of large, moving equipment. At a minimum, personnel must maintain visual contact with the equipment operator. When not operational, equipment must be set and locked so that it cannot be activated, released, dropped, etc.

- Equipment can be energized due to contact with overhead or underground electrical lines, utilities impaired by excavation of communication or potable/wastewater lines, or a potential for fire or explosion may occur due to excavation of below ground propane/natural gas lines. Prior to commencement of invasive operations, a drilling/excavation permit will be obtained, if needed and the area will be inspected and flagged by an ultility markout service. Personnel should be aware that although an area may be cleared, it does not mean that unanticipated hazards will not appear. Safe distances will be maintained from live electrical equipment as specified in HASP. Workers should always be alert for unanticipated events such as snapping cables, digging into unmarked underground utilities, etc. Such occurrences should prompt involved individuals to halt work immediately and take appropriate corrective measures to gain control of the situation.

- Work around large equipment often creates excessive noise. Noise can cause workers to be startled, annoyed, or distracted; can cause physical damage to the ear, pain, and temporary and/or permanent hearing loss; and can interfere with communication. If workers are subjected to noise exceeding an 8-hour time- weighted average sound level of 90 dBA, hearing protection will be selected with an appropriate noise reduction rating to comply with 29 CFR 1910.95 and to reduce noise below levels of concern. Hearing conservation practices will also be implemented at a sound level at or exceeding 85 dBA.

- Personnel may be injured during physical lifting and handling of heavy equipment, bags of grout, gravel, or other well construction materials, or waste containing drums or containers. Additionally, personnel may experience slips, trips, and falls due to irregular terrain of the site, excavations, test pits, or slip on the drill rig due to the presence of oil, grease, or other slurry materials.

- Field operations conducted during the hot summer months can impose excessive heat loading to personnel conducting strenuous activities or activities requiring the additional heat burden created due to the use of PPE.

- Field operations conducted during cold winter months can expose personnel to extreme temperatures and wind chill.

- Field investigation activities intended to define potential sources of environmental contamination often focus on employees to be in direct proximity or contact with hazardous substances. Employees may be exposed through the routes of inhalation of toxic dusts, vapors, or gases. Normal dust particulates from surficial soils may have adsorbed or absorbed toxic solvents, petroleum compounds, polychlorinated biphenyl (PCBs), or toxic metal salts or metal particulates. Soil saturated with petroleum or waste solvents may give off vapors, and create high vapor concentrations in excavations, trenches, pits, and other confined spaces or enclosures. Water collected during well development and groundwater sampling activities may also contain toxic vapors, liquids, and gases and be inhaled during normal operations, or may be splashed onto the skin or in the eyes. Ingestion of toxic materials contained in dusts/particulates can be ingested if eating, smoking, drinking, and gum chewing are permitted prior to personnel washing their hands and face or removing contaminated work clothing and PPE. Some chemicals may be absorbed directly through the skin (e.g., PCB). PPE, properly designed for the chemicals of concern, will be provided and worn when a potential for skin contact is present.

3.2 Hazard Communication

A written OSHA Hazard Communication Program for Construction (required by 29 CFR 1910.1200/1926.59) will be maintained onsite during investigative activities. Employees will be informed of the Hazard Communication Program's existence, contents, and location. This Program will be kept with the SDS and contain a list of site-specific chemicals present. The list will be cross-referenced with the applicable SDS for ease in SDS accessibility.

A SDS for each chemical brought onsite during field activities will be maintained onsite by the Site Health and Safety Officer. Subcontractors must inform the General Supervisor and Site Health and Safety Officer of hazardous substances brought onsite, and provide appropriate SDS to the Site Health and Safety Officer. Chemicals brought onsite must be labeled in accordance with OSHA Hazard Communication Requirements (29 CFR 1910.1200). Site workers and visitors will be informed of the Hazard Communication Program, their legal rights under the Program, the location of the chemical inventory, and the location of the SDS. Subcontractors will coordinate with HRP to provide a list of the hazardous materials that will be used onsite in support of their operations. This information will be shared jointly with site employees and visitors to the site.

Employee awareness of chemical identities, health and physical hazards, and characteristics is essential to safely handle chemicals and minimize potential hazards. The Hazard Communication Program must follow the OSHA requirements listed in 29 CFR 1910.1200/1926.59.

3.2.1 Hazardous Substance List

HRP will maintain a dynamic list of "hazardous materials." Examples of hazardous materials which might be present at the site include solvents, adhesives, irritants, corrosives, flammables, combustibles, compressed gases, organic peroxides (curing agents), and oxidizers (sanitizing agents). This list will be used in the Hazard Communication Program. Additionally, other potential hazardous substances that could be present onsite may also be listed. Examples of other hazardous substances associated with site operations may include carbon monoxide generation from generators or internal combustion engines, contaminants which could be present on the site and encountered in the process of site assessment, and potential atmospheric contaminants present in confined spaces.

3.2.2 Hazard Communication Labeling

HRP will utilize the existing container labeling, if appropriate for containers originating from the manufacturer or distributor. HRP will ensure that in- house containers are properly labeled and that workers understand the contents of containers. Container labels will contain at least information on the name of the product or container, chemical(s) in the product, manufacturer's name and address, protective equipment required for the safe handling of the product, and first aid procedures in case of overexposure to product contents.

3.2.3 Hazard Communication Training

Site employees and visitors must be informed of HRP's Hazard Communication Program, their legal rights under the program, and location of chemical inventory and SDS files. The employee's supervisor must describe hazardous substances used and provide information concerning:

- Nature of potential hazards
- Appropriate work practices
- Appropriate control programs
- Appropriate protective measures
- Methods to detect presence or release of hazardous substances
- Emergency procedures.

3.3 Chemical Hazards

Potential compounds of concern will be determined on a site-specific basis. Typical compounds of concern encountered at investigative sites and their relevant properties are shown in Table 1 at the end of this Generic Health and Safety Plan. Specific potential compounds of concern for each site will be identified in each site-specific HASP Addendum. Potential compounds of concern for a particular site may include, but are not limited to, the following:

- Volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs); total petroleum hydrocarbons; metals, pesticides, and particulates in soil, sediment, groundwater, and surface water;
- VOCs in air; and
- PCBs on concrete and in soil, sediment, and water.

Field operation precautions and preventive measures for Standby Contract sites are described in the following paragraphs:

- Test Pit Excavation/Sampling — VOCs, SVOCs, metals, PCBs, pesticides, and particulates may be encountered. Continuous organic vapor monitoring, upwind worker positioning, and PPE are required (see Section 5 for specific PPE).
- Surface Soil/Wipe Sampling — VOCs, SVOCs, metals, PCBs, pesticides, and particulates may be encountered. Potential routes of worker exposure are through dermal contact and inhalation and ingestion (see Section 5 for specific PPE).
- Surface Water/Sediment Sampling — VOCs, SVOCs, metals, PCBs, pesticides, and particulates may be encountered. Potential routes of worker exposure are through dermal contact and inhalation and ingestion (see Section 5 for specific PPE).
- Installation of Monitoring Wells/Subsurface Soil Sampling — VOCs, SVOCs, metals, PCBs, pesticides, and particulates may be encountered. Continuous organic vapor monitoring, upwind worker positioning, and PPE are required (see Section 5 for specific PPE).
- Groundwater Sampling — VOCs, SVOCs, metals, PCBs, and pesticides may be encountered. Potential routes of worker exposure are through dermal contact, inhalation, and ingestion; wear PPE when in contact with groundwater (see Section 5 for specific PPE).
- Soil Vapor Sampling — VOCs, may be encountered. Potential routes of worker exposure are through dermal contact and inhalation and ingestion; Continuous organic vapor monitoring,

upwind worker positioning, and PPE are required (see Section 5 for specific PPE).

- Remedial System Construction Oversight and System Evaluation — VOCs, SVOCs, metals, PCBs, pesticides, and particulates may be encountered. Potential routes of worker exposure are through dermal contact, inhalation, and ingestion; (see Section 5 for specific PPE).

Dermal contact is a potential concern during the above tasks due to the possible presence of skin irritants such as petroleum products and other toxic substances (PCBs) that may be absorbed through the skin. This information is based upon a worst- case scenario. Dermal protection listed in Section 5 must be worn during work tasks involving contact with soil and groundwater.

A description of the requirements for the different levels of PPE, as well as upgrade/downgrade requirements, is provided in Section 5. Although ingestion of contaminants is also a primary source of exposure, vigilance by site health and safety personnel will ensure proper use of PPE and personal hygiene to practically eliminate this route of exposure.

3.3.1 Chemicals for Equipment Calibrations and Operations

In addition to the compounds detected on the site, the following chemicals are typically used during investigative activities:

- Methane calibration gas
- Isobutylene calibration gas
- Pentane calibration gas
- Hydrogen sulfide calibration gas
- Isopropyl alcohol
- Methanol
- Alconox®
- Citronox®
- Nitric acid
- Sample preservatives (e.g., hydrochloric acid, sodium hydroxide)

These chemicals will be used for equipment calibrations and operations, as well as, processing of samples and decontamination of equipment. Alconox, Citronox, Methanol, Isopropyl Alcohol and diluted Nitric Acid are typically used for cleaning and decontamination. The quantities to be used will not exceed 1-oz quantities for sample preservatives (e.g., Hydrochloric acid, Sodium hydroxide) in each bottle, and will be used within controlled conditions, primarily to support equipment calibration. The anticipated occupational exposures from these operations will be negligible.

3.4 Physical Hazards

Physical hazards can potentially be present during field activities. These physical hazards may include, but not be limited to:

- Fire/explosion hazards
- Heat / cold stress

- Equipment hazards
- Slope stability hazards
- Vehicle and pedestrian hazards
- Noise hazards
- Electrical hazards
- Utilities
- Weather hazards and
- Biological

Physical hazards are listed below for each work task. Standard Operating Procedures provided in the site-specific HASP will list potential hazards and protective measures.

- Test Pit Excavation/Sampling—General safety hazards, heavy equipment hazards, general physical hazards, slope stability hazards, electric hazards, underground utilities, fire/explosion, noise hazards, cold/heat stress, and biological hazards

- Surface Soil/Wipe Sampling—General safety hazards, cold/heat stress, and biological hazards

- Surface Water/Sediment Sampling—General safety hazards, cold/heat stress, and biological hazards

- Drilling and Installation of Monitoring Wells—General safety hazards, heavy equipment hazards, electrical hazards, underground utilities, fire/explosion, noise hazards, cold/heat stress, and biological hazards

- Groundwater Sampling—General physical hazards, cold/heat stress, and noise hazards.

- Soil Vapor Sampling—General safety hazards, heavy equipment hazards, electrical hazards, underground utilities, fire/explosion, noise hazards, cold/heat stress, and biological hazards.

Each site will be visually inspected for the presence of general safety hazards (e.g., trip/slip hazards, unstable surfaces or steep grades, sharp objects) prior to beginning work. If hazards are present, these hazards will be recorded and precautionary measures taken to prevent injury.

3.4.1 Fire/Explosion Hazards

The potential for fire and/or explosion emergencies is always present on a site. Substances capable of creating fire and explosion at a site include methane gas, petroleum-contaminated soils, and other flammable vapors. Workers must continuously monitor the work area for combustible or explosive gases when operations have the potential to generate sparks. Employees should always be alert for unexpected events, such as ignition of chemicals or sudden release of materials under pressure, and be prepared to act in these emergencies.

Field vehicles will be equipped with a fire extinguisher. Employees must be trained in the proper use of fire extinguisher equipment. However, large fires that cannot be controlled with a fire extinguisher should be handled by professionals. The proper authorities should be notified in these instances.

3.4.2 Heat Stress and Heat-Related Illness

Heat-induced occupational illnesses, injuries, and reduced productivity occur in situations in which the total heat load (environmental plus metabolic) exceeds the capacities of the body to maintain normal body functions without excessive strain. The reduction of adverse health effects can be accomplished by the proper application of engineering and work practice controls, worker training and acclimatization, measurements and assessment of heat stress, medical supervision, and proper use of heat protective clothing and equipment. In many cases heat illness can be avoided by common sense techniques such as frequent rest periods, replacement of lost body fluids, and avoidance of working in direct sun. If a lengthy period of work in hot environments is scheduled (i.e. more than three days) then specific heat stress control procedures should be developed.

Specific techniques for the prevention of heat disorders include the following:

- Have workers drink 16 ounces of water before beginning work, such as in the morning or after lunch. Provide disposable 4 ounce cups and water that is maintained at 50-60°F. Urge workers to drink 1-2 of these cups water every 20-minutes for a total of 1-2 gallons per day. Provide a cool, preferably air conditioned area for rest breaks. Discourage the use of alcohol in non-working hours and discourage the intake of coffee during working hours. Monitor for signs of heat stress.

- Aclimate workers to site work conditions by slowly increasing workloads. New employees and workers returning from an absence of 2 weeks or more should have a 5-day period of acclimatization. This period should begin with the worker doing 50 percent of the normal workload and experiencing only 50 percent of heat-exposure time the first day, and gradually building up to 100 percent on the fifth day.

- In hot weather, conduct field activities in the early morning or evening.

- Ensure that adequate shelter is available to protect personnel against heat which can decrease physical efficiency and increase the probability of heat stress. If possible, set up the command post in the shade.

- In hot weather, rotate shifts of workers wearing impervious clothing.

- Good hygienic standards must be maintained by frequent changes of clothing and showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

- Educate employees to be aware of the signs and symptoms of heat disorders.

Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85°F, workers should be monitored for heat stress after every work period. The following procedures should be used:

1. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/min. If the HR is higher, the next work period would be shortened by 10 minutes (or 33 percent) while the length of the rest period stays the same. If the pulse rate is 100 beats/minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent) while the length of the rest period stays the same. However, if the OT exceeds 99.7°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure that it has dropped below 99°F.

3. Manage work/rest schedule. The following work/rest schedule shall be used as a guideline:

Adjusted Temperature (°F)	Active Work Time (min/hr) Using Level B/C Protective Gear
75 or less	50
80	40
85	30
90	20
95	10
100	0

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat, a number of physical reactions can occur ranging from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to fatal. Standard reference books should be consulted for specific treatment.

Heat-related problems include:

1. Heat rash caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Heat rash decreases the ability to tolerate heat as well as being a nuisance.

2. Heat cramps caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.

3. Heat exhaustion caused by increased stress on various organs to meet increased demand to cool the body. Signs: shallow breathing, pale, cool, moist skin, profuse sweating, dizziness, and lassitude.

4. Heat stroke, the most severe form of heat stress. Body must be cooled immediately to prevent severe injury and/or death. Signs and symptoms are: red, hot, dry skin, no perspiration, nausea, dizziness and confusion, strong, rapid pulse, coma.

3.4.3 Cold-Related Illness

Persons working outdoors in temperatures at or below freezing may be adversely affected by cold. Extreme cold for a short time may cause severe injury to the surface of the body, frostbite, or result in profound generalized cooling, causing coma or death. Areas of the body that have a high surface area to volume ratio, such as fingers, toes or ears, are the most susceptible.

Two factors influence the development of a cold injury ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. Even when ambient temperatures are as warm as 50°F, hypothermia can become a significant factor. As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical protective equipment is removed if the clothing underneath is soaked with perspiration.

Employees should be cognizant of the following symptoms of incipient frostbite and systemic hypothermia.

Frostbite - This condition is characterized by white, waxy, firm or hard skin.

Systemic hypothermia - This condition is characterized by shivering, apathy, listlessness and sleeping (in the initial stages) and unconsciousness, glassy stare, slow pulse and slow respiratory rate (in the later stages).

Measures to protect oneself from cold injury which should be implemented whenever temperatures drop below 50°F include the use of gloves, hats, thermal underclothes, insulated footwear, and frequent breaks within a warm area. If any symptoms of frostbite or systemic hypothermia develop, then a longer break in a warm area should be taken until the body returns to normal. In severe cases, medical attention may be necessary. It should be noted that alcohol and caffeine are not recommended for persons with hypothermia.

To avoid cold-related illness, the following steps should be taken:

- Educate workers to recognize the symptoms of frostbite and hypothermia
- Identify and limit known risk factors
- Assure the availability of an enclosed, heated environment on or adjacent to the site
- Assure the availability of dry changes of clothing
- Develop the capability for temperature recording at the site
- Assure the availability of warm drinks.

3.4.4 Heavy Equipment Hazards

The use of heavy equipment (e.g., drill rigs, generators, compressors, etc.) may pose safety hazards to site workers. Heavy equipment work must be conducted only by trained, experienced personnel. If possible, personnel must remain outside the turning radius of large, moving equipment. At a minimum, personnel must maintain visual contact with the equipment operator. No guards, safety appliances, or other devices may be removed or made ineffective unless repairs or maintenance are required, and then only after power has been shut off and locked out. Safety devices must be replaced once repair or maintenance is complete. Exhaust from equipment must be directed so that it does not endanger workers or obstruct the view of the operator. When not operational, equipment must be set and locked so that it cannot be activated, released, dropped, etc.

3.4.5 Slope Stability Hazards

Cave-ins can be a significant hazard wherever test pitting or other excavation work is being performed. The type of soil is one of the factors that helps determine the stability of an excavation and the chance that it will cave in. There are three soil types that you may encounter in New York:

- Type A soil is very stable. Clay is an example.
- Type B soil is less stable than type A soil. Crushed rock, silt, and soils that contain an equal mixture of sand and silt are examples.
- Type C soil is less stable than type B soil. Gravel and sand are examples.

Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

Furthermore, where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

It is HRP's policy to ensure that for construction projects the subcontracted environmental contractor will provide a competent person to perform daily and as needed inspections of excavation sites. This policy will be conveyed through the subcontract agreement with the environmental contractor. At a minimum HRP will provide our employees involved with construction projects with awareness level training regarding excavation hazards and notify the subcontracted firm if any obvious excavation safety hazard exists during the course of on-site activities.

3.4.6 Vehicle and Pedestrian Hazards

Vehicle traffic or pedestrians, particularly in busy areas, may be susceptible to site hazards or may present a hazard to site workers. Equipment must be located in an area that does not present a hazard to bystanders. Barriers must be used to separate the work areas from both vehicular and pedestrian traffic areas and to prevent inadvertent entry into the work area. When possible, work in high traffic areas will be performed when traffic is minimal. Safety cones (with a minimum height of 28 in.) will be placed around the work area to create a buffer zone. Workers should wear safety vests or reflective material to enhance visibility in these areas. The buffer zone will be maintained even when work is not being performed in the area to prevent unauthorized access and to make the work site visible.

3.4.7 Noise Hazards

Work around large equipment often creates excessive noise. Noise can cause workers to be startled, annoyed, or distracted; can cause physical damage to the ear, pain, and temporary and/or permanent hearing loss; and can interfere with communication. Although HRP employees are not normally exposed to noise above the 8 hour Time Weighted Average (TWA) Action Level of 85 decibels (dB) during the course of employment at HRP, as documented by employee monitoring contained in HRP's Health and Safety Files, some job sites present an exposure level which could exceed the 85 dB action level. Therefore, HRP has initiated a Hearing Conservation Program in accordance with 29 CFR 1910.95, which is contained in the Corporate Health and Safety Program.

Based on the employee monitoring conducted by HRP, the following sites and/or activities are likely to exceed the action level:

- Operating a drill rig within a building (>90 dB)
- Operating a drill rig and conducting split spoon sampling (>85 but <90 dB)
- Operating a direct push (i.e. Geoprobe®) rig (88dB)

In addition, historically HRP has assessed noise levels of equipment using a sound level meter. The sound level measurements recorded above 85dB are as follows:

Timco Air Compressor	92dBs
Generators	90dBs
Power Washer	90dBs
Weed Trimmer	94dBs
Core Drill	89dBs
Rotary Hammer	94dBs
Pavement Saw	102dBs
Trash Pump	88dBs
Wet Vac	90dBs

When on a site which exceeds the OSHA’s 8-hour TWA of 90 dB, hearing protection is required (ear plugs and/or ear muffs are provided free of charge at each office location). Because the employee monitoring conducted by HRP can not be completely representative of all sites encountered, and noise levels can vary widely depending on the type of work and distance to source, it will be standard operating procedure to use ear plugs on other types of sites not identified above if the employees expect excessive noise, based on their judgment.

3.4.8 Electrical Hazards

Overhead power lines, electrical wiring, electrical equipment, and buried cables pose risks to workers of electric shock, burns, heart fibrillation, and other physical injuries, as well as fire and explosion hazards. Workers will take appropriate protective measures when working near live electrical parts, including inspection of work areas to identify potential spark/ignition sources, maintenance of a safe distance, proper illumination of work areas, provision of barriers to prevent inadvertent contact, and use of nonconductive equipment. If wiring or other electrical work is needed, it must be performed by a qualified employee or outside contractor. General electrical safety requirements include:

- Electrical wiring and equipment must be a type listed by UL, Factory Mutual Engineering Corporation, or other recognized testing or listing agency.
- Installations must comply with the National Electrical Safety Code or the National Electrical Code regulations.
- Portable and semi-portable tools and equipment must be grounded by a multi-conductor cord having an identified grounding conductor and a multi-contact polarized plug-in receptacle.
- Tools protected by an approved system of double insulation, or its equivalent, need not be grounded. Double insulated tools must be distinctly marked and listed by UL or FM.
- Live parts or wiring or equipment must be guarded to prevent persons or objects from touching them.
- Electric wire or flexible cord passing through work areas must be covered or elevated to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching.
- Circuits must be protected from overload.
- Temporary power lines, switch boxes, receptacle boxes, metal cabinets, and enclosures around equipment must be marked to indicate the maximum operating voltage.
- Plugs and receptacles must be kept out of water unless equipped with approved submersible construction.
- Extension outlets must be equipped with ground fault circuit interrupters.
- Attachment plugs or other connectors must be equipped with a cord grip and be constructed to endure rough treatment.
- Extension cords or cables must be inspected prior to each use, and replaced if worn or damaged. Cords and cables must not be fastened with staples, hung from nails, or suspended by bare wire.
- Flexible cords must be used only in continuous lengths without splice, with the exception of molded or vulcanized splices made by a qualified electrician.
- All extension cords used by HRP in field operations will have been provided with GFCI circuit breaker boxes.

3.4.9 High Voltage Hazards

Employees may be required to work around sources of high voltage at the site. Caution should be exercised to minimize contact with high voltage equipment, including contact between sampling equipment and potentially charged items. The minimum working distances from power transmission and distribution lines and equipment that will be allowed at the site are presented in the table below:

Nominal System Voltage	Miniumum Required Clearance
0.-50 kV	10 ft
51-100 kV	12 ft
101-200 kV	15 ft
201-300 kV	20 ft
301-500 kV	25 ft
501-750 kV	35 ft
751-1,000 kV	45 ft

To minimize the dangers presented by underground high voltage electric lines, prior to commencement of invasive operations, Underground Facilities Protection Organization (UFPO) will be contacted to inspect and flag the area of investigation. In addition, the Project Manager and/or General Supervisor will review existing underground utility maps to determine if underground utilities are present at the proposed test pit, soil boring, and monitoring well locations prior to intrusive activities. Subcontractor personnel performing ground intrusive activities will provide grounding cables that will be attached to equipment and a grounding source (i.e., ground grid cable) during subsurface excavation and drilling. Use of the grounding cables will reduce the potential for worker injury in the event that underground utilities are encountered during intrusive activities.

To minimize the dangers presented by backhoe or drill rig contact with aboveground high voltage electric lines, personnel will locate test pits and monitoring wells to maintain an adequate working distance from power transmission and distribution lines.

3.4.10 Utilities

Underground utilities pose hazards to workers involved in drilling and other invasive operations. These hazards include electrical hazards, explosion, and asphyxiation, as well as costly and annoying hazards associated with damaging communication, sewer, and water lines. Prior to commencement of invasive operations, Underground Facilities Protection Organization (UFPO) will be contacted to inspect and flag the area of investigation. HRP has established guidelines (see HRP's Corperate HASP section 6.3.13) for when private markouts are prudent including:

- Gasoline service stations,
- Marinas
- Sites with multiple buildings
- Interior subsurface work and
- Work in areas where street lights, parking lights, lighted signs, transformer or other features associated with a buried line are present.

When necessary, the Project Manager will contract a private markout firm, in addition to the UPFO markout.

Personnel should be aware that although an area may be cleared, it does not mean that unanticipated hazards will not appear. Workers should always be alert for unanticipated events such as snapping cables, drilling into unmarked underground utilities, drilling into a heavily contaminated zone, etc. Such occurrences should prompt involved individuals to halt work immediately and take appropriate corrective measures to gain control of the situation.

3.4.11 Weather Hazards

Weather conditions should always be taken into consideration. Heavy rains, electrical storms, high winds, and extreme temperatures, for example, may create extremely dangerous situations for employees. Equipment performance may also be impaired because of inclement weather. Whenever unfavorable conditions arise, the General Supervisor and Site Health and Safety Officer will evaluate both the safety hazards and ability of the employees to effectively perform given tasks under such conditions. Activities will be halted at their discretion. The Project Manager may be consulted during the decision process, if time allows.

Wind direction should be accounted for when positioning equipment at sampling locations. If exposure to organic vapors is anticipated, workers should locate upwind of the sampling point. Wind direction often changes abruptly and without warning, so personnel should always be prepared to reposition, if necessary.

3.5 Biological Hazards

Potential hazards may be present at the site due to bites from stray domestic and wild animals (to include rodents), spiders, bees, and other venomous anthropods, ticks may be encountered during field operations potentially resulting in Lyme disease, or punctures from sharp objects presenting a possible hazard from Tetanus. In the case of an animal or insect bite that can be serious or fatal, workers must seek immediate medical attention and report the incident to the Site Health and Safety Officer prior to leaving the site. An employee known to be allergic or sensitive to poisonous insects should alert the General Supervisor and Site Health and Safety Officer. Prompt medical attention procedures, as outlined in Section 11.2 of this HASP will be followed in the event of animal bites (since many animals carry rabies or other diseases/viruses.

3.5.1 Bloodborne Pathogens

During the conduct of site operations, HRP employees may be exposed to blood and body secretions in support of emergency response operations where site personnel have been injured, and require first aid and/or CPR. Due to the potential that blood and body secretions may contain disease causing organisms such as Hepatitis B Virus and Human Immunodeficiency Virus, employees electing to provide first aid and CPR support, until the arrival of a competent onsite medical responder, should take appropriate measures to reduce or eliminate their potential for contact and exposure. The concept of “Universal Precautions” will be followed, assuming a potential hazard is present. Employees providing first aid support should wear the appropriate PPE to prevent or reduce their potential for contact and exposure. This will typically be accomplished through the use of rubber gloves, splash-proof eye protection, and the use of mouth-to-mouth guards and proper cleanup (good sanitation and hygiene) following an incident. Hands and face should be thoroughly washed with water and an antiseptic soap or cleanser following an incident, or antiseptic containing disposable towelettes used in the absence of appropriate field washing facilities. The OHSM should be notified of potential employee exposures to blood and body fluids while conducting work in support of this project.

3.5.2 West Nile Virus

West Nile virus is a member of the Japanese encephalitis complex of flaviviruses, transmissible by mosquitoes, and can cause febrile, sometimes fatal human illness. Until 1999, this virus had never been reported in the Western Hemisphere. Mosquitoes, primarily bird-feeding species, are the primary vectors of West Nile virus, although the virus has been isolated from other bird feeding arthropods, including some tick species. The natural transmission cycle of the virus involves a bird- mosquito cycle, but may include a tick-bird cycle where soft ticks (argasids) or hard ticks (ixodids) are found feeding on reservoir birds. The urban cycle of the disease requires species of mosquitoes that will feed on free-ranging or domestic birds and people. The unprecedented introduction of West Nile virus into the metropolitan area of New York City in the late Summer of 1999 has resulted in a large-scale review of existing programs and required resources to address this threat. Representatives of several local health units and state and federal agencies met to address each of the significant surveillance and response issues associated with this mosquito-borne disease. As a result of these discussions and consultation with community groups, the New York State Department of Health has developed a set of complementary action plans to prevent a further episode of West Nile virus infections.

According to New York State Department of Health, outdoor workers should take the following precautions to minimize potential exposure to the West Nile virus from adult mosquito bites:

- It is not necessary to change standard work health and safety practices outdoors, unless there is evidence of the mosquito-borne disease.
- If the West Nile virus is identified in an area, workers should be advised of the precautions that they may choose to take to try to reduce the risk of mosquito bites.
- Wear shoes, socks, long pants, and a long-sleeved shirt when outdoors for long periods of time or when mosquitoes are most active (between dusk and dawn). Maintain body fluids to avoid heat stress.
- Consider the use of mosquito repellent, according to directions, when it is necessary to be outdoors for long periods or at times when mosquitoes are most active.

3.5.3 Lyme Disease

Lyme Disease commonly occurs in summer and is transmitted by the bite of infected ticks. “Hot spots” in the United States include New York, New Jersey, Pennsylvania, Massachusetts, Connecticut, Rhode Island, Minnesota and Wisconsin. Few cases have been identifies in other states. Symptoms of Lyme disease include a rash or a peculiar red spot, like a bull’s eye, which expands outward in a circular manner. The victim may have a headache, weakness, fever, a stiff neck, swilling and pain in the joints, and eventually, arthritis.

Tick repellant containing diethyltoluamide (DEET) should be used when working in tick infested areas, and pants legs should be tucked into boots. In addition, workers should search the entire body very three or four hours for attached ticks. Ticks should be removed promptly and carefully without crushing, since crushing can squeeze the disease-causing organism into the skin. A gently and steady pulling action should be used to avoid leaving the head or mouth parts in the skin. Hands should be protected with surgical gloves when removing ticks. If a tick bite occurs then the OHSM must be notified.

3.6 Confined Space

Confined spaces are defined as an enclosed space meeting all of the following criteria:

1. It is large enough and so configured that a person can bodily enter;
2. It has limited or restricted means for entry or exit (some examples are tanks, vessels, silos, storage bins, hoppers, vaults, pits, diked areas and trenches);
3. It is not designated for continuous human occupancy; and
4. It has one or more of the following characteristics:
    a. It contains or has a known potential to contain a hazardous atmosphere (including an oxygen deficiency);
    b. It contains a material with the potential for engulfment of an entrant;
    c. It has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes downward and tapers to a smaller cross-section; or
    d. It contains any other recognized serious safety or health hazard.

Confined spaces include, but are not limited to, storage tanks, process vessels, bins, boilers, ventilation or exhaust ducts, sewers, underground utility vaults, tunnels, pipelines, and open top spaces more than 4 ft in depth such as pits, tubs, vaults, and vessels.

Due to the inherent dangers of entering confined spaces and the fact that HRP employees are <u>not</u> trained in confined space entry, <u>HRP personnel are strictly prohibited from performing confined space entry</u>. Confined space entry will only be performed by subcontractors who have the proper training and experience to conduct this type of task.

Entry into a confined space is forbidden until the potential confined space is thoroughly assessed by the Office Health and Safety Officer. Only those personnel properly trained and certified will be allowed to conduct confined space entries.

3.7 Tools – Hand and Power

Requirements for hand and tower tools are provided by OSHA under 29 CFR 1910.242 and 29 CFR Subpart I. In general HRP is responsible for the safe condition of tools and equipment used by employees, including tools and equipment which may be furnished by employees. As such, HRP will ensure:

- Hand tools such as chisels and punches, which develop mushroomed heads during use are reconditioned or replaced as necessary
- Broken or fractured handles on hammers, axes and similar equipment are replaced promptly
- Worn or bent wrenches are replaced regularly
- Appropriate handles are used on files and similar tools
- Tool handles are wedged tightly in the head of all tools
- Tool cutting edges kept sharp so the tool will move smoothly without binding or skipping
- Tools stored in dry, secure location where they won't be tampered with
- Power tools are equipped and used with the correct shield, guard, or attachment, recommended by the manufacturer
- Portable circular saws are equipped with guards above and below the base shoe
- All hand-held powered circular saws having a blade diameter greater than 2 inches, electric, hydraulic or pneumatic chain saws, and percussion tools without positive accessory holding means shall be equipped with a constant pressure switch or control that will shut off the power when the pressure is released.
- All hand-held gasoline powered chain saws shall be equipped with a constant pressure throttle control that will shut off the power to the saw chain when the pressure is released.
- All hand-held powered drills, tappers, fastener drivers, horizontal, vertical, and angle grinders with wheels greater than 2 inches in diameter, disc sanders with discs greater than 2 inches in diameter, belt sanders, reciprocating saws, saber, scroll, and jig saws with blade shanks greater than a nominal ¼-inch, and other similarly operating powered tools are equipped with a constant pressure switch or control, and may have a lock-on control provided that turnoff can be accomplished by a single motion of the same finger or fingers that turn it on.
- All other hand-held powered tools, such as, but not limited to, platen sanders, grinders with wheels 2 inches in diameter or less, disc sanders with discs 2 inches in diameter or less, routers, planers, laminate trimmers, nibblers, shears, saber, scroll, and jig saws with blade shanks a nominal ¼-inch wide or less, are equipped with either a positive "on-off" control, or other controls, as appropriate by OSHA.
- All cord-connected, electrically operated tools and equipment are effectively grounded or of the approved double insulated type
- Effective guards are in place over belts, pulleys, chains, sprockets, on equipment such as concrete mixers, and air compressors
- Portable fans are provided with full guards or screens having openings ½ inch (1.2700 centimeters) or less

HRP employees will conduct a pre-use visual inspection of all hand and power tools for conditions. Also, employees using hand and power tools and exposed to the hazard of falling, flying, abrasive, and splashing objects, or exposed to harmful dusts, fumes, mists, vapors, or gases will be provided with the particular personal protective equipment necessary to protect them from the hazard.

4.0 GENERAL SAFETY PRACTICES

4.1 Safety Procedures

Safe work practices, which must be followed by all site workers, include:

- At least one copy of this HASP must be at the project site, in a location readily available to personnel, and reviewed by project personnel prior to starting work.
- Site personnel must use the buddy system.
- Potentially contaminated PPE must not be removed from the work area before being cleaned or properly packaged and labeled, or properly disposed.
- Potentially contaminated waste, debris, and clothing must be properly contained, and legible and understandable precautionary labels affixed to each container to define its content.
- Removing potentially contaminated soil or debris from protective clothing or equipment with compressed air, shaking, or any other means that may re- suspend contaminants into the air is prohibited.
- Eat, drink, and smoke only in those areas designated by the General Supervisor/Site Health and Safety Officer. These activities will not take place within any work zone.
- Large bulk containers, such as 55-gal drums, must only be moved with the proper equipment, and must be secured to prevent dropping or loss of control during transport.
- Emergency equipment such as eyewash, fire extinguishers, etc. must be staged in readily-accessible locations.
- Employees must be aware, and inform their partners or fellow team members, of the potential non-visible effects of exposure to toxic materials. The symptoms of such exposures may include:

  Headaches
  Dizziness
  Nausea
  Blurred Vision
  Cramps
  Irritation of eyes, skin, or respiratory tract

- Visitors to the site must adhere to thte following:
  - Visitors must be instructed to stay outside the Exclusion Zone and Contaminant Reduction Zone, and remain within the Support Zone during the extent of their stay. Visitors must be cautioned to avoid skin contact with surfaces that are contaminated or suspected to be contaminated.

- Visitors requesting to observe work in the Exclusion of Contaminant Reduction Zones must don appropriate PPE prior to entry into that zone and must be cleared for hazardous site work as evidenced by a complete physical examination. Visitors must also have 40 hours of hazardous waste operators training and 8 hours refresher training within the past 12 months and produce a training record(s) to that fact. If respiratory protective devices are necessary, visitors who wish to enter the Contaminant Reduction Zone must be respirator-trained and fit tested for a respirator within the past 12 months and produce a training record to that fact.

- Visitor inspection or access of the Exclusion Zone will be made at the discretion of the General Supervisor. Only those personnel fully qualified may access the Exclusion Zone as defined by 29 CFR 1910.120/ 1926.65.

Each employee required to take prescription drugs will notify the Site Health and Safety Officer prior to the start of work, and upon approval, may take prescription drugs in the Support Zone only. Controlled or unauthorized drugs will not be permitted onsite at any time.

4.2 Buddy System

Onsite personnel must use the buddy system. Visual contact must be maintained between crew members, and crew members must observe each other for signs of chemical exposure, and heat or cold stress. Indications of adverse effects include, but are not limited to:

- Changes in complexion and skin coloration
- Changes in coordination
- Changes in demeanor
- Excessive salivation and pupillary response and
- Changes in speech pattern

Team members must also be aware of potential exposure to possible safety hazards, unsafe acts, or noncompliance with safety procedures.

If protective equipment or noise levels impair communications, pre-arranged hand signals must be used for communication. Personnel must stay within line of sight of another team member.

4.3 Emergency Equipment

Adequate emergency equipment for the activities conducted onsite and as required by applicable sections of 29 CFR 1910 and 29 CFR 1926 must be maintained onsite. Personnel will be provided with access to emergency equipment including, but not limited to, the following:

- Fire extinguishers of adequate size, class, number, and location (one in each HRP vehicle) as required by applicable sections of 29 CFR 1910 and 29 CFR 1926.
- First aid kit of adequate size for the number of personnel onsite.

4.4 Personal Hygiene and Sanitation

4.4.1 Break Area

Breaks will be taken in the Support Zone, away from the active work area after site personnel complete decontamination procedures. There will be no smoking, eating, drinking, or chewing gum or tobacco in the area other than the Support Zone.

4.4.2 Potable Water

The following rules apply for project field operations:

- An adequate supply of potable water will be provided at the work site. Potable water must be kept away from hazardous materials, contaminated clothing, and contaminated equipment.
- Portable containers used to dispense drinking water must be capable of being tightly closed, and must be equipped with a tap dispenser. Water must not be consumed directly from the container, nor dipped from the container.
- Containers used for drinking water must be clearly marked and not used for any other purpose.
- Disposable cups will be supplied; both a sanitary container for unused cups and a receptacle for disposing of used cups must be provided.

4.4.3 Sanitary Facilities

Access to facilities for washing before eating, drinking, or smoking will be provided. Personnel are required to wash off exposed skin surfaces prior to eating, smoking, or drinking following site operations and work activities.

4.4.4 Lavatory

If permanent toilet facilities are not available, an appropriate number of portable chemical toilets will be provided.

4.4.5 Trash Collection

Trash from the Contaminant Reduction Zone will be inspected and, if considered a hazardous waste, disposed of as a hazardous waste. Trash collected in the Support Zone and break areas disposed of as non- hazardous waste. Labeled trash receptacles will be set up in the Contaminant Reduction Zone and the Support Zone.

4.5 Spill Control Plan

Personnel must take every necessary precaution to minimize the potential for spills during site operations. Onsite personnel are obligated to report immediately any discharge, no matter how small, to the Project Manager.

Spill control apparatus will be located onsite at locations that the General Supervisor foresees with the potential for discharge to the ground. Sorbent materials used for the cleanup will be containerized and labeled separately from other wastes. In the event of a spill, the Project Manager will follow the provisions outlined in the site-specific HASP for each site to contain and control released materials and to prevent the spread to offsite areas.

4.6 Lockout/Tagout Procedures

Maintenance procedures will only be performed by fully qualified and trained individuals. Before maintenance begins, lockout/tagout procedures per OSHA 29 CFR 1910.147 and 1926.417 will be followed.

Lockout is the placement of a device that uses a positive means such as a lock to hold an energy or material isolating device or system ensuring that the equipment cannot be operated until the lockout device is removed. If a device cannot be locked out, a tagout system will be used. Tagout is the placement of a warning tag on an energy or material isolating device indicating that the equipment controlled may not be operated until the tag is removed. Only personnel properly trained in lockout/tagout procedures, and having knowledge of the system requiring maintenance, will conduct these activities. Lockout/tagout procedures will be reviewed and assessed by the Site Health and Safety Officer prior to maintenance being conducted on the system.

5.0 PERSONAL PROTECTIVE EQUIPMENT

5.1 Respiratory Protection Program

Respiratory protection is an integral part of employee health and safety at sites with potential airborne contamination. HRP's Respiratory Protection Program is contained with the Corporate Health and Safety Program and the respiratory protection provisions within this plan will be consistent with the corporate program.

For this contract, the site respiratory protection program will consist of the following:

- Site personnel who use respiratory protection will have an assigned respirator.
- Site personnel who use respiratory protection will have been fit-tested and trained in the use of a half-face or full-face air-purifying respirator within the past 12 months.
- Site personnel who may use respiratory protection must have been medically certified within the past year as capable of wearing a respirator. Documentation of the medical certification must be provided to the Site Health and Safety Officer prior to commencement of site work.
- Only cleaned, maintained, National Institute for Occupational Health and Safety (NIOSH)-approved respirators are to be used on the site.
- If chemical cartridge respirators are used, the chemical cartridge is to be properly disposed of at the end of each work shift, or when load-up or breakthrough occurs, or per change out schedule, whichever occurs first.
- Contact lenses are not to be worn with a respirator.
- Site personnel who use respiratory protection must be clean shaven. Mustaches and side burns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected, and a positive/negative pressure test performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag, away from direct sunlight in a clean, dry location, in a manner that will not distort the face piece, and labeled with the user's name.

5.2 Persponal Protective Equipment

Personal Protection against physical and chemical hazards is an integral part of employee health and safety at sites. HRP's Personal Protection Program is contained with the Corporate Health and Safety Program and the personal protection equipment provisions within this plan will be consistent with the corporate program.

Protective equipment, including personal protective equipment for eyes, face, hand and extremities, protective clothing and respiratory protection, will be required whenever conditions are encountered which are capable of causing injury or impairment in the function of any part of the body throughout absorption, inhalation or physical contact. This covers hazards of process or environment, including chemical, electrical, radiological or mechanical hazards. When protective equipment is required, it will be equipment which meets the applicable standards set forth in 29 CFR 1910 subpart I and used and maintained in a sanitary and reliable condition.

Eye and Face Protection

Whenever there is a reasonable probability that flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or light radiation may be encountered that could cause injury to the eye or face, then eye protection or face shields should be worn.

Foot Protection

Steel toe safety shoes/boots are required to be worn whenever the possibility of injury to the foot exists from falling/dropped or rolling objects. Examples of this include working around drill rigs, bailing monitoring wells with stainless steel bailers, or walking through facilities when powered industrial trucks are utilized.

Head Protection

Hard hats or helmets for protection of the head are required whenever the possibility of falling or swinging objects hitting the head exists. Examples of this include construction type jobs and drill rigs.

Hand Protection

Gloves must be worn whenever employee's hands are exposed to hazards such as those from skin adsorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, and harmful temperature extremes.

Electrical Protection

Special gloves, hard hats, mats, etc. may be necessary when employees could be potentially exposed to electrical hazards.

Based upon currently available information, the sites are considered non-hazardous and will require Level D protection for currently anticipated conditions and activities. In the event that potential chemical hazards are identified, the level of protection may be upgraded appropriately to the potential hazard conditions. Only those personnel identified and qualified for hazardous waste work, as defined in 29 CFR 1910.120 / 29 CFR 1926.65, will be allowed to upgrade beyond Level D or provide support of hazardous material/substance contingency operations. Only the General Supervisor and Site Health and Safety Officer, in conjunction with the OHSM, will be allowed to approve PPE upgrade beyond Level D and site re-entry for the purpose of hazardous conditions assessment. The following is a list of the PPE components for the maximum levels of protection authorized for use during this project.

5.2.1 Level D Personal Protective Equipment

Level D will be worn for initial entry onsite and initially for all activities and will consist of the following:

- Coveralls or appropriate work clothing

- Steel-toe, steel-shank safety boots/shoes
- Hard Hats (when overhead hazards are present or as required by the Site Health and Safety Officer)
- Chemical resistant gloves (nitrile/neoprene) when contact with potentially contaminated soil or water is expected
- Safety glasses with side shields
- Hearing protectors (during drilling or other operations producing excessive noise)
- Boot covers (optional, unless in contact with potentially contaminated soil or water);
- Polycoated coveralls (when contact with contaminated soil and water is anticipated, e.g., when surging/pumping wells and pressure-washing equipment)
- Insulated clothing, hats, etc. must be worn when temperatures or wind chill fall below 40°F

5.2.2 Level C Personal Protectitve Equipment

Based upon the preliminary information concerning the site, contaminant concentrations are not expected to require the use of Level C PPE. However, should the following conditions be identified, the Site Health and Safety Officer is authorized to increase the level of PPE to be worn. Refer to Section 5.3 for PPE upgrade criteria.

If the aforementioned action levels continue to be exceeded, the level of personal protection will be upgraded to Level C. Level C protection consists of:

- Half or Full-facepiece, air purifying respirator equipped with combination organic vapor and high efficiency particulate cartridges
- Polycoated or other water resistant coveralls
- Steel-toe, steel-shank neoprene safety boots/shoes
- Chemical-resistant boot covers
- Hard hat
- Hearing protectors (during drilling or other operations producing excessive noise)
- Chemical resistant inner (latex/nitrile) and outer gloves (nitrile/neoprene)

5.2.3 Level A & B Personal Protective Equipment

Levels A and B offer the highest level of protection to employees based on the highest level of risk to employees during site operations. It is not aniticipated that Level A and B protection under this contract. If Level A or B is necessary, conduct a separate hazard assessment and consider the task non-routine. The Project Manager and OSHM will work together to evaluate the potential hazards and decide on an appropriate course of actions and protective equipment to protect employees. Alternative, a subcontractor will be procured and utilized for the said task. Situations requiring Level A or B protection are noted below.

Level A - This level is the most protective and is selected when the greatest level of skin, respiratory and eye protection is required. Level A protection should be used when:

1. The hazardous substance has been identified and requires the highest level of protection for skin, eyes, and the respiratory system based on either the measured (or potential for) high concentration of atmospheric vapors, gases, or particulates; or the site operations and work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to skin or capable of being absorbed through the skin;

2. Substances with a high degree of hazard to the skin are known or suspected to be present, and skin contact is possible; or

3. Operations are being conducted in confined, poorly ventilated areas, and in the absence of conditions requiring Level A have not yet been determined.

The Level A ensemble will include the following items (must be used in conjunction with Level B respiratory protection):

1. Total-encapsulating chemical protective suite;
2. Coveralls (optional);
3. Outer chemical resistant gloves;
4. Inner chemical resistant gloves,
5. Steel toe and shank boots;
6. Chemical resistant outer bootcovers; and
7. Hard hat (optional)

Level B -This level is less protective of skin, and is usually used in conjunction with Level B (the most protective) respiratory protection. Level B protection should be used when:

1. The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection;
2. The atmosphere contains less than 19.5 percent oxygen; or
3. The presence of incompletely identified vapors or gases is indicated by a direct-reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

NOTE: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard; or that do not meet the criteria for use of air-purifying respirators.

The Level B ensemble will include the following items:

1. Hooded chemical resistant clothing (overalls and long sleeved jacket or one or two piece chemical-splash suit)

2. Outer chemical resistant gloves
3. Inner chemical resistant gloves
4. Steel toe boots
5. Chemical resistant outer boot covers; and
6. Hard hat (optional)

Suit-boot and suit-glove joints should be taped with duct tape to ensure that no contaminants can leak inside the suit.

5.3 Upgrade or Downgrade of Personal Protective Equipment Level

As the site-specific conditions are known, upgrade/downgrade levels are defined in this HASP. Only the General Supervisor and Site Health and Safety Officer, in conjunction with the OHSM, Can authorize an upgrade or downgrade in the PPE level worn onsite, using only the criteria presented in this HASP. Changes in PPE levels must be documented on the PPE Activity Report provided in the site-specific HASP, along with the rationale for the PPE changes. If Level A or Level B is required, this HASP will be amended.

The following general guidelines will be used to help define conditions requiring upgrade to Level C:

- If the sustained level of total organic vapors in the worker breathing zone exceeds 5 ppm above background, site workers will evacuate the Exclusion Zone and the condition should be brought to the attention of the Site Health and Safety Officer. Appropriate air purifying respirators and Level C PPE will be donned. Efforts will then be undertaken to mitigate the source of organic vapors.
- A combination combustible gas detector/oxygen meter reading of 5 percent of the lower flammable limit or an oxygen reading below 20 percent. The level should be reproducible over a 1- to 2-minute period. A reading of greater than 10 percent of the lower flammable limit or less than 19.5 percent oxygen will require immediate evacuation of the Exclusion Zone.
- A visible condition, odor, or employee perception that a chemical of concern may be released or be present requiring respiratory protection or additional skin protection. This condition should always be brought to the attention of the Site Health and Safety Officer. These endpoints are intended to address fuel oil, waste oil, gasoline, methane, oxygen, and other volatile organic vapors and gases.

5.4 Hearing Protection

Hearing protection must be available and properly worn whenever noise levels exceed 90 dBA (noise level at which a normal conversation cannot be carried on at a 3-ft distance). When appropriate or noise exposure data is sufficient, the Site Health and Safety Officer will determine if a potential excessive noise exposure exists and a sound level meter will be used for measurements.

Two types of hearing protection will be available onsite: foam earplugs and ear muffs. The hearing protectors will have a Noise Reduction Rating sufficient to reduce the sound level to below 85 dBA.

5.5 Selection and Use of Personal Protective Equipment

Equipment for personal protection will be selected based on the potential for contact, site conditions, ambient air quality, and the judgment of supervising site personnel and health and safety professionals. The PPE used will be chosen to be effective against the compound(s) present at the site.

Depending upon the level of protection selected, specific donning and doffing procedures may be required. The procedures listed in this section are mandatory when Level D or higher PPE is used.

Persons entering the Exclusion Zone must put on the required PPE in accordance with the requirements of this HASP. When leaving the Exclusion Zone, PPE will be removed in accordance with the procedures listed to minimize the spread of contamination.

5.5.1 Donning Procedures

The following procedures are mandatory when Level D or higher PPE is used at the site:

- Remove bulky outerwear; remove street clothes and store in a clean location, when appropriate.
- Put on work clothes or coveralls.
- Put on chemical protective coveralls or rain gear (if required).
- Put on chemical protective boots or boot covers (if required).
- Tape the legs of the coveralls to the boots with duct tape
- Put on chemical protective gloves (if required).
- Tape the wrists of the protective coveralls to the gloves.
- Don the required respirator (Level C only) and perform appropriate fit check.
- Put hood or head covering over head and respirator straps (Level C only) and tape hood to facepiece.
- Don remaining PPE, such as safety glasses or goggles and hard hat.

When Level C procedures are instituted, one person must remain outside the work area to ensure that each person entering has the proper protective equipment.

5.5.2 Doffing Procedures

These procedures are mandatory when Level D or higher PPE is used at the site. Whenever a person leaves a Level D or higher work area, the following decontamination sequence will be followed:

- Upon entering the Contaminant Reduction Zone, rinse contaminated materials from the boots or remove contaminated boot covers.
- Clean reusable protective equipment.
- Remove protective garments, equipment, and respirator (if necessary); disposable clothing should be placed in plastic bags, which are labeled with contaminated waste labels.
- Wash hands, face, and neck or shower (if necessary).
- Proceed to clean area and dress in clean clothing.
- Clean and disinfect respirator (if necessary) for next use.

Disposable equipment, garments, and PPE must be bagged in plastic bags and labeled for disposal.

6.0 SITE CONTROL

6.1 Authorization to Enter

Only personnel who have completed hazardous waste operations initial training, as defined under OSHA Regulation 29 CFR 1910.120/29 CFR 1926.65, have completed their training or refresher training within the past 12 months, and have been certified by a physician as fit for hazardous waste operations will be allowed within a site area designated as an Exclusion Zone or Contaminant Reduction Zone. Personnel without such training or medical certification may enter the designated Support Zone only. The Site Health and Safety Officer will maintain a list of authorized persons, and only personnel on the list will be allowed within the Exclusion Zone or Contaminant Reduction Zone.

6.2 Site Orientation and Hazard Briefing

Prior to entering the site, personnel will attend a pre-entry orientation session presented by the Site Health and Safety Officer. Personnel will verify attendance of this meeting by signing the HASP Review Record provided in the site-specific HASP.

Visitors entering designated work areas will be subject to applicable health and safety regulations during field operations at the site. The Site Health and Safety Officer is responsible for briefing the personnel onsite of potential hazards that may be encountered on the site, the presence and location of the site HASP, and emergency response procedures. Visitors will be under the direct supervision of the Site Health and Safety Officer or his/her representative.

At a minimum, the pre-entry orientation session will discuss the contents of this HASP, potential health effects of hazards associated with onsite activities, and potential hazards presented by unearthing unidentified hazardous materials. Personnel will be instructed in the emergency notification and evacuation procedures to include onsite communications and implementation of the site-specific contingency plans. Additionally, personnel will be briefed on safe work practices and the proper use and wear of required PPE.

6.3 Certification Documents

A training and medical file will be established for the project and kept in the HRP Office for the employee during site operations. The 24 or 40-hour training updates and specialty training (i.e., CPR/first aid certificates), as well as the current annual medical clearance for project field personnel, will be maintained within the file. However, each worker is required to have a card or copy of their latest HAZWOPER training certificate on-site or on their persons. Site personnel and subcontractor personnel must provide their training and medical documentation to the Project Manager and/or Site Health and Safety Officer prior to the start of field work.

6.4 Entry Log

A log-in/log-out sheet must be maintained at the site by the General Supervisor or his/her designee. Personnel may sign in and out on a log sheet provided in the site- specific HASP as they enter and leave the Contaminant Reduction Zone.

6.5 Entry Requirements

In addition to the authorization, hazard briefing, and certification requirements listed above, personnel will not be allowed on the field site unless the individual is wearing the minimum Support Zone PPE as described in Section 5. Personnel entering the Exclusion Zone or Contaminant Reduction Zone must wear the required PPE for those locations.

6.6 Emergency Entry and Exit

People who must enter the site on an emergency basis will be briefed of the hazards by the Site Health and Safety Officer. Hazardous activities will cease in the event of an emergency and sources of emissions will be controlled, if possible.

People exiting the site because of an emergency will gather in a safe area for a head count. The Site Health and Safety Officer is responsible for ensuring that personnel who entered the work area have exited in the event of an emergency.

Emergency procedures are discussed in more detail in Section 11.

7.0 WORK ZONES AND CECONTAMINATION

7.1 Site Work Zones

In order to reduce the spread of hazardous materials by workers from the contaminated areas to the clean areas, separate work zones have been established at the site, including the Exclusion Zone, Contamination Reduction Zone, and Support Zone. The flow of personnel between the zones will be controlled. Establishment of these work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in case of an emergency.

7.1.1 Exclusion Zone

When logistically feasible and necessary, a 25-ft radius Exclusion Zone will be established at drilling or sampling locations. This area has the highest potential for exposure to chemicals onsite. The Site Health and Safety Officer will have the authority to determine if a lesser Exclusion Zone is appropriate. The Site Health and Safety Officer will consult with the OSHM to document this deviation.

7.1.2 Contamination Reduction Zone

If appropriate, a Contaminant Reduction Zone will be established by the Site Health and Safety Officer between the Exclusion Zone and Support Zone. This zone will include personnel and equipment necessary for decontamination. There will be one access point between the Exclusion Zone and Contaminant Reduction Zone. Personnel and equipment in the Exclusion Zone must pass through this zone before entering the Support Zone.

7.1.3 Support Zone

The Support Zone will include the remaining areas of the job site, such as the HRP vehicle and equipment staging area. Break areas, operational direction, and support facilities will be located in this zone. No equipment or personnel will be permitted to enter the Support Zone from the Exclusion Zone without passing through the personnel or equipment decontamination station. Eating, smoking, and drinking will be allowed only in this area.

7.2 Posting

The Exclusion Zone, Contaminant Reduction Zone, and Support Zone will be prominently marked and delineated using cones or caution tape.

7.3 Decontamination

7.3.1 Decontamination of Personnel

The following procedures will be used for the decontamination of personnel:

- Remove and discard boot covers if worn.

- Wash boots with detergent and water and rinse.
- Wash outer gloves with detergent and water, rinse, and remove.
- Remove coveralls, then respirator if worn.
- Remove and discard inner gloves.
- Wash hands, face, and other exposed skin with soap and water. Shower and shampoo as soon as possible at the end of the work day, before any social activities.
- Place non-disposable coveralls in plastic bags prior to leaving the site and prior to entering any HRP vehicle.
- Launder non-disposable clothing worn in Exclusion Zone prior to reuse, separately from other laundry items

7.3.2 Decontamination of Equipment

The following procedures will be used for the decontamination of equipment:

- Instruments used onsite must be wet-wiped with clean water prior to leaving the site; wet-wipe respirator exteriors whenever exiting work areas.
- Clean respirators with a manufacturer-recommended sanitizer, then hang to drip dry, and place in plastic bags for protection against dust.
- Change respirator chemical cartridges at least daily, when breakthrough occurs, or when breathing resistance becomes high or per change out schedule, whichever occurs first; used cartridges will be damaged to prevent accidental reuse.
- Drilling and sampling equipment must be decontaminated in accordance with federal and state requirements as specified in the site-specific Field Sampling and Analysis Plan.

7.3.3 Personal Protectitve Equipment Decontamination

Wherever and whenever possible, single use, external protective clothing must be used for work within the Exclusion Zone or Contaminant Reduction Zone. This protective clothing must be disposed of in properly labeled containers.

Contaminated reusable protective clothing will be rinsed at the site with detergent and water. The rinseate will be collected for disposal.

When removed from the Contaminant Reduction Zone, the respirator will be thoroughly cleaned with soap and water. The respirator face piece, straps, valves, and covers must be thoroughly cleaned at the end of each work shift and ready for use prior to the next shift. Respirator parts may be disinfected with a solution of bleach and water, or by using a spray disinfectant.

8.0 SITE MONITORING

8.1 Environmental Monitoring and Action Levels

For the intrusive work (e.g., soil borings, test pitting) conducted onsite, the environmental monitoring for toxic, flammable/combustible gases, and oxygen will be performed as needed using a combustible gas indicator and a flame ionization detector or photoionization detector. Instruments will only be used by employees who have been trained in the proper operation, use limitations, and calibration of the monitoring equipment. Monitoring will be conducted at intervals not less than once every 30 minutes using either the photoionization or flame ionization detector or the combustible gas indicator. Task-specific environmental monitoring requirements for the work scheduled at each site will be discussed in each site-specific HASP, including the type of monitoring to be performed, the frequency and location of monitoring, action levels, and required responses if action levels are detected.

Environmental monitoring will include sufficient monitoring of air quality in work zones during intrusive field operations to assess levels of employee exposure and to verify that the level of PPE being worn by personnel is adequate. Monitoring will be conducted to ensure that contaminants are not migrating offsite to minimize the exposure to nearby populations and/or workers.

8.2 Calibration and Maintenance

Direct-reading instruments will be calibrated on a daily basis with a known concentration of calibration gas (typically isobutylene or methane, depending on the instrument) following the instrument manufacturer’s guidance. Instructions in the manufacturer’s operations manual regarding storage, cleaning, and maintenance of the instruments will be followed. Calibration will be properly recorded in the field logbook to show the date, calibration material type and concentration, and the actual reading obtained. Equipment failing to meet the manufacturer’s standards for accuracy and repeatability will be considered suspect and replaced with an alternate, properly functioning piece of equipment.

8.3 Onsite Monitoring Plan and Response Activities

As mentioned above, air monitoring will include sufficient monitoring of air quality in worker breathing zones and other onsite areas during intrusive field operations to assess levels of employee exposure, to determine that the constituent levels do not constitute a fire/explosion hazard, and to verify that the level of PPE being worn by personnel is adequate. Air monitoring is also designed to ensure that contaminants are not migrating offsite to minimize the exposure to nearby populations and/or workers.

Monitoring will be conducted:

- Upon commencement of each different phase of operation.
- During invasive field procedures (at intervals not less than once every 30 minutes using both the photoionization or flame ionization detector and the combustible gas indicator).
- Upon worker or local community complaints or concerns.
- When instruments are used by employees who have been trained in the proper operation,

use limitations, and calibration of the monitoring equipment.

- At a sufficient interval during invasive field operations or emergency conditions to properly quantify the suspected hazard.

If action levels in the worker breathing zone are exceeded, air monitoring will be required at various onsite/perimeter locations to determine appropriate response activities that are protective of personnel onsite who are not directly involved with the investigation, personnel at adjacent commercial sites, and the surrounding community. Additional monitoring (and appropriate response activities) to be implemented if the total organic vapor and particulate levels in the worker breathing zone exceed action levels as discussed below. 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.

8.3.1 Monitoring and Response Activities

Activities that will be implemented if onsite investigation activities generate concentrations of VOCs or particulate that may exceed action levels in the worker breathing zone are described below. 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 also 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.

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) will be monitored periodically at the breathing zone following the protocols established in Table 3.

Volatile organic compounds (VOCs) will 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.

During the investigation, it is also possible that the downwind perimeter of the work area will coincide with the fenced site perimeter. If the level of total organic vapors adjacent to the downwind site perimeter reaches 5 ppm above background, then the level of total organic vapors adjacent to the nearest downwind residential or commercial property from the work zone will be monitored. If, after 30 minutes, the total organic vapor level adjacent to the residential or commercial property has not subsided below 5 ppm above background, then the Site Health and Safety Officer will inform the General Supervisor who will notify the response contacts listed in Section 11. The HRP project manager will be responsible for notifying the New York State Department of Environmental Conservation, New York State Department of Health, and persons who may be exposed at the residential or commercial properties until after the level of total organic vapors on the properties subsides to below 5 ppm above background.

Particulate Monitoring

Particulates will be monitored periodically at the breathing zone following the protocols established in Table 3.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will 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 (mcg/m3) 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/m3 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 mcg/m3 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/m3 of the upwind level and in preventing visible dust migration.

8.4 Noise Monitoring

Noise monitoring will be conducted as required. Hearing protection is mandatory for employees in noise hazardous areas, such as around heavy equipment. As a general rule, sound levels that cause speech interference of normal conversation distance of three feet should require the use of hearing protection.

8.5 Odor Control

If odor complaints are received from members of the surrounding community, then the site activities will be suspended, subsurface openings will be covered, and onsite personnel (in consultation with HRP project managers and the NYSDEC representative) will evaluate an alternative course of action.

9.0 EMPLOYEE TRAINING

9.1 Site Workers

All HRP employees working on a site covered under 29 CFR 1910.120 / 29 CFR 1926.65 (HAZWOPER) shall have completed training which satisfies the requirements of this program prior to site entry. This training will be conducted to protect employees of the potential dangers involved in hazardous substance removal or other activities which expose or potentially expose them to hazardous substances. These workers will have appropriate health and safety training based upon their specific job tasks and activities.

9.1.1 Initial Training

HRP employees engaged in hazardous waste operations, hazardous substance removal or other activities which expose or potentially expose workers to hazardous substances and health hazards will receive a minimum of 40 hours of instruction off the site and a minimum of three (3) days actual field experience under the direct supervision of a trained experienced supervisor. HRP employees engaged occasionally for a specific, limited task (e.g., ground water monitoring, geophysical surveying) and who are unlikely exposed over permissible exposure limits and publish exposure limits, may receive a minimum of 24 hours of instruction off the site and a minimum of one day actual field experience under the direct supervision of a trained, experienced supervisor, instead of the 40-hour/3-day requirement noted above. This decision will be made at the discretion of the COO.

Onsite management and supervisors who are directly responsible for or who supervise employees will receive at least 8 additional hours of specialized management training.

Copies of training certificates and dates of attendance will be available through the Site Health and Safety Officer upon request.

9.1.2 Refresher Training

Annual 8-hour refresher training will be either conducted in-house or via an outside contractor. The curriculum of the refresher course will follow the major components of the initial 40-hour training course, as required by regulation, with additional emphasis on selected topics which will vary from year to year. The subject of selected topics will be based on the experiences of the trainers with regard to the administration of the program from the previous year.

Copies of training certificates and dates of attendance will be available through the Site Health and Safety Officer upon request.

9.1.3 Site Specific Training

The Site Health and Safety Officer with the OHSM will be responsible for developing a site-specific occupational hazard training program and providing training to personnel who are to work at the site. At a minimum, this training will consist of the following topics:

- Names of personnel responsible for site health and safety

- Safety, health, and other hazards at the site
- Proper use of PPE
- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment on the site
- Acute effects of compounds at the site
- Decontamination procedures

Training of site workers in site-specific information will be completed during the pre-entry briefing as outlined in the site-specific HASP. Signing the review section of the Site-Specific HASP will acknowledge receipt of the site-specific training.

9.1.4 Field Experience

As stated in Section 9.1.1, those persons receiving the mandatory one or three days of field experience at a 1910.120 site will be paired with a trained, experienced supervisor. Documentation of the field experience will be kept at each office location and maintained by the OHSM.

9.1.5 First Aid and CPR

Due to the potential remoteness of project sites, all HRP employees working on a site covered under 29 CFR 1910.120 / 29 CFR 1926.65 (HAZWOPER) shall have completed First Aid / CPR training prior to site entry.

9.2 Subcontractor Training

Prior to start of work operations, the Project Manager will obtain a written list of subcontractor personnel to be onsite, and written certification from subcontractor management that these workers meet the training requirements for their assigned tasks.

9.3 Pre-Entry Orientation Session

Prior to entering the site, personnel will attend a pre-entry orientation session presented by the Site Health and Safety Officer. Personnel will verify attendance at this meeting by signing the HASP Review Record provided in the site-specific HASP.

Visitors entering designated work areas will be subject to applicable health and safety regulations during field operations at the site. The Site Health and Safety Officer is responsible for briefing the personnel onsite of potential hazards that may be encountered on the site, the presence and location of the site-specific HASP, and emergency response procedures. Visitors will be under the direct supervision of the Site Health and Safety Officer or his/her representative.

At a minimum, the pre-entry orientation session will discuss the contents of this HASP, potential health effects of hazards associated with onsite activities, and the potential hazards presented by unearthing unidentified hazardous materials. Personnel will be instructed in the emergency procedures to include onsite communications and implementation of the site-specific contingency plans.

10.0 MEDICAL SURVEILLANCE

HRP has a firm commitment to worker health and safety, and is interested in assuring that employees remain in excellent health and fitness throughout their tenure at HRP and beyond. HRP employees are involved in handling hazardous substances and thus, can be exposed to toxic chemicals, safety hazards, environmental hazards and high levels of stress. HRP has established this medical surveillance program to monitor employees' health and fitness both prior to employment and during the course of work in compliance with 29 CFR 1910.120(f). In this way, any adverse medical condition evidenced by employees can be identified and corrected prior to becoming chronic. In addition, accurate medical histories for each employee can be recorded for future reference.

10.1 Medical Examination

This medical surveillance program applies to all HRP employees working on a site covered under 29 CFR 1910.120 (HAZWOPER) who: (1) are or may be ex-posed to hazardous substances or health hazards at levels above PELs or other published exposure limits (without regard to use of respirators) for 30 days or more a year, or (2) must wear a respirator for 30 days or more a year. In addition, any employee who becomes ill or develops signs or symptoms due to possible overexposure involving hazardous substances or health hazards involving hazardous waste operations is also covered. These employees will receive medical examinations with additional follow-up examinations (if necessary) as directed by the examining physician. All physical examinations which are provided in accordance with this section shall be performed by, or under the supervision of, a licensed medical consultant and shall be provided without cost to employees, without loss of pay, and at a reasonable time and place.

Site workers potentially involved with the field sampling operations must have satisfactorily completed a comprehensive medical examination by a licensed occupational physician within 12 months (or 24 months with the approval of the consulting physician) prior to the start of site operations. The date of medical examination of each qualified person will be maintained onsite with the project field team. Medical surveillance protocols must comply with 29 CFR 1910.120/29 CFR 1926.65.

Medical examinations and consultations must be provided for employees covered by this program on the following schedule:

- Prior to assignment
- At least annually for employees covered by the program
- At termination of employment or reassignment to an area where the employee would not be covered if the employee has not been examined within the past 6 months
- *As soon as possible upon the development of signs or symptoms that may indicate an overexposure to hazardous substances or health hazards*
- More frequently if the physician deems such examination necessary to maintain employee health.

10.2 Records

An accurate record of the medical surveillance and exposure will be maintained for each employee for a period of no less than 30 years after the termination of employment, as per 29 CFR 1910.1020. Records must include at least the following information about the employee:

- Name and social security number
- Physician’s written opinions, recommendations, limitations, and test results
- Employee medical complaints related to hazardous waste operations
- Information provided to the physician by the employee concerning possible exposures, accidents, etc.

Specific medical information as described above will be maintained at the Occupational Medical Consultant’s office. Information concerning general employee health and his/her ability to wear a respirator will be maintained with the OHSM.

Subcontractors must provide medical surveillance information in writing to the Project Manager for their workers prior to mobilization onsite.

10.3 First Aid and Medical Treatment

Personel onsite must report a near-miss incident, accident, injury, or illness to the Project Manager who will inform the OHSM, Contract Manager and Human Resources Manager. First aid will be provided by the designated site first aider. Injuries and illnesses requiring medical treatment must be documented. The Site Health and Safgety Officer and/or the OHSM must conduct an accident investigation as soon as emergency conditions no longer exist and first aid and/or medical treatment has been ensured. The accident/incident report must be completed and submitted to the OHSM within 24 hours after the incident.

If first aid treatment is required, first aid kits are kept at the Contaminant Reduction Zone. If treatment beyond first aid is required, the injured individual(s) should be transported to the medical facility. If the injured is not ambulatory, or shows signs of not being in a comfortable or stable condition for transport, then an ambulance/paramedics should be summoned. If there is a doubt as to the injured worker’s condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

The Site Specific HASP will include mapping and describing the route to the nearest hospital or emergency medical facility.

11.0 ACCIDENT PREVENTION AND CONTINGENCY PLAN

11.1 Accident Prevention

Field personnel will receive Health and Safety training prior to the initiation of site activities. On a day-to-day basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency. Before daily work assignments, regular meetings should be held. Discussion should include:

- Tasks to be performed
- Time constraints (e.g., rest periods, cartridge changes)
- Hazards that may be encountered, including their effects, how to recognize symptoms and monitor them, concentration limits, or other danger signals
- Emergency procedures

11.1.1 Drilling

Prior to drilling activity, efforts will be made to determine whether underground installations will be encountered and, if so, where these installations are located. Hard hats, safety glasses, and safety boots must be worn as a minimum, within 25 ft of the drill rig. The drill rig cannot be operated within 10 ft of overhead power lines. The General Supervisor or Site Health and Safety Officer will provide constant onsite supervision of the drilling subcontractor to ensure that they are meeting the health and safety requirements. If deficiencies are noted, work will be stopped and corrective action will be taken (e.g., retrain, purchase additional safety equipment). Reports of health and safety deficiencies and the corrective action taken will be forwarded to the Project Manager.

11.1.2 Vehicles and Heavy Equipment

Working with large motor vehicles and heavy equipment could be a major hazard at this site. Injuries can result from equipment hitting or running over personnel, impacts from flying objects, or overturning of vehicles. Vehicle and heavy equipment design and operation will be in accordance with 29 CFR, Subpart O, 1926.600 through 1926.602. In particular, the following precautions will be utilized to help prevent injuries/accidents:

Brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked at the beginning of each shift by the equipment operator.

- Large construction motor vehicles will not be backed up unless the vehicle has a reverse signal alarm audible above the surrounding noise level, or the vehicle is backed up only when an observer signals that it is safe to do so.
- Heavy equipment or motor vehicle cabs will be kept free of all non- essential items, and loose items will be secured.
- Large construction motor vehicles and heavy equipment will be provided with necessary safety equipment (seat belts, rollover protection, emergency shut-off in case of rollover,

backup warning lights, and audible alarms).

- Blades and buckets will be lowered to the ground and parking brakes will be set before shutting off heavy equipment or vehicles.

11.2 Contingency Plan

11.2.1 Emergency Recognition

Prior to work startup, personnel must be familiar with emergency condition identification, notification, and response procedures. The emergency telephone numbers for local emergency response and reporting organizations and directions and map to the nearest hospital are included in each site-specific HASP. NOTE: The site-specific HASP will be left open to the emergency contacts page at all times during site activities. The General Supervisor and Site Health and Safety Officer will rehearse/review emergency procedures and/or applicable site contingencies initially during site orientation and as part of the ongoing site safety program with HRP and subcontractor personnel. Onsite emergencies will ultimately be handled by offsite emergency personnel. Initial response and first-aid treatment, however, will be provided onsite.

Person(s) identifying an accident, injury, emergency condition, or a scenario requiring implementation of a response in support of this plan will immediately take actions to report the situation to the General Supervisor or Site Health and Safety Officer. Notification may take place by runner, hand-held radio, or telephone. The General Supervisor/Site Health and Safety Officer will initiate the required response based upon the type of incident, following the procedures contained in this HASP. A chain-of- command and sign-in sheets for personnel on the site will be established at the beginning of each work day to ensure personnel are accounted for and who will take control should the General Supervisor or Site Health and Safety Officer become injured. The following items constitute those site conditions requiring an emergency response or contingency action in accordance with this HASP:

- Fire/Explosion
  - The potential for human injury exists
  - Toxic fumes or vapors are released
  - The fire could spread onsite or offsite and possibly ignite other flammable materials or cause heat-induced explosions
  - The use of water and/or chemical fire suppressants could result in contaminated runoff
  - An imminent danger of explosion exists

- Heavy Equipment Accident
  - Onsite accident where personal injury has occurred.

- Natural Disaster
  - A rain storm exceeds the flash flood level
  - The facility is in a projected tornado/hurricane path or a tornado/hurricane has damaged facility property
  - Severe wind gusts are forecasted or have occurred and have caused damage to the facility

  - The facility in the in a projected path for a blizzard or severe winter weather warning

- Medical Emergency
  - Overexposure to hazardous materials
  - Trauma injuries (broken bones, severe lacerations/bleeding, burns, animal bites)
  - Eye or significant skin contact with hazardous materials
  - Loss of consciousness
  - Heat stress (heat stroke)
  - Frost bite / Hypothermia
  - Heart attack
  - Respiratory failure
  - Allergic reaction
- Discovery of Unanticipated Hazards (e.g., unmarked utility lines, heavily contaminated material).

Follow-up operations to evaluate and control the source of fire, explosions, and hazardous materials incidents will occur only after discussion with the DEC Project Manager and General Supervisor. The General Supervisor will act as the Emergency Coordinator at the site to coordinate onsite activities and contingencies until the arrival of outside response organizations. If the General Supervisor is unable to act as the Emergency Coordinator, then the authority to take action will be transferred to the Site Health and Safety Officer, or other designee, as indicated in the daily updated chain-of-command.

The Site Health and Safety Officer will contact the applicable local emergency response organizations listed in each site-specific HASP prior to work start to identify the emergency response requirements and commitments required to support this project. The Project Manager, in coordination with the NYS DEC representative, will contact those local authorities potentially required to respond in the event of an onsite emergency incident or contingency. This notification will inform each applicable agency of the start date, anticipated scope of work, and the existence of the HASP. A copy of the HASP will be made available to each emergency response agency upon request to the Project Manager. At a minimum, the NYS DEC representative, Fire Department, emergency medical services, and hospital will be notified. Emergency activities will be coordinated (as applicable) with the local emergency planning committee, as required in accordance with Superfund Amendments and Reauthorization Act Title III requirements.

11.2.2 Emergency Procedures

In the event of an emergency, the information available at that time must be properly evaluated and the appropriate steps taken to implement the emergency response plan. The General Supervisor (or Site Health and Safety Officer if the General Supervisor is part of the emergency) will assume command of the situation. He/she will alert the emergency management system per instructions provided in each site-specific HASP, and evacuate personnel to the pre-designated evacuation location. In a site emergency, the General Supervisor (or the Site Health and Safety Officer if the General Supervisor is not available) must sound an emergency alarm (designated as an air horn or car horn) repeatedly several times, upon hearing work must stop and personnel must move to the pre-designated evacuation location. If the emergency situation cannot be conveyed by word of mouth, a whistle or other horn will be sounded. Three short blasts, separated by a 2-second silence, will be used as the emergency signal. First aid will be administered only to limit further injury and stabilize the victim. The local Emergency Medical Services must be notified immediately if needed. The routes to the nearest hospital are shown in each site-specific HASP. The General Supervisor/Site Health and Safety Officer will make required notifications to include, but not be limited to, the NYS DEC representative, HRP Project Manager, and HRP Contract Manager, as defined in Section 2.2 and site-specific HASPs and the appropriate federal and state agencies.

Site personnel will have the capability of notifying emergency responders directly from the site using the phone in the company vehicle or in the site support office. In the event of an accident/incident, the HRP Project Manager should be immediately notified of a reportable accident/incident or contingency. The HRP Project Manager will complete and submit to HRP's OHSM, an Accident/Loss and Incident Report using the format provided in each site-specific HASP.

The following information will be provided when reporting an emergency:

- Name and location of person reporting
- Location of accident/incident
- Name and affiliation of injured party
- Description of injuries, fire, spill, or explosion
- Status of medical aid and/or other emergency control efforts
- Details of chemicals involved
- Summary of accident, including suspected cause and time it occurred
- Temporary control measures taken to minimize further risk

This information is not to be released to parties other than those listed in this section and emergency response team members. Once emergency response agencies have been notified, the Project Manager will be notified immediately.

11.2.3 Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure, the procedures outlined below should be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the General Supervisor (via voice and hand signals) of the chemical exposure. The General Supervisor should contact the appropriate emergency response agency.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so, or the clothing should be removed and bagged.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.
- In case of eye contact, an emergency eye wash should be used. Eyes should be washed for

at least 15 minutes.

Chemical exposure incidents must be reported in writing to the OHSM. The Site Health and Safety Officer or General Supervisor is responsible for completing the accident report provided in each site-specific HASP.

11.2.4 Personal Injury

Personnel should always be alert for signs and symptoms of illnesses related to chemical, physical, and onsite health hazards. Severe injuries resulting from accidents must be recognized as emergencies and treated as such. If feasible, in the field, at least two people currently trained in first aud/CPR must be present onsite. This will normally be the General Supervisor and/or Site Health and Safety Officer.

In a medical emergency, the General Supervisor (or the Site Health and Safety Officer if the General Supervisor is not available) must sound the emergency air horn or car horn several times, upon which work must stop and personnel must move to the pre-designated evacuation location. If the emergency situation cannot be conveyed by word of mouth, a whistle or other horn will be sounded. Three short blasts, separated by a 2- second silence, will be used as the emergency signal. Personnel currently trained in first aid will evaluate the nature of the injury, decontaminate the victim (if necessary), and initiate first aid assistance immediately and transport if appropriate. First aid will be administered only to limit further injury and stabilize the victim. The local Emergency Medical Services must be notified immediately if needed. The routes to the nearest hospital are shown in each site-specific HASP. Although not anticipated, victims who are heavily contaminated with toxic or dangerous materials must be decontaminated before being transported from the site. Decontamination will consist of removal of contaminated coveralls/clothing, and wrapping the victim in a sheet or other cloth like material. No persons will re-enter the site of injury/illness until the cause of the injury or symptoms has been determined and controlled. At no time will personnel transport victims to emergency medical facilities unless the injury does not pose an immediate threat to life and transport to the emergency medical facility can be accomplished without the risk of further injury. Emergency Medical Services will be used to transport serious injuries offsite unless deemed otherwise by the General Supervisor/Site Health and Safety Officer.

The General Supervisor and/or Site Health and Safety Officer must complete an Accident/Loss and Incident Report provided in each site- specific HASP and submit it to the Project Manager and within 24 hours of the following types of incidents:

- Job-related injuries and illnesses
- Accidents resulting in loss or damage to property
- Accidents involving vehicles and/or vessels, whether or not they result in damage to property or personnel
- Accidents in which there may have been no injury or property damage, but which have a high probability of recurring with at least a moderate risk to personnel or property
- Near-miss incidents which could have resulted in any of the conditions defined above

An accident that results in a fatality or the hospitalization of three or more employees must be reported within 8 hours to the U.S. Department of Labor through the Project Manager. Subcontractors are responsible for their reporting requirements.

In order to support onsite medical emergencies, first aid/emergency medical equipment will be available at the following locations:

Equipment	Location
First aid kit	Company vehicle or CRZ
Emergency alarm	Horn on the company vehicle or air horn in CRZ
Copy of the HASP	Company vehicle or CRZ
Telephone	Company vehicle or CRZ
Portable Fire Extinguisher	Company vehicle or CRZ

11.2.5 Operations shutdown

The General Supervisor, Site Health and Safety Officer, or the Project Manager may mandate operations shutdown. Conditions warranting work stoppage will include (but are not limited to):

- Uncontrolled fire
- Explosion
- Uncovering potentially dangerous buried hazardous materials
- Condition immediately dangerous to life and health or the environment
- Potential for electrical storms
- Treacherous weather-related conditions
- Limited visibility
- Air contaminant concentrations in excess of the action levels contained in Table 3 (at the of this section)

11.2.6 Evacuation Procedures

In the event the site must be evacuated, the following procedures should be followed:

- The General Supervisor will initiate evacuation procedures by signaling to leave the site.
- Personnel in the work area should evacuate the area and meet in the common designated area.
- Personnel suspected to be in or near the work area should be accounted for and the whereabouts of missing persons determined immediately.

Further instruction will then be given by the General Supervisor.

11.2.7 Procedures Implemented in thee Event of a Major Fire, Explosion, or Onsite Health Emergency Crisis

Fire and explosion must be immediately recognized as an emergency. The Site Health and Safety Officer (or General Supervisor if Site Health and Safety Officer is not available) must sound an emergency signal, and personnel must be decontaminated (if necessary) and evacuated to the pre-designated evacuation location. The procedures for alerting fire/explosion emergencies will be the same as those defined for medical emergencies (Section 11.2.3).

Only persons properly trained in fire suppression and other emergency response procedures will support control activities. Control activities will consist of the use of onsite portable fire extinguishers for limited fire suppression and employee evacuation. Upon sounding the emergency alarm, personnel will evacuate the hazard location and assemble at the designated site meeting area.

Only those site personnel trained in the use of portable fire extinguisher use will attempt to suppress a site fire. Small multipurpose dry chemical extinguishers will be maintained in each HRP vehicle onsite. Fires not able to be extinguished using onsite extinguishers will require the support of the local Fire Department.

The General Supervisor should take measures to reduce injury and illness by evacuating personnel from the hazard location as quickly as possible. The General Supervisor must then notify the local Fire Department. The General Supervisor will determine proper follow-up actions. Site personnel will not resume work during or after a fire/explosion incident until the emergency coordinator has directed that the incident is over and work may resume. During the incident, site personnel will remain outside the incident area and obey the instructions of the Emergency Coordinator.

11.2.8 Emergency Telephone Numbers

Communications will be by telephones located in the HRP vehicle onsite and the field personnel will have access to this telephone to directly contact offsite emergency response organizations. Refer to each site- specific HASP for a listing of emergency telephone numbers.

11.3 Spill Containment Procedures

Small incidental spills, i.e., those which cause no injury to personnel, environment or the public, may be cleaned up quickly and easily. For large spills, i.e., those that contaminate personnel or the environment, attend to first aid measures first, stop the source of the spill if possible, and then notify appropriate emergency response services.

Spills of hazardous materials or wastes which are listed by EPA as having a reportable quantity value must be reported to appropriate federal, state, and local agencies if a reportable quantity or greater is released. The General Supervisor is responsible for determining the appropriate agencies prior to work startup.

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2]	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
1,1,1 Trichloroethane	20 ppm	350 ppm		---		Inh, Ing, Con	Head, Lass, CNS, Derm
1,1,2-Trichloroethane	---	10 ppm	10 ppm	----	[100] ppm	Inh, Ing, Abs, Con	Eyes, Nose Irr, Resp Irr, CNS, Liver, Kidney Damage, Derm
1,1-Dichloroethane	150 ppm	100 ppm	100 ppm	---	3,000 ppm	Inh, Ing, Con	CNS Depres, Skin Irr, Liver, Lung and Kidney Damage
1,1-Dichloroethylene	35 ppm		5 ppm			Inh, Con	CNS depress, Resp
1,2-Dichlorobenzene	30 ppm		50 ppm	50 ppm	200 ppm	Inh, Ing, Abs, Con	Irr, Resp
1,2-Dichloroethylene	26-87 ppm	200 ppm	200 ppm	---	1,000 ppm	Inh, Ing, Con	Vomit, Irrit Eyes, Resp Sys; CNS Depres
1,2-Dichloropropane		75 ppm	75 ppm		[400] ppm	Inh, Con, Ing	Eye irritation, Drow, lightheadedness; irritated skin
1,3-Dichlorobenzene		----		----		----	----
1,4-Dichlorobenzene	20 ppm	75 ppm		----	[150]	Inh, Ing	----
1-Methylnaphthalene							
2,4-Dichlorophenol							
2,4-Dimethylphenol							
2-Methylnaphthalene							
2-Methylphenol (o-cresol) [skin]		5 ppm	5 ppm		250 ppm	Inh, Abs, Ing, Con	Confusion, depression, Resp Fail; difficulty breathing, irregular rapid respiration, weak pulse; skin, eye burns; dermatitis
3, 3'-Dichlorobenzidine	---	None	---	---		Inh, Abs, Ing, Con	Sens, Derm, Head, Dizz, Burns, GI Upset
Acetic Acid	15 ppb	10 ppm	10 ppm	15 ppm	50 ppm	Inh, Con	Irr Eyes, Skin, Nose, Throat, Skin burns, Skin sores, Dental Erosion, Con, Lac Phor Edema, Chronis Bron, Hyper, Keratosis, Black Skin

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2]	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Acetone	300 ppb	1,000 ppm	500 ppm		2,500 ppm	Ing, Inh, Con	Head, Dizz; Irr Eyes, Nose, Throat; Derm, CNS, Depress, Derm
Acetonitrile	30 ppm	40 ppm	40 ppm		500 ppm	Inh, Ing, Abs, Con	Asphy; Nau, Vomit; Chest Pain; Weak, Stupor, Convuls; Eye Irr
Ammonium Persulfate	----	----	0.1 mg/m^3	----		----	----
Anthracene		0.2 mg/m^3					
Antifreeze	90 ppb	----		----		----	----
Arsenic	----	0.5 mg/m^3	0.01 mg/m^3	----	[5 mg/m^3]	Abs, Inh, Con, Ing	Derm; GI; Resp Irr; ulceration of nasal septum; Resp, Irr, Hyper Pig of Skin
Asbestos	Ca	0.1 fibers/ cm^3	0.1 fiber/cc^3	0.1 fibers/ cm^3	Carcinogen	Inh, Ing, Con	Dysp, Interstitial Fib, Restricted Pulm Function, Finger Clubbing, Irr Eyes
Barium	---	0.5 mg/m^3	0.5 mg/m^3		50 mg/m^3	Inh, Ing, Con	Resp. Irr, GI, Muscle Spasm, Eye Irr, Slow Pulse; skin burns
Benzene	200 ppb	10 ppm	0.5 ppm	25 ppm	[500] ppm	Inh, Ing, Abs, Con	Irr Eyes, Nose, Throat; Head, Nau, Derm, Ftg, Anor, Lass
Benzo(a)anthracene							
Benzo(a)pyrene		0.2 mg/m^3	---				
Benzo(b)fluoranthene			---				
Benzo(g,h,i)perylene							
Benzo(k)fluoranthene							
Bis (2-ethylhexyl) Phthalate	N/A	NA		NA		inh, ing	NA
C-1,2-Dichloroethene							
Cadmium (dust)		0.005 mg/m^3	Lowest concentration feasible 0.01 mg/m^3	---	[9 mg/m^3]	Inh, Ing	CNS, Resp, Irr, Vomit, Cough, Head, Chills, Nau, Diarr, Pulm Edema, Dysp, Chest Tight

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2]	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Carbon disulfide		20 ppm	10 ppm	30 ppm	500 ppm	Inh, Abs, Ing, Con	Diz, Head,Ftg, Ner, anorexia, trembling hands, loss of fine motor coord, gastritis, eye, skin burns, Derm
Carbon Tetrachloride	9 ppm	10 ppm	5 ppm [60 min]	25 ppm	[200] ppm	Inh, Abs, Con, Ing	CNS Depres, Nau, Vomit, Irr, Irr Eyes, Skin, Drow, Dizz
Chlordane [skin]		0.5 mg/m^3	0.5 mg/m^3		[100 mg/m^3]	Inh, Abs, Ing, Con	Blurred vision, confusion, delirium, cough; abdominal pian, nausea, vomiting diarrhea; irritability, tremor, convulsions
Chlorobenzene	90 ppb	75 ppm	10 ppm	---	1,000 ppm	Inh, Ing, Con	Irr, Drow, CNS, Depres, Eyes, Skin, Nose, Inco.
Chloroform	133 ppm	50 ppm	10 ppm (60 min)	50 ppm	[500] ppm	Inh, Ing. Con, Abs	Dizz, Dullness, Nau, Head, Ftg, Irr Eyes, Skin, Conf
Chromium	---	1 mg/m^3	0.5 mg/m^3	---	No evidence	Inh, Ing, Con	Irrit Eyes, Sens Derm
Chromium (total)	N/A	0.5 mg/m^3		N/A		Inh, Ing, Con	Irrit Eyes, Sens Derm
Chrysene (coal tar pitch)		0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	Derm, Bron
Cis-1-2-Dichloroethene		700 mg/m^3		----		----	----
Cobalt	N/A	0.1 mg/m^3	0.02 mg/m^3		20 mg/m^3	Inh, Ing, Con	Cough, Pulm Func., Derm, Wheez, Dysp
Copper (dusts and mists) (fumes)		1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	----	100 mg/m^3	Inh, Ing, Con	Vomit, Derm, CNS, Irr, Derm, Nau, Taste (metallic)
Cyanide	3 mg/m^3	5 mg/m^3	5 mg/m^3 (10 min)	5 mg/m^3	50 mg/m^3	Inh, Ing, Abs, Con	Weak, Head, Nau, Conf, Cyan
Dibenzo(a,h)anthracene							
Dibenzofuran							
Dichloroethane	380 ppm	500 ppm		1,000 ppm		Inh, Ing, Con	Ftg, weak, nau, irr, numbness
Dichloromethane	80 ppm	50 ppm		100 ppm		Inh,ing	Weak, Nau, Pares
EDB	76.8	20		30		Inh, Abs	Resp. Irr, Eye Irr.
Ethyl Benzene	870 ppm	100 ppm	100 ppm	125 ppm	800 ppm	Inh, Abs, Con	Head. Irr, Derm, Narc., Irrit Eyes, Skin; Coma

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2]	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Ethyl Glycol Methyl Ether	---	---		---		Inh	Resp. Irr.
Ethylene Glycol (aerosol)	0.10 ppm	25 ppm	---	75 ppm		inh,ing,con	
Fluoranthene							
Fluorine		0.1 ppm					
Freon 113	342 ppm	1,000 ppm		1,250 ppm		Inh,ing	Resp Irr, drow, derm
Freon 113	20 ppm	1,000 ppm		1,250 ppm		Inh, Abs, Con	Loss of coord, Card AR, irrationality
Freon 30 Methylene Chloride Dichloromethane	153-612 ppm	500 ppm		1,000 ppm		Con, Ing, Inh	Narc, CNS, Vomit, Derm, Poison
Fuel Oil/Gasoline	----	----	300 ppm	----		Inh, Abs, Ins, Con	Irrit Eyes, Skin, Derm, Head, Ftg, Blurred Vision, Dizz, Conf
Glycol Monoethyl Ether	---	200 ppm	---	---		Inh	Resp. Irr.
Hydrogen Cyanide(Hydrocyanic Acid)	0.100 ppm	10 ppm	---	---	50 ppm	Con, Inh, Ing, Abs	Asphy & death at high levels; Weak, Head, Conf, Nau, Vomit, Incr. Rate and Depth of Respiration or Respiration Slow and Gasping
Ideno(1,2,3-cd)pyrene							
Iron (as iron oxide)	---	10 mg/m^3		---	2,500 mg/m^3	Inh	Benign Pneumoconiosis
Isopropyl Alcohol		400 ppm	(400 ppm)		2,000 ppm	Inh, Ing, Con	Mild Irr Eyes, Nose, Throat, Drow, Head, Dry Cracking Skin
Isopropyl Ether		500 ppm	250 ppm		1,400 ppm	Inh, Ing, Con	Irrit Eyes, Skin, Nose; Resp Discomfort, Derm
Lead	---	0.2 mg/m^3	0.05 mg/m^3	---	100mg/m^3	Ing, Inh, Con	Irr, Cns, Vomit, Narco, Weak, Pall, Insom, Lass, Abdom, Constip, Anor, Anemia
Lead (inorganic forms and dust as Pb)		0.05 mg/m^3	0.05 mg/m^3		100 mg/m^3	Inh, Ing, Con	Irr, Cns, Vomit, Narco, Weak, Pall, Insom, Lass, Abdom, Constip

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING [2]	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Manganese, Elemental	---	5 mg/m^3	0.2 mg/m^3	5 mg/m^3	500 mg/m^3	Inh, Ing	Mental Conf., Dry Throat, Cough, Tight Chest, Insom, Weak, Dysp
Mercury (organic alkyl compounds) [skin]		0.1 mg/m^3	0.01 mg/m^3	0.1 mg/m^3	2 mg/m^3	Inh, Abs, Ing, Con	Irr Eyes, Skin; Cough & Chest Pain, Bron Pneatis, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia
Mercury (vapor)	----	0.1 mg/m^3	0.025 mg/m^3	0.1 mg/m^3	28 mg/m^3	Inh, Abs, Ing, Con	Irr Eyes, Skin; Cough & Chest Pain, Bron Pneatis, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia
Methanol	2 ppm	200 ppm	200 ppm			Inh, Abs, Ing, Con	Eye Irr, Head, Drwo, Li-Head, Nau, Vomit, Ris Dist, Blindness
Methyl Ether	----	----		----		Inh	Poison
Methyl Ethyl Ketone (2-Butanone)	1 ppm	200 ppm	200 ppm		3,000 ppm	Inh, Con, Ing	Irr, Head, Dizz, Vomit, Cough, Diarr, Eyes, Skin, Nose, Throat, Blisters, Derm
Methylene Chloride	380 ppm	25 ppm	50 ppm	200 ppm	[2,300] ppm	Inh, Ing, Con, Abs	Ftg, Weak, Sleepiness, Light Headed, Limbs Numb, Tingle [carc], Irrit Eyes, Skin
Mineral Spirit	20 ppm	100 ppm		---		Inh, Ing, Con	Irrit Eyes, Nose, Throat, Dizz, Derm
Methyl tert butyl ether (MTBE)	---	---	40 ppm	---		Inh, Abs	
Naphtha	20 ppm	100 ppm		---	1,000 ppm	Inh, Con, Ing	Light Head, Drow, Irr, Derm, Irrit Eyes, Skin, Nose

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL^1	TLV (ACGIH)	OSHA CEILING ^{2}	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE^3
Naphthalene		10 ppm	10 ppm		250 ppm	Inh, Abs, Ing, Con	Eye irritation; headache; confusion, excitement, malaise (vague feeling of ill-being); nausea, vomiting, abdominal pain; irritated bladder; profuse sweating; renal shutdown; dermatitis
Nickel (metal)	---	1 mg/m^3	1.5 mg/m^3	---	10 mg/m^3	Inh, Ing, Con	Head, Vert, Nau, Vomit, Pain, Cough, Weak, Convuls, Delirium, Pheuitis, Hyperpneo
Nitric Acid	0.27	2 ppm	2 ppm	4 ppm	25 ppm	Con, Inh, Ing	Irr Eyes, Skion, Muc Memb, Irr, Delayed Pulm, Edema, Pneutis, Bron, Dental Erosion
Oxalic Acid	----	1 mg/m^3	1 mg/m^3		500 mg/m^3	Inh, Ing, Con	Irr Eyes, Pain, Burns, Cyan, Skin, Muc Memb, Shock, Convuls
PCBs 42% chlorine	Ca	1 mg/m^3 (skin) 0.001 mg/m3	1 mg/m^3	---	[5 mg/m$^{3]}$	Inh, Abs, Ing, Con	Irr, Eyes, Chloracne, Liver Damage [carc]
PCBs 54% chlorine	Ca	0.5 mg/m^3 (skin)	0.5 mg/m^3	---	[5 mg/m$^{3]}$	Inh, Abs, Ing, Con	Irr Eyes; Chloracne, Liver Damage [carc]
Petroleum Distillates	N/A	500 ppm		10,000 ppm	1,100 ppm	Inh, Ing, Con	Dizz, Drow, Headache, Irr, Dry, Nau, Eyes, Nose, Throat
Phenanthrene							
Phenol	0.42-5 ppm	5 ppm	5 ppm	---	250 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Nose, Throat, Anor, Low Wgt, Weak Musc Ache, Pain, Dark Urine, Cyan, Liver, Kidney Damage, Skin, Burns, Derm, Chronosis, Tremor, Convuls, Twitch
Phosphoric Acid	---	1 mg/m^3	1 mg/m^3	3 mg/m^3	1,000 mg/m^3	Inh, Ing, Con	Resp Irr; eye, skin irr; burns eyes, skin; derm

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING [2]	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
p-Nitroaniline	---	1 ppm	3 mg/m^3	---	300 mg/m^3	Inh, Abs, Ing, Con	Cyan, Ataxia, Vomit, Diarr, Tacar, Convuls, Resp Arrest, Anemia, Irrit Nose, Throat
Potassium Salt		5 mg/m^3		5 mg/m^3		Inh, Abs, Ing, Con	Irr Eyes, Skin, Resp, Asphy, Weak, Head, Conf, Nau, Vomit, Incr Rate Resp is Low, Gasping Rsp, Thyroid, Blood Change
Pyrene		0.2 mg/m^3					
Selenium	N/A	0.2 mg/m^3	0.2 mg/m^3	Unknown	1 mg/m^3	Inh, Ing, Con	Irrit, Head, Fever, Chills, Skin/Eye Burns, Metallic Taste, GI, Dysp, Bron
Silver (metal and soluble compounds as Ag)	----	0.01 mg/m^3	Metal = 0.1 mg/m^3 Soluble 0.01 mg/m^3		10 mg/m^3	Inh, Ing, Con	Blue-gray Eyes, Nasal Septum, Throat, Skin; Irr, Ulcer, Skin, GI Dist
Stoddard Solvent (mineral spirits)	1 ppm	500 ppm	100 ppm	1,800 mg/m^3	20,000 mg/m^3	Con, Inh, Ing	Irrit Eye, Nose, Throat; Dizz; Derm
Sulfide	N/A	N/A		N/A		Ing, inh	N/A
Sulfuric Acid	----	1 mg/m^3	1 mg/m^3	----	15 mg/m^3	Inh, Ing, Con	Eye, Nose Irr, Edema, Burns, Skin, Throat, Bron, Derm
Tetraethyl Lead	---	0.075 mg/m^3	0.1 mg/m^3	---		Derm	Narc., Nau, Inco, Insom., Inco.
Tetrachloroethene		100 ppm		200 ppm		Con, Inh, Ing	Vom, CNS, Resp, Irr, Card Ar
Tetrachloroethylene (a.k.a. perchloroethylene)	36 ppm	100 ppm	25 ppm	200 ppm	[150] ppm	Inh, Ing, Con, Abs	Irr, Nau, Nose, Throat, Vert, Dizz, Head, Inco
Tin	N/A	2 mg/m^3	2 mg/m^3	1500 mg/m^3	100 mg/m^3	Inh, Con	Irrit, Weak, Vomit, Cough, Eyes, Skin, Resp Sys
Toluene	150 ppm	200 ppm	50 ppm	300 ppm	500 ppm	Inh, Abs, Ins, Con	Resp, Irr, Ftg, Weak, Conf, Dizz, Head, Derm, Euph, Head, Dilated Pupils, Lac, Ner, Musc FTs, Insom, Pares, Derm
Total Petroleum Hydrocarbons (TPH)	---	---		---		Con, Inh, Ing	---

TABLE 1

CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING [2]	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Trans 1,2-Dichloroethylene	160 ppm	200 ppm		---		Inh, Con	Irr, Resp, CNS depress
Trichloroethylene	10 ppm	100 ppm	50 ppm	200 ppm	[1,000] ppm	Inh, Con, Abs, Ing	Head, Vert, Nau, Vomit, Derm, Vis Dist, Tremors, Som, Nau, Irrit Eyes, Skin, Card Acc., Ftg
Trichlorofluoromethane	5 ppm	1,000 ppm	---	1,000 ppm		Inh, Con	CNS depress, Resp, Irr
Trichlorotrifluoroethane		1,000 ppm		---		Inh, Ing, Con	Head, Loss, Cns, Depression, Derm
Trichlorotrifluoroethane	90 ppm	1,000 ppm		1250 ppm		Inh, Con	Irr, Drow, Derm, Cardiac Arrhythmia
Vanadium (pentoxide) dust or fume	N/A	0.05 mg/m^3	0.05 mg/m^3	70 mg/m^3	35 mg/m^3	Inh, Ing, Con	Irrit Eyes, Skin Throat; Metallic Taste; Wheeze; Green Tongue, Cough, Eczema, Bron, Dysp
Varnish/Xylene	----	100 ppm	100 ppm	150 ppm		Ing, Abs, Ing, Con	Irrit, Dizz, Cough, Vomit, Nau, DermZ
Vinyl Chloride	10-20 ppm	1 ppm	1 ppm	5 ppm		Inh, Con	Weak; Abdom Pain, Gi Bleeding; Hepatomegaly; Pallor or Cyan of Extremities; Liq: Frotbite;[carc]
VM&P Naphtha (petroleum naphtha)	38-191 ppm	400 ppm	300 ppm	---		Con, Ing, Inh	Irr, Burning Sensation, Vomit, Diarrhea, Drowsiness, Intoxication, CNS, Derm
Xylene	20 ppm	100 ppm	100 ppm	150 ppm	900 ppm	Inh, Ing, Abs, Con	Dizz, Drow, Irr, Excite, Nau, Vomit, Eyes, Skin, Nose, Throat
Zinc	---	5 mg/m^3	5 mg/m^3	---	50 mg/m^3	Inh	Dry Throat, Cough, Chills, Tight Chest, Blurred Vision

NOTES

[1] PEL = Permissible Exposure Limit. If no PEL is available, then the NIOSH Threshold Limit Value (TLV) should be used, if available.

[2] Ceiling limit or Short Term Exposure Limit (STEL), if available. Again, the NIOSH TLV may be used if no OSHA standard exists.

[3] Abbreviations are contained on the next page

ABBREVIATIONS

abdom = Abdominal
abs = absorption
anor = Anorexia
anos = Anosmia (loss of the sense of smell)
aspir = Aspiration
bron = Bronchitis
[carc] = Potential occupational carcinogen
CNS = Central nervous system
conf = Confusion
constip = Constipation
con = Skin and/or eye contact
corn = Corneal
depres = Depressant/Depression
derm = Dermatitis
diarr = Diarrhea
dist = Disturbance
dizz = Dizziness
drow = Drowsiness
dysp = Dyspnea (breathing difficulty)
repro = Reproductive
resp = Respiratory
som = Somnolence (sleepiness unnatural drownsiness)
ftg = Fatigue
GI = Gastrointestinal
head = Headache
hyperpig = Hyperpigmentation
inco = Incoordination
ing = Ingestion
inh = Inhalation
inj = Injury
lass = Lassitude (weakness, exhaustion)
li-head = Lightheadedness
liq = Liquid
low-wgt = Weight loss
mal = Malaise (vague feeling of discomfort)
malnut = Malnutrition
mg/m = milligrams/cubic meter
muc memb = Mucous membrane
musc = Muscle
narco = Narcosis
nau = Nausea
ner = Nervousness
para = Paralysis
ppm = parts per million
pares = Paresthesia
peri neur = Peripheral neuropathy
pneu = Pneumonia
prot = Proteinuria
pulm = Pulmonary
emphy = Emphysema
euph = Euphoria
fib = Fibrosis
subs = Substernal (occurring beneath the sternum)
sys = System
vis dist = Visual disturbance
vomit = Vomiting
weak = Weakness
irrit = Irritation
insom = Insomnia
lac = Lacrimination (discharge of tears)

TABLE 2

WORK TASK	MINIMUM PROTECTIVE EQUIPMENT											
	Work Clothes	Steel Toe Shoes	Work Gloves	Chem. Resistant	Safety	Hearing Protection	Tyvek	Apron	Hard Hat	Face Shield	Fall Protection2	Visibility Vest
SAMPLING/ROUTINE												
Air Sampling	X	X		X								
Bridge Inspection/Const. Supervision	X	X				X			X			X
Drilling	X	X		X	X	X			X			
Drum Sampling & Moving	X	X	X	X	X				X	X		
Ground Water Sampling (MW,RW)	X	X		X	X							
Hand Sampling (shovel, auger)	X	X	X	X								
Landfill Sampling (soil, sediment, gw, sw, leachate)	X	X		X	X		X					
Phase 1 Site Inspection	X	X										
Probing	X	X		X	X	X			X			
Product Sampling (RW)	X	X		X	X		X					
Remediation Monitoring (air systems)	X	X		X	X	X						
Remediation Monitoring (water systems)	X	X	X	X	X	X						
Soil Gas Sampling	X	X		X	X							
Stack Testing	X	X		X					X		X	
Stormwater Sampling	X	X		X								
Surface Water Sampling	X	X		X	X							
Surveying	X	X										X
Wastewater Sampling	X	X		X	X							
Wastewater Benchmark Test	X	X		X	X			X		X		
CHEMICAL HANDLING												
Filling Decon Bottles	X	X			X			X				
Soil Sample Disposal	X	X		X	X							
POWER EQUIPMENT												
Circular Saw	X	X			X	X						
Concrete Core Machine	X	X	X		X	X						
Drill Press	X	X			X	X						
Generators	X	X	X		X	X						
Industrial Vacuum	X	X	X		X	X						
Pavement Saw	X	X	X		X	X						
Power Equipment (handrills, grinder, etc.)	X	X	X		X	X						
Power Washer	X	X		X	X	X						
Regenerative Blowers/Air Compressors	X	X	X		X	X						
Rotary Percussion Hammer	X	X	X		X	X						
Sawzall	X	X			X	X						

Notes: Minimum protective equipment means the minimally acceptable protective gear to be donned when performing or using the equipment listed above. Additional protective equipment (i.e. electrical, respirators) may be required as described in the site-specific health and safety plan or based on the anticipated hazards associated with the project. Work clothes include long pants, short or long sleeve shirt and other winter clothing.

[1] The type of chemical resistant glove (i.e. disposable rubber, nitrile, other) must be selected based on the anticipated chemical hazards.

[2] Must be reviewed on a case by case basis.

TABLE 3 AIRBORNE CONSTITUENT ACTION LEVELS

Parameter	Readin	Action
Total Organic Vapors	0 ppm to <1 ppm	Normal operations; record breathing zone monitoring measurements every hour.
	>1 ppm to 5 ppm	Increase recording frequency to at least every 15 minutes, and use benzene Drager tube to screen for the presence of benzene.
	>5 ppm to <50 ppm	Upgrade to Level C personal protective equipment, continue screening for benzene.
	>50 ppm	Stop work; evacuate confined spaces/work area; investigate cause of reading; contact Program Safety and Health Officer.
Benzene	>1 ppm to <10 ppm	Upgrade to Level C personal protective equipment; if >0, investigate source; monitor.
	>10 ppm	Stop work; evacuate confined spaces/work area; investigate cause of
Total Particulate	0 to 0.100 mg/m^3 above Background	Normal operations; if >0, investigate source; monitor
	>0.100 mg/m^3 above background	Initiate wetting of work area to control dust; upgrade to Level C if dust control measures do not control dust within 15 minutes; monitor downwind impacts.
	>0.15 mg/m^3 in breathing zone or at downwind perimeter of work area	Stop work; investigate cause of reading; contact EA Project Manager and Program Safety and Health Officer.
Oxygen	<19.5%	Stop work; evacuate confined spaces/work area; investigate of reading; ventilate area; contact Program Safety and Health Officer.
	>19.5% to <23.5%	Normal operations; if not at background (20.8%), investigate source; monitor continuously.
	>23.5%	Stop work; evacuate confined spaces/work area; investigate cause of reading; ventilate area; contact OHSM.
Carbon Monoxide	0 ppm to <20 ppm	Normal operations; if >0, investigate source; monitor continuously.
	>20 ppm	Stop work; evacuate confined spaces/work area; investigate cause of reading; ventilate area; contact OHSM.
Hydrogen Sulfide	0 ppm to <5 ppm	Normal operations; if >0, investigate source; monitor continuously.
	>5 ppm	Stop work; evacuate confined spaces /work area; investigate cause of reading; ventilate area; contact Program Safety and
Flammable Vapors (Lower Explosive Limit)	<10% LEL	Normal operations; if >0, investigate source; monitor
	>5% LEL	continuously. Upgrade to Level C.
	>10% LEL	Stop work; ventilate area; investigate source of vapors.

MOVE YOUR ENVIRONMENT FORWARD

GENERIC QUALITY ASSURANCE PROJECT PLAN FOR WORK ASSIGNMENTS

Prepared For:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233
Contract No. D009808

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Issued On: August 8, 2019

CERTIFICATION

This Generic Quality Assurance Project Plan (QAPP) has been prepared under the supervision of, and has been reviewed by, the HRP Contract Quality Assurance Officer and the HRP Contract Manager.

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LIST OF REVISIONS

Date	Summary of Changes	Approval
12/2008	Original document preparation	Jeffrey R. Sotek
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

TABLE OF CONTENTS

1.0 PURPOSE AND OBJECTIVES 1
1.1 Purpose 1
1.2 Quality Assurance Project Plan Objectives 1

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES 2
2.1 Overall Project Organization and Responsibilities 2
2.2 Responsibilities for Laboratory Interaction 3

3.0 QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES FOR DATA MANAGEMENT 4
3.1 Introduction 4
3.2 Data Quality Objectives 4
3.3 Laboratory Quality Assurance Objectives 4
3.4 Field Parameters and Quality Assurance Objectives 5
3.5 Detection and Quantitation Levels 6
3.5.1 Detection Limits 6
3.5.2 Quantitation Levels 7
3.5.3 Project-Specific Quality Control and Reporting Limits 7

4.0 SAMPLE HANDLING AND CUSTODY PROCEDURES 9
4.1 Field Sampling Operations 9
4.1.1 Sample Bottle Preparation 9
4.1.2 Sampling Procedures 9
4.2 Laboratory Sample Receipt 9
4.2.1 Laboratory Sample Custody 10
4.2.2 Sample Storage, Security, and Disposal 10

5.0 CALIBRATION PROCEDURES AND FREQUENCY 11
5.1 Calibration System 11
5.1.1 Laboratory Calibration Procedures 11
5.1.2 Calibration Frequency 11
5.1.3 Calibration Reference Standards 11
5.1.4 Calibration Failure 11
5.2 Operational Calibration 12
5.2.1 Preparation of Calibration Curve 12
5.2.2 Blanks 12
5.3 Periodic Calibration 12
5.4 Field Equipment Calibration 12
5.5 Calibration Records 13

6.0 ANALYTICAL PROCEDURES 14
6.1 Field Analytical Procedures 14
6.2 Laboratory Analytical Procedures 14

6.3 Sample Matrices....15
6.3.1 Water....15
6.3.2 Soil, Sediment and Debris....15
6.3.3 Soil Vapor and Indoor/Outdoor Air....15
6.4 Standard Operating Procedures....15
6.5 Recordkeeping....15

7.0 LABORATORY AND FIELD QUALITY CONTROL CHECKS AND FREQUENCY....16
7.1 Laboratory Quality Control Samples....16
7.1.1 Method Blank....16
7.1.2 Laboratory Control Sample....16
7.1.3 Matrix Spike....16
7.1.4 Surrogates....17
7.2 Field Quality Control Samples....17
7.2.1 Field Blanks....17
7.2.2 Equipment Blanks....17
7.2.3 Trip Blanks....18
7.2.4 Field Duplicates....19
7.2.5 Matrix Spike/Matrix Spike Duplicates....19
7.2.6 Temperature Blanks....19

8.0 PREVENTIVE MAINTENANCE....20

9.0 QUALITY ASSURANCE PERFORMANCE AND SYSTEM AUDITS....21
9.1 Responsibility, Authority, and Timing....21
9.2 Field Audits....21
9.3 Laboratory Performance and System Audits....22
9.4 Audit Procedures....22
9.5 Documentation....23

10.0 DATA REDUCTION, VERIFICATION, VALIDATION, AND REPORTING....24
10.1 Data Reduction....24
10.1.1 Field and Technical Data Reduction....24
10.1.2 Laboratory Data Reduction....24
10.2 Data Verification....24
10.2.1 Field and Technical Data Verification....24
10.2.2 Analytical Data Validation....25
10.2.3 Data Usability Summary Report....25
10.3 Reporting....26
10.3.1 Field Measurements....26
10.3.2 Analytical Data....26

11.0 CORRECTIVE ACTION PROCEDURES....27
11.1 Objectives....27
11.2 Rationale....27
11.3 Corrective Action Methods....27

11.3.1 Corrective Action Steps....27
11.3.2 Long-Term Corrective Actions....27
11.3.3 Corrective Action Steps....27
11.3.4 Audit-Based Non-Conformances....28
11.4 Corrective Action Report Review and Filing....28
11.5 Corrective Action Reports to Management....28

12.0 QUALITY ASSURANCE REPORTS....29

13.0 REFERENCES....30

Tables

Table 1 Sample Containers, Preservation, and Holding-Time Requirements
Table 2 Summary of periodic Laboratory Calibration Requirements
Table 3 Field Instrumentation Calibration Frequency
Table 4 Field Measurement Quality Control Objectives
Table 5 Preventive Maintenance Summary

Appendices

Appendix A Standard Operating Procedures for Sample Handling and Field Screening
Appendix B Target Compound Lists and Contract-Required Quantitation Limits

1.0 PURPOSE AND OBJECTIVES

1.1 Purpose

This Generic Quality Assurance Project Plan (QAPP) has been prepared as a generic companion document to accompany site-specific Work Plans and Field Activity Plans prepared for each standby subcontract Work Assignment issued to HRP Associates, Inc. (HRP) by the New York State Department of Environmental Conservation (NYSDEC) under Standby Contract No. D009808. The principal purpose of this document is to specify quality assurance/quality control (QA/QC) procedures for the collection, analysis, and evaluation of data that will be legally and scientifically defensible. A project-specific QAPP, provided as an appendix to each project-specific Work Plan, will supplement this generic document by providing QAPP information that is specific to each site.

1.2 Quality Assurance Project Plan Objectives

The QAPP provides general information related to QA/QC procedures associated with the collection and analysis of samples of environmental media and includes specific representative standard operating procedures (SOPs) applicable to sample handling and field instrumentation use. Descriptions of field activities and SOPs associated with sample collection and field data acquisition associated with an analytical sampling program will be provided in detail in each project-specific Work Plan and the accompanying project-specific Field Activities Plan. Information provided in this generic QAPP includes definitions and generic goals for data quality and required types and quantities of QA/QC samples. The procedures address field documentation; sample handling, custody, and shipping; instrument calibration and maintenance; auditing; data reduction, validation, and reporting; corrective action requirements; and QA/QC reporting specific to the analyses performed by the laboratories that are used for analysis of environmental media collected under Standby Contract No. D009808. Representative laboratory information is provided, since the specific laboratory used will be selected in association with each Work Assignment.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

Each Work Assignment will be managed through an organized effort of scientific and engineering personnel and technical resources. These efforts will employ pre-approved field procedures, sampling techniques, and analytical methods to accomplish the project objectives. Effective program organization and management will permit fulfillment of these requirements by maintaining control over these activities.

2.1 Overall Project Organization and Responsibilities

The overall organizational and management plan for each Work Assignment will be presented in the project-specific Work Plan, which will include an organizational chart that illustrates the project organization and individual roles for personnel tasked with implementing the Work Plan. A Representative Organization Chart is provided with this Generic QAPP as Figure 1. The responsibilities of key project personnel are described below.

The technical management of the Work Assignments will be accomplished by the Contract Manager and the designated Project Manager and an assigned project team. Additional individuals will be made available, if warranted. The Project Manager will be responsible for developing and managing activities associated with the Work Assignment and will coordinate and direct activities identified in the project-specific Work Plan to ensure that those activities are performed in accordance with the project-specific QAPP, Work Plan, and NYSDEC requirements for the work that is performed. The Contract Manager will be responsible for overall completion of the Work Assignment in accordance with all contract requirements and Work Assignments elements and protocols.

The responsibilities of the Contract Quality Assurance (QA) Officer will include working directly with the NYSDEC Project Manager and HRP Project Manager to develop project-specific Data Quality Objectives (DQOs) for each Work Assignment and to address any project-specific changes to the generic QAPP. To maintain objectivity with respect to QA/QC auditing or decision-making, the Contract QA Officer will not be involved in the actual collection of samples and will not serve in any capacity on the project that would involve project productivity or profitability. The Contract QA Officer will act as an HRP liaison with the third-party data validator and work closely with the HRP Project Manager in QA/QC-related discussions or resolving issues with the analytical laboratory.

To facilitate adherence to the project-specific QAPP, Work Plan, and Field Activities Plan with respect to QA/QC, each Work Assignment will have an assigned Project QA Officer (generally the Contract QA Officer) to provide guidance on technical matters and review technical documents relating to the individual Work Assignment. The designated Project QA Officer will work closely with the HRP Project Manager to assess the effectiveness of the QA/QC program and recommend modifications when applicable.

The Project or Contract QA/QC Officer may delegate technical guidance or specific QA/QC activities to specially trained individuals under his/her direction. Such activities could include conducting field audits to ensure that activities performed under each Work Assignment meet technical and QA requirements as specified in the applicable project-specific documents, such as the QAPP, Work Plan, and Field Activities Plan. The Project QA Officer might also delegate preparation of project-specific data usability summary reports (DUSRs), which would subsequently be reviewed by Project QA Officer and the Contract QA Officer, depending on the project-specific requirements and the complexity of the issues identified.

HRP's Program Health and Safety Officers for each office location are also an integral part of the project implementation teams. These individuals will be responsible for the development, final technical review, and approval of the Generic Health and Safety Plan and project-specific Health and Safety Plans. In addition, they will provide authorization, if warranted, to modify personal protective equipment requirements based on field conditions. They will also provide final review of all health and safety monitoring records and personal protective equipment changes to ensure compliance with the provisions of the Health and Safety Plans.

2.2 Responsibilities for Laboratory Interaction

The HRP Project Manager or his/her designee will be responsible for directing laboratories selected for a specific Work Assignment to perform chemical analyses of environmental samples in accordance with the project-specific Work Plan. The HRP Contract QA Officer is responsible for 1) confirming that the selected laboratory is capable of providing the necessary range of analytical services in a manner that is consistent with the most recent version of the New York State Department of Environmental Conservation (NYSDEC) Analytical Service Protocol (ASP) and current United Stated Environmental Protection Agency (EPA) protocols and 2) ensuring that the selected laboratory has maintained their certification by the New York State Department of Health Environmental Laboratory Approval Program (ELAP) throughout the course of a Work Assignment.

A Laboratory Project Manager (designated by the Laboratory) will serve as the liaison between the laboratory staff and the HRP Project Manager for the Work Assignment. The laboratory is responsible for following their internal protocols for conducting QA/QC reviews of all data before those data are released to HRP, and it is the responsibility of the Laboratory Project Manager to contact the HRP Project Manager with any sample discrepancies or data concerns. The HRP Project Manager will involve the HRP Project QA Officer, as appropriate, based on the nature of the issue(s) identified.

The HRP Project QA Officer, in coordination with the HRP Project Manager, will be responsible for ensuring that laboratory QA/QC reports are provided to HRP and NYSDEC as electronic data deliverables consistent with NYSDEC requirements and electronic submission protocols, as well as in a hardcopy (such as a PDF) format. Any necessary corrective actions will be reported by the Laboratory Project Manager to the HRP Project Manager along with the QA/QC reports. The HRP Project Manager (or his/her designee), HRP QA Officer, or NYSDEC personnel may contact the laboratory directly to discuss QA concerns.

3.0 QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES FOR DATA MANAGEMENT

3.1 Introduction

This section discusses QA objectives for the environmental investigation activities at the Site. QA objectives are the requirements specifying the quality of the environmental data needed to support the decision-making process. The uncertainty must be maintained at levels that will allow the resultant data to be used for its intended purposes.

Data collected during the Work Assignments will include field measurements and laboratory analytical data. This section reviews the various types of data anticipated, and presents QA/QC objectives for data collected in conjunction with the Work Assignments.

3.2 Data Quality Objectives

Data Quality Objectives are qualitative and quantitative statements, which specify the quality of data required to support decisions. DQOs are developed to achieve the level of data quality required for anticipated data use. DQOs are implemented so that, for each task, the data are legally and scientifically defensible. The development of DQOs for a specific site takes into account a number of project-specific considerations, including: project objectives, types of data to be collected, intended use of the data, and data collection methods. These factors are used to evaluate whether the quality and quantity of data are adequate for its intended use. Sampling protocols have been developed and sampling documentation and handling procedures have been identified to result in the required data quality.

DQOs are established prior to data collection and are not considered a separate deliverable. Rather, the DQO development process is integrated with the conceptual site modeling and project planning processes, and the results are incorporated into the project-specific QAPP for the specific site location and Work Assignment. DQOs will be specified for each planned data collection activity. The DQO process results in an effective plan, which details the chosen sampling and analysis options, and the statements of confidence in decisions made during the corrective action process. Confidence statements are possible through the application of statistical techniques to the data and reference to the conceptual model that has been developed for the site.

3.3 Laboratory Quality Assurance Objectives

The fundamental mechanisms that will be employed to achieve these quality goals in laboratory analyses can be categorized as prevention, assessment, and correction. These include:

- Prevention of defects in the quality through planning and design; documented instructions and procedures; and careful selection of skilled, qualified personnel.
- Quality assessment through a program of regular audits and inspections to supplement continual informal review.
- Permanent correction of conditions adverse to quality through a closed-loop corrective action system.

Overall compliance with laboratory QC procedures will be evaluated against the criteria specified for each method. Deviations will be reported in the narrative, which contains comments or problems encountered during fractional analyses of the samples. The narrative includes the laboratory's assessment of the impact on data usability and will address QC issues related to the following:

- *Laboratory Method Performance* - QC criteria for method performance must be met for target analytes for data to be reported. These criteria generally apply to such information as instrument tune, calibration, method blanks, surrogates, and laboratory control samples.
- *Sample Matrix Effects* - QC samples are analyzed to determine measurement bias due to the sample matrix, and may include surrogates, matrix spikes, matrix spike duplicates, and laboratory duplicates. If criteria are not met, matrix interferences are confirmed either by reanalysis or by inspection of the laboratory control sample results to verify that laboratory method performance is in control. Data are reported with appropriate qualifiers or discussion.

3.4 Field Parameters and Quality Assurance Objectives

Water-quality parameters, specifically pH, conductivity, dissolved oxygen and/or oxidation/reduction potential, temperature, and turbidity (at a minimum) will be measured to provide general surface water and groundwater quality information. These parameters will also be monitored for stability during purging of groundwater monitoring wells. HRP's standard operating procedures (SOP) for field screening will be followed during field screening activities. This SOP can be found in Appendix A. Field methods used to measure these specific parameters will be described in detail in each of the project-specific Work Plans and Field Activity Plans.

Field screening of soil samples using a photoionization detector will be performed to assess the presence and relative concentrations of volatile organic vapors. The method for quantification of volatile organic compounds (VOCs) in soil using headspace measurement, as well as operational protocols of the photoionization detector, will be presented in the site-specific Work Plan and Field Activity Plan for each Work Assignment.

Soil vapor, indoor/outdoor air, and soil/sediment sampling locations and monitoring wells will be surveyed with the accuracy and precision requirements discussed in the project-specific Field Activity Plans. Ground surface and top-of-casing elevations for each of the newly installed monitoring wells will be measured to the nearest 0.01 foot as referenced to the North American Vertical Datum of 1988.

For field QA/QC data, specific QA objectives for each project will be determined by the HRP Project Manager in coordination with the NYSDEC Project Manager. Field QA/QC data will be maintained collected for descriptive purposes and data variability and to assist in decision-making during the performance of field activities, particularly when a dynamic work plan approach is part of the overall project work plan. The Project Manager and Project QA Officer will be responsible for reviewing and evaluating the field QC data for several purposes, including 1) recognizing whether the data collected is in accordance with project-specific DQOs and is consistent with the conceptual site model for the project and 2) recognizing anomalous or unexpected field conditions, and whether such conditions might indicate whether changes to the existing Work Plan might be necessary in a timely manner, and 3) assessing how field QC data might affect the evaluation of data usability.

Similar samples will be collected using consistent sampling methods, analyzed using consistent analytical procedures, and reported in conventional units (e.g., µg/L, µg/kg, and µg/m^3 for analytical results). Consistency in such elements is important to provide a high degree of comparability for data collected throughout the project.

3.5 Detection and Quantitation Levels

In addition, analytical sensitivity is an important component of data quality, and is evaluated using analyte detection and quantitation levels.

3.5.1 Detection Limits

A detection limit has been defined by the Committee on Environmental Improvement of the American Chemical Society (Anal. Chem. 55:2210-2218 [1983]) as "the lowest concentration that can be determined to be statistically different from a blank." Various methods are available for determining detection limits, most of which are based on the standard deviation of measurements in the region near the blank responses. The following detection limits are determined routinely in the laboratory.

Instrument Detection Limits (IDLs) are determined using the protocols given in the inorganic and organic statements of work for the EPA Contract Laboratory Program (CLP). A standard deviation is calculated from replicate measurements of a low-level standard and multiplied by 3 to give the IDL. IDLs are used as an index of instrument performance that does not include sample effects and, therefore, represent the lowest detection limit achievable. IDLs can vary between instruments of the same type and can change when re-determined.

Method Detection Limits (MDLs) are determined using the EPA procedure published in 40 Code of Federal Regulations 136 Appendix B. The MDL is defined as "the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte." This procedure requires that "sample processing steps of the analytical method be included in the determination of the method detection limit." Therefore, the sample matrix and sample preparation process, as well as the analytical instrumentation influence MDLs. A minimum of 7 replicate spikes at 1 to 5 times the expected MDL are analyzed. The MDL is calculated by multiplying the standard deviation of the measurements by the Student t-value for a 99 percent confidence level. Because of the wide variety of matrix types analyzed by the laboratory, MDLs are routinely determined in reagent water or standard solid matrix. These MDLs represent, therefore, the optimum values, and the MDLs for actual sample matrices are likely to be higher. MDLs can be determined for specific matrices when requested by the client.

Unless superseded by other program, project, or client requirements, IDLs and MDLs are determined annually. In addition, IDLs and MDLs are re-determined after an instrument is moved or modified, and MDLs are re-determined after a method has been significantly changed. Where more than one instrument is used in sample analyses by a given technique (e.g., gas chromatograph/mass spectrometry, gas chromatograph, graphite furnace/atomic absorption, or inductively coupled plasma), detection limit studies are performed for each instrument. A standard laboratory reporting limit is determined for each analyte based on the highest detection limit determined. Data for instruments are maintained for use in reporting data when project-specific requirements dictate lower detection limits.

A detection limit measured at a given time is an estimate of the true detection limit because the measured standard deviation used to calculate the detection limit is subject to random error and is an estimate of the population standard deviation. The confidence limits on the standard deviation and, hence the detection limit, can be determined using the chi-square (X2) distribution (40 Code of Federal Regulations 136 Appendix B). The 95 percent confidence limits for an MDL determined from 7 replicates are 0.64 MDL and 2.20 MDL. A re-determination of the detection limit could produce a value between the chi-square limits, even if the conditions remain the same. Day-to-day changes in instrument performance can further produce changes in the measured detection limit.

Interpreting data near detection limits can be problematic. When a measured concentration is reported as greater than the detection limit, the analyte has the specified probability of actually being present (i.e., of having a true concentration greater than zero). However, a measured concentration less than the detection limit cannot be used to draw conclusions regarding the presence or absence of an analyte in that sample. From the definition of the MDL, there is a 1 percent chance that a sample with no analyte present will be reported as a concentration greater than or equal to the MDL (false-positive). However, the probability is 50 percent that a sample with a concentration at the MDL will be measured at less than the MDL (false-negative).

3.5.2 Quantitation Levels

To ensure better precision in low-level data and to reduce the false-negative error rate, quantitation limits have been proposed as the minimum concentration at which an analyte can be quantified with an acceptable degree of confidence. The American Chemical Society Committee on Environmental Improvement has recommended that quantitation limits be calculated by multiplying 10 times the standard deviation, giving a relative standard deviation of 10 percent. The Committee further advised that quantitative interpretation, decision making, and regulatory actions should be limited to data at or above the limit of quantitation. The laboratories will use the term “Reporting Limit” for the laboratory quantitation limit.

3.5.3 Project-Specific Quality Control and Reporting Limits

The contract-required quantitation limits (CRQLs) for each Work Assignment, are the minimum levels of quantitation acceptable under the contract as listed in NYSDEC ASP 2005 Exhibit C and D, which are listed in Appendix B. Any project-specific revisions to these values will be addressed in the project-specific QAPP, Work Plan, and Field Activities Plan for that project.

As indicated in NYSDEC ASP (2005) Exhibit E, it is expected that the laboratories used for each Work Assignment will perform and report annual verification of MDLs by the method specified in Exhibit D (NYSDEC ASP), and that the results of the MDL study will be submitted to the NYSDEC Quality Assurance Officer. HRP will ensure that the MDLs for all samples collected each Work Assignment will meet, or be lower than, the Contract-Required Quantitation Limits (CRQLs) specified in Appendix B of this QAPP, unless an alternative MDL is approved by the NYSDEC Project Manager.

4.0 SAMPLE HANDLING AND CUSTODY PROCEDURES

4.1 Field Sampling Operations

The collection and subsequent laboratory analyses of environmental samples will provide the majority of the data collected during the standby contract Work Assignments. The number and types of analyses to be performed and the matrix of each of the samples are provided in each project-specific QAPP and Work Plan.

4.1.1 Sample Bottle Preparation

Chain-of-custody procedures begin with preparation of sample containers and preservatives to be used in sample collection. The standby laboratories will provide cleaned sample containers and batch-certified clean SUMMA canisters. Sample kits (coolers containing chain-of-custody forms, custody seals, sample containers, preservatives, and packing materials) will be prepared by the standby laboratories in response to receipt of the analytical task order submitted by the HRP Project Manager.

Container, preservation, and holding-time requirements for aqueous and soil samples will follow HRP's SOP for sample handling and preparation, provided in Appendix A. Table 1 summarizes sampling protocols, such as container size and type, preservatives, and holding times that will generally be used during investigations conducted during Work Assignments. Project-specific sample requirements will be provided in the project-specific QAPP and Work Plan.

4.1.2 Sampling Procedures

Sampling protocols will be presented in the project-specific Work Plans and Field Activities Plans. The protocols include standard sampling procedures for sample collection, accurate sample identification, and packing of samples for shipment. Each sample container is provided with a sample label, which is filled out at the time of sample collection. During sample collection, a chain-of-custody form is initiated, which accompanies the samples during shipment to the analytical laboratory.

4.2 Laboratory Sample Receipt

Upon receipt at the laboratory, a laboratory representative inspects the samples for integrity and checks the shipment against the chain-of-custody/analytical task order form. Discrepancies are addressed at this point and documented on the chain-of-custody form and the cooler checklist. Discrepancies are reported to the Laboratory Project Manager who contacts the HRP Project Manager for resolution.

When the shipment and the chain-of-custody are in agreement, the custodian enters the samples into the Laboratory Information Management System and assigns each sample a unique laboratory number. This number is affixed to each sample bottle. The custodian then enters the sample and analysis information into the laboratory computer system.

4.2.1 Laboratory Sample Custody

The laboratory must satisfy the sample chain-of-custody requirements by implementing the following SOPs for laboratory/sample security:

- Samples are stored in a secure area
- Access to the laboratory is through a monitored area
- Visitors sign a visitor's log and are escorted while in the laboratory
- Only the designated sample custodians have keys to sample storage area(s)
- Transfers of samples in and out of storage are documented.

4.2.2 Sample Storage, Security, and Disposal

While in the laboratory, the samples and aliquots that require storage at 4°C ± 2°C are maintained in a locked refrigerator unless they are being used for analysis. The laboratory is responsible for sample storage and security to ensure that:

- Samples and extracts are stored for at least 60 days after the final analytical data report has been forwarded to the client, unless otherwise specified by DEC in coordination with the contracted laboratory. The samples, extracts, and digestates are then discarded in accordance with Occupational Safety and Health Administration guidance.
- Samples are not stored with standards or sample extracts.

5.0 CALIBRATION PROCEDURES AND FREQUENCY

Instruments and equipment used by the laboratories are controlled by a formal calibration program, which verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity, or whose performance is expected at a stated level, are subject to calibration. Calibration is performed using reference standards or externally by calibration agencies or equipment manufacturers. Various types of field equipment are also subject to calibration and must be calibrated in accordance with a specified program designed to ensure that each instrument is working property and the information and data obtained from the instrument will meet project-specific DQOs for the intended use of such data.

5.1 Calibration System

The following sections provide a discussion of the elements comprising the calibration system.

5.1.1 Laboratory Calibration Procedures

Written procedures are used for all instruments and equipment subject to calibration. The standby laboratories will follow NYSDEC ASP (2005) calibration procedures for laboratory equipment. Whenever possible, recognized procedures, such as those published by ASTM International or EPA, or procedures provided by manufacturers, are adopted. If established procedures are not available, a procedure is developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured.

5.1.2 Calibration Frequency

Calibration frequency is based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

5.1.3 Calibration Reference Standards

Two types of reference standards will be used by the standby laboratories for calibration:

- ***Physical standards***, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration.
- ***Chemical standards***, such as Standard Reference Materials provided by the National Institute of Standards and Technology (NIST) or EPA. These may include vendor-certified materials traceable to NIST or EPA Standard Reference Materials. These are primarily used for operational calibration.

5.1.4 Calibration Failure

Equipment that cannot be calibrated or becomes inoperable is removed from service. Such equipment must be repaired and satisfactorily recalibrated before re-use. For laboratory equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken and the analyst achieves an acceptable calibration. This is documented in a Non-Conformance Record, which is discussed in Section 11.

Laboratory managers are responsible for development and implementation of a contingency plan for major equipment failure. The plan includes guidelines on waiting for repairs, use of other instrumentation, subcontracting analyses, and evaluating scheduled priorities.

5.2 Operational Calibration

Operational calibration is generally performed as part of the analytical procedure and refers to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Included is the preparation of a standard response (calibration) curve and often the analysis of blanks.

5.2.1 Preparation of Calibration Curve

Preparation of a standard calibration curve is accomplished by the analysis of calibration standards, which are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards are chosen to cover the working range of the instrument or method. Sample measurements are made within this working range. The calibration curve is prepared by plotting or regressing the instrument responses versus the analyte concentrations. Concentrations of the analyzed samples are back-calculated from the calibration curve.

5.2.2 Blanks

Reagent and/or solvent blanks are analyzed to assess if the materials used to prepare the standards are free from interfering substances that could affect the analysis. A method blank is prepared whenever samples are processed through steps that are not applied to the calibration standards.

5.3 Periodic Calibration

Periodic calibrations are performed for equipment (e.g., balances, thermometers) that is required in the analytical method, but that is not routinely calibrated as part of the analytical procedure. The periodic calibration requirements used by the standby laboratories will be provided in Table 2. It should be noted that each standby laboratory may calibrate more equipment than what is presented in the table; in this instance the requirements will be included in the project-specific QAPP. Each laboratory will maintain on-site copies of all calibrations completed.

5.4 Field Equipment Calibration

The frequencies and standards used for the calibration of field equipment are provided in Table 3.

5.5 Calibration Records

Records are prepared and maintained for each piece of equipment (laboratory and field equipment) subject to calibration. Records demonstrating accuracy of preparation, stability, and proof of continuity of reference standards are also maintained. The standby laboratory maintains these documents on-site. Copies of the raw calibration data are kept with the analytical sample data. HRP maintains such records for field equipment used during Work Assignments in the project-specific file. A copy of the calibration records are also maintained by the HRP Field Services Department for all equipment owned by HRP.

6.0 ANALYTICAL PROCEDURES

6.1 Field Analytical Procedures

Field analytical procedures include the measurement of temperature, conductivity, dissolved oxygen, pH, turbidity, organic vapors, and groundwater levels. Site personnel will follow HRP's SOPs for field screening and sample handling and preparation. Project-specific field-measurement protocols are presented in each project-specific Work Plan and Field Activities Plan. Typical field measurement QC limits in terms of precision and accuracy are presented in Table 4. Changes to these typical values would be included in the project-specific QAPP, Work Plan, and Field Activities Plan.

6.2 Laboratory Analytical Procedures

Laboratory analytical requirements presented in the subsections below include a general summary of project-specific requirements related to each sample matrix to be analyzed. In accordance with NYS Public Health Law Section 502, environmental samples must be analyzed by laboratories accredited by the NYS Department of Health Environmental Laboratory Approval Program. Each analytical laboratory is responsible for maintaining internal quality controls as part of their quality assurance plan.

Concentrations of target compounds and analytes will be analyzed according to the laboratory-specific method SOPs developed for the NYSDEC ASP (2005) and EPA SW-846 Methods listed in the table below. Methods not listed in the table below are listed in the NYSDEC ASP (2005). Additional information regarding the number and types of samples to be collected at each area of concern will be presented in each project-specific Work Plan and Field Activities Plan.

Analyte List	Matrices	Method No.
EPA CLP Target Compound Lists for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs)	Groundwater, surface water, surface and subsurface soil, sediment, and debris	EPA SW-846 Method 8260C for VOCs EPA SW-846 Method 8270D for SVOCs
EPA CLP Target Analyte List for metals	Groundwater, surface water, surface and subsurface soil, sediment, and debris	EPA Method 6010C Mercury by Cold Vapor AAS (SW-846 Method 7471A/B)
Polychlorinated biphenyls	Groundwater, surface water, surface and subsurface soil, sediment, and debris	EPA SW-846 Method 8082/A
VOCs	Air and Soil Vapor	EPA TO-15, EPA TO-14A
NOTE: Specific methods or target analyte lists that might be used for a specific project will be identified in the project-specific QAPP and project-specific Work Plan. AAS = Atomic Adsorption Spectrophotometer		

Samples will be analyzed by the laboratory within the holding times presented in each project-specific Work Plan and Field Activities Plan on a standard turnaround schedule, unless a shorter turn-around time is requested by HRP or NYSDEC.

6.3 Sample Matrices

6.3.1 Water

No laboratory filtering of groundwater samples will be performed. Analytical results for laboratory analyses will be reported in units identified in Appendix B.

6.3.2 Soil, Sediment and Debris

Analytical results of soil, sediment, and debris samples will be reported in terms of dry weight in the units identified in Appendix B.

6.3.3 Soil Vapor and Indoor/Outdoor Air

Analytical results for soil vapor and indoor/outdoor air samples will be reported in terms of volume in the units identified in Appendix B.

6.4 Standard Operating Procedures

The standby laboratories will maintain a manual of procedures other than laboratory-specific analytical methods in a document-controlled SOP Manual. Laboratory Method SOPs will be maintained as controlled documents in the laboratory's Methods Manuals.

6.5 Recordkeeping

The requirements for laboratory recordkeeping are provided in the laboratory's SOP Manual. Data entries are made in indelible, water-resistant ink. The date of the entry and the observer are clear on each entry. The observer uses his/her full name or initials. An initial and signature log is maintained so that the recorder of every entry can be identified. Information is recorded in a notebook or on other records at the time the observations are made. Recording information on loose pieces of paper is not allowed.

When a mistake is made, the wrong entry is crossed out with a single line initialed and dated by the person making the entry, and the correct information recorded. Obliteration of an incorrect entry or writing over it is not allowed; neither is the use of correction tape or fluid on any laboratory records.

7.0 LABORATORY AND FIELD QUALITY CONTROL CHECKS AND FREQUENCY

QC measurements for analytical protocols are designed to evaluate laboratory performance and measurement bias resulting from the sample matrix and field performance.

- ***Laboratory Method Performance*** - QC criteria for method performance must be met for all target analytes for data to be reported. These criteria generally apply to instrument tune, calibration, method blanks, laboratory control samples, and Standard Reference Materials.

- ***Sample Performance*** - The accuracy and precision of sample analyses are influenced by both internal and external factors. Internal factors are those associated with sample preparation and analysis. Internal factors are monitored by the use of laboratory QC samples. Field QC samples are analyzed to determine any measurement bias due to the sample matrix based on evaluation of matrix spikes, matrix spike duplicates, and laboratory duplicates.

- ***Field Performance*** - QC samples are collected to evaluate the effectiveness of the sampling program in obtaining representative samples and identifying whether cross-contamination has occurred.

7.1 Laboratory Quality Control Samples

Laboratory QC samples are included in each analysis to provide information on both method performance and sample measurement bias and are included with each analytical batch. A batch is defined as a group of field samples of similar matrix, not to exceed 20, which are processed as a unit using the same method and the same lots of standards and reagents. The laboratory QC samples discussed in the following sections are not counted in the maximum batch size of 20.

7.1.1 Method Blank

The method blank is used to monitor laboratory contamination. This is usually a sample of laboratory reagent water, or a standard solid matrix, processed through the same analytical procedure as the sample (i.e., digested, extracted, distiilled). One method blank is prepared and analyzed with each analytical batch.

7.1.2 Laboratory Control Sample

A fortified method blank is analyzed with each analysis. These samples generally consist of a standard matrix fortified with the analytes of interest for single-analyte methods and selected analytes for multi-analyte methods according to the appropriate analytical method. The analyte recovery from each is used to monitor analytical accuracy and precision.

7.1.3 Matrix Spike

A matrix spike is an aliquot of a field sample, which is fortified with the analyte(s) of interest and analyzed to monitor measurement bias associated with the sample matrix. A matrix spike and matrix spike duplicate will be performed for every laboratory analytical batch. Only matrix spikes performed on samples collected from the specific site associated with the Work Assignment can be used to evaluate matrix interference for the specific media. Use of site-specific matrix spikes and matrix spike duplicates will be identified in the project-specific QAPP, Work Plan, and Field Activities Plan.

7.1.4 Surrogates

Surrogates are organic compounds that are similar to analytes of interest in chemical composition, extraction, and chromatography, but are not normally found in environmental samples. Surrogates are added to field and QC samples in every batch. These compounds are used to monitor system performance as well as sample measurement bias. Percent recoveries are calculated for each surrogate, and evaluated against acceptance criteria.

7.2 Field Quality Control Samples

Field quality control samples are not included specifically as laboratory QC samples but are analyzed when submitted. Data for these QC samples are reported with associated samples. Often, and in accordance with project-specific DQOs, field QA/QC samples will be submitted to the laboratory with no identification that the samples submitted are QA/QC samples (i.e., submitted “blind”). In such cases, the laboratory will not be able to associate the QC samples with any specific sample location, which helps ensure that such samples are analyzed and managed in the same way as any other field sample. Such an approach provides an added level of confidence in the evaluation of results for such samples relative to the actual field samples.

7.2.1 Field Blanks

Field blanks will be collected to determine if there is cross-contamination of samples from dust, off-gassing, and/or contaminants in the air during the time when samples are being collected in the field. Field blanks will be collected at a frequency requested in the Work Assignment, and site-specific information related to the collection of field blanks will be provided in the project-specific QAPP, Work Plan, and Field Activities Plan.

The analytical laboratory will provide field blank DI water and sample jars for the collection of all field blanks. Glass jars will be used for organic blanks. The field blanks as well as the trip blanks will accompany field personnel to the sampling location.

Field blank sample bottles provided by the laboratory will be opened on-site and then resealed and place sample in a cooler and maintain a temperature of 4ºC until receipt by the laboratory.

All sample logs, labels, and chain-of-custody forms for field blank samples will be filled out and recorded in field logbook as for any other sample collected.

7.2.2 Equipment Blanks

Equipment blanks will be collected to evaluate the cleanliness of sampling equipment for soil and aqueous samples, and the potential for cross-contamination of samples due to equipment handling, decontamination and/or contaminants in the ambient air during sample collection. Equipment blanks will be collected at a minimum frequency of one per equipment type and/or media per day. Equipment blanks will not be collected in conjunction with the collection of air or vapor samples.

Equipment blanks will be collected during the course of an analytical field sampling event by pouring deionized or potable water over a particular piece of sampling equipment and into a sample container. The analytical laboratory will provide equipment blank water and sample jars with preservatives for the collection of all equipment blanks. Glass jars will be used for organic blanks. The equipment blanks, as well as the trip blanks, will accompany field personnel to the sampling location. The equipment blanks will be analyzed for the same analytes as the environmental samples being collected that day and shipped with the samples taken. In some cases, it may be acceptable to collect an equipment blank that will also serve as a field blank. Should this be determined to be appropriate for a specific project, such information will be conveyed in the project-specific QAPP, Work Plan, and Field Activity Plan.

Equipment blanks will be collected in accordance with the procedures described below:

- Decontaminate sampling device in accordance with procedures described in the applicable SOP or the project-specific Field Activity Plan.
- Pour distilled/deionized water over the sampling equipment, and collect the rinsate water in the appropriate bottles.
- Immediately place sample in a cooler and maintain a temperature of 4ºC until receipt by the laboratory.

Fill out sample log, labels, and constituents of concern forms, and record in field logbook.

7.2.3 Trip Blanks

The trip blank will be used to determine if any volatile organic cross-contamination occurs between aqueous samples during shipment. Trip blanks are only used for samples to be analyzed for volatile organic compounds (VOCs). Trip blanks will be supplied by the analytical laboratory as aliquots of distilled, deionized water that will be sealed in a sample bottle prior to initiation of each day of field work. Glass vials (40 ml) with Teflon®-lined lids will be used for trip blanks. The sealed trip blank bottles will be placed in a cooler with the empty sample bottles and shipped to the site by laboratory personnel. If multiple coolers are necessary to store and transport samples to be analyzed for VOCs, each cooler must contain an individual trip blank. Therefore, efforts will be made to include all samples to be analyzed for VOCs in a smallest number of coolers. However, if particularly contaminated samples have been collected during the same sampling event as samples expected to contain low levels of VOCs, it would be more appropriate to separate the more contaminated samples from those with lower anticipated levels of contamination. If such a situation is anticipated, the approach and applicable procedures should be described in the project-specific QAPP, Work Plan, and Field Activities Plan. Trip blanks will not be collected in conjunction with the air or soil vapor samples.

7.2.4 Field Duplicates

Field duplicates are two samples of the same matrix, often referred to as “replicate samples,” that are collected, to the extent possible, from the same location at the same time using the same techniques. Field duplicates provide information on the precision of the sampling and analysis process. Field duplicates will be collected at a minimum frequency of 1 duplicate per 20 samples from each environmental media. Separate duplicate samples will be collected for the following media: surface and subsurface soil, sediment, surface water, groundwater, air, and soil vapor samples. Project-specific information on duplicate sampling will be provided in the project-specific QAPP, Work Plan, and Field Activities Plan.

7.2.5 Matrix Spike/Matrix Spike Duplicates

If determined to be necessary by the HRP’s QA Officer and/or NYSDEC Project Manager, specific sampling locations/sampling intervals will be selected for collection of additional replicate samples of the environmental media that will be analyzed as matrix spike/matrix spike duplicate (MS/MSD) samples. The need for collection of MS/MSD samples and specific details regarding the collection of such samples will be identified in the project-specific QAPP and Work Plan.

7.2.6 Temperature Blanks

Laboratory will use either 1) an infrared instrument to measure the temperature of liquid samples or 2) a temperature blank will be used to measure the temperature of liquid samples. If used, temperature blanks will be supplied by the analytical laboratory. If multiple coolers are necessary to store and transport aqueous samples, then each cooler must contain an individual temperature blank (if used).

8.0 PREVENTIVE MAINTENANCE

Periodic preventive maintenance is required for all sensitive equipment. Instrument manuals will be kept on file for reference if equipment needs repair. The troubleshooting chapter of factory manuals may be used in assisting personnel in performing maintenance tasks. The frequency of preventive maintenance for field equipment is indicated in each operating instruction manual.

Field equipment is checked by field personnel under the supervision of HRP's Technical Services Group's Field Manager and/or Project Manager based on the individual's experience with the specific instrument. It is the responsibility of HRP's Technical Services Group's Field Manager or his/her qualified designee to conduct preventive maintenance. A summary of general preventative maintenance schedule is provided in Table 5.

Major instruments in the laboratory are covered by annual service contracts with manufacturers. Under these agreements, regular preventive maintenance visits will be made by trained service personnel. Maintenance is documented and maintained in permanent records by the individual responsible for each instrument.

Laboratory management is responsible for preparation and documentation of the laboratory's preventative maintenance program. Section Chiefs and QC Chemists implement the program, and the Quality Services Manager reviews implementation to verify compliance. For each operational group, the preventive maintenance program includes the following:

- Listing of the instruments and equipment that are included in the program
- Frequency of maintenance considering manufacturer's recommendations and/or previous experience with equipment
- For each instrument in the program, a file is maintained for the following information:
    - List of spare parts maintained by the laboratory
    - External service contracts
    - Items to be checked and/or serviced during maintenance and directions for performing maintenance (if external service is not provided of if not stated in manufacturer's instrument manuals).

9.0 QUALITY ASSURANCE PERFORMANCE AND SYSTEM AUDITS

Audits are systematic checks to determine the quality of operation of some activity or function in the field or laboratory. Field audits will be conducted to assure adherence to proper field and sampling procedures. The number of audits performed during a project will depend on the length of time over which auditable activities occur, but at least one audit will be performed during the course of a project.

Several factors will influence the number of audits that might be appropriate for a given Work Assignment. For example, for field audits, such factors would include the number of different types of field activities that are performed, the number of different field personnel conducting a specific field activity, and whether any non-conformances (and the nature of such non-conformances) have been identified during a prior audit for that project. Specific auditing of field activities that is planned for any Work Assignment will be identified in the project-specific QAPP and Work Plan. Auditing for laboratory activities will be in accordance with laboratory QA/QC and New York State Department of Health ELAP procedures.

Audits are of two types:

- ***Performance audits*** are independent safety and health, procedure, and/or sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process.

- ***System audits*** are on-site qualitative inspections and reviews of the QA system used by some part of or the entire measurement system. The audits are performed with respect to whether elements identified in the QAPP and/or Work Plan are performed properly. A checklist is typically generated from the requirements and becomes the basis for the audit. The results of any deficiencies noted during the audit are summarized in an audit report.

Laboratory performance and system audits are performed by the QA staff to assess the effectiveness of the quality system. These internal audits are performed on a routine basis. Audits are also performed by certifying agencies. Audit reports and corrective actions are available to NYSDEC for review.

9.1 Responsibility, Authority, and Timing

QA audits to be conducted for the project may include system, performance, and data audits. The Contract QA Officer will keep a tentative schedule on record that details the number and types of audits.

9.2 Field Audits

Field performance audits will be conducted on an ongoing basis during the project as field data are generated, reduced, and analyzed. All numerical manipulations, including manual calculations, will be documented. All records of numerical analyses will be legible, of reproduction quality, and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator.

Indicators of the level of field performance include the analytical results of the blank and replicate samples. Each blank analysis will be considered an indirect audit of the effectiveness of measures taken in the field to ensure sample integrity (e.g., field decontamination procedures). The results of the field replicate analyses are an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

System audits of site activities will be accomplished by an assessment of all field site activities. During this audit, the auditor(s) will compare existing field practices with standard procedures, as described in the project-specific QAPP, Field Activities Plan, and Work Plan. The audit will particularly focus on whether all procedures and analyses are being conducted in accordance with procedures outlined in those documents.

Specific elements to be evaluated during the field system audit include:

- Sample documentation
- Working order of instruments and equipment
- Level of QA conducted per each field team
- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding
- Decontamination procedures
- Level of efficiency with which each team conducts planned activities at one site and proceeds to the next
- Sample packaging and shipment.

After completion of the audit, any deficiencies will be discussed with the field staff and corrections identified. If any of these deficiencies could affect the integrity of the samples being collected, the auditor(s) will inform the field staff and corrections will be implemented immediately. Field audits will be performed by the Contract QA Officer, project-specific QA Officer (if not the Contract QA Officer) and/or the Project Manager or their properly qualified designee.

9.3 Laboratory Performance and System Audits

A certified laboratory that has satisfactorily completed performance audits and performance evaluation samples in accordance with The New York State Department of Health ELAP Contract Laboratory Program will be used for all sample analysis. The results of the most recent performance audits and performance evaluations will be made available upon request.

9.4 Audit Procedures

The Contract QA Officer will ensure that a standard audit form is used for all field audits. During an audit and upon its completion, the auditor(s) will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will then prepare and submit an audit report to the manager of the audited group, the Project Manager, the Project QA Officer(if applicable), and the Contract QA Officer.

The manager of the audited group will then prepare and submit, to the Contract QA Officer and the Project Manager (and project QA Officer, if applicable), a plan for implementing the corrective action to be taken on non-conformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files.

9.5 Documentation

To ensure that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures, a checklist will be completed during each audit. The checklist will detail the activities to be executed and ensure that the auditing plan is accurate. Audit checklists will be prepared in advance and will be available for review. Following each system, performance, and data audit, the Quality Services Manager (for laboratories) or the Project QA Officer (for field audits) will prepare a report to document the findings of the specific audit.

10.0 DATA REDUCTION, VERIFICATION, VALIDATION, AND REPORTING

10.1 Data Reduction

10.1.1 Field and Technical Data Reduction

Field personnel will record all field data in bound field logbooks and on standard forms. After checking the validity of the data in the field notes, the Project Manager and/or General Supervisor or his/her designee will reduce the data to tabular form, when possible, by entering the data into an electronic database. Where appropriate, the data files will be set up for direct input into the electronic project database. Subjective data will be filed as hard copies for later review by the Project Manager and appropriate members of the project team and incorporation into technical reports, as appropriate.

10.1.2 Laboratory Data Reduction

Data reduction is the process by which raw analytical data generated from laboratory instrument systems is converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses, or observations, are processed by the laboratory and converted into concentrations expressed in appropriate units for the specific analyte or analytical group. Raw data from these systems include compound identifications, concentrations, retention times, and data system print-outs. Raw data are usually reported in graphic form, bar graph form, or tabular form. The laboratory will follow standard operating procedures consistent with the data handling requirements of the applicable methods.

The laboratory reporting limits for each project must be less than or equal to those stipulated for each Work Assignment. Contract-required quantitation limits are presented in Appendix B of this QAPP.

10.2 Data Verification

10.2.1 Field and Technical Data Verification

Verification of objective field and technical data will be performed at different levels and at different stages of the project. The first level of data verification will be performed at the time of collection by following standard procedures and QC checks. Field work sheets will be reviewed by the Project Manager or his/her designee for completeness and accuracy for each project within one to days of each day of field work. The Project Manager or designee will make any necessary inquiries with field personnel regarding missing information or data or suspected inconsistencies or errors in the field reports within one to two days of identifying such issues and will follow up to ensure that any necessary corrections or changes have been made, not just to the field reports themselves, but also with respect to any necessary changes that might be necessary to the field program based on identified issues.

Final review of field work sheets will be conducted following completion of the field sampling activities and prior to placement of the work sheets into the project file. The work sheets, including any necessary corrections, will be included in the final project report.

Auditing of field activities by the Project Manager, Project QA Officer, or a qualified designee will provide random checks of sampling and field conditions as the field activities are occurring. Once field data has been organized and, as appropriate, entered into an electronic database, the Project Manager or designee will then review the data to ensure that the correct codes and units have been included and will review data sets for anomalous values and other issues that might affect the quality of the field data generated for the project. This task will generally be conducted as soon as possible after data has been organized into tables, graphs, and/or figures, with the objective of reviewing the data within a time-frame that will permit additional data collection, if necessary, to obtain a dataset that will meet the project-specific DQOs.

10.2.2 Analytical Data Validation

If a Work Assignment requires the validation of data, formal data validation will be performed to establish the quality for all analytical data that will be used when making project decisions. Laboratories will submit results that are supported by sufficient back-up data and QA/QC results to enable the reviewer to conclusively determine the quality of the data. The laboratory will review data prior to its release from the custody of the laboratory. The laboratory is required to evaluate and confirm their ability to meet the objectives for data quality (data quality objectives) established for each project and identified in each project-specific QAPP, Work Plan, and/or FAP. Outlying data will be flagged in accordance with laboratory standard operating procedures, and corrective action will be taken to rectify the problem.

The purpose of data validation is to identify and document the quality of the analytical data generated by the laboratory, as all data used for decision-making purposes must be of known and acceptable quality for the intended use of the data. The person performing the data validation effort must be independent of the laboratory that generated the data. When full data validation is deemed necessary by the NYSDEC project manager, a NYSDEC-approved, qualified, independent third-party data validator, as described in the Schedule 1 of the Standby Contract D009808 (Attachment 1) will review the data package to determine completeness and compliance in accordance with that document.

A narrative describing how the data did or did not meet the validation criteria is part of the data validation procedure. The validation assessment will describe the overall quality of the data and the data validation report will provide a written statement upon completion of the validation indicating whether or not the data are valid and usable and will include a percent completeness value of usable data, and a spreadsheet that summarizes the results of the data validation effort. The data validation report will be reviewed by the QA Officer.

10.2.3 Data Usability Summary Report

For all data generated during Work Assignments, a Data Usability Summary Report (DUSR) will be prepared to provide a thorough evaluation of analytical data without third-party data validation. The primary objective of a DUSR is to determine whether the data, as presented, meet the project-specific criteria for data quality and usability, as indicated in the project-specific data quality objectives established in the project-specific QAPP, Work, and FAP. The DUSR will be prepared by a NYSDEC-approved qualified environmental scientist in accordance with Schedule 1 of the Standby Contract D009808 and will be reviewed by the QA Officer.

10.3 Reporting

10.3.1 Field Measurements

Any field analysis results will be recorded in a dedicated field logbook at the time the results are available. The field logbook will be reviewed by the General Supervisor and/or the Project Manager for completeness and accuracy within one to two days. The General Supervisor and/or the Project Manager will make any necessary inquiries with Field Personnel regarding missing information or data or suspected inconsistencies or errors in the field reports within one to two days of identifying such issues and will follow up to ensure that any necessary corrections or changes have been made, not just to the field reports themselves, but also with respect to any necessary changes that might be necessary to the field program based on identified issues. Final review of field work sheets will be conducted following completion of the field sampling activities and prior to placement of the work sheets into the project file.

The results will be tabulated and plotted in the office as part of the reporting tasks. Reports also will consist of the field logbook, required field data forms and work sheets, photographic documentation, and daily QC reports, as applicable. The work sheets, including any necessary corrections, will be included in the final project report.

10.3.2 Analytical Data

The content of analytical laboratory data packages designed for work conducted in association with each Work Assignment are site-specific and will include the following information:

- Pertinent physical data presented in concise, easy to follow formats (i.e., sample number, client, date of sample preparation, date analyzed, percent moisture, etc.)
- Reference for the analytical methodology used
- General discussion including a description of sample types, tests performed, any problems encountered, and general comments
- Data from each discrete sample, including all pertinent dates, information, and reporting limits
- Data for associated QC samples such as blanks, spikes and spike duplicates, laboratory duplicates, field duplicates, and appropriate check standards. (In some cases, field QC samples will not be provided as such to the laboratory, instead being submitted to the laboratory in a “blind” manner so the laboratory is not alerted to the fact that specific samples are actually QC samples.)
- Copies of chain-of-custody sheets
- Raw data.

11.0 CORRECTIVE ACTION PROCEDURES

11.1 Objectives

The objectives of the corrective action procedures presented below are to ensure that recognized errors in performance of sample and data acquisition lead to effective remedial measures and that those steps are documented to provide assurance that any data quality deficiencies are recognized in later interpretation and taken into account during the evaluation of data usability. The overall objective of corrective action procedures is to ensure that the activity that required corrective action does not recur.

11.2 Rationale

Many times corrective measures are undertaken in a timely and effective fashion but go undocumented. In other cases, corrective actions are of a complex nature and may require scheduled interactions between departmental groups. In either case, documentation in a formal or informal sense can reinforce the effectiveness and duration of the corrective measures taken.

11.3 Corrective Action Methods

11.3.1 Corrective Action Steps

Immediate corrective actions are of a minor or routine nature such as correcting malfunctioning equipment, correction of data transcription errors, and other such activities routinely made in the field, laboratory, or office by technicians, analysts, and other project staff.

11.3.2 Long-Term Corrective Actions

Long-term corrective action will be used to identify and eliminate causes of non-conformances which are of a complex nature and that are formally reported between management groups.

11.3.3 Corrective Action Steps

For long-term corrective actions, steps comprising closed-loop corrective action system are as follows:

- Define the problem
- Assign responsibility for investigating the problem
- Investigate and determine the cause of the problem
- Determine a corrective action to eliminate the problem
- Assign and accept responsibility for implementing the corrective action
- Verify that the corrective action has eliminated the problem.

11.3.4 Audit-Based Non-Conformances

Following audits, corrective action is initiated by documenting the audit finding and recommended corrective action on an Audit Finding Report.

11.4 Corrective Action Report Review and Filing

Immediate and long-term corrective actions require review to assure that, during the time of non-conformance, erroneous data were not generated or that, if possible, correct data were acquired instead. Such initial confirmation and review is the responsibility of the supervisor of the staff implementing the corrective action. Confirmation will be acknowledged by notation and dated signature on the affected data record or appropriate form or by memorandum to the Project Manager, Project QA Officer (if applicable), and Contract QA Officer. Such notification of the initial issue and corrective action must be made in a sufficient time-frame that any necessary additional actions can be taken to ensure the collection of data that meets the project-specific DQOs.

11.5 Corrective Action Reports to Management

The Contract Manager will be informed verbally of non-conformance events as soon as possible, and decisions made after evaluation is documented in the Non-Conformance Records. The Contract QA Officer will provide the Contract Manager with corrective action reports in a timely manner. A copy of each Non-Conformance Record is maintained in the report.

12.0 QUALITY ASSURANCE REPORTS

Fundamental to the success of the QA/QC effort is the active participation of the Project Manager, General Supervisor, Project QA Officer (when that role is fulfilled by someone other than the Contract QA Officer), and the Contract QA Officer. The Contract QA Officer will be advised of project activities and will participate in development, review, and operation of the project. Project management will be informed of QA activities through the receipt, review, and/or approval of:

- Project- or task-specific work plans and QAPPs
- Corporate and project-/task-specific QA/QC plans and procedures
- Corrective action notices
- Non-conformance records.

Periodic assessment of field and laboratory QA/QC activities and data accuracy, precision, and completeness will be conducted and reported by the Contract QA Officer and the laboratory Quality Services Manager, as appropriate relative to the specific activity. Items to be included in the QA reports are the summary of results for the performance or the system audit and, where applicable:

- Assessment of adherence to work scope and schedule for the audited task
- Assessment of the precision, accuracy, and completeness of sample batches and subsequent status of data processing and analyses
- Significant QC problems and the status of any ongoing corrective actions
- Changes to the project-specific Work Plan, Field Activities Plan, and or QAPP
- Status of implementation of the project-specific Work Plan, Field Activities Plan, and or QAPP.

13.0 REFERENCES

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TABLE 1

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING-TIME REQUIREMENTS

Soil

					Containers per Sample			Preservation Requirements			
Parameter	**Matrix**	**Number of Samples (including Field QC)**	**Preparation Method**	**Analytical Method***	**No.**	**Size**	**Type**	**Temp.**	**Light Sensitive**	**Chemical**	**Maximum Holding Time**
VOCs by GC/MS	Soil/Sediment	Provided in project-specific QAPP	5035A	SW-846 Method 8260B	3 vials 1 jar	40 ml vials, any size jar	glass vials clear glass jar	2-6º C	No	MeOH/ Sodium bisulfate/deionized water/freezing	14 days * *
SVOCs by GC/MS	Soil/Sediment	Provided in project-specific QAPP	3546	SW-846 Method 8270C	1	8 oz	amber glass jar	2-6º C	Yes	NA	14 days
Trace metals by ICP-AES	Soil/Sediment	Provided in project-specific QAPP	3050B	SW-846 Method 6010B	1	8 oz	clear glass jar	NA	No	NA	6 months
Mercury by Cold Vapor AAS	Soil/Sediment	Provided in project-specific QAPP Addendum	Inc. in 7471A method	SW-846 Method 7471A	1	8 oz	clear glass jar	NA	No	NA	28 days
Trace Metals by AAS and Direct Aspiration	Soil/Sediment	Provided in project-specific QAPP	3050B	SW-846 Method 7000 series	1	8 oz	clear glass jar	NA	No	NA	6 months
PCBs by GC	Soil/Sediment	Provided in project-specific QAPP	3546	SW-846 Method 8082	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
Chlorinated Pesticides by GC	Soil/Sediment	Provided in project-specific QAPP	3546	SW-846 Method 8081A	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
Total and Physiologically Available Cyanide	Soil/Sediment	Provided in project-specific QAPP	Inc. in 9014 method	Modified SW-846 Method 9014	1	8 oz	plastic jar	2-6º C	No	NA	14 days
Colorimetric Hexavalent Chromium	Soil/Sediment	Provided in project-specific QAPP	3060A	SW-846 Method 7196A	1	8 oz	clear glass jar	2-6º C	No	NA	30 days
Total Petroleum Hydrocarbons	Soil/Sediment	Provided in project-specific QAPP	3646	SW-846 Method 8100	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
TPH	Soil/Sediment	Provided in project-specific QAPP	3546	SW-846 Methods 8015M/8015B/8100	1	8 oz	clear glass jar	2-6º C	No	NA	14 days
TCLP 1311	Soil/Sediment	Provided in project-specific QAPP	NA	SW-846 Method 1311	1	8 oz	analysis specific see method	NA	NA	NA	NA
SPLP 1312	Soil/Sediment	Provided in project-specific QAPP	NA	SW-846 Method 1312	1	8 oz	analysis specific see method	NA	NA	NA	NA

TABLE 1

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIME REQUIREMENTS (Continued)

Groundwater

					Containers per Sample			Preservation Requirements			
Parameter	Matrix	Number of Samples (including Field QC)	Preparation Method	Analytical Method*	No.	Size	Type	Temp.	Light Sensitive	Chemical	Maximum Holding Time
VOCs by GC/MS	Aqueous	Provided in project-specific QAPP	5035	SW-846 Method 8260B	2	40 ml	glass vial	2-6º C	No	HCL	14 days
SVOCs by GC/MS	Aqueous	Provided in project-specific QAPP	3510C	SW-846 Method 8270C	2	1 liter	amber bottle	2-6º C	Yes	NA	7 days
Trace metals by ICP-AES	Aqueous	Provided in project-specific QAPP	3005A	SW-846 Method 6010B	1	250 ml	plastic bottle	NA	No	Nitric Acid	6 months
Mercury by Cold Vapor AAS	Aqueous	Provided in project-specific QAPP	Inc. in 7470 method	SW-846 Method 7470A	1	250 ml	plastic bottle	NA	No	Nitric Acid	28 days
Trace Metals by AAS and GF	Aqueous	Provided in project-specific QAPP	3050B	SW-846 Method 7000 series	1	250 ml	plastic	NA	No	Nitric Acid	6 months
Trace Metals by AAS and Direct Aspiration	Aqueous	Provided in project-specific QAPP	3005A	SW-846 Method 7000 series	1	250 ml	plastic	NA	No	Nitric Acid	6 months
ETPH	Aqueous	Provided in project-specific QAPP	3510C	CT ETPH	1	1 liter	amber bottle	2-6º C	Yes	NA	7 days
PCBs by GC	Aqueous	Provided in project-specific QAPP	3510C	SW-846 Method 8082	2	liter	clear glass bottle	2-6º C	No	NA	7 days
Chlorinated Pesticides by GC	Aqueous	Provided in project-specific QAPP	3510C	SW-846 Method 8081	2	liters	clear glass bottle	2-6º C	No	NA	7 days
Total and Physiologically Available Cyanide	Aqueous	Provided in project-specific QAPP	Inc. in 9014 method	Modified SW-846 Method 9014	1	250 ml	plastic bottle	2-6º C	No	NaOH	14 days
Colorimetric Hexavalent Chromium	Aqueous	Provided in project-specific QAPP	Inc. in 7196 method	SW-846 Method 7196A	1	250 ml	plastic bottle	2-6º C	No	NA	24 hours
EDB and DBCP	Aqueous	Provided in project-specific QAPP	Inc. in 504.1 method	EPA Method 504.1	2	40 ml	vials	2-6º C	No	Sodium Thiosulfate	14 days
VOCs by GC/MS	Aqueous	Provided in project-specific QAPP	Inc. in 624 method	EPA Method 624	2	40 ml	vials	2-6º C	No	HCL * * *	14 days
ICP-MS	Aqueous	Provided in project-specific QAPP	3005A	EPA Method 6020A	1	250 ml	plastic bottle	NA	No	Nitric Acid	6 months
200.7	Aqueous	Provided in project-specific QAPP	3005A	EPA Method 200.7	1	250 ml	plastic bottle	NA	No	Nitric Acid	6 months
TPH	Aqueous	Provided in project-specific QAPP	3510C	SW-846 Method 8015M/8015B/8100	1	1 liter	amber bottle	2-6º C	No	NA	7 days
Total Hardness	Aqueous	Provided in project-specific QAPP	NA	EPA 130.2	1	250 ml	plastic bottle	2-6º C	No	NA	6 months
Reactivity	Aqueous	Provided in project-specific QAPP	NA	Sulfide=7332930A, Cyanide=SW9014	1	500 ml	plastic bottle	2-6º C	No	NA	14 days
Conductivity	Aqueous	Provided in project-specific QAPP	NA	EPA Method 2510B	1	250 ml	plastic bottle	2-6º C	No	NA	28 days
Flashpoint	Aqueous	Provided in project-specific QAPP	NA	SW-846 Method 1010	1	flashpoint bottle	amber, small neck	2-6º C	Yes	NA	asap
Sulfide	Aqueous	Provided in project-specific QAPP	NA	SN4500S2E	1	250 ml	plastic bottle	2-6º C	no	0.43 ml Zn acetate & 0.50 ml NaOH	7 days
Chloride	Aqueous	Provided in project-specific QAPP	NA	SM4500CLB	1	250 ml	plastic bottle	2-6º C	no	NA	28 days

TABLE 1

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIME REQUIREMENTS (Continued)

Soil Gas

					Containers per Sample			Preservation Requirements			
Parameter	Matrix	Number of Samples (including Field QC)	Preparation Method	Analytical Method*	No.	Size	Type	Temp.	Light Sensitive	Chemical	Maximum Holding Time
TO-15	Air	Provided in project-specific QAPP	NA	EPA TO-15	1	3-Liter, 6-Liter	Summa Canister, Tedlar Bag	NA	No	NA	30 Days (Summa Canister), 48 hours (Tedlar Bag)

* Analytical Methods in accordance with NYSDEC ASP 2005.
* * VOC soil/sediment samples can be frozen. If this option is selected, the sample must be frozen within 48 hours of collection. The holding time recommences when thawing begins. The total holding time is calculated to freezing plus the time allowed for thawing. The total elapsed time must be less than 14 days.
* * * Sodium bisulfate preservation can lead to formation of acetone in samples containing high amount of humic material, and certain analytes, such as styrene, vinyl chloride, trichloroethene (TCE), may be decomposed by the bisulfate, leading to low- biased results. For carbonate rich soils effervescence may occur, which would result in significant losses of VOCs. In such cases, the sodium bisulfate cannot be used as a preservation method. Although use of this preservation technique is discouraged unless the limiting factors are known not to be present, preservation for low-concentration samples may be an acceptable option as long as the limitations are considered on a site-specific basis.

Acronym List:

AAS: Atomic Absorption Spectrometer
AES: Atomic Emission Spectrometry
GC: Gas Chromatography
GF: Graphite Furnace
HCL: Hydrochloric Acid
HPLC: High Performance Liquid Chromatography
ICP: Inductively Coupled Plasma
MeOH: Methanol
MS: Mass Spectrometry
N/A: Not Applicable
NaOH: Sodium Hydroxide
PCBs: Polychlorinated Biphenyls
VOCs: Volatile Organic Compounds

TABLE 2

SUMMARY OF PERIODIC LABORATORY CALIBRATION REQUIREMENTS

Instrument	Calibration Frequency	Acceptance Limits	Corrective Actions
Analytical Balances	Daily: Sensitivity (with a Class P weight)	0.001 g	Adjust sensitivity
	Monthly: Checked with Class S Weights	Standard deviation of <0.1 mg	Service balance
	Annually: Calibrated by outside vendor against certified Class S weights	0.001 g	Service balance
Thermometers	Annually: Calibrated against certified National Institute of Standards and Technology thermometers by outside vendor	± 0.5°C	Tag and remove from service
Automatic Pipettors	Quarterly: Gravimetric check	High volume (>100 mL): d1.0% relative error as relative standard deviation	Service or replace
		Low volume (<100 mL): d2.0% relative error as relative standard deviation	

TABLE 3

FIELD INSTRUMENTATION CALIBRATION FREQUENCY

Instrument	Frequency of Calibration Check	Calibration Standard
pH Meter	Prior to use – daily, and as needed in the field	Commercially prepared pH buffer solutions (4.01, 7.00, 10.00)
Conductivity Meter	Prior to use – daily, and as needed in the field	Commercially prepared saline solution (12.9 mS/cm)
Water-level Meter	Prior to initiating field work	100-ft engineer's tape
Dissolved Oxygen Meter	Per sampling event, and as needed in the field	Saturation
Photoionization Detector	Prior to use – daily, and as needed in the field	100 ppm isobutylene
Turbidity	Prior to use – daily, and as needed in the field	10 NTU, 200 NTU

Note: mS/cm = millisiemens per centimeter
NTU = Nephelometric Turbidity Units
ppm = parts per million

TABLE 4

FIELD MEASUREMENT QUALITY CONTROL OBJECTIVES

Field Parameter	Precision	Accuracy
Water Temperature	± 1°C	± 1°C (instrument capability)
pH	± 0.1 pH Standard Unit	± 0.1 pH Standard Unit (instrument capability)
Conductivity	± 1 mS/cm	±5% standard
Dissolved Oxygen	± 0.02 mg/L	±5%
Turbidity	± 1.0 NTU	±2% standard
Water Level	± 0.01 foot	±0.01 foot

Note: Precision units presented in applicable significant figures.
mS/cm = millisSiemens per centimeter
ppm = parts per million
mg/L = mg/liter
NTU = Nephelometric Turbidity Units

TABLE 5

PREVENTATIVE MAINTENANCE SUMMARY

Maintenance	Frequency
Conductivity, pH, Dissolved Oxygen Meters	
Store in protective casing	D
Inspect equipment before and after use	D
Clean probes	D
Keep logbook in instrument	D
Have replacement meter available	D
Replace probes	X
Return to manufacturer for service	X
Calibration	D
Turbidity Meter	
Store in protective casing	D
Inspect equipment before and after use	D
Clean sample cells	D and X
Clean lens	M and X
Check and recharge batteries	D
Keep logbook in instrument	D
Have replacement meter available	D
Return to manufacturer for service	X
Calibration	D
Thermometer	
Store in protective casing	D
Inspect equipment before and after use	D
Have replacement thermometer available	D
Water-level Meter	
Store in protective covering	D
Inspect equipment before and after use	D
Check indicators/batteries	D
Keep logbook on instrument	D
Have replacement meter available	D
Photoionization Detector	
Store in protective casing	D
Inspect equipment before and after use	D
Check and recharge batteries	D
Clean ultraviolet lamp and ion chamber	M and X
Keep logbook in instrument	D
Have replacement meter available	D
Return to manufacturer for service	X
Calibration	D

Note: D = Daily. M = Monthly. X = Operator’s discretion/as needed.

APPENDIX A

STANDARD OPERATING PROCEDURES
for
SAMPLE HANDLING and FIELD SCREENING

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Sample Handling

SOP #106

Revision Date: August 8, 2019

LIST OF REVISIONS

Date	Summary of Changes	Approval
	Original document preparation	
8/2019	Multiple revisions throughout document	Gail L. Batchelder, Ph.D.

Reviewed by:

Technical Director/
Quality Assurance Officer

Gail L. Batchelder
Gail L. Batchelder, Ph.D., P.G., L.E.P.

August 8, 2019
Date

Vice President/
Practice Leader - Environmental:

Scot Kuhn, P.G., L.E.P.

August 8, 2019
Date

TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 CONTAINERS 2

2.1 Soils and Unconsolidated Materials 2
2.2 Liquids 2
2.3 Gasses 2

3.0 PRESERVATION 3

3.1 Refrigeration 3
3.2 pH Adjustment and Other Preservatives 3
3.3 Holding Times 3

4.0 SAMPLE COLLECTION AND PREPARATION 4

4.1 Filtration 4
4.2 Compositing 5
4.3 Chain-of-Custody Procedures 5
4.3.1 Chain-of-Custody Form 5
4.3.2 Sample Labeling Nomenclature 5
4.3.3 Delivery/Receipt Procedures 6

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) 7

5.1 Blanks 7
5.2 Duplicates 7

6.0 REFERENCES 8

ATTACHMENT

Attachment A Representative Chain-of-Custody Form

1.0 INTRODUCTION

This SOP identifies the containers, preservatives, sample preparation, chain-of-custody procedures, and QA/QC procedures associated with the various types of samples collected and analyzed by HRP.

Equipment:	This SOP deals primarily with methods requiring no equipment other than sample containers.
Documentation:	Field notebook and map or field work sheets to detail location of sampling points and relevant information related to sample collection. Chain-of-custody form for each sample delivery group.

2.0 CONTAINERS

2.1 Soils and Unconsolidated Materials

Samples of soil and other unconsolidated materials will be collected into wide-mouth glass jars with tightly fitting lids, or other appropriate container based on the analyses to be conducted. Specific information related to the appropriate container can be found in the project-specific Quality Assurance Project Plan (QAPP) and/or work plan. Sample containers to be submitted directly to the laboratory should be filled to the extent possible to eliminate any headspace and to ensure that sufficient sample is available for all analyses to be performed, although filling the jar completely is not required if that amount of soil is not needed to accomplish the project objectives for analyses to be performed.

However, for those samples for which analysis for volatile organic compounds (VOCs) will be conducted, EPA Method 5035A methods for sample collection and preservation will be used. Those methods are described in detail in HRP SOP #105 *Soil Sample Collection for VOC Analysis*. For such samples, 40-milliliter (ml) vials are obtained in advance from the laboratory filled with the appropriate amount of methanol and/or sodium bisulfate, and the vials are filled with the appropriate amount of soil specified by the SOP or the laboratory (if different).

2.2 Liquids

Several types of containers are available for liquid samples. The type(s) of container to be used are determined by the analyses to be performed and the nature and chemical properties of the liquid. Another factor that influences the type of container used for storage and transport of liquids is the sample volume requirements for the specific analyses to be performed. For example, oil samples may be contained in wide-mouth glass jars, similar to containers used for unconsolidated samples. Since samples collected for VOC analysis may undergo a loss of volatile constituents, vials used for water samples collected for subsequent VOC analysis must be fitted with Teflon™ septa and must be overfilled before closing to ensure that no headspace (air) is present in the vial. Other constituents may be subject to photochemical degradation and thus require collection into amber glass containers. Preservatives that must be used for liquid samples are specific to the nature and chemical properties of the specific analytes for which analysis is to be conducted. Information on sample collection requirements are provided in the QAPP and/or project-specific work plan.

2.3 Gasses

Gasses are intrinsically mobile and must be contained in fully-enclosed containers. The following types of container are available: Tedlar™ bags and glass bulbs with Teflon™ septa to allow insertion of hypodermic syringes. Summa® canisters are also typically used, especially for sub-slab soil vapor samples and indoor air samples that are used to evaluate vapor intrusion. Specifications for sample collection devices for gas samples should be selected based on data quality objectives for the project and will be specified in the project-specific QAPP and work plan.

3.0 PRESERVATION

Preservation requirements are provided in the QAPP and/or site-specific work plan that is developed for a project. Should there be any questions regarding preservation of samples, the analytical laboratory should be contacted or the most current update of EPA SW-846 should be consulted.

3.1 Refrigeration

Samples which do not require refrigeration are: oil samples; gaseous samples; and water samples to be analyzed only for metals. All other samples must be kept cool (ideally at 4°C ± 2°C) until delivery to the lab for analysis. Soil samples intended for VOC analysis should be preserved and otherwise managed in accordance with HRP SOP # 105.

Samples must not be allowed to freeze in cold weather. The jars/vials could break and the samples will be lost. Storage and transport containers and modes of transport must take the potential for freezing into account.

3.2 pH Adjustment and Other Preservatives

The pH of water samples should be adjusted in the field, as necessary, using the preservatives which are specified in the QAPP and/or site-specific work plan or the most recent SW-846 promulgated method for the requisite analytical parameter. Questions on preservatives should be directed to the analytical testing laboratory.

Gaseous samples do not require preservatives or pH-adjusting compounds to be added. In general, samples of unconsolidated material (soil, concrete, sediment) or sludge do not require the addition of a preservative. The exception is analysis for VOCs, in which case soil and sediment samples should be collected using EPA Method 5035A. These samples should be collected in vials pre-preserved with methanol and/or sodium bisulfate. The soil/preservative ratio should be indicated on the sampling container prior to sample collection or obtained directly from the testing laboratory. Additional detail on sample collection for subsequent VOC analysis is provided in HRP's SOP #105, as noted in Section 2.1.

3.3 Holding Times

Holding times for various parameters are specifically indicated in the most recent EPA SW-846 promulgated method for the requisite analytical parameter. Questions on holding times should be directed to the analytical laboratory. Additional information regarding sampling containers, preservation, and holding times will be made available in the QAPP and/or site-specific work plan.

4.0 SAMPLE COLLECTION AND PREPARATION

Samples will collected into appropriate, laboratory-supplied containers recommended for the media and analytical methods, as indicated in Section 2.0, and other relevant documents, such as the QAPP and site-specific work plan.

4.1 Filtration

Groundwater samples should not be filtered prior to analysis, except as allowed in accordance with regulatory guidance. The appropriateness of filtration for water samples and filter size is based on a number of factors, including objectives for the sampling effort, data quality objectives for the project, and regulatory considerations related to filtration of water samples. The need for filtration of groundwater samples must be discussed in the project-specific work plan, and the discussion must include the rationale for collection of filtered groundwater samples, as well as the procedures that would be used for collection of the filtered samples. Unless specifically indicated otherwise in a project-specific work plan (and the rationale for such a decision must be provided), an unfiltered sample should always be collected for analysis in addition to the filtered sample.

Whenever possible, an in-line filter should be used to filter groundwater samples as the water is withdrawn from the well. The selection of which, if any, filter should be used depends on the data quality objectives for the project and will be specified in the QAPP and/or site-specific work plan. A 0.45-micron filter is used for samples for which the objective is to obtain results for dissolved constituents (usually metals). A 10-micron filter is used to distinguish analytical results for dissolved plus colloidal constituents vs. analytical results that include constituents that might be absorbed onto fine-grained particles that are present in the water sample.

In some cases, water samples other than groundwater samples must be filtered in the field prior to sample collection into appropriate sampling bottles. To accomplish this, a sample of the water to be filtered is collected into a clean container with sufficient volume to fill all sampling containers for which a filtered sample is necessary. If electric power is unavailable, battery packs are required to operate the peristaltic pump. A ring stand with clamp to hold the in-line filter is optional but may be useful.

The procedure for filtration of water samples from a source other than a monitoring well is as follows:

- A sufficient length of new Tygon™ tubing (or tubing of other appropriate inert material) is inserted into a peristaltic pump.
- The input end of the tubing is then inserted into the unfiltered water sample, and an in-line filter (0.45-micron or 10-micron filter, as appropriate, depending on the objective for the sampling event) is inserted into the output end of the tubing.
- An additional length of tubing is connected to the other end of the in-line filter to better direct the filtered water into the sample bottle(s). The flow direction shown on the filter must match the actual flow direction.
- Once the in-line filter is placed over the sample container, the pump is then turned on and run until sample collection is complete.

As noted above for filtration of groundwater samples from monitoring wells, the selection of which, if any, filter should be used depends on the data quality objectives for the project and will be specified in the QAPP and/or site-specific work plan.

4.2 Compositing

Compositing of samples for investigation purposes is strongly discouraged. Therefore, compositing of soil or water should only be performed if specifically indicated in the project-specific work plan, and the specific rationale and approach to compositing should be clearly described in that document.

However, compositing of similar materials for the purposes of obtaining waste disposition approvals is generally acceptable, and often required. Careful consideration should be given to the objectives of the sampling before collection of any composite sample is performed.

Those soil samples to be analyzed for non-volatile parameters may be mixed in any convenient, clean container. Soil samples to be analyzed for volatile organic compounds should not be composited.

For waste oil and other wastes, only those of similar appearance (color, viscosity, suspended material, odor if determined) should be composited. Liquid samples may be composited by pouring the appropriate percentages into the sample container to be sent to the laboratory.

4.3 Chain-of-Custody Procedures

4.3.1 Chain-of-Custody Form

A copy of a representative chain-of-custody form is provided in Attachment A. The sampler must fill in all relevant information as indicated on the form, including the "laboratory preparation" section. Any preparation required should be indicated on the form. The sampler must sign the form in the space indicated, including data and time of transfer, when relinquishing samples to another individual or to the laboratory. Each successive handler of the samples must also sign the form with data and time when relinquishing samples, and the receiving entity must acknowledge receipt.

4.3.2 Sample Labeling Nomenclature

Samples shall be labeled with the following information:

- Date
- HRP
- HRP Job #
- Sample identification. Samples from test borings must have, in addition to the test boring identification, the depth from which the sample was retrieved.
- Special labeling requirements may also be required for certain jobs. These requirements should be detailed in the QAPP and/or project-specific work plan.

4.3.3 Delivery/Receipt Procedures

As noted above, the chain-of-custody forms must be signed by both the person delivering the samples and the person receiving them. The time and date of transfer must be indicated.

5.0 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

5.1 Blanks

Field, trip, and equipment blanks are slightly different from one another. For preparation of an equipment blank, an appropriate blank material (deionized water) is brought in contact with the pre-cleaned sampling tools used for "real" samples. Equipment blanks, in theory, indicate whether the sampling equipment has been properly decontaminated. Field blanks are prepared by carrying the blank material to the sampling site and placing it in appropriate containers. Field blanks are used to determine whether airborne contamination is present at the sampling site. Field blanks are collected only when airborne contamination is suspected. Trip blanks are prepared at the analytical laboratory and transported to the site in sealed containers. They are used to evaluate the potential for contamination that may be attributed to shipping and handling procedures. Temperature blanks are prepared prior to sampling. They document the temperature preservation of samples upon receipt at the laboratory.

Blank samples are typically used for quality control and quality assurance. They provide qualitative information concerning contamination, handling and shipping procedures which may affect the quality of data that is collected. The rate at which blank samples are collected depends on the DQOs established for the project, but are typically prepared at a rate of 5% (i.e., 1 per 20 samples). For VOC analyses, trip blanks are prepared at a rate of 1 per shipping container in which samples for VOC analysis are transported. In some cases, blank samples may be collected at a rate of 1 per day if less than 20 samples have been collected. A group of samples that are transported together generally constitutes the sample delivery group (SDG). Specific requirements for collection of blank samples should be provided in the project-specific QAPP and work plan.

Water: Water for blanks shall consist of analyte-free water. The blank sample should be collected in the same kind of container used for the other water samples. Blank samples should be given plausible "well" identifications such as "MW-28". Trip blanks are typically analyzed only for VOCs. Analysis of equipment and field blanks are generally determined on a site-by-site basis or as specified in a site-specific work plan or QAPP.

Soil: Due to difficulties in preparing representative samples, blanks comprised of soil are uncommon.

5.2 Duplicates

True duplicates of samples cannot really be obtained, but replicate samples (which are commonly referred to as “duplicates”) should be collected as near as possible, both in time as well as space, to their principal samples. Depending on project objectives, sampling identification may indicate to the laboratory that the sample is a duplicate of another sample or the sample may be submitted to the laboratory as a “blind duplicate,” i.e., with no indication in the sample identifier that the sample is a duplicate or replicate of another sample.

Information regarding the collection of duplicate samples will be specified in the QAPP and/or project-specific work plan.

6.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC). 2010. *DER-10, Technical Guidance for Site Investigation and Remediation*, Division of Environmental Remediation. May 2010.

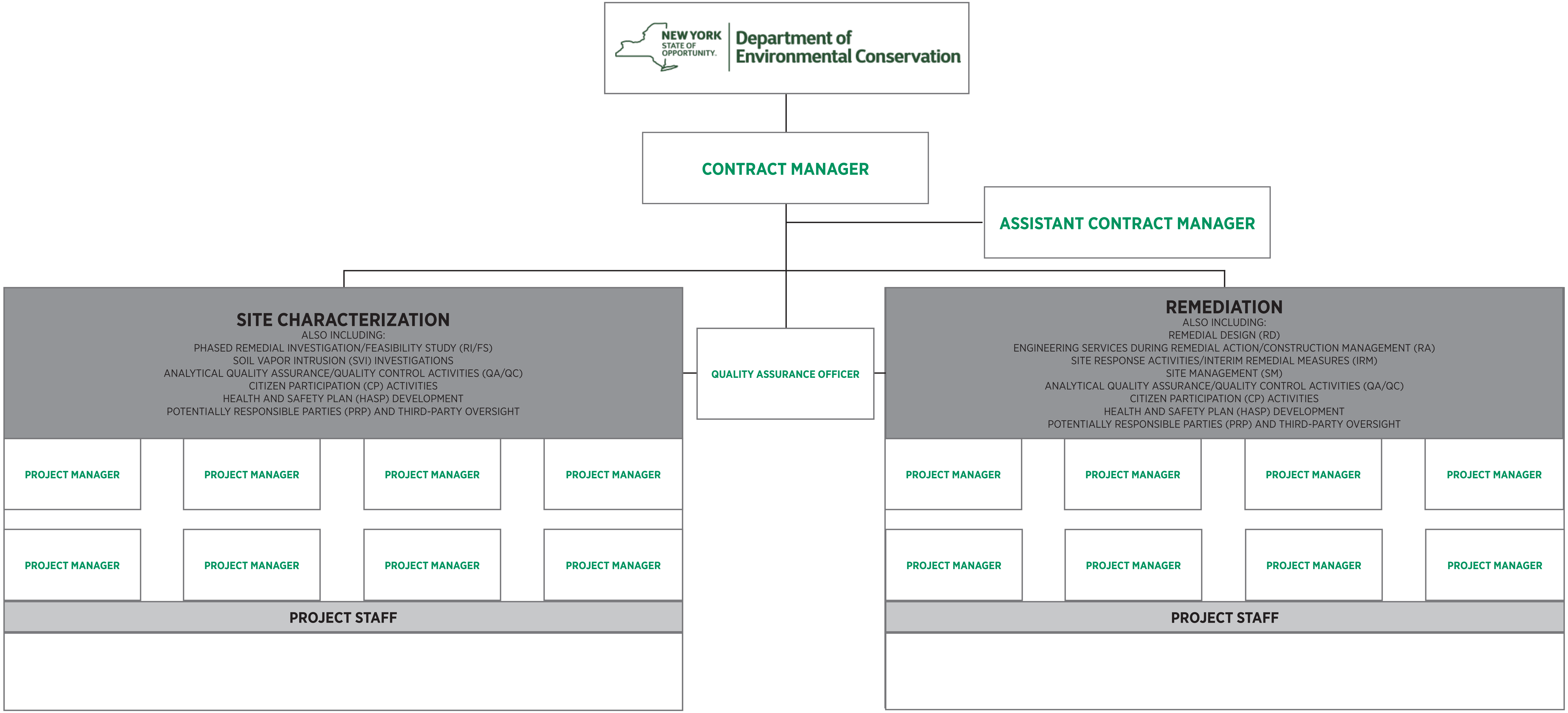
NYSDEC, Technical Procedure Guidance, Quality Assurance/Quality Control Procedures, *Spill Guidance Manual*, Section 2.4.

USEPA. 2015*. Standard Operating Procedure - Sample Receiving, Handling, and Storage,* SERAS SOP No. 1008, Rev. 2.1, Scientific, Engineering, Response and Analytical Services, December 9, 2015*.*

FIGURE

FIGURE 1

REPRESENTATIVE ORGANIZATION CHART



NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

CONTRACT MANAGER

ASSISTANT CONTRACT MANAGER

QUALITY ASSURANCE OFFICER

SITE CHARACTERIZATION

ALSO INCLUDING:
PHASED REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)
SOIL VAPOR INTRUSION (SVI) INVESTIGATIONS
ANALYTICAL QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES (QA/QC)
CITIZEN PARTICIPATION (CP) ACTIVITIES
HEALTH AND SAFETY PLAN (HASP) DEVELOPMENT
POTENTIALLY RESPONSIBLE PARTIES (PRP) AND THIRD-PARTY OVERSIGHT

PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER
PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER

PROJECT STAFF

REMEDIATION

ALSO INCLUDING:
REMEDIAL DESIGN (RD)
ENGINEERING SERVICES DURING REMEDIAL ACTION/CONSTRUCTION MANAGEMENT (RA)
SITE RESPONSE ACTIVITIES/INTERIM REMEDIAL MEASURES (IRM)
SITE MANAGEMENT (SM)
ANALYTICAL QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES (QA/QC)
CITIZEN PARTICIPATION (CP) ACTIVITIES
HEALTH AND SAFETY PLAN (HASP) DEVELOPMENT
POTENTIALLY RESPONSIBLE PARTIES (PRP) AND THIRD-PARTY OVERSIGHT

PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER
PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER	PROJECT MANAGER

PROJECT STAFF

ATTACHMENT A

Representative Chain-of-Custody Form

con-test ANALYTICAL LABORATORY

Phone: 413-525-2332
Fax: 413-525-6405
Email: info@contestlabs.com

http://www.contestlabs.com

CHAIN OF CUSTODY RECORD

Doc # 381 Rev 1_03242017

39 Spruce Street
East Longmeadow, MA 01028

Page _____ of _____

Company Name:
Address:
Phone:
Project Name:
Project Location:
Project Number:
Project Manager:
Con-Test Quote Name/Number:
Invoice Recipient:
Sampled By:

Requested Turnaround Time

7-Day ☐ 10-Day ☐
Due Date:

Rush-Approval Required

1-Day ☐ 3-Day ☐
2-Day ☐ 4-Day ☐

Data Delivery

Format: PDF ☐ EXCEL ☐
Other:
CLP Like Data Pkg Required: ☐
Email To:
Fax To #:

# of Containers	
[2] Preservation Code	
[3] Container Code	

Dissolved Metals Samples

○ Field Filtered
○ Lab to Filter

Orthophosphate Samples

○ Field Filtered
○ Lab to Filter

ANALYSIS REQUESTED

Con-Test Work Order#	Client Sample ID / Description	Beginning Date/Time	Ending Date/Time	Composite	Grab	[1]Matrix Code	Conc Code

Comments:

Please use the following codes to indicate possible sample concentration within the **Conc Code** column above:
H - High; M - Medium; L - Low; C - Clean; U - Unknown

[1] **Matrix Codes:**
GW = Ground Water
WW = Waste Water
DW = Drinking Water
A = Air
S = Soil
SL = Sludge
SOL = Solid
O = Other (please define)

[2] **Preservation Codes:**
I = Iced
H = HCL
M = Methanol
N = Nitric Acid
S = Sulfuric Acid
B = Sodium Bisulfate
X = Sodium Hydroxide
T = Sodium Thiosulfate
O = Other (please define)

[3] **Container Codes:**
A = Amber Glass
G = Glass
P = Plastic
ST = Sterile
V = Vial
S = Summa Canister
T = Tedlar Bag
O = Other (please define)

Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:
Relinquished by: (signature)	Date/Time:
Received by: (signature)	Date/Time:

Detection Limit Requirements

MA:
CT:
Other:

Special Requirements

☐ MA MCP Required
MCP Certification Form Required
☐ CT RCP Required
RCP Certification Form Required
☐ MA State DW Required
PWSID #

con-test® ANALYTICAL LABORATORY
www.contestlabs.com

NELAC and AIHA-LAP, LLC Accredited

Project Entity

☐ Government ☐ Municipality ☐ MWRA ☐ WRTA
☐ Federal ☐ 21 J ☐ School
☐ City ☐ Brownfield ☐ MBTA

Other

☐ Chromatogram
☐ *AIHA-LAP,LLC*

PCB ONLY

☐ Soxhlet
☐ Non Soxhlet

Recommended Containers, Preservation, Storage, & Holding Times For Water, Drinking Water, and Wastewater

Description	Method	Matrix	Sample container	Preservative	Prep/Analysis Holding Time	Volume
Organic Analyses						
EDB, DBCP	504.1	H_2O	40ml Vial Teflon septa	Cool 4^{0}C $Na_2S_2O_3$	14 days	40 ml
GCMS - Volatiles	524.2	H_2O	40ml Vial Teflon septa	Cool 4^{0}C Ascorbic acid & HCL to pH<2	14 days	40 ml
	624, 8260	H_2O	40ml Vial Teflon septa	Cool 4^{0}C HCL to pH<2	14 days	40 ml
GC-Pesticides & PCBs	608	H_2O	Amber Glass Teflon Cap	Cool 4^{0}C NaOH or H_2SO_4 to pH 5-9	7/40 days	1 Liter
GC-Pesticides & PCBs	8081, 8082	H_2O	Amber Glass Teflon Cap	Cool 4^{0}C	7/40 days	1 Liter
GC/MS-Semivolatiles - PAH's Base Neutral/Acid Extractables	625, 8270	H_2O	Amber Glass Teflon Cap	Cool 4^{0}C	7/40 days	1 Liter
Petroleum Hydrocarbons						
Oil & Grease	1664	H_2O	Amber Glass Teflon Cap	Cool 4^{0}C H_2SO_4 to pH<2	28 days	1 Liter
Diesel Range Organics (DRO)	Modified 8015B	H_2O	Glass Teflon Cap	Cool 4^{0}C	7/40 days	1 Liter
Gasoline Range Organics (GRO)	Modified 8015B	H_2O	Glass Teflon Cap	Cool 4^{0}C HCL to pH<2	14 days	40 ml
Total Petroleum Hydrocarbons (TPH) by GC	Modified 8100	H_2O	Glass Teflon Cap	Cool 4^{0}C	7/40 days	1 Liter
MA DEP VPH	98-1	H_2O	40ml Vial Teflon septa	Cool 4^{0}C 3-4 drops of 1:1HCL	14 days	40 ml
MA DEP EPH	97-12	H_2O	Amber Glass Teflon Cap	Cool 4^{0}C 5 ml of 1:1HCL	14/40 days	1 Liter
CT ETPH	CT ETPH	H_2O	Amber Glass Teflon Cap	Cool 4^{0}C	14/40 days	1 Liter
Metals						
ICP/ICPMS Metals	200.7/200.8 6010/6020	H_2O	Plastic / Glass	Cool 4^{0}C HNO_3 to pH<2	6 months	DW-1L WW-250ml
Mercury (Hg)	245.1/7470A	H_2O	Plastic / Glass	Cool 4^{0}C HNO_3 to pH<2	28 days	DW-1L WW-250ml
Chromium VI (Cr^{+6})	SM 3500 Cr D	H_2O	Plastic / Glass	Cool 4^{0}C	24 hours	200 ml
Chromium VI (Cr^{+6})	SW-846 7196A	H_2O	Plastic / Glass *	Cool 4^{0}C	24 hours	200 ml
Inorganic/Wet Chemistry						
Alkalinity	SM 2320B	H_2O	Plastic / Glass *	No Headspace Cool 4^{0}C	14 days	250 ml
BOD	SM 5210B	H_2O	Plastic / Glass	Cool 4^{0}C	48 hours	1 Liter
Chloride	SM 4500 Cl B	H_2O	Plastic / Glass	Not Required	28 days	250 ml
Chlorine, Total Residual	SM4500 Cl G	H_2O	Plastic / Glass	Not Required	Analyze immediately	250 ml
COD	410.4/Hach 8000	H_2O	Plastic / Glass	Cool 4^{0}C H_2SO_4 to pH<2	28 days	250 ml
Coliform, Fecal	SM 9222D	H_2O	Sterile Plastic	Cool 4^{0}C	6 hours	100 ml
Coliform, Total	SM 9222B	H_2O	Sterile Plastic	Cool 4^{0}C	30 hours	100 ml
E. Coli confirmation	SM 9222G	H_2O	Sterile Plastic	Cool 4^{0}C	30 hours	100 ml
Heterotropic Plate Count	SM 9215B	H_2O	Sterile Plastic	Cool 4^{0}C	8 hours	100 ml
Inorganic/Wet Chemistry (continued)						
Color	SM 2120B	H_2O	Sterile Plastic	Cool 4^{0}C	48 hours	200 ml
Conductance	SM 2510B	H_2O	Plastic / Glass	Cool 4^{0}C	28 days	100 ml
Cyanide, Amenable	SM4500 Cn-C,E	H_2O	Amber Glass	Cool 4^{0}C NaOH to pH>12	14 days	500 ml
Cyanide, Free	SM4500 Cn-C,E	H_2O	Plastic / Glass	Cool 4^{0}C NaOH to pH>12	14 days	500 ml
Cyanide, Total	SM4500 Cn-C,E	H_2O	Plastic / Glass	Cool 4^{0}C NaOH to pH>12	14 days	500 ml
Flashpoint	SW 846 1010	H_2O	Plastic / Glass	Cool 4^{0}C	ASAP	50 ml
Flouride (drinking water)	SM 4500F-C	H_2O	Plastic / Glass	Not Required	28 days	200 ml
Hardness	SM 2340C	H_2O	Plastic / Glass	Cool 4^{0}C	6 months	250 ml
MBAS (Surfactants)	SM5540C	H_2O	Plastic / Glass	Cool 4^{0}C	48 hours	250 ml
Nitrogen, Ammonia	SM 4500 NH3C	H_2O	Plastic / Glass	Cool 4^{0}C H_2SO_4 to pH<2	28 days	250 ml
Nitrogen, Total Kjeldahl	SM 4500-N Org B, C,	H_2O	Plastic / Glass	Cool 4^{0}C H_2SO_4 to pH<2	28 days	500 ml
Nitrogen, Nitrate	SM 4500 NO3 F	H_2O	Plastic / Glass	Cool 4^{0}C H_2SO_4 to pH<2	48 hours / 28 days preserved	250 ml
Nitrogen, Nitrite	SM 4500 NO2 B	H_2O	Plastic / Glass	Cool 4^0 C	48 hours	100 ml
Nitrogen, Nitrate + Nitrite	SM 4500 NO3 F	H_2O	Plastic / Glass	Cool 4^0 C H_2SO_4 to pH<2	48 hours / 28 days preserved	100 ml
Odor	SM 2150B	H_2O	Plastic / Glass	Cool 4^{0}C	24 hours	500 ml
Orthophosphate	SM 4500 P E	H_2O	Plastic / Glass	Cool 4^{0}C	48 hours	100 ml
Oxygen, Dissolved	SM 4500 O-C1 SM S210B	H_2O	Plastic / Glass with glass top	Cool 4^{0}C	Analyze immediately	300 ml
pH, Hydrogen ion	SM 4500 H-B	H_2O	Plastic / Glass	Not Required	Analyze immediately	25 ml
Phenolics	420.1	H_2O	Plastic / Glass	Cool 4^{0}C H_2SO_4 to pH<2	28 days	1 Liter
Phosphorous, Total	SM4500P-E	H_2O	Plastic / Glass	Cool 4^{0}C H_2SO_4 to pH<2	28 days	500 ml
Total Dissolved Solids (TDS)	SM 2540C	H_2O	Plastic / Glass	Cool 4^{0}C	7 days	300 ml
Total Suspended Solids (TSS)	SM 2540D	H_2O	Plastic / Glass	Cool 4^{0}C	7 days	300 ml
Settleable Solids	SM 2540 F	H_2O	Plastic / Glass	Cool 4^{0}C	48 hours	1 Liter
Sulfate	ASTM DS16-90	H_2O	Plastic / Glass	Cool 4^{0}C	28 days	300 ml
Sulfide	SM 4500 S2,E	H_2O	Plastic / Glass with Glass top	Cool 4^{0}C NaOH to pH>9 2N Zn Acetate	Analyze immediately	500 ml
Sulfite	377.1 / SM 4500 SO3	H_2O	Plastic / Glass	Not Required	Analyze immediately	100 ml
Total Organic Carbon (TOC)	SM S310B	H_2O	Amber Glass Teflon Cap	Cool 4^{0}C HCL to pH<2	28 days	100 ml
Turbidity	180.1 / SM 2130 B	H_2O	Plastic / Glass	Cool 4^{0}C	48 hours	100 ml

Recommended Containers, Preservation, Storage, & Holding Times For Soil, Solids, and Other Wastes

Description	Method	Matrix	Sample container	Preservative	Prep/Analysis Holding Time	Volume
Organic Analyses						
GCMS - Volatiles	8260B	Soil/Waste	Glass w/ Teflon Septa	Cool 4^{0}C 15 ml CH_3OH or 5 ml NaHSO4 5 or ml DI H_2O	14 days	15g or 5g or 5g
GC-Pestacides & PCBs	8081A/8082	Soil/Waste	Glass w/ Teflon Septa	Cool 4^{0}C	14/40 days	100 g or 8oz Jar
GC/MS-Semivolatiles - PAH's Base Neutral/Acid Extractables	8270C	Soil/Waste	Glass w/ Teflon Septa	Cool 4^{0}C	14/40 days	100 g or 8oz Jar
Petroleum Hydrocarbons						
Diesel Range Organics (DRO)	Modified 8015B	Soil	Glass w/ Teflon Septa	Cool 4^{0}C	14/40 days	100 g or 8oz Jar
Gasoline Range Organics (GRO)	Modified 8015B	Soil	Glass w/ Teflon Septa	Cool 4^{0}C 15 ml CH_3OH	14 days	15 grams
Total Petroleum Hydrocarbons (TPH) by GC	Modified 8100	Soil	Glass w/ Teflon Septa	Cool 4^{0}C	14/40 days	100 g or 8oz Jar
MA DEP VPH	98-1	Soil	40ml Vial Teflon septa	Cool 4^{0}C 15 ml CH_3OH	14 days	15 grams
MA DEP EPH	97-12	Soil	Amber Glass Teflon Cap	Cool 4^{0}C	14/40 days	100 g or 8oz Jar
CT ETPH	CT ETPH	Soil	Glass w/ Teflon Septa	Cool 4^{0}C	14/40 days	100 g or 8oz Jar
Metals						
ICP Metals	6010	Soil	Plastic / Glass	Cool 4^{0}C	6 months	100 g or 8oz Jar
Chromium VI (Cr^{+6})	SW-846 7196A	Soil	Plastic / Glass *	Cool 4^{0}C	24 hours	(2) - 2oz Jars
Mercury (Hg)	7471	Soil	Plastic / Glass	Cool 4^{0}C	28 days	100 g or 8oz Jar
Inorganic/Wet Chemistry						
General Inorganics	9000 Series	Soil	Glass Teflon Cap	Cool 4^{0}C	See Table 1.	100 g or 8oz Jar
Flashpoint/Ignitibility	1010	Soil	Glass Teflon Cap	Cool 4^{0}C	ASAP	100 g or 8oz Jar
pH/Corrosivity	9045C	Soil/Waste	Plastic / Glass	Cool 4^{0}C	ASAP	100 g or 2oz Jar
Reactivity	SW 846 (7.3)	Soil/Waste	Plastic / Glass	Cool 4^{0}C	ASAP	100 g or 8oz Jar
TCLP/SPLP	1311/1312	Soil/Waste	Glass Teflon Cap	Cool 4^{0}C	Varied	500g or 32 oz Jar
TCLP/SPLP	1311/1312	Soil/Waste	Glass Teflon Cap	Cool 4^{0}C	Varied	500g or 32 oz Jar

* Requires It's own container

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con-test®
ANALYTICAL LABORATORY

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
for

Field Screening

SOP #108

Revision Date: August 8, 2019

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August 8, 2019
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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 FIELD SCREENING PHYSICAL METHODS 2

- 2.1 Visual Observations 2
- 2.2 Olfactory Observation 2

3.0 NON-AQUEOUS PHASE LIQUID (NAPL) DETERMINATION KITS (SOILS) 3

4.0 FIELD INSTRUMENT SCREENING 4

- 4.1 Photoionization Detector (PID) 4
  - 4.1.1 Specific Equipment List 4
  - 4.1.2 Documentation 4
  - 4.1.3 Procedure 4
- 4.2 Gas Chromatograph 5
  - 4.2.1 Specific Equipment List 5
  - 4.2.2 Documentation 5
  - 4.2.3 Procedure 5
- 4.3 Specific Conductance, pH, Dissolved Oxygen, Oxidation/reduction Potential 7
  - 4.3.1 Specific Conductance 7
    - 4.3.1.1. Specific Equipment List 7
    - 4.3.1.2. Procedure 7
  - 4.3.2 pH 8
    - 4.3.2.1. Specific Equipment List 8
    - 4.3.2.2. Procedure 8
  - 4.3.3 Dissolved Oxygen Meter 8
    - 4.3.3.1. Specific Equipment List 8
    - 4.3.3.2. Procedure 8
  - 4.3.4 Oxidation/reduction Potential 8
    - 4.3.4.1. Specific Equipment List 8
    - 4.3.4.2. Procedure 9
- 4.4 Turbidity 9
  - 4.4.1 Specific Equipment List 9
  - 4.4.2 Procedure 9

5.0 EQUIPMENT CALIBRATION METHODS 10

- 5.1 Photoionization Detector (PID) 10
- 5.2 Temperature/Conductance Meter 10
- 5.3 pH Meter 11
- 5.4 Dissolved Oxygen Meter 11
- 5.5 Equipment Deficiency/Operational Status Reporting 11

6.0 PREVENTATIVE MAINTENANCE 12
6.1 Routine Maintenance 12
6.2 Documentation 12
6.3 Contingency 12
7.0 REFERENCES FOR FIELD SCREENING METHODS 13

1.0 INTRODUCTION

This SOP identifies the general procedures to be used for screening of soil and water samples during the performance of field activities. Field-screening procedures include use of tool, instrument, or technique that results in the collection of real-time or near real-time environmental data.

Equipment:	Equipment used for field screening varies by the type of screening to be performed. The types of equipment needed for each field screening technique are identified in the specific sections of this SOP associated with the individual types of field screening procedures.
Documentation:	Field notebook, map, and/or field work sheets, including geologic boring logs, to detail location of sampling points and relevant information related to sample collection and field screening measurements.

This SOP has been prepared to describe standard procedures that will be used in most cases during the performance of field screening activities. However, nothing in this standard operating procedure is intended to preclude the application of sound professional judgement during the performance of field activities. Should situations arise that require alternative procedures to those described herein in order to accomplish overall project objectives or to meet data quality objectives, field personnel should document the rationale for changes to the standard procedures in the field paperwork and describes the procedures that were followed instead. In some cases, the need for changes to standard protocols may be recognized ahead of time, in which case, the procedures to be followed should be described in project-specific work plans or work instructions.

Similarly, the procedures described herein are not intended to conflict with any specific federal, state, or local statutes, regulations, guidance, protocols, or specific instructions of a regulatory authority. If changes to the SOP are needed, such changes should be identified in project-specific work plans or other similar document that will be maintained in the project record.

2.0 FIELD SCREENING PHYSICAL METHODS

2.1 Visual Observations

Visual observations of samples being collected during environmental investigations can be an important tool in understanding the hydrogeology and/or geochemistry at and in the vicinity of the location where the sample was collected and provide useful information for development of the conceptual site model and selection of individual samples for subsequent laboratory analysis. Therefore, detailed descriptions of soil and water characteristics are considered to be an important component of field screening procedures.

For soil, observations should include such characteristics as color, texture and grain-size distribution, relative moisture content, and relative density. Characterization of soil samples should be recorded in the field on geologic boring logs for soil samples collected from soil borings. Descriptions of soil samples for other collection methods should be recorded on appropriate field paperwork designated for that purpose.

Visual observations should be in accordance with one or more standard protocols for visual identification of soil samples based on grain-size distribution and physical characteristics of the soil sample. Specifically, soil descriptions and classifications should be performed in accordance with ASTM Standard D2488-17, *Practice for Description and Identification of Soils (Visual-Manual Procedure)* and ASTM Standard D2487-17*, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System),* and/or HRP's SOP #103 *Soil Logging Using a Modified Burmister Classification System,* as appropriate based on the data quality objectives for the project and any regulatory requirements or guidance.

For water, the sampler should record such observations as color; turbidity; and amount, nature, and color of any suspended material as settling occurs. If a sheen or separate-phase non-aqueous-phase liquid (NAPL) is observed, that should be noted, and the nature of the observation with respect to color, general appearance, and density relative to the water sample (i.e., whether the separate-phase accumulates at the top of a container of the water or at the bottom), which would indicate whether the separate-phase liquid is light NAPL (LNAPL) or dense NAPL (DNAPL).

2.2 Olfactory Observation

Olfactory observations should be noted only if odors are evident in ambient air conditions. Under no circumstances are personnel allowed to directly smell samples from containers. Only if the nature of the odor is clearly recognizable as attributable to a certain type of chemical (such as petroleum product or chlorinated solvent, for example), is it permissible to record that aspect of the olfactory observation on the field boring log or in field notes.

3.0 NON-AQUEOUS-PHASE LIQUID (NAPL) DETERMINATION KITS (SOILS)

Where NAPL is suspected based upon historical site knowledge or elevated screening levels for volatile organic compounds, project-specific DQOs for data collection may include an evaluation of the presence NAPL in the field. Commercial NAPL detection/screening products will be used by HRP personnel. In all cases, manufacturer's instructions will be followed. Non-Sudan IV based dyes will be preferentially selected as a non-toxic, hydrophobic indicator of the presence NAPL. Sudan IV based dyes should not be selected unless specifically required by a state of federal agency, due to the recent determination that Sudan IV dye is a mutagen. The limitations of the specific products selected should be well understood prior to use, and it should be recognized that any product is more likely to yield a false-negative result than a false-positive result, so information gained during field screening for the presence of NAPL must be reviewed in conjunction with other data available for each sample and for the investigation area as a whole.

Personal protective equipment (PPE) should be donned and maintained in accordance with the site-specific work plan and/or health and safety plan during the sampling and screening procedures. In the event that no PPE has been specified for a particular sampling event, disposable latex gloves should be donned, at a minimum, during all sampling procedures. Gloves must be changed after each individual sample collection event.

Sampling/screening equipment will be largely determined by manufacturer's instructions. Commercial test kits may consist of pre-measured dye packets that are enclosed in clean sampling cups. Specified quantities of soils are emplaced in the sampling cups, taking care not to disturb the dye package. Clean tap water is then added to the container. The container is sealed and shaken vigorously. If NAPL is present at a concentration generally greater than 500 ppm, it will separate from the soils and change color. The color of the NAPL will be dependent on the test kit selected. The sampling kits and soils should be containerized and properly disposed.

4.0 FIELD INSTRUMENT SCREENING

4.1 Photoionization Detector (PID)

PIDs are used during the performance of field activities for general screening of soil, water, or air for the presence of volatile organic compounds (VOCs). The instrument is used only to screen for the presence of total concentrations of VOCs, not for the presence of individual constituents, and not all constituents of interest may be detected by the instrument.

PIDs can only monitor air quality, and no water/soil should be introduced into sample line. This method has limited use in high humidity or in the presence of methane or other compounds that have high ionization potentials. However, performance may be improved by using a vapor trap in PID models that may be equipped with one.

Users should refer to the operation manual for the instrument being used to ensure that electron voltage for the bulb used is appropriate for compounds to be detected. Halogenated alkanes, such as 1,1,1-trichloroethane, or higher molecular weight aromatic compounds traditionally use a higher electron volt bulbs (11.7 ev) due to the increased strength of bonding force of these chemicals. For general screening of matrices, use a 10.6 electron volt bulb as an "all purpose" bulb; but a predetermination of compounds to be detected is helpful before making this decision. Generally, straight-chain hydrocarbon carbons are not ionizable using a PID, and therefore, the presence of those compounds will not be detected by the instrument.

4.1.1 Specific Equipment List

- Photoionization detector
- Sealable plastic/polyethylene bags
- Personal protection equipment
- Calibration gas

4.1.2 Documentation

- Site plan
- Activity log/sample log
- Notebook – sketch pad

4.1.3 Procedure

Following calibration of instrument:

1. Record background reading.
2. Place a small quantity of matrix to be tested into a sealable plastic/polyethylene bag.
3. Let matrix warm to room temperature.
4. Insert probe tip into bag (do not insert probe into matrix).
5. Record reading.

Samples that are wet may give a false positive reading. This effect is present when readings gradually increase with no discernable leveling off. If this effect is observed, the instrument bulb should be cleaned, and the instrument recalibrated, prior to re-testing the sample. If the response persists, the screening results should be noted as suspect. However, to help minimize the effect of moisture on screening results, some PID models may be equipped with a moisture trap to remove at least some of the moisture as the air enters the instrument.

For air monitoring purposes one can either wear the monitor with straps or have monitor in the exclusion zone close and at the breathing zone level. Instrument readings will be recorded through time at intervals specified in the health and safety plan.

For water samples, place approximately 10 milliliters (ml) of water in a non-preserved glass 40 ml VOA vial. Shake vigorously and allow to settle. Open vial and tip cap slightly sideways to allow entrance of instrument probe. Do not insert probe into water, as the instrument pump will draw water into the sample line and to the bulb, which will ruin the instrument and bulb.

4.2 Gas Chromatograph

4.2.1 Specific Equipment List

- Portable gas chromatograph with a pre-column, backflush oven, and PID detector
- Ultra-zero air
- Water standards/blanks
- Syringes

4.2.2 Documentation

- Site plan
- Activity log
- Organic vapor headspace form
- Notebook – sketch pad

4.2.3 Procedure

A portable gas chromatograph with a pre-column, backflush oven, and PID/FID detector is used to analyze the “headspace gas” obtained from each soil sample. The peak amplitudes and retention times obtained from each sample are compared to standard peaks and retention times obtained from prepared in-house standards from a suite of volatile organic compounds expected, or likely, to be present in the media sampled. Based on a comparison of the sample results with the standards, the amounts and types of contaminants in each sample are determined.

The headspace screening is performed on-site in a mobile trailer laboratory, a support vehicle, or in a designated location in a site building. This is an initial semi-quantitative “headspace” screening only and is not a state-certified laboratory analysis performed using standard EPA methods.

“Ultra-zero air” certified to contain less than 0.1 parts per million (ppm) total hydrocarbons is used as the carrier gas. The gas chromatograph’s oven runs isothermally at 40ºC. The total run time for each sample is sufficient to allow analysis of the targeted volatile organics. Both sample and standard injection volumes are recorded to allow direct quantification between standards and unknowns. The carrier gas flow rate is also held constant at approximately 10 cubic centimeters (cc)/minute to assure constant retention times.

During the screening, a Quality Assurance/Quality Control (QA/QC) program is followed. The purpose of the QA/QC program is to assure that any soil contamination detected in the soil samples did not arise from interferences and to provide semi-quantitative basis for sample evaluation.

The QA/QC program consists of a periodic injection of “headspace” gas obtained from water standards and analysis of “blanks”. Calibration standards of specific compounds and a range of concentrations for certain targeted volatile organic compounds will be obtained from a state-certified laboratory or prepared by HRP (determined on a site-specific basis). These standards are injected into the GC, and results for the targeted compounds are then stored in the GC’s “memory” prior to sample collection. Various “blank” analyses were performed to evaluate potential avenues of cross-contamination.

“Blank” analyses consist of:

1. Instrument blanks (no injection) to check the potential for column carry-over and “ultra-zero air” cleanliness;
2. Syringe blanks to check the potential for needle carry-over;
3. Soil sample container blanks to determine container cleanliness (although sample containers are pre-tested for contaminants under a QA/QC program which is completed by the manufacturer of the containers); and
4. Ambient “background” air blanks in both the sample collection and instrument areas to check the potential for cross-contamination from airborne contaminant sources.

All chromatograms are stored on a computer library and are later downloaded to a hard copy. Peak areas are integrated by the GC’s computer by comparison with standards pre-programmed into the library. Preparations containing selected potential site contaminants are generally injected into the GC to “check” retention times on a twice daily basis.

The objectives of the QA/QC program are achieved on the sampling dates when:

1. GC column carry-over is not found to be significantly interfering with any of the analyses;
2. Carry-over syringe contamination is not detected after any sample injection;
3. No interference due to volatile organic contamination is detected in any container blanks (e.g. 40 ml VOA septa soil sampling jar);
4. Ambient air in the sample analysis area and outside the building is not found to be significantly interfering with the soil sample screening results; and
5. The “ultra-zero air” used in the gas chromatograph has no contaminants present before testing.

4.3 Specific Conductance, pH, Dissolved Oxygen, Oxidation/reduction Potential

Screening-level measurements of the standard water-quality parameters of specific conductance, pH, dissolved oxygen (DO), and oxidation/reduction potential (ORP), may be made using stand-alone instruments specific to the parameter being measured, or by combination instruments that measure one or more of the parameters at the same time. The most common type of combination measurement technique currently used is a flow-through cell that is used in conjunction with low-flow groundwater sampling techniques. When using a flow-through cell, measurements are made using specific electrodes within a closed cell as groundwater is pumped from a well at a low flow rate moves through the cell. In contrast, most stand-alone meters require that separate aliquots of water be collected into a container that is exposed to the atmosphere as the electrodes equilibrate in the solution and measurements are recorded.

Although the equipment varies depending on the instrument(s) used, documentation is the same for all types or combinations of instruments. Documentation needs include the following:

- Activity Report
- Notebook
- Monitor Well Data Sheet or field sampling log (for water samples other than groundwater).

In all cases, instruments should be used, calibrated, and maintained in accordance with manufacturer's instructions. Information provided in the following sub-sections is provided as an overview of information related to measurement of specific parameters. Additional, more detailed information can found in the operating manuals for the specific equipment and in the references provided in Section 7.0 of this SOP.

4.3.1 Specific Conductance

Conductivity/salinity meters are used to determine the electrical conductance and salinity of water/wastewater. Values are generally expressed in µmhos/cm or µS/cm (µSiemens/cm).

4.3.1.1. Specific Equipment List

- Instrumentation for measurement of specific conductance (e.g., conductivity/salinity meter, hand-held conductivity meter)
- Calibration solution

4.3.1.2. Procedure

Calibration of the instrument must be performed prior to measurement of specific conductance for individual samples. All calibration procedures and measurements of specific conductance for samples will be conducted in accordance with manufacturer's instructions for the specific instrument being used. Specific conductance readings are affected by temperature, so it is important that the instrument settings are adjusted to take the temperature into account or to ensure that the specific conductance meter uses an automatic temperature compensator.

4.3.2 pH

The pH meter is used for determining the acidity of water and wastewater as expressed in pH units.

4.3.2.1. Specific Equipment List

- Instrumentation used to measure pH (may be a combination meter that measures other parameters or may be a stand-alone, hand-held pH meter).
- Standard pH calibration solutions (pH 4.0, pH 7.0, pH 10.)

4.3.2.2. Procedure

Following calibration procedures, immerse end of probe into liquid sample (an aliquot of sample not used for laboratory analysis). Allow probe to acclimate to sample. Meter will provide digital read-out of pH in standard pH units.

4.3.3 Dissolved Oxygen Meter

The dissolved oxygen (DO) meter is used for determining the dissolved oxygen content in milligrams per liter.

4.3.3.1. Specific Equipment List

- DO Meter
- Potassium chloride (KCl) solution
- Probe membranes

4.3.3.2. Procedure

Following calibration procedures, immerse end of probe into liquid sample (aliquot of sample not used for laboratory analysis). Allow probe to acclimate to sample. Meter will provide a digital read-out in mg/l or %. The probe should be slowly raised and lowered while remaining completely submersed in the sample in order to obtain an accurate reading.

4.3.4 Oxidation/reduction Potential

An oxidation/reduction potential measurement indicates the difference in electric potential between an indicator electrode and an appropriate reference electrode. Oxidation/reduction potential is a useful indicator of the equilibrium oxidation state of a chemical species in the water sample being tested, particularly when evaluated in conjunction with the pH of the solution. ORP is reported in millivolts (mV).

4.3.4.1. Specific Equipment List

- Instrumentation for measurement of ORP (meter, indicator electrode, reference electrode)
- Calibration solution (Zobell solution)

4.3.4.2. Procedure

ORP is temperature dependent, so the meter should have automatic temperature compensation and the probe must be allowed to equilibrate to the ambient temperature of the solution before the measurement is recorded (calibration solution must be at ambient temperature), or a separate temperature measurement must be made and the value measured by the instrument must be corrected based on the recorded temperature of the solution.

In some cases, the instruction manual will indicate that the instrument is calibrated at the factory. If so, the Zobell solution should be used to verify the factory calibration. If the two measurements do not agree, the first step is to use a new Zobell solution. If the measured value still does not agree with the value for the Zobell calibration solution, the instrument will need to be recalibrated by the manufacturer.

4.4 Turbidity

Instruments that measure turbidity measure the difference between the intensity of light scattered by a liquid sample, generally water, compared to the intensity of light scattered by a standard reference suspension. Turbidity measurements indicate the amount of suspended or colloidal material in a water sample, and results may be affected by the color of the water sample. A turbidity meter (turbidimeter) provides results in nephelometric turbidity units (NTUs).

4.4.1 Specific Equipment List

- Turbidimeter
- Calibration solution (for example, a commercially available polymer primary standards (AMCO-AEPA-1)

4.4.2 Procedure

The calibration standard (or standards if the instrument uses more than one standard) should be allowed to equilibrate to the ambient temperature. Initially, a standard with a low turbidity value (0.0 or 0.02 NTU) should be used to calibrate the instrument in accordance with the manufacturer’s instructions. A 0 NTU standard solution can be prepared by filtering distilled water through a 0.45-micron filter. The instrument should read the standard value to within the specifications of the instrument. If the instrument accepts more than one standard, at least one additional standard at a relatively high turbidity value should be used. If the instrument accepts only one standard, the higher standard should be used as a check standard for the instrument to ensure that the instrument identifies the value of the check standard within the specifications of the instrument.

An important consideration when using a turbidimeter is ensuring that the cuvettes in which the water samples and calibration solution are placed for measurement are free from scratches and that the outside surface are dry and the clarity is not affected by such things as fingerprints or dust. If the cuvette cannot be cleaned, it should be discarded. Therefore, it is important to have a number of cuvettes available for each sampling event.

5.0 EQUIPMENT CALIBRATION METHODS

All field equipment will be calibrated immediately prior to use in the field. The calibration procedures will follow standard manufacturer's instructions or routine HRP procedures to assure that the equipment is functioning within tolerances established by the manufacturer and required by the project. Field personnel will document all instrument calibrations in bound field notebooks and on specific calibration forms. All records generated will be maintained by field personnel and are subject to audit by the Task or Project Manager.

The detailed calibration, operation, and maintenance procedures for field instrumentation routinely used by HRP personnel are specific to manufacturer's instructions. The following sections will briefly summarize these procedures.

Calibration standards and pH buffer solutions used for field instrumentation calibration checks will be obtained from scientific products supply companies (e.g., Fisher Scientific; American Scientific Products, etc.). All buffer and calibration standards obtained will be certified and standardized against or traceable to a reliable primary reference standard. All solutions are stored according to manufacturer's suggestion for optimal shelf-life. Chemical container labels must also include the date received, date opened, as well as the initials of the analyst who first opened the container. Stock solutions will be marked with expiration date and replaced with new solutions when the recommended shelf-life is exceeded.

5.1 Photoionization Detector (PID)

HRP uses several types of PIDs made by different manufacturers. Calibration procedures which are specific to each instrument can be found in the manufacturer's operation manual. The PIDs will be calibrated in the field, under the working temperature conditions where it is to be used. The calibration gas typically used is isobutylene at a concentration of 100 ppm. Calibrations should be recorded in the field notebook and on the calibration log of the Health and Safety Plan. Calibration records should note the date, instrument manufacturer and model, calibration gas and concentration, and operator.

5.2 Temperature/Conductance Meter

Calibration is performed at the start of each sampling day using potassium chloride (KCl) standard solutions. Calibrations are recorded in either a bound field notebook or on field calibration forms. Specific conductance standards are selected to bracket the range of values expected in the samples. If the unit has a calibration adjustment, the meter is calibrated in the same manner as the pH meter. Internal automatic adjustments are made on meters which lack a designated calibration knob. The meter must read within 10 percent of the standard to be considered in control and acceptable.

If the calibration indicates the meter is out of calibration, a backup unit should be employed. Readings from conductivity meters lacking calibration adjustments are limited to checks at the beginning and end of the sampling day. All calibrations may be recorded in a bound field notebook along with conclusions as to the acceptability of readings.

Temperature is measured using a glass thermometer. Field thermometers must be periodically checked against a National Institute of Standards Technology (NIST) thermometer. Acceptance criteria are ±1°C. Any thermometers exceeding these limits should not be used to record temperature readings. The calibration frequencies noted above are the minimum requirements. Additional checks should be performed if the unit experiences harsh conditions or if readings become erratic.

5.3 pH Meter

Calibration is performed at the start of each sampling day using at least two standard calibration solutions which bracket the pH range expected in the samples. Standard calibration solutions are available as pH 4, pH 7, and pH 10. Calibration is recorded in either a bound field notebook or on field calibration forms. Calibration knobs are used to set the meter to read the value of the standard. The meter is then checked during the sampling period, using at least one standard, at a frequency which results in little or no calibration adjustment. If the reading varies by more than one-tenth of a unit between calibration checks, the frequency of the checks must be increased. Temperature and pH must be taken on an aliquot of the sample that is not used for laboratory analysis.

5.4 Dissolved Oxygen Meter

Calibration is performed at the start of each sampling day following instructions in the operation manual. The DO probe uses potassium chloride (KCl) solution contained within a membrane. This membrane and solution should be changed as part of daily calibration procedures. If a bubble is present behind the membrane, if the solution is not present, or if the solution has not been recently changed, accurate DO readings will not be obtained, and the membrane and solution will require replacement. For calibration, place the probe in its storage/calibration chamber within the instrument housing. Using the calibration mode, the instrument is self-calibrating. Calibrations should be recorded in a field notebook or on field calibration forms.

5.5 Equipment Deficiency/Operational Status Reporting

All calibrations will be recorded in a field notebook. These calibration records become part of the individual project files as documentation of the attainment of QA objectives.

6.0 PREVENTATIVE MAINTENANCE

6.1 Routine Maintenance

HRP personnel routinely maintain field equipment for optimal results. All maintenance procedures are documented in control logbooks designated for each piece of equipment. Any field activities involving routine maintenance will be recorded in field logbooks by the individual performing the adjustment of the equipment. Maintenance performed at an authorized repair service will be documented in the maintenance log, including service location, specific repair, and method of transport. Methods of routine maintenance depend on the instrument and manufacturer. The manufacturers' operations manuals will be the primary source of information for these procedures.

6.2 Documentation

Field Services Managers maintain all documentation concerning routine maintenance and non-routine repairs. All pertinent information regarding instrument status is recorded in personnel field log books along with calibration documentation.

6.3 Contingency

In the event that the primary field equipment is inoperable as determined by calibration difficulties, back-up field instruments will be obtained from other sources. These instruments will be calibrated prior to recording data. In no event shall instruments be used to record data unless the performance of the equipment has been documented.

7.0 REFERENCES FOR FIELD SCREENING METHODS

New York State Department of Environmental Conservation (NYSDEC). 2010. "DER-10, Technical Guidance for Site Investigation and Remediation", Division of Environmental Remediation. May 2010.

NYSDEC. Technical Procedural Guidance, Equipment Training, Calibration, and Maintenance, “Spill Guidance Manual” Section 2.2.

USEPA. 2017. “Standard Operating Procedure Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction potential [ORP], and turbidity)”, USEPA, Region 1, Quality Assurance Unit, Revision Number 3, Revised March 23, 2017.

APPENDIX B

TARGET COMPOUND LISTS and CONTRACT-REQUIRED QUANTITATION LIMITS

From: ***NYSDEC ANALYTICAL SERVICE PROTOCOL***
(NYSDEC. 2005. Analytical Service Protocol, July 2005.)

EXHIBIT C

TARGET COMPOUND LISTS (TCLs)

AND

CONTRACT REQUIRED QUANTITATION LIMITS (CRQLs)

PART I - SUPERFUND-CLP ORGANICS
and
PART II - SUPERFUND-CLP INORGANICS

INTRODUCTION

NOTE: *The values in these tables are minimum quantitation limits, not absolute detection limits. The amount of material necessary to produce a detector response that can be identified and reliably quantified is greater than that needed to simply be detected above the background noise. Most of the quantitation limits in these tables are set at the concentrations in the sample equivalent to the concentration of the lowest calibration standard analyzed for each analyte.*

Specific quantitation limits are highly matrix dependent. It is expected that the laboratory make every effort possible to meet the quantitation limits listed herein but it is realized that these limits may not be achievable in all instances.

CRQL values listed on the following pages are based on the analysis of samples according to the specifications given in Exhibit D. Modifications to the sample amounts processed may deviate from those listed in Exhibit D, as long as the limits listed herein can still be achieved.

All CRQL values are rounded to two significant figures.

The term “Solids” is used to denote the following matrices: soil, sediment, sludge, tissue, ash, oil, or mixed phase samples.

CRQL values listed for solids (soil, sediments, etc., except for tissue) are all based on 100% solids content. The quantitation limits calculated by the Laboratory for soil/sediment, calculated on dry weight basis, as required by the Protocol, will be higher. Results for tissue samples should be reported on a wet weight basis, along with their Percent lipid (% Lipid) content.

Changes to the Organic Target Compound Lists (TCLs) (e.g. adding an additional analyte) or lower CRQLs may be requested under the flexibility clause in the contract.

PART I – SUPERFUND-CLP ORGANICS

Volatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples

	Volatile Analyte	CAS Number	Trace Water By SIM (µg/L)	Trace Level Water (µg/L)	Low Level Water (µg/L)
1.	Dichlorodifluoromethane	75-71-8		0.50	5.0
2.	Chloromethane	74-87-3		0.50	5.0
3.	Vinyl Chloride	75-01-4		0.50	5.0
4.	Bromomethane	74-83-9		0.50	5.0
5.	Chloroethane	75-00-3		0.50	5.0
6.	Trichlorofluoromethane	75-69-4		0.50	5.0
7.	1,1-Dichloroethene	75-35-4		0.50	5.0
8.	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1		0.50	5.0
9.	Acetone	67-64-1		5.0	10.0
10.	Carbon Disulfide	75-15-0		0.50	5.0
11.	Methyl Acetate	79-20-9		0.50	5.0
12.	Methylene chloride	75-09-2		0.50	5.0
13.	trans-1,2-Dichloroethene	156-60-5		0.50	5.0
14.	Methyl tert-Butyl Ether	1634-04-4		0.50	5.0
15.	1,1-Dichloroethane	75-34-3		0.50	5.0
16.	cis-1,2-Dichloroethene	156-59-2		0.50	5.0
17.	2-Butanone	78-93-3		5.0	10.0
18.	Bromochloromethane	74-97-5		0.50	5.0
19.	Chloroform	67-66-3		0.50	5.0
20.	1,1,1-Trichloroethane	71-55-6		0.50	5.0
21.	Cyclohexane	110-82-7		0.50	5.0
22.	Carbon tetrachloride	56-23-5		0.50	5.0
23.	Benzene	71-43-2		0.50	5.0
24.	1,2-Dichloroethane	107-06-2		0.50	5.0
25.	1,4-Dioxane	123-91-1	1.0	25	125
26.	Trichloroethane	79-01-6		0.50	5.0

Volatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples (Continued)

	Volatile Analyte	CAS Number	Trace Water By SIM (µg/L)	Trace Level Water (µg/L)	Low Level Water (µg/L)
27.	Methylcyclohexane	108-87-2		0.50	5.0
28.	1,2-Dichloropropane	78-87-5		0.50	5.0
29.	Bromodichloromethane	75-27-4		0.50	5.0
30.	cis-1,3-Dichloropropene	10061-01-5		0.50	5.0
31.	4-methyl-2-pentanone	108-10-1		5.0	10.0
32.	Toluene	108-88-3		0.50	5.0
33.	Trans-1,3-Dichloropropene	10061-02-6		0.50	5.0
34.	1,1,2-Trichloroethane	79-00-5		0.50	5.0
35.	Tetrachloroethene	127-18-4		0.50	5.0
36.	2-Hexanone	591-78-6		5.0	10.0
37.	Dibromochloromethane	124-48-1		0.50	5.0
38.	1,2-Dibromoethane	106-93-4	0.05	0.50	5.0
39.	Chlorobenzene	108-90-7		0.50	5.0
40.	Ethylbenzene	100-41-4		0.50	5.0
41.	Xylenes (Total)	1330-20-7		0.50	5.0
42.	Styrene	100-42-5		0.50	5.0
43.	Bromoform	75-25-2		0.50	5.0
44.	Isopropylbenzene	98-82-8		0.50	5.0
45.	1,1,2,2-Tetrachloroethane	79-34-5		0.50	5.0
46.	1,3-Dichlorobenzene	541-73-1		0.50	5.0
47.	1,4-Dichlorobenzene	106-46-7		0.50	5.0
48.	1,2-Dichlorobenzene	95-50-1		0.50	5.0
49.	1,2-Dibromo-3-chloropropane	96-12-8	0.05	0.50	5.0
50.	1,2,4-Trichlorobenzene	120-82-1		0.50	5.0
51.	1,2,3-Trichlorobenzene	87-61-6		0.50	5.0

Volatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Solid Samples

	Volatile Analyte	CAS Number	Low Level Soil (µg/Kg)	Med. Level Soil (µg/Kg)
1.	Dichlorodifluoromethane	75-71-8	5.0	500
2.	Chloromethane	74-87-3	5.0	500
3.	Vinyl Chloride	75-01-4	5.0	500
4.	Bromomethane	74-83-9	5.0	500
5.	Chloroethane	75-00-3	5.0	500
6.	Trichlorofluoromethane	75-69-4	5.0	500
7.	1,1-Dichloroethene	75-35-4	5.0	500
8.	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	5.0	500
9.	Acetone	67-64-1	10.0	1000
10.	Carbon Disulfide	75-15-0	5.0	500
11.	Methyl Acetate	79-20-9	5.0	500
12.	Methylene chloride	75-09-2	5.0	500
13.	trans-1,2-Dichloroethene	156-60-5	5.0	500
14.	Methyl tert-Butyl Ether	1634-04-4	5.0	500
15.	1,1-Dichloroethane	75-34-3	5.0	500
16.	cis-1,2-Dichloroethene	156-59-2	5.0	500
17.	2-Butanone	78-93-3	10.0	1000
18.	Bromochloromethane	74-97-5	5.0	500
19.	Chloroform	67-66-3	5.0	500
20.	1,1,1-Trichloroethane	71-55-6	5.0	500
21.	Cyclohexane	110-82-7	5.0	500
22.	Carbon tetrachloride	56-23-5	5.0	500
23.	Benzene	71-43-2	5.0	500
24.	1,2-Dichloroethane	107-06-2	5.0	500
25.	1,4-Dioxane	123-91-1	125	12500
26.	Trichloroethane	79-01-6	5.0	500
27.	Methylcyclohexane	108-87-2	5.0	500
28.	1,2-Dichloropropane	78-87-5	5.0	500

Volatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Solid Samples (Continued)

	Volatile Analyte	CAS Number	Low Level Soil (µg/Kg)	Med. Level Soil (µg/Kg)
29.	Bromodichloromethane	75-27-4	5.0	500
30.	cis-1,3-Dichloropropene	10061-01-5	5.0	500
31.	4-methyl-2-pentanone	108-10-1	10.0	1000
32.	Toluene	108-88-3	5.0	500
33.	Trans-1,3-Dichloropropene	10061-02-6	5.0	500
34.	1,1,2-Trichloroethane	79-00-5	5.0	500
35.	Tetrachloroethene	127-18-4	5.0	500
36.	2-Hexanone	591-78-6	10.0	1000
37.	Dibromochloromethane	124-48-1	5.0	500
38.	1,2-Dibromoethane	106-93-4	5.0	500
39.	Chlorobenzene	108-90-7	5.0	500
40.	Ethylbenzene	100-41-4	5.0	500
41.	Xylenes (Total)	1330-20-7	5.0	500
42.	Styrene	100-42-5	5.0	500
43	Bromoform	75-25-2	5.0	500
44.	Isopropylbenzene	98-82-8	5.0	500
45.	1,1,2,2-Tetrachloroethane	79-34-5	5.0	500
46.	1,3-Dichlorobenzene	541-73-1	5.0	500
47.	1,4-Dichlorobenzene	106-46-7	5.0	500
48.	1,2-Dichlorobenzene	95-50-1	5.0	500
49.	1,2-Dibromo-3-chloropropane	96-12-8	5.0	500
50.	1,2,4-Trichlorobenzene	120-82-1	5.0	500
51.	1,2,3-Trichlorobenzene	87-61-6	5.0	500

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples

	Semivolatile Analyte	CAS Number	Low Water By SIM[1] (µg/L)	Water (µg/L)
1.	Benzaldehyde	100-52-7		5.0
2.	Phenol	108-95-2	0.10	5.0
3.	Bis-(2-chlorothyl) ether	111-44-4		5.0
4.	2-Chlorophenol	95-57-8	0.10	5.0
5.	2-Methylphenol	95-48-7	0.10	5.0
6.	2,2'-Oxybis (1-chloropropane)[3]	108-60-1		5.0
7.	Acetophenone	98-86-2		5.0
8.	4-Methylphenol	106-44-5	0.10	5.0
9.	N-Nitroso-di-n-propylamine	621-64-7		5.0
10.	Hexachloroethane	67-72-1		5.0
11.	Nitrobenzene	98-95-3		5.0
12.	Isophorone	78-59-1		5.0
13.	2-Nitrophenol	88-75-5	0.10	5.0
14.	2,4-Dimethylphenol	105-67-9	0.10	5.0
15.	Bis (2-chloroethoxy) methane	111-91-1		5.0
16.	2,4-Dichlorophenol	120-83-2	0.10	5.0
17.	Naphthalene	91-20-3	0.10	5.0
18.	4-Chloroaniline	106-47-8		5.0
19.	Hexachlorobutadiene	87-68-3		5.0
20.	Caprolactam	105-60-2		5.0
21.	4-Chloro-3-methylphenol	59-50-7	0.10	5.0
22.	2-Methylnaphthalene	91-57-6		5.0
23.	Hexachlorocyclopentadiene	77-47-4		5.0
24.	2,4,6-Trichlorophenol	88-06-2	0.10	5.0
25.	2,4,5-Trichlorophenol[4]	95-95-4	0.20	10.0
26.	1,1'-Biphenyl	92-52-4		5.0
27.	2-Chloronaphthalene	91-58-7		5.0

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples (Continued)

	Semivolatile Analyte	CAS Number	Low Water By SIM[1] (µg/L)	Water (µg/L)
28.	2-Nitroaniline[4]	88-74-4		10.0
29.	Dimethylphthalate	131-11-3		5.0
30.	2,6-Dinitrotoluene	606-20-2		5.0
31.	Acenaphthylene	208-96-8	0.10	5.0
32.	3-Nitroaniline[4]	99-09-2		10.0
33.	Acenaphthene	83-32-9	0.10	5.0
34.	2,4-Dinitrophenol[4]	51-28-5	0.20	10.0
35.	4-Nitrophenol[4]	100-02-7	0.20	10.0
36.	Dibenzofuran	132-64-9		5.0
37.	2,4-Dinitrotoluene	121-14-2		5.0
38.	Diethylphthalate	84-66-2		5.0
39.	Fluorene	86-73-7	0.10	5.0
40.	4-Chlorophenyl-phenyl ether	7005-72-3		5.0
41.	4-Nitroaniline[4]	100-01-6		10.0
42.	4,6-Dinitro-2-methylphenol[4]	534-52-1	0.20	10.0
43.	N-Nitrosodiphenylamine	86-30-6		5.0
44.	1,2,4,5-Tetrachlorobenzene	95-34-3		5.0
45.	4-Bromophenyl-phenylether	101-55-3		5.0
46.	Hexachlorobenzene	100-52-7		5.0
47.	Atrazine	108-95-2	0.10	5.0
48.	Pentachlorophenol	111-44-4	0.20	10.0
49.	Phenanthrene	95-57-8	0.10	5.0
50.	Anthracene	95-48-7	0.10	5.0
51.	Carbazole	108-60-1		5.0
52.	Di-n-butylphthalate	98-86-2		5.0

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Aqueous Samples (Continued)

	Semivolatile Analyte	CAS Number	Low Water By SIM[1] (µg/L)	Water (µg/L)
53.	Fluoroanthene	106-44-5	0.10	5.0
54.	Pyrene	621-64-7		5.0
55.	Butylbenzylphthalate	67-72-1		5.0
56.	3,3'-Dichlorobenzidine	98-95-3		5.0
57.	Benzo (a) anthracene	78-59-1		5.0
58.	Chrysene	88-75-5	0.10	5.0
59.	Bis (2-ethylhexyl) phthalate	105-67-9	0.10	5.0
60.	Di-n-octylphthalate	111-91-1		5.0
61.	Benzo (b) fluoranthene	120-83-2	0.10	5.0
62.	Benzo (k) fluoranthene	91-20-3	0.10	5.0
63.	Benzo (a) pyrene	106-47-8		5.0
64.	Indeno (1,2,3-cd) pyrene	87-68-3		5.0
65.	Benzo (a,h) anthracene	105-60-2		5.0
66.	Benzo (g,h,i) perylene	59-50-7	0.10	5.0

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Solid Samples

	Semivolatile Analyte	CAS Number	Low Level By SIM[1] (µg/Kg)	Low Level Solids[2] (µg/Kg)	Med. Level Solids[2] (µg/Kg)
1.	Benzaldehyde	100-52-7		170	50000
2.	Phenol	108-95-2	3.3	170	50000
3.	Bis-(2-chlorothyl) ether	111-44-4		170	50000
4.	2-Chlorophenol	95-57-8	3.3	170	50000
5.	2-Methylphenol	95-48-7	3.3	170	50000
6.	2,2'-Oxybis (1-chloropropane)[3]	108-60-1		170	50000
7.	Acetophenone	98-86-2		170	50000
8.	4-Methylphenol	106-44-5	3.3	170	50000
9.	N-Nitroso-di-n-propylamine	621-64-7		170	50000
10.	Hexachloroethane	67-72-1		170	50000
11.	Nitrobenzene	98-95-3		170	50000
12.	Isophorone	78-59-1		170	50000
13.	2-Nitrophenol	88-75-5	3.3	170	50000
14.	2,4-Dimethylphenol	105-67-9	3.3	170	50000
15.	Bis (2-chloroethoxy) methane	111-91-1		170	50000
16.	2,4-Dichlorophenol	120-83-2	3.3	170	50000
17.	Naphthalene	91-20-3	3.3	170	50000
18.	4-Chloroaniline	106-47-8		170	50000
19.	Hexachlorobutadiene	87-68-3		170	50000
20.	Caprolactam	105-60-2		170	50000
21.	4-Chloro-3-methylphenol	59-50-7	3.3	170	50000
22.	2-Methylnaphthalene	91-57-6		170	50000
23.	Hexachlorocyclopentadiene	77-47-4		170	50000
24.	2,4,6-Trichlorophenol	88-06-2	3.3	170	50000

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Solid Samples (Continued)

	Semivolatile Analyte	CAS Number	Low Level By SIM[1] (µg/Kg)	Low Level Solids[2] (µg/Kg)	Med. Level Solids[2] (µg/Kg)
25.	2,4,5-Trichlorophenol[4]	95-95-4	6.7	330	100000
26.	1,1'-Biphenyl	92-52-4		170	50000
27.	2-Chloronaphthalene	91-58-7		170	50000
28.	2-Nitroaniline[4]	88-74-4		330	100000
29.	Dimethylphthalate	131-11-3		170	50000
30.	2,6-Dinitrotoluene	606-20-2		170	50000
31.	Acenaphthylene	208-96-8	3.3	170	50000
32.	3-Nitroaniline[4]	99-09-2		330	100000
33.	Acenaphthene	83-32-9	3.3	170	50000
34.	2,4-Dinitrophenol[4]	51-28-5	6.7	330	100000
35.	4-Nitrophenol[4]	100-02-7	6.7	330	100000
36.	Dibenzofuran	132-64-9		170	50000
37.	2,4-Dinitrotoluene	121-14-2		170	50000
38.	Diethylphthalate	84-66-2		170	50000
39.	Fluorene	86-73-7	3.3	170	50000
40.	4-Chlorophenyl-phenyl ether	7005-72-3		170	50000
41.	4-Nitroaniline[4]	100-01-6		330	100000
42.	4,6-Dinitro-2-methylphenol[4]	534-52-1	6.7	330	100000
43.	N-Nitrosodiphenylamine	86-30-6		170	50000
44.	1,2,4,5-Tetrachlorobenzene	95-34-3		170	50000
45.	4-Bromophenyl-phenylether	101-55-3		170	50000
46.	Hexachlorobenzene	118-74-1		170	10000
47.	Atrazine	1912-24-9		170	50000
48.	Pentachlorophenol	87-86-5	6.7	330	100000

Semivolatiles Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) for Solid Samples (Continued)

	Semivolatile Analyte	CAS Number	Low Level By SIM[1] (µg/Kg)	Low Level Solids[2] (µg/Kg)	Med. Level Solids[2] (µg/Kg)
49.	Phenanthrene	85-01-8	3.3	170	50000
50.	Anthracene	120-12-7	3.3	170	50000
51.	Carbazole	86-74-8		170	50000
52.	Di-n-butylphthalate	84-74-2		170	50000
53.	Fluoroanthene	206-44-0	3.3	170	50000
54.	Pyrene	129-00-0	3.3	170	50000
55.	Butylbenzylphthalate	85-68-7		170	50000
56.	3,3'-Dichlorobenzidine	91-94-1		170	50000
57.	Benzo (a) anthracene	56-55-3	3.3	170	50000
58.	Chrysene	218-01-9	3.3	170	50000
59.	Bis (2-ethylhexyl) phthalate	117-81-7		170	50000
60.	Di-n-octylphthalate	117-84-0		170	50000
61.	Benzo (b) fluoranthene	205-99-2	3.3	170	50000
62.	Benzo (k) fluoranthene	207-08-9	3.3	170	50000
63.	Benzo (a) pyrene	50-32-8	3.3	170	50000
64.	Indeno (1,2,3-cd) pyrene	193-39-5	3.3	170	50000
65.	Benzo (a,h) anthracene	53-70-3	3.3	170	50000
66.	Benzo (g,h,i) perylene	191-24-2	3.3	170	50000

Semivolatile Notes

[1] CRQLs for optional analysis of water and soil samples using SIM (Selected Ion Monitoring) techniques for PAHs and phenols.

[2] Denotes soil, sediment, tissue, or mixed phase samples.

[3] Previously known as bis (2-Chloroisoproply) ether.

[4] Seven semivolatile compounds are calibrated using only a four point initial calibration, eliminating the lowest standard. Therefore, the CRQL values for these eight compounds are 2 times higher for all matrices and levels.

Pesticide Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) For Aqueous and Solid Samples

	Pesticide Analyte	CAS Number	Water (µg/L)	Solids[1] (µg/Kg)
1.	alpha-BHC	319-84-6	0.050	1.7
2.	beta-BHC	319-85-7	0.050	1.7
3.	delta-BHC	319-86-8	0.050	1.7
4.	gamma-BHC (Lindane)	58-89-9	0.050	1.7
5.	Heptachlor	76-44-8	0.050	1.7
6.	Aldrin	309-00-2	0.050	1.7
7.	Heptachlor epoxide[2]	1024-57-3	0.050	1.7
8.	Endosulfan I	959-98-8	0.050	1.7
9.	Dieldrin	60-57-1	0.10	3.3
10.	4,4'-DDE	72-55-9	0.10	3.3
11.	Endrin	72-20-8	0.10	3.3
12.	Endosulfan II	33213-65-9	0.10	3.3
13.	4,4'-DDD	72-54-8	0.10	3.3
14.	Endosulfan sulfate	1031-07-8	0.10	3.3
15.	4,4'-DDT	50-29-3	0.10	3.3
16.	Methoxychlor	72-43-5	0.10	3.3
17.	Endrin ketone	53494-70-5	0.10	3.3
18.	Endrin aldehyde	7421-93-4	0.10	3.3
19.	alpha-Chlordane	5103-71-9	0.050	1.7
20.	gamma-Chlordane	5103-74-2	0.050	1.7
21.	Toxaphene	8001-35-2	5.0	34

Pesticide Notes

[1] There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of pesticides.

[2] Only the exo-epoxy isomer (isomer B) of heptachlor epoxide is reported on the data reporting forms (Exhibit B).

PCB Aroclor Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) For Aqueous and Solid Samples

	Aroclor Analyte	CAS Number	Water (µg/L)	Solids[1] (µg/Kg)
1.	Arochlor-1016	12674-11-2	1.0	33
2.	Arochlor-1221	11104-28-2	1.0	33
3.	Arochlor-1232	11141-16-5	1.0	33
4.	Arochlor-1242	53469-21-9	1.0	33
5.	Arochlor-1248	12672-29-6	1.0	33
6.	Arochlor-1254	11097-69-1	1.0	33
7.	Arochlor-1260	11096-82-5	1.0	33
8.	Arochlor-1262	37324-23-5	1.0	33
9.	Arochlor-1268	11100-14-4	1.0	33

Aroclor PCB Notes

[1] There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of Aroclor PCBs.

PCB Congeners Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) For Aqueous and Solid Samples

	Congener Analyte	IUPAC Number	CAS Number	Water (pg/L)	Solids[1] (ng/Kg)
1.	2-MoCB	1	2051-60-7	20	2.0
2.	4-MoCB	3	2051-62-9	20	2.0
3.	2,2'-DiCB	4	13029-08-8	20	2.0
4.	4,4'-DiCB	15	2050-68-2	20	2.0
5.	2,2',6'-TrCB	19	38444-73-4	20	2.0
6.	3,4,4'-TrCB	37	38444-90-5	20	2.0
7.	2,2',6,6'-TeCB	54	15968-05-5	20	2.0
8.	3,3',4,4'-TeCB	77	32598-13-3	20	2.0
9.	3,4,4',5-TeCB	81	70362-50-4	20	2.0
10.	2,2',4,6,6'-PeCB	104	56558-16-8	20	2.0
11.	2,3,3',4,4'-PeCB	105	32598-14-4	20	2.0
12.	2,3,4,4',5-PeCB	114	74472-37-0	20	2.0
13.	2,3',4,4',5-PeCB	118	31508-00-6	20	2.0
14.	2',3,4,4',5-PeCB	123	65510-44-3	20	2.0
15.	3,3',4,4',5-PeCB	126	57465-28-8	20	2.0
16.	2,2',4,4',6,6'-HxCB	155	33979-03-2	20	2.0
17.	2,3,3',4,4',5-HxCB	156	38380-08-4	20	2.0
18.	2,3,3',4,4',5'-HxCB	157	69782-90-7	20	2.0
19.	2,3',4,4',5,5'-HxCB	167	52663-72-6	20	2.0
20.	3,3',4,4',5,5'-HxCB	169	32774-16-6	20	2.0
21.	2,2',3,4',5,6,6'-HpCB	188	74487-85-7	20	2.0
22.	2,2',3,4',5,6,6'-HpCB	189	39635-31-9	20	2.0
23.	2,2',3,3',5,5',6,6'-OcCB	202	2136-99-4	20	2.0
24.	2,3,3',4,4',5,5',6-OcCB	205	74472-53-0	20	2.0
25.	2,2',3,3',4,4',5,5',6-NoCB	206	40186-72-9	20	2.0

PCB Congeners Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) For Aqueous and Solid Samples (Continued)

	Congener Analyte	IUPAC Number	CAS Number	Water (pg/L)	Solids[1] (ng/Kg)
26.	2,2’,3,3’,4,5,5’,6,6’-NoCB	208	52663-77-1	20	2.0
27.	DeCB	209	2051-24-3	20	2.0

Congener PCB Notes

[1] There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of congener PCBs.

PCDD/F Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL) For Aqueous and Solid Samples

	PCDD/F Analyte	CAS Number	Water (pg/L)	Solids[1] (ng/Kg)
1.	2,3,7,8-TCDD	1746-01-6	10	1.0
2.	1,2,3,7,8-PeCDD	40321-76-4	50	5.0
3.	1,2,3,6,7,8-HxCDD	57653-85-7	50	5.0
4.	1,2,3,4,7,8-HxCDD	39227-28-6	50	5.0
5.	1,2,3,7,8,9-HxCDD	19408-74-3	50	5.0
6.	1,2,3,4,6,7,8-HpCDD	35822-46-9	50	5.0
7.	OCDD	3268-87-9	100	10
8.	2,3,7,8-TCDF	51207-31-9	10	1.0
9.	1,2,3,7,8-PeCDF	57117-41-6	50	5.0
10.	2,3,4,7,8-PeCDF	57117-31-4	50	5.0
11.	1,2,3,6,7,8-HxCDD	57117-44-9	50	5.0
12.	1,2,3,7,8,9-HxCDD	72918-21-9	50	5.0
13.	1,2,3,4,7,8-HxCDD	70648-26-9	50	5.0
14.	2,3,4,6,7,8-HxCDD	60851-34-5	50	5.0
15.	1,2,3,4,6,7,8-HpCDD	67562-39-4	50	5.0
16.	1,2,3,4,7,8,9-HpCDD	55673-89-7	50	5.0
17.	OCDF	39001-02-0	100	10

PCDD/F Notes

[1] There is no differentiation between the preparation of low and medium soil samples in this method for the analysis of PCDDs and PCDFs.

Total PCDD/F Homologues

Data are reported for the total concentration of all detected chlorinated dibenzo-p-dioxins (CDD) or chlorinated dibenzofurans (CDF's) in the following homologues. However, because the number of non-2,3,7,8-substituted isomers that might be detected in a sample is unpredictable, it is not possible to assign Contract Required Quantitation Limits (CRQLs) values to the total homologue concentrations.

PCDD/F Homologue	CAS Number	No. of Possible Isomers	No. of 2,3,7,8-Substituted Isomers
Total TCDD	41903-57-5	22	1
Total PeCDD	36088-22-9	14	1
Total HxCDD	34465-46-8	10	3
Total HpCDD	37871-00-4	2	1
Total TCDF	55722-27-5	38	1
Total PeCDF	30402-15-4	28	2
Total HxCDD	55684-94-1	16	4
Total HpCDD	38998-75-3	4	2

There is only one isomer in both the OCDD on OCDF homologues, hence the total concentration is the same as the 2,3,7,8-substituted concentration.

Homologue	Definition
TCDD	Tetrachlorinated dibenzo-p-dioxin
PeCDD	Pentachlorinated dibenzo-p-dioxin
HxCDD	Hexachlorinated dibenzo-p-dioxin
HpCDD	Heptachlorinated dibenzo-p-dioxin
OCDD	Octachlorinated dibenzo-p-dioxin
TCDF	Tetrachlorinated dibenzofuran
PeCDF	Pentachlorinated dibenzofuran
HxCDD	Hexachlorinated dibenzofuran
HpCDD	Heptachlorinated dibenzofuran
OCDF	Octachlorinated dibenzofuran

PART II – SUPERFUND-CLP INORGANICS

Inorganic Target Compound List (TCL) and Contract Required Quantitation Limits (CRQLs) For Aqueous and Solid Samples

	Analyte	CAS Number	ICP-AES[1] CRQL for Water (µg/L)	ICP-AES[1] CRQL for Solids (mg/Kg)	ICP-MS[1] for Water (µg/L)
1.	Aluminum	7429-90-5	200	40	30
2.	Antimony	7440-36-0	60	12	2
3.	Arsenic	7440-38-2	15	3	1
4.	Barium	7440-39-3	200	40	10
5.	Beryllium	7440-41-7	5	1	1
6.	Cadmium	7440-43-9	5	1	1
7	Calcium	7440-70-2	5000	1000	--
8.	Chromium	7440-47-3	10	2	2
9.	Cobalt	7440-48-4	50	10	0.5
10.	Copper	7440-50-8	25	5	2
11.	Iron	7439-89-6	100	20	--
12.	Lead	7439-92-1	10	2	1
13.	Magnesium	7439-95-4	5000	1000	--
14.	Manganese	7439-96-5	15	3	0.5
15.	Mercury[2]	7439-97-6	0.2	0.1	--
16.	Nickel	7440-02-0	40	8	1
17.	Potassium	7440-09-7	5000	1000	--
18.	Selenium	7782-49-2	35	7	5
19.	Silver	7440-22-4	10	2	1
20.	Sodium	7440-23-5	5000	1000	--
21.	Thallium	7440-28-0	25	5	1
22.	Vanadium	7440-62-2	50	10	1
23.	Zinc	7440-66-6	60	12	1
24.	Cyanide[2]	57-12-5	10	1	--

Inorganic Notes

[1] Any analytical method specified in Exhibit D, may be utilized as long as the documented instrument or method detection limits (IDLs or MDLs) are less than one half the Contract Required Quantitation Level (CRQL) requirements. Higher quantitation levels may only be used in the following circumstance:

If the sample concentration exceeds five times the quantitation limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the Contract Required Quantitation Limit. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 220
Contract Required Quantitation Level (CRQL) = 3

The value of 220 may be reported even though instrument detection limit is greater than Contract Required Quantitation Limit. The instrument or method detection limit must be documented as described in Exhibit E.

[2] Mercury is analyzed by cold vapor atomic absorption. Cyanide is analyzed by colorimetry/spectrophotometry.

APPENDIX B

Site-Specific Health and Safety Plan

MOVE YOUR ENVIRONMENT FORWARD

SITE-SPECIFIC HEALTH AND SAFETY PLAN (HASP)

Newtown Creek Site Characterization

Maspeth, Queens County, New York
DEC Site ID # 241117

Prepared For:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233
Contract #D009808

Prepared By:

HRP Associates, Inc.
1 Fairchild Square, Suite 110
Clifton Park, NY 12065

HRP #: DEC1025.P3

Issued On: July 21, 2021

Addendum Number	Date Issued	Reason For Modification

Disclaimer

HRP Associates does not guarantee the health or safety of any person entering this site. Due to the potential hazards of this site and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards which may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury at this site. The health and safety guidelines in this plan were prepared specifically for this site for use and should not be used on any other site.

CERTIFICATION

This Addendum to HRP's Generic Health and Safety Plan has been prepared under the supervision of, and has been reviewed by, a Certified Safety Professional (CSP) certified by the Board of Certified Safety Professionals.

Ali Werst

Alisa Werst, CSP
BCSP # 36431

TABLE OF CONTENTS

CERTIFICATION 2

1.0 EMERGENCY CONTACTS/PLANNING 1

2.0 INTRODUCTION 2
- 2.1 Purpose and Scope 2
- 2.2 Site Information and Areas of Environmental Concern 2
- 2.3 Background and Project Description 2

3.0 AREAS OF ENVIRONMENTAL CONCERN 5
- 3.1 Scope of Work 5

4.0 HAZARD ANALYSIS 6
- 4.1 Hazard Analysis Summary/Minimization 7
- 4.2 Changes in Conditions or Scope 7
- 4.3 Monitoring Procedures 7
- 4.4 Working Near Water 9

5.0 ENGINEERING CONTROL MEASURES/GENERAL SAFETY 10
- 5.1 Air Monitoring 10
- 5.2 Protective Zones 10

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) 11
- 6.1 Level of Protection 11

7.0 DECONTAMINATION 14
- 7.1 Decontamination Procedures 14
- 7.2 Emergency Decontamination 14
- 7.3 Personal Hygiene 14

8.0 EMERGENCY ACTION PLAN/SPILL RESPONSE 15

9.0 TRAINING/MEDICAL SURVEILLANCE 16
- 9.1 Training Requirements 16
- 9.2 Pre-Entry Briefing 16
- 9.3 Morning Safety (Tailgate) Meeting 16
- 9.4 Medical Surveillance 17

10.0 AUTHORIZATIONS 18

11.0 FIELD TEAM REVIEW 19

12.0 APPROVALS 20

Figures

Figure 1 Route and Map to Nearest Hospital and Medical Center
Figure 2 Site Location Map

Tables

Table 1 Chemical Hazards Known or Suspected On Site
Table 2 HASP Acceptance and Site Visitor Log

Appendices

Appendix A Safety and Logistics Planning Call Log
Appendix B Personnel Log
Appendix C Supervisor’s Investigation Report
Appendix D Daily Job Brief Record
Appendix E Equipment Calibration Log
Appendix F Community Air Monitoring Plan
Appendix G COVID-19 Health and Safety Guidelines
Appendix H Safety Data Sheets (for chemicals brought to the site)
Appendix I Working Near Water SOP

1.0 EMERGENCY CONTACTS/PLANNING

The Health and Safety Officer will coordinate the entry and exit of response personnel in the event of an emergency. The following information, including directions to the nearest hospital shall be posted at the Site. When contacting the local authorities, be sure to provide: your name, facility name, full address, telephone number, and the nature of the emergency.

Emergency Phone Numbers Newtown Creek Site Characterization Maspeth, Queens County, NY	
Emergency Contact	Phone Number
Fire, Ambulance, Police Emergency:	911
New York City Police Department (94th Precinct routine calls):	718-383-3879
New York City Fire Department (routine calls):	311
NYU Langone Health Emergency Department (New York, NY):	212-263-5550
Poison Control Center:	1-800-222-1222
DEC spills hotline:	1-800-457-7362
National Response Center:	800-424-8802
Project Manager: Matthew Cavas	518-222-5486
Site Safety Officer: Kristin Amodeo	203-300-7884
NYSDEC Project Manager: Michael Haggerty	518-402-9688

Map and directions to the following medical facilities are provided in Figure 1:

- NYU Langone Health – Ronald O. Perelman Center for Emergency Services - located at 570 First Avenue, New York, NY 10016
(approximately 3.5 miles from the work site)

First Aid, Fire Protection, Emergency Response Equipment Storage Locations	
First Aid Kit:	In Vehicle and On Vessel
Fire Extinguisher:	In Vehicle
Eye Wash (Bottle):	In Vehicle and On Vessel
Hand Sanitizer (Bottle):	In Vehicle and On Vessel
Spill Kit:	On Vessel

A Safety and Logistics Planning call will be held prior to conducting any field activities at the site. Representatives from HRP and each subcontractor will attend the call to discuss logistical and safety challenges general to the scope of work and specific to the Site. This call is documented on the Safety and Logistics Planning Call Log in Appendix A.

2.0 INTRODUCTION

2.1 Purpose and Scope

This Health and Safety Plan (HASP) addresses the health and safety practices that will be employed by HRP Associates, Inc. personnel and our subcontractors participating in the Site Characterization (SC) at Newtown Creek. The SC will be comprised of several tasks to evaluate the environmental condition of the Site and the surrounding area, including completion of a shoreline survey and collection of aqueous samples.

This HASP has been developed in accordance with HRP's Generic Safety and Health Program as required under OSHA's Hazardous Waste Operations Standard (29 CFR 1910.120). This Plan has been developed to establish minimum standards necessary for onsite investigation activities to protect the health and safety of HRP personnel. HRP site personnel have received the required level of training and field experience as required under subpart (e) of the Standard, and have received medical examinations in accordance with HRP's medical surveillance program as required under subpart (f) of the Standard. No other personnel will be permitted in the Exclusion Zone unless they have received training and medical surveillance under the Standard.

HRP personnel and associated subcontractors shall be familiar with this HASP prior to conducting proposed site work. This plan must be present on site and be available for reference/inspection when the subject site work is being conducted.

2.2 Site Information and Areas of Environmental Concern

2.2.1 Site Information and Description

Site Name:	Newtown Creek and associated tributaries
Site Address:	Maspeth, Queens County, NY
Site Contact:	Michael Haggerty
Phone Number:	518-402-9688

2.3 Background and Project Description

The Newtown Creek Site in located in Maspeth, Queens County, New York. Newtown Creek forms a portion of the border between Queens and Kings counties and includes the tributaries Dutch Kills, Whale Creek, East Branch, English Kills and Maspeth Creek (Newtown Creek; Figure 2). The entire creek system extends approximately 3.8 miles with the vast majority of shoreline area contained behind bulkheads and other man-man structures.

Newtown Creek is primarily used for the transport of materials and goods, produced and consumed by industry both along its boundaries as well as throughout the greater New York Harbor. A small amount of recreational boating occurs within the creek as well as various forms of fishing despite posted fishing restrictions. The United States Environmental Protection Agency (USEPA) is the lead agency for remedial investigation and feasibility studies (RI/FS) on Newtown Creek having developed and negotiated an RI/FS Work Plan. On behalf of New York State Department of Environmental Conservation (NYSDEC) HRP will be conducting shoreline surveys and sampling of identified seeps.

The number of passengers on a vessel will follow the United States Coast Guard regulations (e.g., six persons at most on 24-foot Carolina Skiff) and each passenger and the vessel operator will be required to have a personal floatation device (PFD) on and worn properly at all times. The vessel operator shall be an experienced operator, familiar with safe operations of the vessel, and will be in charge at all times while underway. The vessel itself will be registered and will be equipped with navigation lighting, fire extinguisher, flare(s), horn, rope sufficient for tying along dock or towing (if necessary), at least one throwable lifesaving device (e.g., life ring or throw-rope) and at least one oar for use as secondary propulsion.

2.3.1 Personnel Designations

The following personnel are designated to perform the stated project activities and to ensure that the requirements of this HASP are met. The same person may fill more than one role, and/or serve as an alternate in the absence of the designated team member.

The following personnel are designated to perform the stated project activities and to ensure that the requirements of this HASP are met. The same person may fill more than one role, and/or serve as an alternate in the absence of the designated team member. All subcontractors must have received the required level of training and field experience as required under subpart (e) of OSHA 29 CFR 1910.120 and OSHA 29 CFR 1926.65 for Hazardous Waste Operations and Emergency Response (HAZWOPER).

Project Team Member	Responsibilities and Tasks
Kristin Amodeo (or Qualified Alternate Safety Officer)	HSO – HRP Associates, Inc. - Ensuring all site work is being performed in accordance with HRP Associates, Inc. Safety Program, as well as in accordance with local, state and federal regulations. - Directing and implementing HRP's HASP. - Reviewing the Subcontractor's HASP and being aware of the hazards detailed therein. - Conduct a job orientation meeting and routine safety meetings for HRP Associates, Inc. employees and subcontractors, as applicable. - Provide copies of these inspections, recordkeeping/personnel logs to the engineer/contractor as required. - Ensuring all project personnel have been adequately trained in the recognition and avoidance of unsafe conditions. - Authorizing Stop Work Orders that shall be executed upon the determination of an imminent health and safety concern, and will notify the appropriate contacts upon issuance of this order. - Authorizing work to resume, upon approval from the Contractor. - Directing activities, as defined in the HRP's and the Contractor's written HASP, during emergency situations. - Providing personnel monitoring where applicable. - Ensuring that adequate personal protective equipment and first aid supplies are available. - Ensure site security, to the extent practicable. - Ensure accident victims are promptly cared for, and the incident is investigated and properly reported.
Matthew Cavas (Site Supervisor/ Project Manager) Jessica Kruczek (Alternate Site Supervisor)	Site Supervisor/Project Manager – HRP Associates, Inc. - Monitor and assist the site Health and Safety officer. - Maintain appropriate rules, regulations and codes at the job site. - Provide advance safety planning for all activities through the use of scheduling and administrative controls. - Obtain site-specific health and safety information and communicate that information with the appropriate personnel (i.e. subcontractors, client, etc.) - Report all injuries, illnesses and other incidents to the Director of Safety. - Ensure all HRP personnel are trained and qualified to perform site work.
Site Workers (Subcontractors)	Site Workers - Read and work in accordance with this HASP. - Report all unsafe work practices to the HSO. - Report all incidents, including near-misses to the HSO. - Work in a safe manner. - Provide Designated Competent Person
A complete list of HRP employee and subcontractor responsibilities (as applicable) can be found in the HRP Generic Health and Safety Plan. 1 A list of site workers will be maintained in the Personnel Log (Appendix B) 2 Supervisors Incident Investigation Report included as (Appendix C)	

3.0 AREAS OF ENVIRONMENTAL CONCERN

3.1 Scope of Work

In general, the work to be performed by HRP and HRP's subcontractors consists of investigative methods to evaluate the environmental condition of the Site. The SC investigation fieldwork for this task includes the following subtasks:

- In-field screening of the Newtown Creek shoreline area utilizing team(s) on vessel(s) to survey the shoreline around low-tide. Survey tasks will be conducted during daylight hours and include recording of visual observations and collection of high-resolution photographs of the shoreline in attempt to identify potential seeps (water and/or NAPL) to Newtown Creek. Photographs collected will use a GPS-enabled camera so that the image location is electronically stored with the image allowing field teams to easily return to a location during additional surveys (as needed).

- Areas or sites of interest where potential seeps are observed will be flagged for thermal imaging using a handheld, high-resolution thermal imagery camera.

- Environmental samples (seep and/or surface water) may be collected, once access has been granted, to further characterize potential groundwater and/or NAPL seeps observed. Collected samples may be analyzed for one or more of the following parameters, including but not limited to:

    - Volatile Organic Compounds
    - Polycyclic aromatic hydrocarbons (PAH)
    - Total Petroleum Hydrocarbons (TPH)
    - Polychlorinated Biphenyls (PCBs)
    - Metals (including copper and lead)
    - Dioxin/Furans
    - Pesticides

Additional information is provided in the Site Specific Work Plan prepared for this Site.

4.0 HAZARD ANALYSIS

The project hazard analysis below identifies the hazards that are anticipated to be encountered by the project team.

Physical Hazards Present	☐ Electricity ☒ Trips/Falls/Floor openings ☐ Holes/Pits ☒ Inclement weather ☒ Heat ☒ Cold ☐ Vibration ☐ Flying particles	☐ Ionizing radiation ☐ Non-Ionizing radiation ☐ Lasers ☒ Overhead hazards ☒ Noise ☐ Visible dust ☐ Falling objects ☐ Other ________________
Health/Chemical Hazards Present [1]	☐ Dust/Fumes/Particulates ☐ Flammable/Combustible ☐ Compressed gas ☐ Explosive ☐ Water reactive ☐ Unstable ☒ Contact with contaminated media	☐ Oxidizer ☐ Corrosive ☐ Toxic ☐ Highly Toxic ☐ Irritant ☐ Sensitizer ☐ Carcinogen/Mutagen ☐ Other ________________
Environmental/Equipment Hazards Present	☐ Heavy machinery ☐ Drilling ☒ Water operations ☒ Mobile equipment ☐ Road work ☐ Railroad work ☐ Forklifts ☐ Power tools ☐ Welding ☐ Gas cylinders ☒ Overhead/underground utilities	☐ Trenching/excavation ☐ Elevated heights/man lifts ☐ Scaffolding ☐ Ladders ☐ Confined spaces ☐ Energized equipment ☒ Overhead hazards ☒ Drums/container handling ☒ Insects/rodents/snakes ☒ Biological hazards ☐ Other ________________
Personal Safety Considerations	☒ Security Issues ☐ Remote setting ☐ Employees working alone ☐ Limited lighting	☐ Off hour shifts ☐ Dangerous wildlife/animals ☐ Limited cell phone service ☐ Other ________________

[1] Table 1 (following the text of this HASP) provides a list of chemical substances for reference, along with odor threshold, permissible exposure limit (PEL), threshold limit value (TLV), OSHA ceiling, IDLH concentration, route of exposure and symptoms of acute exposure, if any.

Details of specific hazards associated with individual tasks will be discussed in the Daily Job Brief Record (Appendix D).

4.1 Hazard Analysis Summary/Minimization

HRP's Corporate Health & Safety Plan (in conjunction with this HASP) will be cross-referenced in order to obtain the safe work practice procedures for mitigating and preventing project site hazards identified in the table above. Job site hazard prevention and minimization information can be found in Section 3 of HRP's Generic Health & Safety Plan.

Confined Spaces

Only properly trained HRP personnel are authorized to enter confined spaces. Confined space entry may be performed by subcontractors who have the proper training and experience to conduct this work. Confined space entry is not anticipated during the SC.

Excavations

It is HRP's policy to ensure that for excavation projects the subcontracted environmental contractor will provide a competent person to perform daily and as needed inspections of excavation sites. This policy will be conveyed through the subcontract agreement with the environmental contractor. At a minimum HRP will provide our employees involved with construction projects with awareness level training regarding excavation hazards and notify the subcontracted firm if any obvious excavation safety hazard exists during the course of on-site activities. Excavations are not planned as part of the SC activities.

Chemical Hazards

Hazardous chemicals known or suspected to be onsite are listed in Table 1 (follows text). Table 1 includes Chemical name, odor threshold OSHA PEL, ACGIH TLV, OSHA STEL, IDLH Concentrations, routes of exposure and symptoms of acute exposure. Chemicals likely to be encountered during site work are highlighted.

4.2 Changes in Conditions or Scope

Should conditions or the scope of work described herein change significantly; a HASP Addendum will be completed.

4.3 Monitoring Procedures

Air monitoring will be used to determine the concentrations of various chemicals while working in the exclusion zone to evaluate worker exposure to contaminated media. In order to determine potential health hazards and to determine the level of personal protection needed during sampling activities within the areas of concern, a Photoionization Detector (PID) will be periodically operated to monitor air quality for the purpose of ensuring minimal exposure to volatile organic compounds, as necessary.

The following environmental monitoring instruments/procedures shall be used on-site at the specified intervals.

Instrument/Procedure	Sampling Interval

Photoionization Detector (PID) in the breathing zone	Periodically as deemed by HSO

Background ambient air levels will be established outside the exclusion zone prior to commencement of site work. Ambient air sampling will occur in the breathing zone of site workers for comparison to the action levels (described below). Additionally, air sampling will be conducted in the vicinity of any surface waters or seeps to determine if any contaminants are present.

The following *Action Levels* will be used:

Instrument	Action Level	Level of Protection or Action Required
PID	No reading above background	▪ No action required. ▪ Continue PID monitoring. ▪ (Modified) Level D protection.
PID	Up to 5 ppm above background	▪ Evacuate exclusion zone. ▪ Recheck levels after 15 minutes. ▪ If levels are sustained, reassess. ▪ Use engineering controls to lower breathing zone vapors. ▪ Level C protection (at the HSO direction).
PID	>5 ppm above background	▪ Evacuate exclusion zone. ▪ Recheck levels after 15 minutes. ▪ Use engineering controls to lower breathing zone vapors. ▪ If levels are sustained, contact Safety Manager, and re-evaluate HASP.

When an action level is equaled or exceeded, the work area should be evacuated and the area re-tested with the sampling device. If the appropriate action level continues to be exceeded, the HSO will have to assess the use of engineering controls to lower vapor levels or availability of required increased personal protection equipment before authorizing re-entry.

Calibration of all instruments will occur at least once per day, when in use. An equipment calibration log is included in Appendix E.

Community Air Monitoring

As outlined in section 1.9 of the NYSDEC Division of Environmental Remediation-10 (DER-10), a community air monitoring program (CAMP) is not generally required for the investigation or delineation of site conditions which are not considered intrusive activities. These activities include the sampling of:

- surface soil;
- groundwater;
- surface water;
- sediment;
- ambient or indoor air; and/or

- soil gas and sub-slab soil vapor, after the sampling ports have been installed.

Should the SC require intrusive activities, HRP has developed and will implement a CAMP, which requires real time monitoring of volatile organics and dust during the intrusive activities completed during the site characterization. The CAMP, included as Appendix F will be implemented during all intrusive activities and serve as a baseline monitoring plan. The CAMP may be implemented and modified appropriately should intrusive activities be added to the scope of work.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will 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 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.

If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than the background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques 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 mcg/m3 above the upwind level, work will 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/m3 of the upwind level and in preventing visible dust migration.

4.4 Working Near Water

While working near or on the water, all personnel shall review and follow applicable requirements from HRP's SOP for Working Near Water (Addendum I). When working within a navigable waterway or federally marked navigation channel ensure that necessary permits have been submitted and approved prior to the start of work. At minimum, a notice to mariners shall be completed describing the general area of work, type of work and vessels being used. The notice to mariner will be filed with USCG or other responsible agency as required.

Employees working within ten feet of water will be required to wear a U.S. Coast Guard-approved PFD. Prior to and after each use, PFDs shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used. Additionally, at least one throwable rescue device shall be immediately available on the vessel while underway.

5.0 ENGINEERING CONTROL MEASURES/GENERAL SAFETY

5.1 Air Monitoring

In order to determine potential health hazards and to determine the level of personal protection needed during drilling, excavation and sampling activities within the areas of concern, a PID will be periodically operated to monitor air quality for the purpose of ensuring minimal exposure to volatile organic compounds. Please refer to Section 4.3 of this plan for specific air monitoring procedures/action levels.

5.2 Protective Zones

Prior to commencement of work in area of suspected contamination, protective zones specific for each phase of the Plan will be established by the HSO if necessary prior to the start of field work. The purpose of the protective zones is to prevent potential cross-contamination of adjacent areas as well as to protect project personnel from exposure to contaminated areas.

Protective zones shall be delineated as follows:

- Exclusion Zone: This is the contaminated area in which workers will handle samples of potentially contaminated media. The “Area of Environmental Concern” (AOEC) is located within this area. For purposes of this scope of work, the support vessel will be considered the exclusion zone with handling of potentially contaminated media restricted to the main portion of the vessel away from the helm station as much as practical. The Exclusion Zone delineation and any necessary modifications will be based on site conditions.

- Contaminant Reduction Zone: This zone is a transition zone located between the Exclusion Zone and the Support Zone and is utilized to decontaminate personnel and equipment. For purposes of this scope of work, the contaminant reduction zone will be the portion of the vessel near the helm station to the extent practicable.

- Support Zone: This zone will be utilized by equipment and vehicle storage and will be kept free of contaminated material. The HSO will determine the location of this zone but for this scope of work the support zone will be on land in the parking lot of the Newtown Creek Wastewater Treatment Plant (WWTP) where field team (s) will access the water. In the event of a site evacuation, the rally point will be at the parking lot on the Newtown Creek WWTP (Figure 2). The designated rally point may be relocated by the HSO based on project or site conditions. All site workers will be notified of any relocation prior to implementation.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

6.1 Level of Protection

As identified in Section 4.0, the overall health and safety risk associated with chemical hazards for HRP and associated contractors is considered minimal. This is primarily due to the moderate concentrations of chemical contaminants expected based on minimal contact personnel will have with any potentially contaminated media. Therefore, the minimal level of protection for HRP personnel during the conduct of all the environmental work performed at the site will be Level D PPE, and will generally consist of the PPE listed below:

- Steel toe/shank work boots
- Personal floatation device (PFD) with Safety of Life at Sea (SOLAS) reflective tape
- Cold-weather survival suit with SOLAS reflective tape (survival suit), as necessary
- Hard hat, as necessary
- Safety vest, as necessary
- Safety glasses/goggles/face shield, as necessary
- Hearing protection, as necessary

If site conditions warrant, an upgrade to Level C PPE may be required (refer to Section 4.3 for the appropriate *Action Levels*) then the subcontractors will make Level C personal protective equipment (PPE) readily available. Level C PPE generally includes:

- Full face, air purifying respirator with organic vapor cartridges
- Same as Level D, but also includes tyvek taped pant/boot and glove/shirt

If it is determined protection beyond Level C is required, HRP will re-evaluate the HASP as well as the site conditions, and will revise the HASP as required. The following table provides a summary of the minimum level of PPE required on site:

Description	Level of Protection [1]	
	D	C
Body		
Work Clothes	R	R
Chemical Protective Suit (Tyvek)	O	R
Visibility Vest	O [2]	O [2]
PFD with SOLAS reflective tape (worn when within 10 feet of water)	R	R
Survival suit or float coat and bibs (to be used when average daily combined air + water temperatures are below 90 ° F)	R	R
Apron	O	O
Head		
Hard Hat	O [2]	O [2]
Head Warmer	O	O
Eyes & Face		
Safety Glasses	R	R

Description	Level of Protection [1]	
	D	C
Goggles (based on hazard)	O	R
Face Shield	O	O
Ears		
Plugs or Muffs	R [2]	R [2]
Hands & Arms		
Work Gloves	R	R
Chemical Resistant Gloves (Nitrile)	R	R
Insulated Gloves	O	O
Foot		
Work Boots/Steel Toe Boots	R	R
Chemical Resistant Boots	O	O
Disposable Boot Covers	O	O
Respiratory Protection [3]		
½ Mask Air Purifying Respirator (APR) or Full face APR	NA	R
Dust Protection	O[2]	NA
Powered APR	NA	NA
SCBA/Supplied Air Respirator	NA	NA

R = Required, O = Optional, NA = Not Applicable

[1] The level of protection identified here does not include the necessary equipment for entering confined spaces. Refer to Moran Environmental Recovery's Safety Manual Confined Space Program for atmospheric sampling protocols and breathing and rescue equipment necessary for those operations.

[2] The use of this PPE may or may not be required depending on site conditions/location and will be addressed at the time of task assignment by the HSO.

[3] Respiratory protection necessary to protect against VOC, dusts/particulates and not oxygen deficient atmospheres.

The following table provides a general description of potential field activity tasks to be performed and associated (recommended) PPE. The use of this PPE may or may not vary depending on site conditions and will be addressed at the time of task assignment by the HSO.

Task Description	Invasive (Y/N)	Protection Level
Site Mobilization – travel to site, establish IDW storage area and Site orientation.	N	Modified Level D
Shoreline Survey - Loading/unloading vessel, visual/photographic survey of shoreline and documentation of observations.	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Sheen and/or Surface Water Sampling - Collection of aqueous samples in dedicated laboratory jars and/or sheen nets.	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Waste Management – Move used personal protection equipment (gloves, etc.) to IDW storage area and place in drums. Load-out for off-site disposal	Y	Modified Level D – or Upgrade to Level C dependent on monitoring
Site Control (Exclusion, Decontamination, Support Zones)	Y	Modified Level D – or Upgrade to Level C dependent on monitoring

Task Description	Invasive (Y/N)	Protection Level
Communications - Use of hand signals, backup alarms, and voice	N	NA

7.0 DECONTAMINATION

7.1 Decontamination Procedures

All personnel and equipment leaving the exclusion zone must be properly cleaned and decontaminated. When there is evidence of chemical contamination during the site operations, all personnel will be decontaminated under the direction of the HSO. Clean-up and/or decontamination of personnel shall consist of washing off excessively soiled PPE with a disinfectant detergent scrub and water. At the very least, all personnel should wash their hands and face before leaving the exclusion zone. After washing, all disposable clothing (tyvek, gloves, etc.) will be removed and placed in a double lined plastic bag.

Sampling tools and any other non-disposable items will be decontaminated between sampling points, and at the direction of HRP personnel, to prevent cross-contamination of work areas or environmental samples, as applicable.

7.2 Emergency Decontamination

If immediate medical attention is required in an emergency, decontamination will be performed after the victim has been stabilized. If a worker has been exposed to an extremely toxic or corrosive material, then emergency decontamination will consist of flushing with copious amounts of water. If the victim cannot be decontaminated because it will interfere with emergency medical aid being administered, then the victim should be wrapped with plastic or other available items (i.e. an uncontaminated coverall) to reduce potential contamination of other personnel or medical equipment.

If a site worker has been overcome by heat or cold related illness, then any protective clothing should be removed immediately. In the case of non-medical emergency evacuation, decontamination should be performed as quickly as possible, unless instant evacuation is necessary to save life or prevent injury.

7.3 Personal Hygiene

All employees will be required to wash hands and face prior to eating, smoking, drinking and going to the bathroom. Workers will be required to remove contaminated PPE and clothing prior to leaving the Contaminant Reduction Zone. All field personnel should avoid contact with potentially contaminated substances such as puddles, pools, mud, etc.

Additional personal hygiene requirements, intended to prevent the spread of the novel corona virus to site workers will be in effect during site activities. These procedures include mobile handwashing stations, bottles of hand sanitizer and the requirement for site workers to wear face coverings as current state/local guidance deems necessary. Additional details are included in Appendix G.

8.0 EMERGENCY ACTION PLAN/SPILL RESPONSE

In the event of a worker injury, fire, explosion, spill, flood, or other emergency that threatens the safety and health of site workers, the following procedure will be followed:

1. If the emergency originates within the work area covered by this Plan, the HRP HSO shall act as the Emergency Coordinator. The emergency evacuation signal is an air horn or a loud yell. All emergency situations (including worker injuries, no matter how small) will be reported to the HSO, who will determine the appropriate emergency response, up to and including evacuation. Only the HSO may initiate evacuation of the work area. The HSO will be responsible for reporting any emergency situation to the appropriate authorities, using a telephone or other appropriate method.

2. In the case of an evacuation, site workers will exit the site along the safest route(s) and assemble with team members at a safe rally point. Those workers in the Exclusion Zone will follow the emergency decontamination procedures outlined in Section 7.2. Accounting of all site personnel will be conducted by the HSO using the personnel log at a location determined by the HSO.

3. HRP personnel are not permitted to participate in handling the emergency. Fire and medical emergencies will be handled by the local fire department and ambulance service. In the case of a spill of hazardous materials the NYSDEC will be contacted.

   In addition, the HSO/Project Manager must advise the site contact that the New York Spill Hotline should be contacted and, if the spill quantity is greater than the Reportable Quantity (RQ) under CERCLA and/or SARA, the National Response Center (NRC) and Local Emergency Planning Committee should also be contacted. If the spill begins to flow overland and threatens to contaminate a storm drain or surface water, HRP personnel may attempt to contain and isolate the spill using any available resources, but only if, in the judgment of the HSO, such action will not expose the workers to dangerous levels of hazardous substances and is necessary to preserve life or property. In the event that a spill of material of any amount threatens to reach navigable waters, the NRC shall be contacted.

4. Once initial emergency procedures to protect worker safety and health have been addressed, and control of emergency has been completed, the HSO will complete an Investigation Report and submit this form to the appropriate personnel (HRP and/or client contact).

5. All site workers will be familiarized with the above procedures during the pre-entry briefing to be conducted before site work begins.

9.0 TRAINING/MEDICAL SURVEILLANCE

9.1 Training Requirements

All HRP and HRP subcontractor personnel who enter the work zone and/or Exclusion Zone must have successfully completed the 40-hour or 24-hour training requirement outlined in 29 CFR 1910(e). If the 40-hour or 24-hour training of any person occurred more than 12 months prior to commencement of work, then that person must have attended an 8-hour refresher course within the 12 months prior to commencement of work. If respirators are in use in the Exclusion Zone, then all personnel must have undergone respirator training and a fit test within the last 12 months. Training certificates and records for HRP employee(s) are on file at HRP. All other subcontractors will be required to supply written proof of training before being allowed into the Exclusion Zone.

9.2 Pre-Entry Briefing

Prior to commencement of work in an area of suspected contamination, HRP's Health and Safety Officer will conduct a pre-entry briefing with on-site subcontractors, which will include the following:

- Name of the HSO and person responsible for the visitor log.
- Description of the parcel as well as location of emergency telephones and the location/boundaries of the Exclusion Zone, Contamination Reduction Zone, and Support Zone, if established.
- Review of hospital locations and directions.
- Review of tasks to be conducted within the parcel by the site workers.
- Review of the Emergency Action Plan and rally point, including the nearest emergency communications and telephone numbers.
- The nature, level, and degree of anticipated hazards (physical and chemical) involved in the site work.
- Required personal protective equipment.
- Decontamination procedures.

The HSO should also, at this time, ensure that all on-site HRP and HRP subcontractor personnel have read the HASP and signed the last page of the original (Section 11.0). If additional information on the site becomes available, the HSO will call additional briefings as necessary.

9.3 Morning Safety (Tailgate) Meeting

The HRP HSO will conduct a safety overview meeting at the beginning of each workday on the site. The meeting will be given in addition to any tailgate meetings that the subcontractor conducts. A summary of the meeting topics signed by the personnel attending the meeting is included in Appendix D.

9.4 Medical Surveillance

All HRP and HRP subcontractor personnel entering the Exclusion Zone must have had a physical within the 12 months prior to commencement of site work. A physician's written opinion regarding fitness for work for each employee including work limitations, if any, is on file at HRP, as applicable. A written opinion for all other site personnel must be supplied prior to commencement of site work to the HRP HSO. Any work limitations for site personnel, or relevant medical information (i.e. allergic reactions to medication) should be included in this Plan.

10.0 AUTHORIZATIONS

Personnel authorized to enter the Exclusion Zone include the personnel listed in Section 2.4. Persons not listed in Section 2.4 may enter the Exclusion Zone only if the appropriate training and medical fitness certifications have been supplied to either the HRP Project Manager or Health and Safety Manager and the HSO or his/her designee on site has approved site entry. All personnel entering or leaving the Exclusion Zone must sign in and sign out with the recordkeeper.

11.0 FIELD TEAM REVIEW

All HRP personnel shall sign below after reading this HASP and shall agree with the following statement:

> *"I have read and understand this site specific Health and Safety Plan.*
> *I will comply with the provisions set forth therein."*

Printed Name	Signature	Date

12.0 APPROVALS

This plan meets the minimum requirements of 29 CFR 1910.120 and 29 CFR 1929.65 and has been written for specified site conditions, dates, and personnel, and must be amended if conditions change. By their signature, the undersigned certify that this HASP is approved and will be utilized during activities at the project.

______________________________________ __________
Date
On-Site Health and Safety Officer

7/21/2021
Matthew Cavas, PG
Project Manager
Date

7/21/2021
Alisa Werst, CSP
Health and Safety Officer
Date

Subcontractor:

I have been provided a copy of this HASP for review.

______________________________________ __________
[name] Date

Representing ____

The Designated Competent person representing [subcontractor] at the site will be

__________________________________.

Any alternate Competent Person will be noted in the Daily Job Brief Record (Appendix D).

ADDITIONAL APPROVALS (or Re-Approvals)	
Name:	Date:

FIGURES

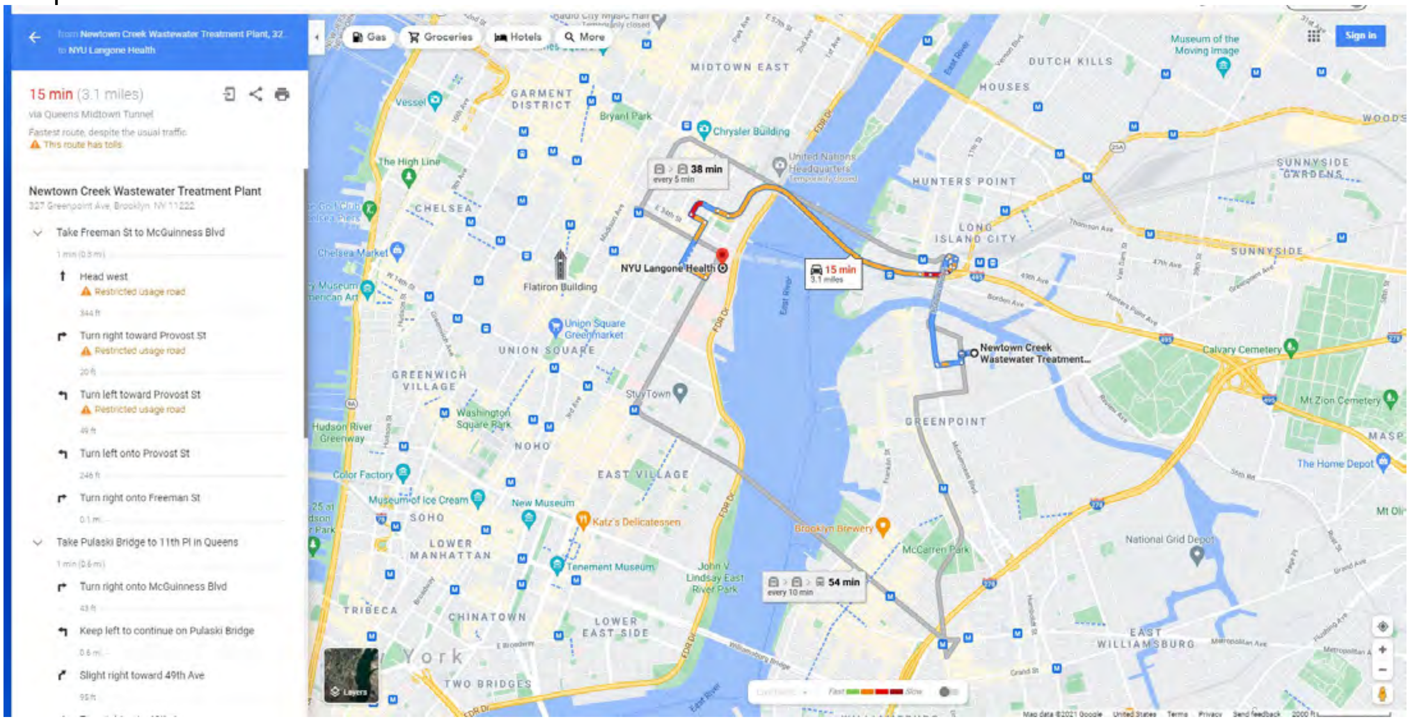
Figure 1: Route and Map to Nearest Hospital and Medical Center

- Directions to NYU Langone Health – Ronald O. Perelman Center for Emergency Services

Total Estimated Time: 15 minutes
Total Estimated Distance: 3.5 miles

End at NYU Langone Health
located at 570 First Avenue, New York, NY 10016

Step 1



from Newtown Creek Wastewater Treatment Plant, 32…
to NYU Langone Health

15 min (3.1 miles)
via Queens Midtown Tunnel
Fastest route, despite the usual traffic
⚠ This route has tolls

Newtown Creek Wastewater Treatment Plant
327 Greenpoint Ave, Brooklyn, NY 11222

Take Freeman St to McGuinness Blvd
1 min (0.5 mi)

Head west
⚠ Restricted usage road
344 ft

Turn right toward Provost St
⚠ Restricted usage road
20 ft

Turn left toward Provost St
⚠ Restricted usage road
49 ft

Turn left onto Provost St
246 ft

Turn right onto Freeman St
0.1 mi

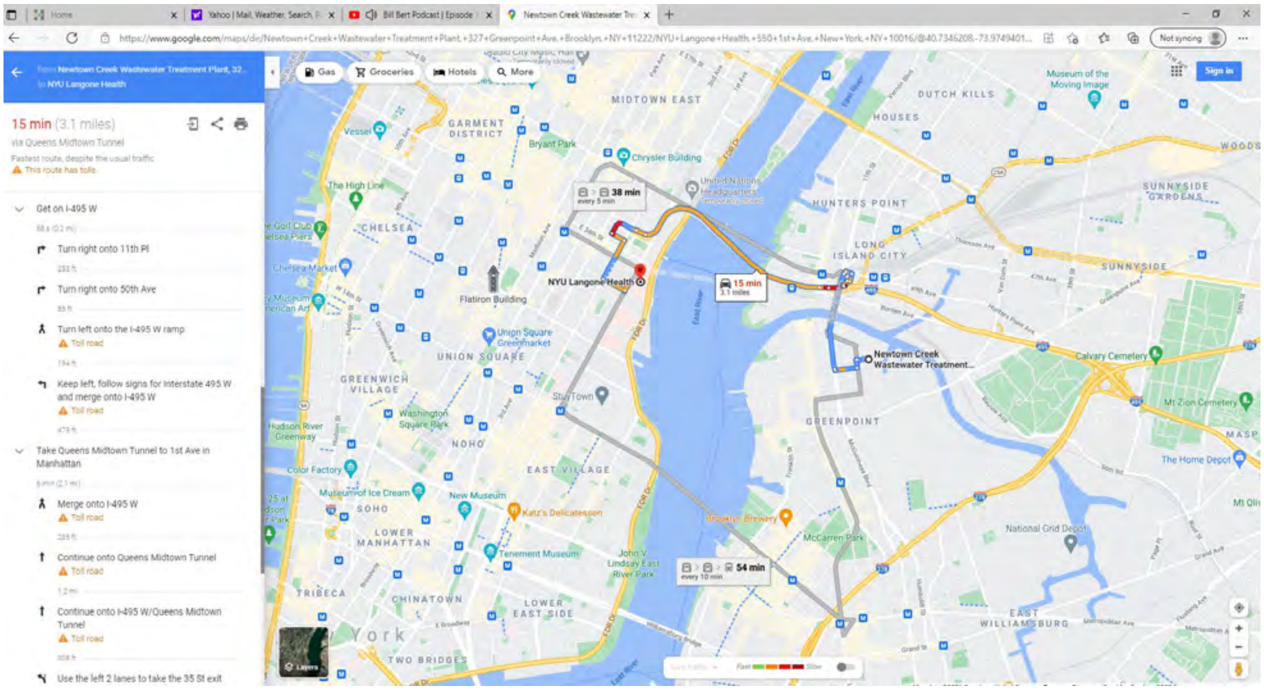
Take Pulaski Bridge to 11th Pl in Queens
1 min (0.6 mi)

Turn right onto McGuinness Blvd
43 ft

Keep left to continue on Pulaski Bridge
0.6 mi

Slight right toward 49th Ave
95 ft

Step 2



from Newtown Creek Wastewater Treatment Plant, 32...
to NYU Langone Health

15 min (3.1 miles)
via Queens Midtown Tunnel
Fastest route, despite the usual traffic
⚠ This route has tolls.

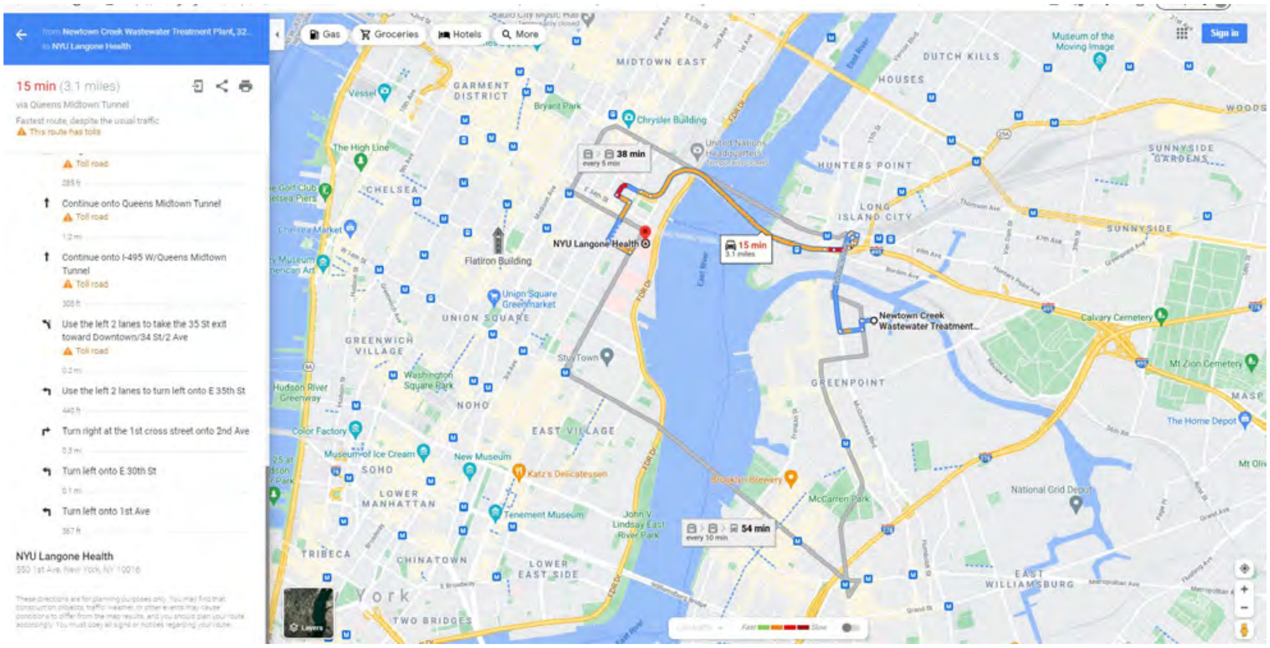
Get on I-495 W
58 s (0.2 mi)

- Turn right onto 11th Pl
  253 ft
- Turn right onto 50th Ave
  55 ft
- Turn left onto the I-495 W ramp
  ⚠ Toll road
  194 ft
- Keep left, follow signs for Interstate 495 W and merge onto I-495 W
  ⚠ Toll road
  479 ft

Take Queens Midtown Tunnel to 1st Ave in Manhattan
6 min (2.1 mi)

- Merge onto I-495 W
  ⚠ Toll road
  285 ft
- Continue onto Queens Midtown Tunnel
  ⚠ Toll road
  1.2 mi
- Continue onto I-495 W/Queens Midtown Tunnel
  ⚠ Toll road
  308 ft
- Use the left 2 lanes to take the 35 St exit

Step 3



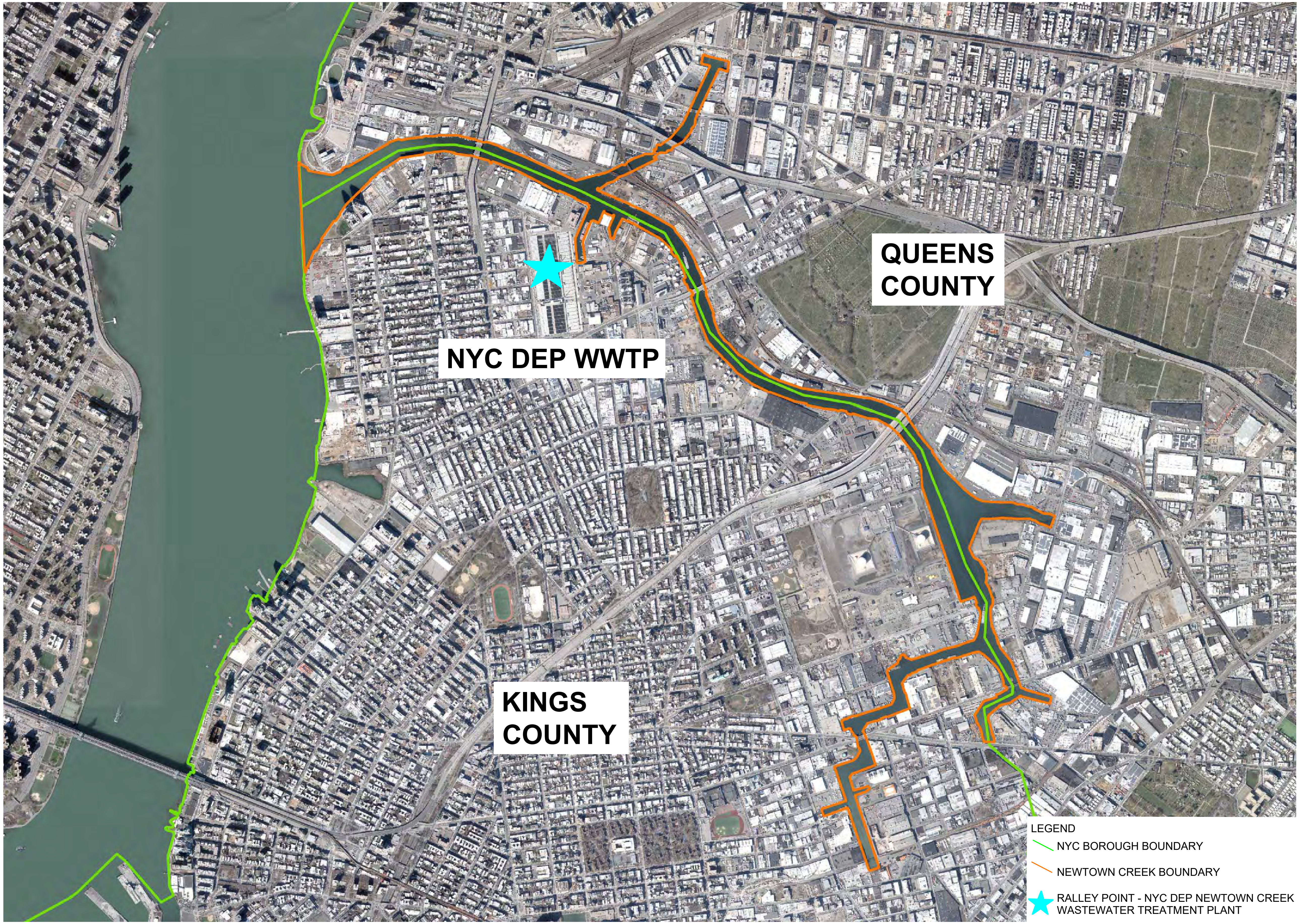
from Newtown Creek Wastewater Treatment Plant, 32...
to NYU Langone Health

15 min (3.1 miles)
via Queens Midtown Tunnel
Fastest route, despite the usual traffic
⚠ This route has tolls

- ⚠ Toll road
  285 ft
- Continue onto Queens Midtown Tunnel
  ⚠ Toll road
  1.2 mi
- Continue onto I-495 W/Queens Midtown Tunnel
  ⚠ Toll road
  308 ft
- Use the left 2 lanes to take the 35 St exit toward Downtown/34 St/2 Ave
  ⚠ Toll road
  0.2 mi
- Use the left 2 lanes to turn left onto E 35th St
  440 ft
- Turn right at the 1st cross street onto 2nd Ave
  0.3 mi
- Turn left onto E 30th St
  0.1 mi
- Turn left onto 1st Ave
  387 ft

NYU Langone Health
550 1st Ave, New York, NY 10016

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.



LEGEND

- NYC BOROUGH BOUNDARY
- NEWTOWN CREEK BOUNDARY
- ★ RALLEY POINT - NYC DEP NEWTOWN CREEK WASTEWATER TREATMENT PLANT

HRP
MOVE YOUR ENVIRONMENT FORWARD

NORTH

0 1000' 2000'

REVISIONS

NO.	DATE

DESIGNED BY: CMS
DRAWN BY: CMS
REVIEWED BY:
ISSUE DATE: 07/07/2021
PROJECT NUMBER: DEC1025.P3
SHEET SIZE: 11"x17"

SITE LOCATION MAP
NEWTOWN CREEK

FIGURE
2

TABLES

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL^1	TLV (ACGIH)	OSHA CEILING^2 /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE^3
1,1,1 Trichloroethane	44 ppm	350 ppm	350 ppm	---	700 ppm	Inh, Ing, Con	Head, Lass, CNS, Derm
1,1,2-Trichloroethane	---	10 ppm	10 ppm	----	[100 ppm]	Inh, Ing, Abs, Con	Eyes, Nose Irrit, Resp Irrit, CNS, Liver, Kidney Damage, Derm, [Carc]
1,2,4 Trimethylbenzene 1,3,5 Trimethylbenzene		25 mg/m^3	25 ppm	25 mg/m^3	ND	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Resp Sys, Bron, Hyprochronic Anemia, Head, Drow, Ftg, Dizz, Nau, Inco, Vomit, Conf, Chemical Pneu (aspir liq)
1,1' Biphenyl	0.0062 mg/m^3	0.2 ppm	0.2 ppm	---	100 mg/m^3	Inh	
1,1-Dichloroethane	120 ppm	100 ppm	100 ppm	---	3,000 ppm	Inh, Ing, Con	CNS Depres, Skin Irrit, Liver, Lung and Kidney Damage
1,1-Dichloroethylene***	500 ppm	---	5 ppm	---	---	Inh, Con	CNS depress, Resp, [Carc]
1,2-Dichlorobenzene	50 ppm	50 ppm	25 ppm		200 ppm	Inh, Ing, Abs, Con	Irrit, Resp
1,2-Dichloroethylene	26-87 ppm	200 ppm	200 ppm	---	1,000 ppm	Inh, Ing, Con	Vomit, Irrit Eyes, Resp Sys; CNS Depres
1,2-Dichloropropane	130-190 ppm	75 ppm	75 ppm	---	[400 ppm]	Inh, Con, Ing	Eye irritation, Drow, light-headedness; irritated skin, [Carc]
1,3-Dichlorobenzene	---	----	---	----	---	----	----
1,4-Dichlorobenzene	20 ppm	75 ppm	10 ppm	----	[150 ppm]	Inh, Ing	[Carc], Eye Irrit, swelling around eye, headache, nausea, vomiting
1-Methylnaphthalene	0.02 ppm	---	---	---	---	---	---
2,4-Dichlorophenol	1.4007 mg/m^3	---	---	---	---	---	---
2,4-Dimethylphenol	0.001 mg/m^3	---	---	---	---	---	---
2-Methylnaphthalene	0.01 ppm	---	---	---	---	---	---
2-Methylphenol (o-cresol) [skin]	1.4 mg/L	5 ppm	5 ppm	---	250 ppm	Inh, Abs, Ing, Con	Confusion, depression, Resp Fail; difficulty breathing, irregular rapid respiration, weak pulse; skin, eye burns; dermatitis

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
3, 3'-Dichlorobenzidine	---	None	---	---	---	Inh, Abs, Ing, Con	Sens, Derm, Head, Dizz, Burns, GI Upset, [Carc]
4-Isopropyltoluene	---	---	---	---	---	Con, Inh, Ing	Defat, Eryt
Acenephthene	0.5048 mg/m^3	---	---	---	---	---	---
Acenaphthylene	---	---	---	---	---	---	---
Acetone	47.5 mg/m^3	1,000 ppm	500 ppm		2,500 ppm	Ing, Inh, Con	Head, Dizz; Irrit Eyes, Nose, Throat; Derm, CNS, Depress, Derm
Acetonitrile	70 mg/m^3	40 ppm	20 ppm	---	500 ppm	Inh, Ing, Abs, Con	Asphy; Nau, Vomit; Chest Pain; Weak, Stupor, Convuls; Eye Irrit
Aldrin	---	0.25 mg/m^3	0.25 mg/m^3	---	25 mg/m^3	Inh, Abs, Ing, Con	Head, Dizz, Nau, Vomit, Mal, Myo, [Carc]
Anthracene (Coal Tar Pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	Derm, bron, [carc]
Antifreeze		50 ppm	100 mg/m^3 (aerosol)	---	ND	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Nau, Vomit, Abdom Pain, Lass, Dizz, Stup, Conv, CNS, Depres, Skin Sen
Arsenic	----	0.010 mg/m^3	0.01 mg/m^3	----	[5 mg/m^3]	Abs, Inh, Con, Ing	Derm; GI; Resp Irrit; ulceration of nasal septum; Resp, Irrit, Hyper Pig of Skin, [Carc]
Barium (elemental)	---	0.5 mg/m^3	0.5 mg/m^3		50 mg/m^3 (barium components)	Inh, Ing, Con	Resp. Irrit, GI, Muscle Spasm, Eye Irrit, Slow Pulse; skin burns
Benzene*	4.7 ppm	1 ppm	0.5 ppm	5 ppm	[500 ppm]	Inh, Ing, Abs, Con	Irrit Eyes, Nose, Throat; Head, Nau, Derm, Ftg, Anor, Lass, [Carc]
Benzo(a)anthracene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(a)pyrene (coal tar pitch)	---	0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(b)fluoranthene (coal tar pitch)	---	0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Benzo(g,h,i)perylene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Benzo(k)fluoranthene (coal tar pitch)	---	0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc], Derm, Bron
Bis (2-ethylhexyl) Phthalate**	N/A	5 mg/m^3	5 mg/m^3	10 mg/m^3	[5,000 mg/m^3]	Inh, Ing, Con	[Carc], Irrit Eyes
Cadmium (dust)	---	0.005 mg/m^3	Lowest concentration feasible 0.01 mg/m^3	---	[9 mg/m^3]	Inh, Ing	CNS, Resp, Irrit, Vomit, Cough, Head, Chills, Nau, Diarr, Pulm Edema, Dysp, Chest Tight, [Carc]
Carbazole	---	---	---	---	---	Inh	---
Carbon disulfide	0.1-0.2 ppm	20 ppm	1 ppm	30 ppm	500 ppm	Inh, Abs, Ing, Con	Diz, Head,Ftg, Ner, anorexia, trembling hands, loss of fine motor coord, gastritis, eye, skin burns, Derm
Carbon Tetrachloride***	21.4 ppm	10 ppm	5 ppm	25 ppm	[200 ppm]	Inh, Abs, Con, Ing	CNS Depres, Nau, Vomit, Irrit, Irrit Eyes, Skin, Drow, Dizz, [Carc]
Chlorobenzene***	0.98 mg/m^3	75 ppm	10 ppm	---	1,000 ppm	Inh, Ing, Con	Irrit, Drow, CNS, Depres, Eyes, Skin, Nose, Inco.
Chloroform***	85 ppm	50 ppm	10 ppm	50 ppm	[500 ppm]	Inh, Ing. Con, Abs	Dizz, Dullness, Nau, Head, Ftg, Irrit Eyes, Skin, Conf, [Carc]
Chromium	---	1 mg/m^3	0.5 mg/m^3	---	250 mg/m^3	Inh, Ing, Con	Irrit Eyes, Sens Derm
Chrysene (coal tar pitch)		0.2 mg/m^3	---		[80 mg/m^3]	Inh, Con	Derm, Bron, [Carc]
Cis-1-2-Dichloroethylene	---	200 ppm	200 ppm	----	1000 ppm	Inh, Con, Ing	Irrit Eyes, Resp, CNS Depress
Copper (dusts and mists) (fumes)		1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	----	100 mg/m^3	Inh, Ing, Con	Vomit, Derm, CNS, Irrit, Derm, Nau, Taste (metallic)
Cyanide	0.9 mg/m^3	5 mg/m^3	5 mg/m^3 (10 min)	5 mg/m^3	25 mg/m^3	Inh, Ing, Abs, Con	Weak, Head, Nau, Conf, Cyan
Dibenzo(a,h)anthracene						Inh, Ing	
Dichloromethane	540 mg/m^3	25 ppm	50 ppm	125 ppm	[2,300 ppm]	Inh, Abs, Ing, Con	Irrit Eyes, Skin, lass, drow, dizz, Numb, tingl, Nau, [Carc]

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL^1	TLV (ACGIH)	OSHA CEILING^2 /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE^3
Diethylphthalate**	---	None	5 mg/m^3	---	N.D.	Inh, Ing, Con	Irrit Eyes, Skin, Nose, Throat, Head, Dizz, Nau, Lac, Possible Polyneur, Vestibular Dysfunc, Pain, Numb, lass, Spasms in Arms and Legs
Di-n-octylphthalate	---	---	---	---	---	Inh, Ing, Con	---
Dimethylpthalate	---	5 mg/m^3	5 mg/m^3	---	2,000 mg/m^3	Inh, Ing, Con	Irrit, Resp, Abdom
Ethyl Benzene*	8.7 mg/m^3	100 ppm	100 ppm	125 ppm	700 ppm	Inh, Abs, Con	Head. Irrit, Derm, Narc., Irrit Eyes, Skin; Coma
Fluoranthene		0.2 mg/m^3	0.2 mg/m^3			Ing, Inh	[Carc]
Fluorine*	6 mg/m^3	0.1 ppm	1 ppm	2 ppm	25 ppm	Inh, Con	
Fuel Oil/#2	----	----	300 ppm	----		Inh, Abs, Ins, Con	Irrit Eyes, Skin, Derm, Head, Ftg, Blurred Vision, Dizz, Conf
Ideno(1,2,3-cd)pyrene		0.2 mg/m^3				Ing, Inh	
Lead (inorganic forms and dust as Pb)****		0.05 mg/m^3	0.05 mg/m^3		100 mg/m^3	Inh, Ing, Con	Irrit, Cns, Vomit, Narco, Weak, Pall, Insom, Lass, Abdom, Constip
Mercury (organic alkyl compounds) [skin]		0.01 mg/m^3	0.01 mg/m^3	0.03 mg/m^3	2 mg/m^3	Inh, Abs, Ing, Con	Irrit Eyes, Skin; Cough & Chest Pain, Bron Pneu, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia
Mercury (compounds)	----	0.1 mg/m^3	0.025 mg/m^3	0.1 mg/m^3	10 mg/m^3	Inh, Abs, Ing, Con	Irrit Eyes, Skin; Cough & Chest Pain, Bron Pneu, Tremor, Insom, Irrty, Indecision, Head, Ftg, Weak, Stomatitis, Salv, GI Dist, Anor, Low-wgt, Ataxia
Methanol	13.1150 mg/m^3	200 ppm	200 ppm	---	6,000 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Resp, Head, drow, dizz, Nau, Vomit, vis dist, Optic, derm
Methyl Ether	----	----	---	----	---	Inh	Poison

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Methyl Ethyl Ketone (2-Butanone)***	0.7375 mg/m^3	200 ppm	200 ppm	300 ppm	3,000 ppm	Inh, Con, Ing	Irrit Eyes, Skin, Nose, Throat, Head, Dizz, Vomit, Derm
Methylene Chloride	540 mg/m^3	25 ppm	50 ppm	125 ppm	[2,300 ppm]	Inh, Ing, Con, Abs	Ftg, Weak, dizz, drow, Numb, Tingle [carc], Irrit Eyes, Skin, Nau
Mineral Spirit	20 ppm	500 ppm	100 ppm	---	20,000 mg/m^3	Inh, Ing, Con	Irrit Eyes, Nose, Throat, Dizz, Derm, Chemical pneu
Methyl tert butyl ether (MTBE)	---	---	50 ppm	---		Inh, Abs	
Naphtha	0.86 ppm	100 ppm	400 ppm	---	1,000 ppm	Inh, Con, Ing	Light Head, Drow, Irrit, Derm, Irrit Eyes, Skin, Nose
Naphthalene*	0.084 ppm	10 ppm	10 ppm	15 ppm	250 ppm	Inh, Abs, Ing, Con	Eye irritation; headache; confusion, excitement, malaise (vague feeling of ill-being); nausea, vomiting, abdominal pain; irritated bladder; profuse sweating; renal shutdown; dermatitis
Nickel (metal)	---	1 mg/m^3	1.5 mg/m^3	---	[10 mg/m^3]	Inh, Ing, Con	Head, Verti, Nau, Vomit, Pain, Cough, Weak, Convuls, Delirium, Pneu, ,[Carc]
Nitrobenzene	0.0235 mg/m^3	1 ppm	1 ppm	---	200 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Anoxia, Derm, Anem, Methem
n-Butylbenzene	---	---	---	---	---	---	---
n-Propylbenzene	---	---	---	---	---	---	---
PCBs 42% chlorine (Aroclor 1242)	---	1 mg/m^3 (skin)	1 mg/m^3 (skin)	---	[5 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes, Chloracne, Liver Damage [carc]
PCBs 54% chlorine (Aroclor 1254)	---	0.5 mg/m^3 (skin)	0.5 mg/m^3 (skin)	---	[5 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes; Chloracne, Liver Damage [carc]
Petroleum Distillates	---	500 ppm	100 ppm		[1,100 ppm]	Inh, Ing, Con	Dizz, Drow, Head, Dry Skin, Nau, Irrit Eyes, Nose, Throat, [Carc]

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Phenanthrene (Coal Tar Pitch)		0.2 mg/m^3	0.2 mg/m^3		[80 mg/m^3]	Inh, Con	Derm, bron, (carc)
Phenol**	0.1786 mg/m^3	5 ppm	5 ppm	---	250 ppm	Inh, Abs, Ing, Con	Irrit Eyes, Nose, Throat, Anor, Low Wgt, Weak Musc Ache, Pain, Dark Urine, Cyan, Liver, Kidney Damage, Skin, Burns, Derm, Ochronosis, Tremor, Convuls, Twitch
Pyrene		0.2 mg/m^3			[80 mg/m^3]	Inh, Con	[Carc]
Sec-Butylbenzene	---	---	---	---	---	---	---
Selenium	N/A	0.2 mg/m^3	0.2 mg/m^3	Unknown	1 mg/m^3	Inh, Ing, Con	Irrit, Head, Fever, Chills, Skin/Eye Burns, Metallic Taste, GI, Dysp, Bron
Silver (metal and soluble compounds as Ag)	----	0.01 mg/m^3	Metal = 0.1 mg/m^3 Soluble 0.01 mg/m^3		10 mg/m^3	Inh, Ing, Con	Blue-gray Eyes, Nasal Septum, Throat, Skin; Irrit, Ulcer, Skin, GI Dist
Tetrachloroethylene (a.k.a. perchloroethylene)***	4.68 ppm	100 ppm	25 ppm	200 ppm	[150 ppm]	Inh, Ing, Con, Abs	Irrit Eyes, Skin, Nose, throat, Resp. Nau, flush face, Neck, dizz, inco, head, drow, eryth, [Carc]
Toluene*	2.14 ppm	200 ppm	50 ppm	300 ppm	500 ppm	Inh, Abs, Ins, Con	Resp, Irrit, Ftg, Conf, Dizz, Head, Derm, Euph, Head, Dilated Pupils, Lac, Ner, Musc FTg, Insom, Pares, Derm, lass
Petroleum Distillates (naphtha)	10 ppm	100 ppm	400 ppm	---	1,000 ppm	Con, Inh, Ing	---
Trans 1,2-Dichloroethylene	0.3357 mg/m^3	200 ppm	200 ppm	---	1,000 ppm	Inh, Con	Irrit, Resp, CNS depress
Trichloroethylene***	21.4 ppm	100 ppm	50 ppm	200 ppm	[1,000 ppm]	Inh, Con, Abs, Ing	Head, Vert, Nau, Vomit, Derm, Vis Dist, Tremors, Som, Nau, Irrit Eyes, Skin, Card Acc., Ftg, [Carc]
Trichlorofluoromethane	28 mg/m^3	1,000 ppm	1,000 ppm		2,000 ppm	Inh, Con, Ing	Inco, trem, derm, card, asph, frost

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL^1	TLV (ACGIH)	OSHA CEILING^2 /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE^3
Trichlorotrifluoroethane	45 ppm	1,000 ppm	1,000 ppm	1,250 ppm	2,000 ppm	Inh, Con, Ing	Irrit Skin, throat, Drow, Derm, CSN, Depress
Vinyl Chloride***	10-20 ppm	1 ppm	1 ppm	5 ppm	ND	Inh, Con	Lass, Abdom, Gi Bleeding; Hepatomegaly; Pallor or Cyan of Extremities; Liq: Frostbite; [Carc]
VM&P Naphtha (petroleum naphtha)	---	---	300 ppm	---	ND	Con, Ing, Inh	Irrit Eyes, Nose, Throat, Dizz, drow, head, nau, dry skin, chem. Pneumonitis
Xylene*	4.5 mg/m^3	100 ppm	100 ppm	150 ppm	900 ppm	Inh, Ing, Abs, Con	Dizz, Drow, Irrit, Excite, Nau, Vomit, Eyes, Skin, Nose, Throat
Zinc (oxide)	---	5 mg/m^3	2 mg/m^3	---	500 mg/m^3	Inh	Dry Throat, Cough, Chills, Tight Chest, Blurred Vision
4,4' DDD	---	---	---	---	---	Ing, Inh, Con	---
4,4' DDE	---	---	---	---	---	Ing, Inh, Con	---
4,4' DDT	5.0725 mg/m^3	1 mg/m^3	1 mg/m^3	---	[500 mg/m^3]	Inh, Abs, Ing, Con	Irrit Eyes, Skin, Pares, Tongue, Lips, Face, Trem, Anxi, Dizz, Conf, Mal, Head, Lass, Conv, Paresi Hands, Vomit, [Carc]
Aldrin		0.25 mg/m^3	0.25 mg/m^3	---	[25 mg/m^3]	Inh, Abs, Ing, Con	Head, Dizz, Nau, Vomit, Mal, Myo [Carc]
Chlordane [skin]	0.0084 mg/m^3	0.5 mg/m^3	0.5 mg/m^3		[100 mg/m^3]	Inh, Abs, Ing, Con	Blurred vision, confusion, delirium, cough; abdominal pian, nausea, vomiting diarrhea; irritability, tremor, convulsions [Carc]
EDB	76.8 mg/m^3	20 ppm		30 ppm	[100 ppm]	Inh, Abs	Resp. Irr, Eye Irr. [Carc]
Endosulfan I Endosulfan II	---	0.1 mg/m^3	0.1 mg/m^3	---	N.D.	Inh, Abs, Ing, Con	Irrit, Skin, Nau, Conf, Agit, Flush, Dry, Trem, Conv, Head
Endosulfan Sulfate		---	0.1 mg/m^3	---	---	Ing, Con	---
Endrin	1.8 x 10^{-2} ppm	0.1 mg/m^3	0.1 mg/m^{-3}	---	2 mg/m^3	Inh, Abs, Ing, Con	Epil Conv, Stup, Head, Dizz, Abdom, Nau, Vomit, Insom, Agress, Conf, Drow, Lass, Anor

TABLE 1
CHEMICAL HAZARDS KNOWN OR SUSPECTED ON-SITE

CONTAMINANT	ODOR THRESHOLD	OSHA PEL[1]	TLV (ACGIH)	OSHA CEILING[2] /STEL	IDLH CONC.	ROUTES OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE[3]
Endrin Aldehyde	1.8×10^{-2} ppm	---	---	---	---	Inh, Con	---
Endrin Ketone	---	---	---	---	---	---	---
Heptachlor	0.02 ppm	0.5 mg/m^3	0.05 mg/m^3	---	[35 mg/m^3]	Inh, Abs, Ing, Con	In animals, Trem, Conv, [Carc]
Heptachlor epoxide	0.02 ppm	---	0.05 mg/m^3	---	---	Ing, Inh	Trem, Conv, [Carc]
Hydrogen Cyanide(Hydrocyanic Acid)	0.9 mg/m^3	10 ppm (11 mg/m^3)	4.7 ppm	4.7 ppm	50 ppm	Con, Inh, Ing, Abs	Asphy & death at high levels; Weak, Head, Conf, Nau, Vomit, Incr. Rate and Depth of Respiration or Respiration Slow and Gasping

NOTES

* = Constituent found in ETPH
**=Constituent found in Acid/Base/Neutral Extractable Compounds
***=Constituent found in Volatile Organic Compounds
****=Constituent found in Leaching Lead

[1] PEL = Permissible Exposure Limit. If no PEL is available, then the NIOSH Threshold Limit Value (TLV) should be used, if available.
[2] Ceiling limit or Short Term Exposure Limit (STEL), if available. Again, the NIOSH TLV may be used if no OSHA standard exists.
[3] Abbreviations are contained on the next page

[ ] = Potential Occupational Carcinogen
ND = Not Been Determined

ABBREVIATIONS

abdom = Abdominal
abs = Absorption
aggress = Aggressiveness
agit = Agitation
anor = Anorexia
anos = Anosmia (loss of the sense of smell)
Anxi = anxiety
anem – Anemia
aspir = Aspiration
asph – asphyxia
bron = Bronchitis
bron pneu = Bronchitis pneumonitis
[carc] = Potential occupational carcinogen
Card = Cardiac arrhythmias
CNS = Central nervous system
conf = Confusion
constip = Constipation
con = Skin and/or eye contact
conv = Convulsions
corn = Corneal
cyan = Cyanosis
defat = Defatting
depres = Depressant/Depression
derm = Dermatitis
diarr = Diarrhea
dist = Disturbance
dizz = Dizziness
drow = Drowsiness
dry = Dry mouth
dysp = Dyspnea (breathing difficulty)
emphy = Emphysema
epil-conv = Epileptiform convulsions
eryth = Erythema
euph = Euphoria
fib = Fibrosis
frost = frostbite
ftg = Fatigue
flush = Flushing
GI = Gastrointestinal
head = Headache
hyperpig = Hyperpigmentation
inco = Incoordination
ing = Ingestion
inh = Inhalation
inj = Injury
insom = Insomnia
irrit = Irritation
irrty = Irritability
lac = Lacrimination (discharge of tears)
lass = Lassitude (weakness, exhaustion)
li-head = Lightheadedness
liq = Liquid
low-wgt = Weight loss
mal = Malaise (vague feeling of discomfort)
malnut = Malnutrition
methem = Methemoglobinemia
myo = Myochonic (jerks of limbs)
mg/m = milligrams/cubic meter
muc memb = Mucous membrane
mus ftg = Muscle fatigue
narco = Narcosis
nau = Nausea
ner = Nervousness
numb = Numbness
optic = Optic nerve damage (blindness)
pall = Facial pallor
parap = Paralysis
ppm = Parts per million
pares = Paresthesia
paresi = Paresis
peri neur = Peripheral neuropathy
pneu = Pneumonitis
prot = Proteinuria
pulm = Pulmonary
peri neur = Peripheral neuropathy
pneu = Pneumonia
prot = Proteinuria
pulm = Pulmonary
repro = Reproductive
resp = Respiratory
skin sen = skin sensitization
salv = Salvation
som = Somnolence (sleepiness unnatural drowsiness)
subs = Substernal (occurring beneath the sternum)
stup = Stupor
sys = System
tingle = tingle limbs
trem – Tremors
verti = Vertigo
vis dist = Visual disturbance
vomit = Vomiting
weak = Weakness

APPENDIX A

Safety and Logistics Planning Call Log

Safety and Logistics Call Log
DEC340021

Date of Call ________________
Work Assignment Number / Task ________________
DEC Site Name and Number ________________

Names of Attendees (and phone #s):

HRP
HRP PM ________________
HRP SSO ________________
HRP Other ________________
HRP Other ________________
HRP Other ________________

Subcontractors
Driller Contact ________________
Utility Survey ________________
Surveyor ________________
Construction ________________
Other ________________

DEC
DEC PM ________________
DEC Other ________________

Other ________________
____

Brief Description Scope of Work (Task Specific): Use additional forms for additional tasks.

Logisitics:
Date of Work: ________________
Time to Meet: ________________
Site Contact (phone): ________________
Notification of Site Contact made by: ________________
Describe any unusal site-specific conditions/logistics here (if any): ________________

Notes below as needed:

Water Needed? Source Confirmed?	Y / N	
Electricity Needed? Source Confirmed?	Y / N	
Water Storage Needed?	Y / N	
Water Discharges? Permits Needed/Attained?	Y / N	
Air Monitoring - CAMP?	Y / N	

Will there be intrusive work? Y / N ________________
Locations marked in the field? Y / N ________________
NYS Code Rule 753/Dig Safe System: Ticket Number: ________________
Confirmed that mark-out complete? Y / N

Anticipated Subsurface Conditions (Geology, Utilites, etc.): ________________
Anticipated Depth to Groundwater: ________________
Will NAPL/Product be Present: Y / N Describe: ________________

Safety and Logistics Call Log
DEC009808

Will there be any other parties entering the work zones? Describe control measures:

Lab and Equipment:

Equipment: Y / N PID IP Water Level Indicator CAMP Pumps controllers Survey Eq. GPS
Other:

Lab Analytical Required: Y / N VOCs SVOCs Metals PFAS 1,4D PCBs Pest/Herb
Other:

Media Tested: Soil Sediment Groundwater Surface Water Sub-slab[soil] Vapor Indoor Air
Notes of sample collection methods:

Bottle Order Received/ Checked? Y / N
How will samples be conveyed to lab?
Sample TAT? Standard 24 hr TAT 48 hr TAT Other:

Review Site - Specific Hazards (per Site-Specific HASP to be provided prior to all parties):

Site Constituents of Concern:
(circle)

VOCs
HVOCs
AVOCs
SVOCs
PFAS
1,4-Dioxane

metals
Asbestos
Lead
Biologicals
pesticides
herbicides
PCBs
Other:____________________________

Site Setting: Urban Suburban Unoccupied
Traffic Bystanders Crime Plants Animals Vectors
Overhead Utilities Underground Utilities Large Equipment
High Voltage Flood/Tidal Limited Access
Confined Spaces

Task-Specific Chemicals and Hazards (describe):
PPE Level (circle): D C B A Modifications:
Glove types: Face covering needed? Y/ N
Other specialty PPE:

Safe to Work Alone: Y / N
Other Precautions: Y / N Describe:

COVID 19 Protocols to be Observed: Y / N

Waste Containment:

How/ where will materials be contained, labelled, stored, or disposed?

Miscellaneous:

APPENDIX B

Personnel Log

PERSONNEL LOG

Name	Representing	Date	Time In	Time Out

APPENDIX C

Supervisor’s Incident Investigation Report

INCIDENT REPORT

Section 1.0: Complete By Employee and Project Manager
(provide to Human Resources Manager)

Incident Case No. ______

Employee Name: Employee Title/Position:	Age: Sex: ☐ Female ☐ Male	Time employee began work: Date of Incident: Time of Incident:	Weather Conditions: Date of Report: Time Report Completed:
Department: Office Location: Supervisor:			
Employee Address: Street: City/Town: Zip Code: Phone Number:	Location of Incident: Address: City/Town: State:		

Type of Incident:

☐ Motor Vehicle Accident or ☐ Near Miss or ☐ Injury occurred during routine work

☐ Company or ☐ Personal Vehicle?

First-Aid performed on-site? Yes / No
Other Medical Attention Provided? Yes / No

Time lost from work? Yes / No Number of Hours: or Number of Days:

If injuries occurred, list names and describe nature, degree, and body part injured: Number of injured:_____

1.
2.
3.
4.

Complete Section 3.0

WITNESS STATEMENT: WHAT HAPPENED AND WHAT WAS THE EMPLOYEE DOING BEFORE THE INCIDENT OCCURRED? WHAT WAS THE EMPLOYEE DOING WHEN THE INCIDENT OCCURRED? WHAT WAS THE EMPLOYEE DOING AFTER THE INCIDENT OCCURRED?	Describe what took place? Who was at fault for vehicle accidents, citation? Was power equipment involved, if so, describe?

WHAT WAS THE NATURE OF THE INJURY OR ILLNESS?	Tell us the body part that was affected and how it was affected – be specific Examples: strained lower back; chemical burn on hand
WHAT WAS THE ROOT CAUSE OF THE INCIDENT? List other individual involved in Section 3. COULD INCIDENT HAVE BEEN AVOIDED? HOW?	Get all the facts by studying the Job and situation involved. Question by use of WHY - WHAT – WHERE – WHEN – WHO – HOW Were there other factors (e.g., noise, ventilation, illumination, fatigue, age, medical conditions) that contributed to the accident?
WAS TRAINING FOR THE WORK ACTIVITY PROVIDED: TYPE: DATES:	WERE WARNING SIGNS OR LABELS POSTED:
WHAT SHOULD BE DONE? HOW CAN INCIDENT BE AVOIDED IN THE FUTURE?	WAS PERSONAL PROTECTIVE EQUIPMENT USED? NEEDED: AVAILABLE: CONTRIBUTED TO INJURY:
WHAT HAVE YOU DONE THUS FAR?	Take or recommend action, depending upon your authority. Follow up – was action effective?
HOW WILL THIS IMPROVE OPERATIONS?	OBJECTIVE Eliminate job hindrances

Completed by:	Reviewed by:	Date

Section 2.0: Complete By Supervisor or Human Resources Manager

Name: Role (witness, observer, injured, participant, etc.):	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number
Name: Role:	Address: Phone Number

Section 3.0: Corrective Actions (To be Completed by OHSM and CHSO)

Are corrective actions warranted? ☐ Yes ☐ No If so, proceed with corrective action list

Corrective Actions. List long term actions to be taken as a result of incident (use additional sheets if needed)	How was the corrective action implemented?	Target date of completion

OHSM Name:	CHSO Name:
OHSM Signature:	CHSO Signature:

End of incident report. Section 4.0 is to be completed and maintained by the Human Resources Department.

Section 4.0: Complete By Human Resources Manager

Incident Report Case No. ____________

The information on this page is considered CONFIDENTIAL and must be treated as such. This page will only be available to Human Resources Department or the employee's supervisor.

Insured Name:	Employee Hire Dates: Start at Company: Current Position:
Policy Number:	Is employee a company: Owner, Officer, Neither.
Employee Soc. Sec. No.:	Marital Status: Spouse Name:
Was Employee Pay Interrupted, or paid in full for time:	Employee Pay Period: Weekly, Bi-Weekly, Monthly, Other (specify)
Employee Compensated by hourly or salary? Wage Information: (tips, bonuses, commission)	Typical No. of hours worked per day____, hours per week____. Typical Start of day time__________, end of day time________.
Date of Stop Work: Date Returned to Work:	How often has employee visited doctor/hospital?
Doctor: Authorized by Co.: Y / N Street: City/Town: Zip Code: Phone Number: Authorized by Co.: Y / N	Hospital: Street: City/Town: Zip Code: Phone Number: Authorized by Co.: Y /N
Was the employee treated in an emergency room? ☐ Yes ☐ No	Was employee hospitalized overnight as an in-patient? ☐ Yes ☐ No If so, for how many days? _________

APPENDIX D

Daily Job Brief Record

JOB BRIEF RECORD

	Newtown Creek, Maspeth, Queens County	DEC1025.P3
Person Conducting	Site Name/Address	HRP Client Name/Job #
Michael Haggerty/518-402-9688	Alisa Werst	Matthew Cavas
Client Contact/Phone	HRP H&S Rep.	HRP Supervisor
Date/Time	Number Attending	Weather

Designated Competent Person: ____________________

Description of Work: ____________________

Attendees (use additional sheets as needed):

Name	Company	Signature

Emergency Telephone Numbers FIRE / POLICE / AMBULANCE: 911

Hospital Name & Location: NYU Langone Health – Ronald O. Perelman Center for Emergency Services - located at 570 First Avenue, New York, NY 10016

NYSDEC Spill Line: 1-518-457-7362

National Response Center: 800-424-8802

CBYD: 800-922-4455

Health & Safety Manager: Mark Wright: 203-308-0983

HAZARDS

- ☐ Toxic
- ☐ Corrosive
- ☐ Flammable
- ☐ Combustible
- ☐ Reactive
- ☐ Path Waste
- ☐ Asbestos
- ☐ Extreme Cold/Heat
- ☐ Drains/Sumps
- ☐ Sharp Objects
- ☐ Drilling in Soil
- ☐ Lighting
- ☐ Slips/Trips/Falls
- ☐ Lead
- ☐ Soil Excavation
- ☐ Tank Excavation
- ☐ Trenching
- ☐ Floor Holes
- ☐ Working on/near Water
- ☐ Underground/Overhead Utilities
- ☐ Vehicle Traffic
- ☐ Hot Work
- ☐ Vac Truck
- ☐ Ladders
- ☐ Noise
- ☐ Lifting
- ☐ Powerwashing
- ☐ Elevated Work Area
- ☐ Live Electrical Circuits
- ☐ Pneumatic Tools
- ☐ Drum Handling
- ☐ Abrasive Blasting

PERSONAL SAFETY

- ☐ Supplied Air Respirator
- ☐ Fully Encapsulating Suit
- ☐ Overboots
- ☐ Safety Glasses
- ☐ Reflective Vests
- ☐ Hearing Protection
- ☐ SAR w/Egress Bottle
- ☐ Flash Suit
- ☐ Lifebelt/Lanyard
- ☐ Chemical Goggles
- ☐ Eye Wash
- ☐ Evacuation Plan
- ☐ SCBA
- ☐ NOMEX (flam resistant)
- ☐ Hardhats
- ☐ Face Shield
- ☐ Safety Shower
- ☐ Communications
- ☐ Air Purifying Respirator Cartridge: ____________
- ☐ Protected Coveralls, Type: ____________
- ☐ Outer Gloves, Type: ____________
- ☐ Inner Gloves, Type: ____________
- ☐ First Aid Kit
- ☐ Properly Sloped Excavation/ Trench
- ☐ PFD's
- ☐ Ventilation

FIRE SAFETY

☐ Fire Extinguishers
☐ Equipment Grounded & Bonded
☐ Smoking Area Designated Location: ______________________
☐ Fire Hose Laid Out
☐ Hot Work Permit
☐ Non-Sparking Tools
☐ Fire Blanket
☐ Eliminate Ignition Sources
☐ Alarm Box in Area, Location: ______________________
☐ Explosion-Proof Equipment
☐ Area Kept Wet

ISOLATE EQUIPMENT

☐ Establish Exclusion Zone/Traffic Cones
☐ Stop Transfers
☐ GFCIS
☐ Work Signs
☐ Caution Tape Area
☐ Temporary Fencing

ELECTRICAL EQUIPMENT

☐ LockOut/TagOut
☐ Equipment Grounded
☐ Non-Conductive Tools
☐ FR Suits/Coveralls

AIR MONITORING

Type of Meter: ______________________ Date last calibrated: ____________

SUBSTANCE	LEVEL B MAX.	ACTION LEVEL/LEVEL C MAX.	LEVEL D MAX.

Health & Safety Comments / Topics & Safety Rules Reviewed / Questions / Concerns:

____
____
____
____
____
____
____

Contaminants of Concern: ______________________________________

HEALTH & SAFETY SIGNATURE: ______________________ Date: ____________

Is there a Site-Specific or Generic Health & Safety Plan available on-site? Yes ☐ No ☐

☐ HAZARD ZONES NOT APPLICABLE, GENERAL WORK AREA

Level D ☐ Modified Level D ☐ Level C ☐

Anything above Level C, foreman should use a Confined Space Permit/Form.

Note: HOT WORK requires a hot work permit and minimum 20# fire extinguisher. Foreman or HSM must record at least one contaminant of concern above. Toxic plants may be considered a COC if no chemical hazards are expected.

LEVEL C
Respirator Type: ______________________________________

Name	Zone	Time In	Time Out	Decon Type

Before performing Level C work, ALL employees must review HRP's Respiratory Protection Program - a copy of which must be on-site along with a HASP.

APPENDIX E
Equipment Calibration Log

EQUIPMENT CALIBRATION LOG

Instrument	Calibration Date	Calibrated By

APPENDIX F

Community Air Monitoring Plan

Community Air Monitoring Plan

This Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of a designated work area when certain activities are in progress. The CAMP is not intended for use in establishing action levels for workers 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.

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

Depending on the nature of known or potential contaminants at the site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary.

Continuous monitoring will be required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil samples. "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, continuing monitoring may be required during sampling activities.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will 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 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.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than the background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques 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 mcg/m^3 above the upwind level, work will be stopped, and a re-evaluation of activities initiated. Work can resume if 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.

All readings will be recorded and be available for State (DEC and DOH) personnel to review.

VOC Monitoring, Response Levels, and Actions

VOCs will 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 will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a photo ionization detector (PID) equipped with a 10.2 eV bulb. The PID will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will 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 will be halted, the source of the 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 will be shutdown.

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

APPENDIX G

COVID-19 Health and Safety Guidelines

COVID19
SITE SPECIFIC HASP ADDENDUM

This addendum will remain in effect until what time the CDC, NIAID, and/or Surgeon General guidance is provided that removes the heightened awareness of social distancing, hand washing, and other protocols in response to COVID-19.

NECESSARY ADDITIONAL SUPPLIES

- Hand sanitizer (minimum 60% alcohol)
- Squeeze bottles of water (if no running water at job site)
- Soap
- Disinfectant (for tools, vehicles, common areas, etc.)
- Caution tape, cones or similar to set up social distancing boundaries as needed

EMPLOYEE HEALTH PROTECTION – ZERO TOLERANCE

The following applies to both HRP employees and contracted staff working on behalf of the HRP or the client.

- ZERO TOLERANCE FOR SICK WORKERS REPORTING TO WORK. IF YOU ARE SICK, STAY HOME! IF YOU FEEL SICK, GO HOME! IF YOU SEE SOMEONE SICK, SEND THEM HOME!
- If you are exhibiting any of the symptoms below, you are to report this to your supervisor (via phone, text or email) right away, and head home from the job site or stay home if already there.

  If you notice a co-worker showing signs or complaining about such symptoms, he or she should be directed to their supervisor (via phone, text or email) and asked to leave the project site immediately.

  COVID-19 Typical Symptoms:
    - Fever
    - Cough
    - Shortness of Breath
    - Sore Throat
    - Loss of taste or smell
- Prior to starting a shift, each employee will verbally self-certify to their supervisor that they:
    - Have no signs of a fever or a measured temperature above 100.3 degrees or greater, a cough or trouble breathing within the past 24 hours.
    - Have not had “close contact” with an individual diagnosed with COVID-19. “Close contact” means living in the same household as a person who has tested positive for COVID-19, caring for a person who has tested positive for COVID-19, being within 6 feet of a person who has tested positive for COVID-19 for about 15 minutes, or coming in direct contact with secretions (e.g., sharing utensils, being coughed on) from a person who has tested positive for COVID-19, while that person was symptomatic.
    - Have not been asked to self-isolate or quarantine by their doctor or a public health official.
    - These self-certifications may be documented at the request of the site owner
- Workers that are working in a confined space or inside a closed building envelope will have to be temperature screened by a Medical Professional or designated individual. Such screening shall be performed out of public view to respect privacy and results are kept private.
- Employees exhibiting symptoms or unable to self-certify should be directed to leave the work

site and seek medical attention and applicable testing by their health care provider. They are not to return to the work site until cleared by a medical professional.

GENERAL ON-THE-JOB GUIDANCE TO PREVENT EXPOSURE & LIMIT THE TRANSMISSION OF THE VIRUS

All Job Sites

- No touching or direct contact with other individuals, including handshaking.
- Wash hands often with soap and water for at least 20 seconds or alternatively when soap and water are not available, use an alcohol-based hand sanitizer with at least 60% ethanol or 70% isopropanol
- A "No Congregation" policy is in effect, individuals must implement social distancing by maintaining a minimum distance of 6-feet from all other individuals
- Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing
- Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 10 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion
- Be sure to use your own water bottle, and do not share
- To avoid external contamination, bring food from home
- Maintain Social Distancing separation during breaks and lunch.
- To avoid sharing germs, please clean up after yourself. DO NOT make others responsible for moving, unpacking and packing up your personal belongings
- If you or a family member is feeling ill, stay home!

Multi-person job sites (i.e. HRP and subcontractors, etc.)

- Contractor and Field Offices are to be locked down to all but authorized personnel
- Each jobsite should develop cleaning and decontamination procedures that are posted and shared (if multi-person job site). These Procedures must cover all areas including trailers, gates, equipment, vehicles, etc. and shall be posted at all entry points to the sites, and throughout the project site.
- All individual work crew meetings/tailgate talks should be held outside and follow social distancing
- Please keep all crews a minimum of 6' apart at all times to eliminate the potential of cross contamination
- At each job briefing/tool box talk, employees are asked if they are experiencing any symptoms, and are sent home if they are
- Each jobsite should have laminated COVID-19 safety guidelines and handwashing instructions (last page of this addendum)
- All restroom facilities/porta-potties should be cleaned and handwashing stations must be provided with soap, hand sanitizer and paper towels
- All surfaces should be cleaned at least twice a day, including desk, work stations, door handles, laptops, etc.
- All common areas and meeting areas are to be regularly cleaned and disinfected at least once a day but preferably twice a day

- Single person job sites (just one HRP employee, no subs, vendors, etc.)
  - It is that person's responsibility to clean and disinfect all tools and reusable supplies upon return to the office

  - Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands, if no tissue is available then cough into your elbow
  - Avoid touching eyes, nose, and mouth with your hands

WORK SITE RISK PREVENTION PRACTICES

- At the start of each shift, confirm with all employees that they are healthy.
- All employees will be required to wear gloves (either latex or cut resistant depending on the task at hand)
- Use of eye protection is required (Safety glasses or googles at a minimum with or without face shields).
- In work conditions where required social distancing is impossible to achieve, affected employees shall be supplied PPE including as appropriate a standard face covering, gloves, and eye protection.
- All employees shall drive to work site/parking area in a single occupant vehicle. No one should ride together in the same vehicle
- When entering a machine or vehicle which you are not sure you were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant prior to entry
- In instances where it is possible, workers should maintain separation of 6' from each other per CDC guidelines.
- Multi person activities will be limited where feasible (two person lifting activities)
- Large gathering places on the site such as shacks and break areas will be eliminated and instead small break areas will be used with seating limited to ensure social distancing.
- Contact the cleaning person for your office trailer or office space and ensure they have proper COVID- 19 sanitation processes. Increase their cleaning visits to daily
- Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to desks, laptops and vehicles

Wash Stations: All sites without ready access to an indoor bathroom or running water MUST install Wash Stations or provide other means for handwashing

- Install hand wash stations with hot water, if possible, and soap at fire hydrants or other water sources to be used for frequent handwashing for all onsite employees.
- All onsite workers must help to maintain and keep stations clean
- If a worker notices soap or towels are running low or out, immediately notify supervisors
- Garbage barrels will be placed next to the hand wash station for disposal of tissues/towels
- If no other alternative exists, bring squeeze bottles with water and soap (only authorized for single employee job sites)

Please Note: This document is not intended to replace any formalized procedures currently in place within the site specific HASP or any job related contracts.

Where this guidance does not meet or exceed the standards put forth by the state, municipality, site owner, contractor or subcontractor, everyone shall abide by the most stringent procedure.

A site-specific COVID-19 Officer (also known as the Health and Safety Officer) shall be designated for every site.

Print and post at each job site

COVID-19/ Health and Safety Officer Name: ______________________________

Phone Number: ____

Wash your hands often with soap and warm water, or use an alcohol-based hand sanitizer.

Avoid touching your eyes, nose and mouth.

Cover your mouth when you cough or sneeze. Use a tissue or your inner elbow, not your hands.

Clean things that are frequently touched (like doorknobs and countertops) with household cleaning spray or wipes.

Stay home if you are sick and avoid close contact with others.

Think ahead about how to take care of yourself and your loved ones. Visit **mass.gov/KnowPlanPrepare** for preparedness tips.

Any issue of non-compliance with these guidelines shall be a basis for pausing the work. The Health and Safety Officer will address corrective actions with the subcontractor. Any additional issues of non-conformance may be subject to action against the subcontractor's prequalification and certification status.

APPENDIX H

Safety Data Sheets
(for chemicals brought to the site)

Safety Data Sheet

according to 1907/2006/EC (REACH), 1272/2008/EC (CLP), 29CFR1910/1200 and GHS Rev. 3

Effective date: 12.08.2015 **Revision** : 12.10.2015

Trade Name: Alconox

1 Identification of the substance/mixture and of the supplier

1.1 Product identifier

Trade Name: Alconox
Synonyms:
Product number: Alconox

1.2 Application of the substance / the mixture : Cleaning material/Detergent

1.3 Details of the supplier of the Safety Data Sheet

Manufacturer	**Supplier**
Alconox, Inc. 30 Glenn Street White Plains, NY 10603 1-914-948-4040	Not Applicable

Emergency telephone number:
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

2 Hazards identification

2.1 Classification of the substance or mixture:

In compliance with EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments.

Hazard-determining components of labeling:
Tetrasodium Pyrophosphate
Sodium tripolyphosphate
Sodium Alkylbenzene Sulfonate

2.2 Label elements:

Skin irritation, category 2.
Eye irritation, category 2A.

Hazard pictograms:

Signal word: Warning

Hazard statements:
H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:
P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Additional information: None.

Hazard description

Hazards Not Otherwise Classified (HNOC): None

Information concerning particular hazards for humans and environment:

The product has to be labelled due to the calculation procedure of the "General Classification guideline for preparations of the EU" in the latest valid version.

Classification system:

The classification is according to EC regulation No. 1272/2008, 29CFR1910/1200 and GHS Rev. 3 and amendments, and extended by company and literature data. The classification is in accordance with the latest editions of international substances lists, and is supplemented by information from technical literature and by information provided by the company.

3 Composition/information on ingredients

3.1 Chemical characterization : None

3.2 Description : None

3.3 Hazardous components (percentages by weight)

Identification	Chemical Name	Classification	Wt. %
CAS number: 7758-29-4	Sodium tripolyphosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	12-28
CAS number: 68081-81-2	Sodium Alkylbenzene Sulfonate	Acute Tox. 4; H303 Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	8-22
CAS number: 7722-88-5	Tetrasodium Pyrophosphate	Skin Irrit. 2 ; H315 Eye Irrit. 2; H319	2-16

3.4 Additional Information : None.

4 First aid measures

4.1 Description of first aid measures

General information: None.

After inhalation:

Maintain an unobstructed airway.
Loosen clothing as necessary and position individual in a comfortable position.

After skin contact:

Wash affected area with soap and water.
Seek medical attention if symptoms develop or persist.

After eye contact:

Rinse/flush exposed eye(s) gently using water for 15-20 minutes.
Remove contact lens(es) if able to do so during rinsing.
Seek medical attention if irritation persists or if concerned.

After swallowing:

Rinse mouth thoroughly.
Seek medical attention if irritation, discomfort, or vomiting persists.

4.2 Most important symptoms and effects, both acute and delayed

None

4.3 Indication of any immediate medical attention and special treatment needed:

No additional information.

5 Firefighting measures

5.1 Extinguishing media

Suitable extinguishing agents:

Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition.

For safety reasons unsuitable extinguishing agents : None

5.2 Special hazards arising from the substance or mixture :

Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Protective equipment:

Wear protective eye wear, gloves and clothing.
Refer to Section 8.

5.4 Additional information :

Avoid inhaling gases, fumes, dust, mist, vapor and aerosols.
Avoid contact with skin, eyes and clothing.

6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures :

Ensure adequate ventilation.
Ensure air handling systems are operational.

6.2 Environmental precautions :

Should not be released into the environment.
Prevent from reaching drains, sewer or waterway.

6.3 Methods and material for containment and cleaning up :

Wear protective eye wear, gloves and clothing.

6.4 Reference to other sections : None

7 Handling and storage

7.1 Precautions for safe handling :

Avoid breathing mist or vapor.
Do not eat, drink, smoke or use personal products when handling chemical substances.

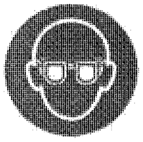
7.2 Conditions for safe storage, including any incompatibilities :

Store in a cool, well-ventilated area.

7.3 Specific end use(s):

No additional information.

8 Exposure controls/personal protection



8.1 Control parameters :
7722-88-5, Tetrasodium Pyrophosphate, OSHA TWA 5 mg/m3.

8.2 Exposure controls

Appropriate engineering controls:
Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Respiratory protection:
Not needed under normal conditions.

Protection of skin:
Select glove material impermeable and resistant to the substance.

Eye protection:
Safety goggles or glasses, or appropriate eye protection.

General hygienic measures:
Wash hands before breaks and at the end of work.
Avoid contact with skin, eyes and clothing.

9 Physical and chemical properties

Appearance (physical state, color):	White and cream colored flakes - powder	**Explosion limit lower**: **Explosion limit upper**:	Not determined or not available. Not determined or not available.
Odor:	Not determined or not available.	**Vapor pressure at 20°C**:	Not determined or not available.
Odor threshold:	Not determined or not available.	**Vapor density**:	Not determined or not available.
pH-value:	9.5 (aqueous solution)	**Relative density**:	Not determined or not available.
Melting/Freezing point:	Not determined or not available.	**Solubilities**:	Not determined or not available.
Boiling point/Boiling range:	Not determined or not available.	**Partition coefficient (n-octanol/water)**:	Not determined or not available.
Flash point (closed cup):	Not determined or not available.	**Auto/Self-ignition temperature**:	Not determined or not available.
Evaporation rate:	Not determined or not available.	**Decomposition temperature**:	Not determined or not available.

Flammability (solid, gaseous):	Not determined or not available.	**Viscosity**:	a. Kinematic: Not determined or not available. b. Dynamic: Not determined or not available.
Density at 20°C:	Not determined or not available.		

10 Stability and reactivity

10.1 Reactivity : None

10.2 Chemical stability : None

10.3 Possibility hazardous reactions : None

10.4 Conditions to avoid : None

10.5 Incompatible materials : None

10.6 Hazardous decomposition products : None

11 Toxicological information

11.1 Information on toxicological effects :

Acute Toxicity:

Oral:

: LD50 > 5000 mg/kg oral rat - Product .

Chronic Toxicity: No additional information.

Skin corrosion/irritation:

Sodium Alkylbenzene Sulfonate: Causes skin irritation. .

Serious eye damage/irritation:

Sodium Alkylbenzene Sulfonate: Causes serious eye irritation .

Tetrasodium Pyrophosphate: Rabbit - Risk of serious damage to eyes .

Respiratory or skin sensitization: No additional information.

Carcinogenicity: No additional information.

IARC (International Agency for Research on Cancer): None of the ingredients are listed.

NTP (National Toxicology Program): None of the ingredients are listed.

Germ cell mutagenicity: No additional information.

Reproductive toxicity: No additional information.

STOT-single and repeated exposure: No additional information.

Additional toxicological information: No additional information.

12 Ecological information

12.1 Toxicity:

Sodium Alkylbenzene Sulfonate: Fish, LC50 1.67 mg/l, 96 hours.
Sodium Alkylbenzene Sulfonate: Aquatic invertebrates, EC50 Daphnia 2.4 mg/l, 48 hours.
Sodium Alkylbenzene Sulfonate: Aquatic Plants, EC50 Algae 29 mg/l, 96 hours.
Tetrasodium Pyrophosphate: Fish, LC50 - other fish - 1,380 mg/l - 96 h.
Tetrasodium Pyrophosphate: Aquatic invertebrates, EC50 - Daphnia magna (Water flea) - 391 mg/l - 48 h.

12.2 Persistence and degradability: No additional information.

12.3 Bioaccumulative potential: No additional information.

12.4 Mobility in soil: No additional information.

General notes: No additional information.

12.5 Results of PBT and vPvB assessment:

PBT: No additional information.

vPvB: No additional information.

12.6 Other adverse effects: No additional information.

13 Disposal considerations

13.1 Waste treatment methods (consult local, regional and national authorities for proper disposal)

Relevant Information:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities. (US 40CFR262.11).

14 Transport information

14.1 UN Number:
ADR, ADN, DOT, IMDG, IATA — None

14.2 UN Proper shipping name:
ADR, ADN, DOT, IMDG, IATA — None

14.3 Transport hazard classes:
ADR, ADN, DOT, IMDG, IATA

Class: None
Label: None
LTD. QTY: None

US DOT
Limited Quantity Exception: None

Bulk:	**Non Bulk:**
RQ (if applicable): None	**RQ (if applicable):** None
Proper shipping Name: None	**Proper shipping Name:** None
Hazard Class: None	**Hazard Class:** None
Packing Group: None	**Packing Group:** None
Marine Pollutant (if applicable): No additional information.	**Marine Pollutant (if applicable):** No additional information.

	Comments: None	**Comments:** None
14.4	**Packing group:** ADR, ADN, DOT, IMDG, IATA	None
14.5	**Environmental hazards** :	None
14.6	**Special precautions for user:**	None
	Danger code (Kemler):	None
	EMS number:	None
	Segregation groups:	None
14.7	**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code:** Not applicable.	
14.8	**Transport/Additional information:**	
	Transport category:	None
	Tunnel restriction code:	None
	UN "Model Regulation":	None

15 Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture.

North American

SARA

Section 313 (specific toxic chemical listings): None of the ingredients are listed.
Section 302 (extremely hazardous substances): None of the ingredients are listed.

CERCLA (Comprehensive Environmental Response, Clean up and Liability Act) Reportable Spill Quantity: None of the ingredients are listed.

TSCA (Toxic Substances Control Act):

Inventory: All ingredients are listed.
Rules and Orders: Not applicable.

Proposition 65 (California):

Chemicals known to cause cancer: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for females: None of the ingredients are listed.

Chemicals known to cause reproductive toxicity for males: None of the ingredients are listed.

Chemicals known to cause developmental toxicity: None of the ingredients are listed.

Canadian

Canadian Domestic Substances List (DSL):
All ingredients are listed.

EU

REACH Article 57 (SVHC): None of the ingredients are listed.

Germany MAK: Not classified.

Asia Pacific

Australia

Australian Inventory of Chemical Substances (AICS): All ingredients are listed.

China

Inventory of Existing Chemical Substances in China (IECSC): All ingredients are listed.

Japan

Inventory of Existing and New Chemical Substances (ENCS): All ingredients are listed.

Korea

Existing Chemicals List (ECL): All ingredients are listed.

New Zealand

New Zealand Inventory of Chemicals (NZOIC): All ingredients are listed.

Philippines

Philippine Inventory of Chemicals and Chemical Substances (PICCS): All ingredients are listed.

Taiwan

Taiwan Chemical Substance Inventory (TSCI): All ingredients are listed.

16 Other information

Abbreviations and Acronyms: None

Summary of Phrases

Hazard statements:

H315 Causes skin irritation.
H319 Causes serious eye irritation.

Precautionary statements:

P264 Wash skin thoroughly after handling.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P302+P352 If on skin: Wash with soap and water.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
P321 Specific treatment (see supplemental first aid instructions on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P501 Dispose of contents and container as instructed in Section 13.

Manufacturer Statement:

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

NFPA: 1-0-0

HMIS: 1-0-0

SAFETY DATA SHEET

Version 5.2
Revision Date 02/24/2014
Print Date 11/13/2016

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name	:	Distilled water
Product Number	:	07-6061
Brand	:	Katayama OEM Partner
REACH No.	:	A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.
CAS-No.	:	7732-18-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	:	H2O H_2O
Molecular Weight	:	18.02 g/mol
CAS-No.	:	7732-18-5
EC-No.	:	231-791-2

No ingredients are hazardous according to OSHA criteria.
No components need to be disclosed according to the applicable regulations.

4. FIRST AID MEASURES

4.1 Description of first aid measures

If inhaled
If not breathing give artificial respiration

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

no data available

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5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2 Special hazards arising from the substance or mixture

no data available

5.3 Advice for firefighters

no data available

5.4 Further information

The product itself does not burn.

---

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

For personal protection see section 8.

6.2 Environmental precautions

no data available

6.3 Methods and materials for containment and cleaning up

Wipe up with absorbent material (e.g. cloth, fleece).

6.4 Reference to other sections

For disposal see section 13.

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7. HANDLING AND STORAGE

7.1 Precautions for safe handling

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

No special storage conditions required.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

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8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice.

Personal protective equipment

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min

Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374
If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Respiratory protection
No special protective equipment required.

Control of environmental exposure
Prevent product from entering drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Colour: colourless
b)	Odour	no data available
c)	Odour Threshold	no data available
d)	pH	6.0 - 8.0 at 25 °C (77 °F)
e)	Melting point/freezing point	0.0 °C (32.0 °F)
f)	Initial boiling point and boiling range	100 °C (212 °F) - lit.
g)	Flash point	not applicable
h)	Evapouration rate	no data available
i)	Flammability (solid, gas)	no data available
j)	Upper/lower flammability or explosive limits	no data available
k)	Vapour pressure	no data available
l)	Vapour density	no data available
m)	Relative density	1.000 g/cm3 at 3.98 °C (39.16 °F)
n)	Water solubility	completely miscible
o)	Partition coefficient: n-octanol/water	no data available
p)	Auto-ignition temperature	no data available
q)	Decomposition temperature	no data available
r)	Viscosity	no data available
s)	Explosive properties	no data available
t)	Oxidizing properties	no data available

9.2 Other safety information

no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

no data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

no data available

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

no data available

10.6 Hazardous decomposition products

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

no data available

Inhalation: no data available

Dermal: no data available

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

no data available

Specific target organ toxicity - single exposure

no data available

Specific target organ toxicity - repeated exposure

no data available

Aspiration hazard
no data available

Additional Information
RTECS: ZC0110000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity
no data available

12.2 Persistence and degradability
not applicable

12.3 Bioaccumulative potential
no data available

12.4 Mobility in soil
no data available

12.5 Results of PBT and vPvB assessment
PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Taking into account local regulations the product may be disposed of as waste water after neutralisation.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

REACH No. : A registration number is not available for this substance as the substance or its uses are exempted from registration, the annual tonnage does not require a registration or the registration is envisaged for a later registration deadline.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Water	7732-18-5	

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

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16. OTHER INFORMATION

HMIS Rating

Health hazard:	0
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	0
Fire Hazard:	0
Reactivity Hazard:	0

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 5.2 Revision Date: 02/24/2014 Print Date: 11/13/2016

Safety Data Sheet

Material Name: Gasoline All Grades **SDS No. 9950**
US GHS

Synonyms: Hess Conventional (Oxygenated and Non-oxygenated) Gasoline; Reformulated Gasoline (RFG); Reformulated Gasoline Blendstock for Oxygenate Blending (RBOB); Unleaded Motor or Automotive Gasoline

* * * Section 1 - Product and Company Identification * * *

Manufacturer Information

Hess Corporation
1 Hess Plaza
Woodbridge, NJ 07095-0961

Phone: 732-750-6000 Corporate EHS
Emergency # 800-424-9300 CHEMTREC
www.hess.com (Environment, Health, Safety Internet Website)

* * * Section 2 - Hazards Identification * * *

GHS Classification:

Flammable Liquid - Category 2
Skin Corrosion/Irritation - Category 2
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1B
Toxic to Reproduction - Category 1A
Specific Target Organ Toxicity (Single Exposure) - Category 3 (respiratory irritation, narcosis)
Specific Target Organ Toxicity (Repeat Exposure) - Category 1 (liver, kidneys, bladder, blood, bone marrow, nervous system)
Aspiration Hazard - Category 1
Hazardous to the Aquatic Environment – Acute Hazard - Category 3

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

DANGER

Hazard Statements

Highly flammable liquid and vapour.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
May damage fertility or the unborn child.
May cause respiratory irritation.
May cause drowsiness or dizziness.
Causes damage to organs (liver, kidneys, bladder, blood, bone marrow, nervous system) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Wash hands and forearms thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Do not breathe mist/vapours/spray.
Use only outdoors or in well-ventilated area.
Do not eat, drink or smoke when using this product.
Avoid release to the environment.

Response

In case of fire: Use water spray, fog, dry chemical fire extinguishers or hand held fire extinguisher.
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.
IF exposed or concerned: Get medical advice/attention.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a poison center or doctor/physician if you feel unwell.
Get medical advice/attention if you feel unwell.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. Do not induce vomiting.

Storage

Store in a well-ventilated place.
Keep cool. Keep container tightly closed.
Store locked up.

Disposal

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	Component	Percent
86290-81-5	Gasoline, motor fuel	100
108-88-3	Toluene	1-25
106-97-8	Butane	<10
1330-20-7	Xylenes (o-, m-, p- isomers)	1-15
95-63-6	Benzene, 1,2,4-trimethyl-	<6
64-17-5	Ethyl alcohol	0-10
100-41-4	Ethylbenzene	<3
71-43-2	Benzene	0.1-4.9

110-54-3	Hexane	0.5-4

A complex blend of petroleum-derived normal and branched-chain alkane, cycloalkane, alkene, and aromatic hydrocarbons. May contain antioxidant and multifunctional additives. Non-oxygenated Conventional Gasoline and RBOB do not have oxygenates (Ethanol). Oxygenated Conventional and Reformulated Gasoline will have oxygenates for octane enhancement or as legally required.

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin

Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or with waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.

Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

Extinguishing Media

SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO_2, water spray, fire fighting foam, or gaseous extinguishing agent.

LARGE FIRES: Water spray, fog or fire fighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers.

Firefighting foam suitable for polar solvents is recommended for fuel with greater than 10% oxygenate concentration.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment/Instructions

Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other fire fighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied fire fighting foam.

* * * Section 6 - Accidental Release Measures * * *

Recovery and Neutralization

Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal. Caution, flammable vapors may accumulate in closed containers.

Emergency Measures

Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Spills may infiltrate subsurface soil and groundwater; professional assistance may be necessary to determine the extent of subsurface impact.

Personal Precautions and Protective Equipment

Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of fire fighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection.

Prevention of Secondary Hazards

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

USE ONLY AS A MOTOR FUEL.
DO NOT SIPHON BY MOUTH

Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Special slow load procedures for "switch loading" must be followed to avoid the static ignition hazard that can exist when higher flash point material (such as fuel oil) is loaded into tanks previously containing low flash point products (such as this product) - see API Publication 2003, "Protection Against Ignitions Arising Out Of Static, Lightning and Stray Currents."

Storage Procedures

Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks In Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks".

Incompatibilities

Keep away from strong oxidizers.

* * * Section 8 - Exposure Controls / Personal Protection * * *

Component Exposure Limits

Gasoline, motor fuel (86290-81-5)

ACGIH:	300 ppm TWA 500 ppm STEL

Toluene (108-88-3)

ACGIH:	20 ppm TWA
OSHA:	200 ppm TWA; 375 mg/m3 TWA 150 ppm STEL; 560 mg/m3 STEL
NIOSH:	100 ppm TWA; 375 mg/m3 TWA 150 ppm STEL; 560 mg/m3 STEL

Butane (106-97-8)

ACGIH:	1000 ppm TWA (listed under Aliphatic hydrocarbon gases: Alkane C1-4)
OSHA:	800 ppm TWA; 1900 mg/m3 TWA
NIOSH:	800 ppm TWA; 1900 mg/m3 TWA

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH:	100 ppm TWA 150 ppm STEL
OSHA:	100 ppm TWA; 435 mg/m3 TWA 150 ppm STEL; 655 mg/m3 STEL

Benzene, 1,2,4-trimethyl- (95-63-6)

NIOSH:	25 ppm TWA; 125 mg/m3 TWA

Ethyl alcohol (64-17-5)

ACGIH:	1000 ppm STEL
OSHA:	1000 ppm TWA; 1900 mg/m3 TWA
NIOSH:	1000 ppm TWA; 1900 mg/m3 TWA

Ethylbenzene (100-41-4)

ACGIH:	20 ppm TWA
OSHA:	100 ppm TWA; 435 mg/m3 TWA 125 ppm STEL; 545 mg/m3 STEL
NIOSH:	100 ppm TWA; 435 mg/m3 TWA 125 ppm STEL; 545 mg/m3 STEL

Benzene (71-43-2)

ACGIH:	0.5 ppm TWA 2.5 ppm STEL Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA:	5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH:	0.1 ppm TWA 1 ppm STEL

Hexane (110-54-3)

ACGIH:	50 ppm TWA Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA:	500 ppm TWA; 1800 mg/m3 TWA
NIOSH:	50 ppm TWA; 180 mg/m3 TWA

Engineering Measures

Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory

A NIOSH/MSHA-approved air-purifying respirator with organic vapor cartridges or canister may be permissible under certain circumstances where airborne concentrations are or may be expected to exceed exposure limits or for odor or irritation. Protection provided by air-purifying respirators is limited.

Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands

Gloves constructed of nitrile, neoprene, or PVC are recommended.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes

Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body

Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	Translucent, straw-colored or light yellow	**Odor:**	Strong, characteristic aromatic hydrocarbon odor. Sweet-ether like
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	6.4 - 15 RVP @ 100 °F (38 °C) (275-475 mm Hg @ 68 °F (20 °C)	**Vapor Density:**	AP 3-4
Boiling Point:	85-437 °F (39-200 °C)	**Melting Point:**	ND
Solubility (H2O):	Negligible to Slight	**Specific Gravity:**	0.70-0.78
Evaporation Rate:	10-11	**VOC:**	ND
Percent Volatile:	100%	**Octanol/H2O Coeff.:**	ND
Flash Point:	-45 °F (-43 °C)	**Flash Point Method:**	PMCC
Upper Flammability Limit (UFL):	7.6%	**Lower Flammability Limit (LFL):**	1.4%
Burning Rate:	ND	**Auto Ignition:**	>530°F (>280°C)

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products

Keep away from strong oxidizers.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Contact with nitric and sulfuric acids will form nitrocresols that can decompose violently.

* * * Section 11 - Toxicological Information * * *

Acute Toxicity

A: General Product Information

Harmful if swallowed.

B: Component Analysis - LD50/LC50

Gasoline, motor fuel (86290-81-5)

Inhalation LC50 Rat >5.2 mg/L 4 h; Oral LD50 Rat 14000 mg/kg; Dermal LD50 Rabbit >2000 mg/kg

Toluene (108-88-3)

Inhalation LC50 Rat 12.5 mg/L 4 h; Inhalation LC50 Rat >26700 ppm 1 h; Oral LD50 Rat 636 mg/kg; Dermal LD50 Rabbit 8390 mg/kg; Dermal LD50 Rat 12124 mg/kg

Butane (106-97-8)

Inhalation LC50 Rat 658 mg/L 4 h

Xylenes (o-, m-, p- isomers) (1330-20-7)
Inhalation LC50 Rat 5000 ppm 4 h; Inhalation LC50 Rat 47635 mg/L 4 h; Oral LD50 Rat 4300 mg/kg; Dermal LD50 Rabbit >1700 mg/kg

Benzene, 1,2,4-trimethyl- (95-63-6)
Inhalation LC50 Rat 18 g/m3 4 h; Oral LD50 Rat 3400 mg/kg; Dermal LD50 Rabbit >3160 mg/kg

Ethyl alcohol (64-17-5)
Oral LD50 Rat 7060 mg/kg; Inhalation LC50 Rat 124.7 mg/L 4 h

Ethylbenzene (100-41-4)
Inhalation LC50 Rat 17.2 mg/L 4 h; Oral LD50 Rat 3500 mg/kg; Dermal LD50 Rabbit 15354 mg/kg

Benzene (71-43-2)
Inhalation LC50 Rat 13050-14380 ppm 4 h; Oral LD50 Rat 1800 mg/kg

Hexane (110-54-3)
Inhalation LC50 Rat 48000 ppm 4 h; Oral LD50 Rat 25 g/kg; Dermal LD50 Rabbit 3000 mg/kg

Potential Health Effects: Skin Corrosion Property/Stimulativeness

Practically non-toxic if absorbed following acute (single) exposure. May cause skin irritation with prolonged or repeated contact. Liquid may be absorbed through the skin in toxic amounts if large areas of skin are repeatedly exposed.

Potential Health Effects: Eye Critical Damage/ Stimulativeness

Moderate irritant. Contact with liquid or vapor may cause irritation.

Potential Health Effects: Ingestion

Ingestion may cause gastrointestinal disturbances, including irritation, nausea, vomiting and diarrhea, and central nervous system (brain) effects similar to alcohol intoxication. In severe cases, tremors, convulsions, loss of consciousness, coma, respiratory arrest, and death may occur.

Potential Health Effects: Inhalation

Excessive exposure may cause irritations to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

WARNING: the burning of any hydrocarbon as a fuel in an area without adequate ventilation may result in hazardous levels of combustion products, including carbon monoxide, and inadequate oxygen levels, which may cause unconsciousness, suffocation, and death.

Respiratory Organs Sensitization/Skin Sensitization

This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity

This product may cause genetic defects.

Carcinogenicity

A: General Product Information

May cause cancer.

IARC has determined that gasoline and gasoline exhaust are possibly carcinogenic in humans. Inhalation exposure to completely vaporized unleaded gasoline caused kidney cancers in male rats and liver tumors in female mice. The U.S. EPA has determined that the male kidney tumors are species-specific and are irrelevant for human health risk assessment. The significance of the tumors seen in female mice is not known. Exposure to light hydrocarbons in the same boiling range as this product has been associated in animal studies with effects to the central and peripheral nervous systems, liver, and kidneys. The significance of these animal models to predict similar human response to gasoline is uncertain.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

B: Component Carcinogenicity

Gasoline, motor fuel (86290-81-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Xylenes (o-, m-, p- isomers) (1330-20-7)

ACGIH: A4 - Not Classifiable as a Human Carcinogen
IARC: Monograph 71 [1999]; Monograph 47 [1989] (Group 3 (not classifiable))

Ethyl alcohol (64-17-5)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 100E [in preparation] (in alcoholic beverages); Monograph 96 [2010] (in alcoholic beverages) (Group 1 (carcinogenic to humans))

Ethylbenzene (100-41-4)

ACGIH: A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans
IARC: Monograph 77 [2000] (Group 2B (possibly carcinogenic to humans))

Benzene (71-43-2)

ACGIH: A1 - Confirmed Human Carcinogen
OSHA: 5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH: potential occupational carcinogen
NTP: Known Human Carcinogen (Select Carcinogen)
IARC: Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Reproductive Toxicity

This product is suspected of damaging fertility or the unborn child.

Specified Target Organ General Toxicity: Single Exposure

This product may cause drowsiness or dizziness.

Specified Target Organ General Toxicity: Repeated Exposure

This product causes damage to organs through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

Very toxic to aquatic life with long lasting effects. Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Gasoline, motor fuel (86290-81-5)

Test & Species		Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]	
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L	
24 Hr EC50 Daphnia magna	170 mg/L	

Toluene (108-88-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	15.22-19.05 mg/L [flow-through]	1 day old
96 Hr LC50 Pimephales promelas	12.6 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.89-7.81 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	14.1-17.16 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	5.8 mg/L [semi-static]	
96 Hr LC50 Lepomis macrochirus	11.0-15.0 mg/L [static]	
96 Hr LC50 Oryzias latipes	54 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.2 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	50.87-70.34 mg/L [static]	
96 Hr EC50 Pseudokirchneriella subcapitata	>433 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	12.5 mg/L [static]	
48 Hr EC50 Daphnia magna	5.46 - 9.83 mg/L [Static]	
48 Hr EC50 Daphnia magna	11.5 mg/L	

Xylenes (o-, m-, p- isomers) (1330-20-7)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	13.4 mg/L [flow-through]	

96 Hr LC50 Oncorhynchus mykiss	2.661-4.093 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	13.5-17.3 mg/L	
96 Hr LC50 Lepomis macrochirus	13.1-16.5 mg/L [flow-through]	
96 Hr LC50 Lepomis macrochirus	19 mg/L	
96 Hr LC50 Lepomis macrochirus	7.711-9.591 mg/L [static]	
96 Hr LC50 Pimephales promelas	23.53-29.97 mg/L [static]	
96 Hr LC50 Cyprinus carpio	780 mg/L [semi-static]	
96 Hr LC50 Cyprinus carpio	>780 mg/L	
96 Hr LC50 Poecilia reticulata	30.26-40.75 mg/L [static]	
48 Hr EC50 water flea	3.82 mg/L	
48 Hr LC50 Gammarus lacustris	0.6 mg/L	

Benzene, 1,2,4-trimethyl- (95-63-6)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	7.19-8.28 mg/L [flow-through]	
48 Hr EC50 Daphnia magna	6.14 mg/L	

Ethyl alcohol (64-17-5)

Test & Species		Conditions
96 Hr LC50 Oncorhynchus mykiss	12.0 - 16.0 mL/L [static]	
96 Hr LC50 Pimephales promelas	>100 mg/L [static]	
96 Hr LC50 Pimephales promelas	13400 - 15100 mg/L [flow-through]	
48 Hr LC50 Daphnia magna	9268 - 14221 mg/L	
24 Hr EC50 Daphnia magna	10800 mg/L	
48 Hr EC50 Daphnia magna	2 mg/L [Static]	

Ethylbenzene (100-41-4)

Test & Species		Conditions
96 Hr LC50 Oncorhynchus mykiss	11.0-18.0 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	4.2 mg/L [semi-static]	
96 Hr LC50 Pimephales promelas	7.55-11 mg/L [flow-through]	
96 Hr LC50 Lepomis macrochirus	32 mg/L [static]	
96 Hr LC50 Pimephales promelas	9.1-15.6 mg/L [static]	
96 Hr LC50 Poecilia reticulata	9.6 mg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	4.6 mg/L	
96 Hr EC50 Pseudokirchneriella subcapitata	>438 mg/L	
72 Hr EC50 Pseudokirchneriella subcapitata	2.6 - 11.3 mg/L [static]	

96 Hr EC50 Pseudokirchneriella subcapitata	1.7 - 7.6 mg/L [static]
48 Hr EC50 Daphnia magna	1.8 - 2.4 mg/L

Benzene (71-43-2)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	10.7-14.7 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	5.3 mg/L [flow-through]	
96 Hr LC50 Lepomis macrochirus	22.49 mg/L [static]	
96 Hr LC50 Poecilia reticulata	28.6 mg/L [static]	
96 Hr LC50 Pimephales promelas	22330-41160 µg/L [static]	
96 Hr LC50 Lepomis macrochirus	70000-142000 µg/L [static]	
72 Hr EC50 Pseudokirchneriella subcapitata	29 mg/L	
48 Hr EC50 Daphnia magna	8.76 - 15.6 mg/L [Static]	
48 Hr EC50 Daphnia magna	10 mg/L	

Hexane (110-54-3)

Test & Species		Conditions
96 Hr LC50 Pimephales promelas	2.1-2.98 mg/L [flow-through]	
24 Hr EC50 Daphnia magna	>1000 mg/L	

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 - Disposal Considerations * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

* * * Section 14 - Transportation Information * * *

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

DOT Information

Shipping Name: Gasoline
UN #: 1203 **Hazard Class:** 3 **Packing Group:** II
Placard:

* * * Section 15 - Regulatory Information * * *

Regulatory Information

A: Component Analysis

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Toluene (108-88-3)

SARA 313:	1.0 % de minimis concentration
CERCLA:	1000 lb final RQ; 454 kg final RQ

Xylenes (o-, m-, p- isomers) (1330-20-7)

SARA 313:	1.0 % de minimis concentration
CERCLA:	100 lb final RQ; 45.4 kg final RQ

Benzene, 1,2,4-trimethyl- (95-63-6)

SARA 313:	1.0 % de minimis concentration

Ethylbenzene (100-41-4)

SARA 313:	0.1 % de minimis concentration
CERCLA:	1000 lb final RQ; 454 kg final RQ

Benzene (71-43-2)

SARA 313:	0.1 % de minimis concentration
CERCLA:	10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

Hexane (110-54-3)

SARA 313: 1.0 % de minimis concentration
CERCLA: 5000 lb final RQ; 2270 kg final RQ

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
X	X	X	--	--

Component Marine Pollutants

This material contains one or more of the following chemicals required by US DOT to be identified as marine pollutants.

Component	CAS #	
Gasoline, motor fuel	86290-81-5	DOT regulated marine pollutant

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Gasoline, motor fuel	86290-81-5	No	No	No	No	Yes	No
Toluene	108-88-3	Yes	Yes	Yes	Yes	Yes	No
Butane	106-97-8	Yes	Yes	Yes	Yes	Yes	No
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	Yes	Yes	Yes	Yes	No
Benzene, 1,2,4-trimethyl-	95-63-6	No	Yes	Yes	Yes	Yes	No
Ethyl alcohol	64-17-5	Yes	Yes	Yes	Yes	Yes	No
Ethylbenzene	100-41-4	Yes	Yes	Yes	Yes	Yes	No
Benzene	71-43-2	Yes	Yes	Yes	Yes	Yes	No
Hexane	110-54-3	No	Yes	Yes	Yes	Yes	No

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.
WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Toluene	108-88-3	1 %
Butane	106-97-8	1 %
Benzene, 1,2,4-trimethyl-	95-63-6	0.1 %
Ethyl alcohol	64-17-5	0.1 %
Ethylbenzene	100-41-4	0.1 %
Benzene	71-43-2	0.1 %
Hexane	110-54-3	1 %

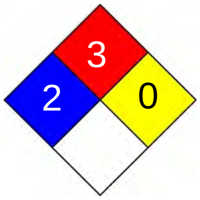
Additional Regulatory Information

Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Gasoline, motor fuel	86290-81-5	No	DSL	EINECS
Toluene	108-88-3	Yes	DSL	EINECS
Butane	106-97-8	Yes	DSL	EINECS
Xylenes (o-, m-, p- isomers)	1330-20-7	Yes	DSL	EINECS
Benzene, 1,2,4-trimethyl-	95-63-6	Yes	DSL	EINECS
Ethyl alcohol	64-17-5	Yes	DSL	EINECS
Ethylbenzene	100-41-4	Yes	DSL	EINECS
Benzene	71-43-2	Yes	DSL	EINECS
Hexane	110-54-3	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

NFPA® Hazard Rating		
	Health	2
	Fire	3
	Reactivity	0



HMIS® Hazard Rating			
	Health	2	Moderate
	Fire	3	Serious
	Physical	0	Minimal
			*Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

Information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

End of Sheet

SAFETY DATA SHEET

1. Identification

Product identifier: HYDROCHLORIC ACID

Other means of identification

Synonyms: Muriatic Acid, Hydrogen Chloride, Aqueous

Product No.: 9385, 9538, 9165, V226, V187, V078, V001, 6900, 2624, 2515, H999, H987, H616, 5861, 2612, 5800, 9625, 5587, 9551, 9544, 9539, 9535, 9530, 9529, 5367, H613, 37825, 25496,

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Details of the supplier of the safety data sheet

Manufacturer

Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034

Telephone: Customer Service: 855-282-6867

Fax: 610-573-2610
Contact Person: Environmental Health & Safety
E-mail: info@avantormaterials.com

Emergency telephone number:
CHEMTREC: 1-800-424-9300 within US and Canada
CHEMTREC: 1-703-527-3887 outside US and Canada

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Corrosive to metals	Category 1

Health Hazards

Acute toxicity (Oral)	Category 4
Skin Corrosion/Irritation	Category 1
Serious Eye Damage/Eye Irritation	Category 1
Specific Target Organ Toxicity - Single Exposure (Inhalation - vapor)	Category 3

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement:
May be corrosive to metals.
Harmful if swallowed.
Causes severe skin burns and eye damage.
May cause respiratory irritation.

Precautionary Statement

Prevention: Keep only in original container. Wash thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. Do not eat, drink or smoke when using this product.

Response: Absorb spillage to prevent material damage. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

Storage: Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in corrosive resistant container with a resistant inner liner.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	Common name and synonyms	CAS number	Content in percent (%)*
HYDROCHLORIC ACID		7647-01-0	20 - 40%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing If breathing is difficult, give oxygen.

Skin Contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Causes severe skin and eye burns. Harmful if swallowed.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: No unusual fire or explosion hazards noted.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Fire or excessive heat may produce hazardous decomposition products.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: Ventilate closed spaces before entering them. Keep unauthorized personnel away. Evacuate area. Keep upwind. See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up: Neutralize with lime or soda ash. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Inform authorities if large amounts are involved.

Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: Do not eat, drink or smoke when using the product. Do not get in eyes, on skin, on clothing. Wash hands thoroughly after handling. Do not breathe dust/fume/gas/mist/vapors/spray. Use caution when adding this material to water.

Conditions for safe storage, including any incompatibilities: Keep container tightly closed. Store in a well-ventilated place. Unsuitable containers: metals.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	type	Exposure Limit Values		Source
HYDROCHLORIC ACID	Ceiling	2 ppm		US. ACGIH Threshold Limit Values (2011)
	Ceil_Time	5 ppm	7 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	Ceiling	5 ppm	7 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	Ceiling	5 ppm	7 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	Ceiling	2 ppm		US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (01 2015)
	TWA PEL	0.3 ppm	0.45 mg/m3	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (01 2015)

Appropriate Engineering Controls No data available.

Individual protection measures, such as personal protective equipment

General information: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Eye/face protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin Protection

Hand Protection: Chemical resistant gloves

Other: Wear suitable protective clothing and gloves.

Respiratory Protection: If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn. Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

Hygiene measures: Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Do not get in eyes. Wash contaminated clothing before reuse. Do not get this material in contact with skin.

9. Physical and chemical properties

Appearance	
Physical state:	liquid
Form:	liquid
Color:	Colorless
Odor:	Pungent
Odor threshold:	No data available.
pH:	0.1 (1 N aqueous solution)
Melting point/freezing point:	-35 °C
Initial boiling point and boiling range:	48 °C
Flash Point:	not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	14.1 kPa
Vapor density:	No data available.
Relative density:	1.18 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Reacts violently with strong alkaline substances.
Chemical Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
Conditions to avoid:	Avoid contact with strong reducing agents. Strong oxidizing agents. Contact with alkalis.
Incompatible Materials:	Amines. Alkalies. Metals. Reducing agents. Oxidizing agents.
Hazardous Decomposition Products:	Chlorine. hydrogen chloride By heating and fire, corrosive vapors/gases may be formed.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	Harmful if swallowed.
Inhalation:	Causes severe burns.
Skin Contact:	Causes severe skin burns.

Eye contact: Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product: ATEmix (Rat): 581 mg/kg

Dermal

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID: LD 50 (Mouse): 1,449 mg/kg

Inhalation

Product: No data available.

Specified substance(s):

HYDROCHLORIC ACID: LC 50 (Mouse, 1 h): 1108 ppm
LC 50 (Rat, 1 h): 3124 ppm

Repeated dose toxicity

Product: No data available.

Skin Corrosion/Irritation

Product: Causes severe skin burns.

Serious Eye Damage/Eye Irritation

Product: Causes serious eye damage.

Respiratory or Skin Sensitization

Product: Not a skin sensitizer.

Carcinogenicity

Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro

Product: No mutagenic components identified

In vivo

Product: No mutagenic components identified

Reproductive toxicity

Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure

Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure

Product: None known.

Aspiration Hazard

Product:	Not classified
Other effects:	None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish

Product:	No data available.
Specified substance(s):	
HYDROCHLORIC ACID	LC 50 (Western mosquitofish (Gambusia affinis), 96 h): 282 mg/l Mortality

Aquatic Invertebrates

Product:	No data available.
Specified substance(s):	
HYDROCHLORIC ACID	LC 50 (Green or European shore crab (Carcinus maenas), 48 h): 240 mg/l Mortality LC 50 (Common shrimp, sand shrimp (Crangon crangon), 48 h): 260 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish

Product:	No data available.

Aquatic Invertebrates

Product:	No data available.

Toxicity to Aquatic Plants

Product:	No data available.

Persistence and Degradability

Biodegradation

Product:	Expected to be readily biodegradable.

BOD/COD Ratio

Product:	No data available.

Bioaccumulative Potential

Bioconcentration Factor (BCF)

Product:	No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)

Product:	No data available.

Mobility in Soil:	The product is water soluble and may spread in water systems.
Other Adverse Effects:	Large amounts of the product may affect the acidity (pH-factor) in water with possible risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions:	Discharge, treatment, or disposal may be subject to national, state, or local laws.
Contaminated Packaging:	Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN Number:	UN 1789
UN Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es)	
Class(es):	8
Label(s):	8
Packing Group:	II
Marine Pollutant:	Not a Marine Pollutant
Special precautions for user:	–

IMDG

UN Number:	UN 1789
UN Proper Shipping Name:	HYDROCHLORIC ACID
Transport Hazard Class(es)	
Class(es):	8
Label(s):	8
EmS No.:	F-A, S-B
Packing Group:	II
Marine Pollutant:	Not a Marine Pollutant
Special precautions for user:	–

IATA

UN Number:	UN 1789
Proper Shipping Name:	Hydrochloric acid
Transport Hazard Class(es):	
Class(es):	8
Label(s):	8
Marine Pollutant:	Not a Marine Pollutant
Packing Group:	II
Special precautions for user:	–

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	5000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Acute (Immediate)

SARA 302 Extremely Hazardous Substance

Chemical Identity	Reportable quantity	Threshold Planning Quantity
HYDROCHLORIC ACID	5000 lbs.	500 lbs.

SARA 304 Emergency Release Notification

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	5000 lbs.

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
HYDROCHLORIC ACID	500lbs

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
HYDROCHLORIC ACID	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	Reportable quantity: 5000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

Chemical Identity	Reportable quantity
HYDROCHLORIC ACID	15000 lbs
HYDROCHLORIC ACID	5000 lbs

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity
HYDROCHLORIC ACID

US. Massachusetts RTK - Substance List

Chemical Identity
HYDROCHLORIC ACID

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity
HYDROCHLORIC ACID

US. Rhode Island RTK

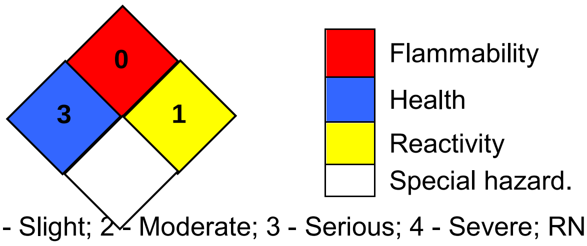
Chemical Identity
HYDROCHLORIC ACID

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EU EINECS List:	On or in compliance with the inventory
EU ELINCS List:	Not in compliance with the inventory.
Japan (ENCS) List:	On or in compliance with the inventory
EU No Longer Polymers List:	Not in compliance with the inventory.
China Inv. Existing Chemical Substances:	On or in compliance with the inventory
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Switzerland Consolidated Inventory:	Not in compliance with the inventory.
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

NFPA Hazard ID



Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible

Issue Date: 09-09-2016

Revision Date: No data available.

Version #: 4.1

Further Information: No data available.

Disclaimer:	THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED “AS IS,” AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

SAFETY DATA SHEET

1. Identification

Product identifier: NITRIC ACID

Other means of identification

Synonyms:	Aqua Fortis, Azotic Acid
Product No.:	9604, V471, V231, V230, V077, 6623, 2712, 2707, 2706, 2704, H988, 5876, 5856, 5801, 5796, 1409, 9761, 9670, 9618, 9617, 9616, 9615, 9612, 9607, 9606, 9601, 9598, 9597, 5371, 20758, 20754, 20752, 20750, 9766

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Details of the supplier of the safety data sheet

Manufacturer

Company Name:	Avantor Performance Materials, Inc.
Address:	3477 Corporate Parkway, Suite 200 Center Valley, PA 18034
Telephone:	Customer Service: 855-282-6867
Fax:	610-573-2610
Contact Person:	Environmental Health & Safety
E-mail:	info@avantormaterials.com

Emergency telephone number:
CHEMTREC: 1-800-424-9300 within US and Canada

2. Hazard(s) identification

Hazard Classification

Physical Hazards

Oxidizing liquids	Category 3
Corrosive to metals	Category 1

Health Hazards

Skin Corrosion/Irritation	Category 1A
Serious Eye Damage/Eye Irritation	Category 1
Specific Target Organ Toxicity - Single Exposure	Category 3

Unknown toxicity - Health

Acute toxicity, oral	65 %
Acute toxicity, dermal	65 %
Acute toxicity, inhalation, vapor	100 %
Acute toxicity, inhalation, dust or mist	100 %

Unknown toxicity - Environment

Acute hazards to the aquatic environment	65 %
Chronic hazards to the aquatic environment	65 %

Label Elements

Hazard Symbol:

Signal Word: Danger

Hazard Statement:
May intensify fire; oxidizer.
May be corrosive to metals.
Causes severe skin burns and eye damage.
May cause respiratory irritation.

Precautionary Statements

Prevention: Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling. Keep only in original container. Keep away from heat. Keep/Store away from clothing/combustible materials. Take any precaution to avoid mixing with combustibles. Use only outdoors or in a well-ventilated area.

Response: In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction. Immediately call a POISON CENTER/doctor. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Absorb spillage to prevent material damage.

Storage: Store locked up. Store in corrosive resistant container with a resistant inner liner. Store in a well-ventilated place. Keep container tightly closed.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

Chemical Identity	**Common name and synonyms**	**CAS number**	**Content in percent (%)***
NITRIC ACID		7697-37-2	65 - 70%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

Ingestion: Call a physician or poison control center immediately. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.

Inhalation: Move to fresh air. Call a physician or poison control center immediately. If breathing stops, provide artificial respiration. If breathing is difficult, give oxygen.

Skin Contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Causes severe skin burns and eye damage. Causes digestive tract burns. Spray mists may cause respiratory tract irritation.

Hazards: Corrosive.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General Fire Hazards: Strong oxidizer - contact with other material may cause fire.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Water spray, fog, CO2, dry chemical, or regular foam.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Oxidizing Contact with combustible material may cause fire. Fire may produce irritating, corrosive and/or toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Keep unauthorized personnel away. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Use personal protective equipment. See Section 8 of the SDS for Personal Protective Equipment. Ventilate closed spaces before entering them. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Methods and material for containment and cleaning up:

Keep combustibles (wood, paper, oil, etc.) away from spilled material. Stop leak if possible without any risk. Do not absorb in sawdust or other combustible materials. Absorb spill with vermiculite or other inert material. Collect in a non-combustible container for prompt disposal. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures:

Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

Environmental Precautions:

Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling:

Keep away from combustible material. Do not get in eyes, on skin, on clothing. Wash hands thoroughly after handling. Do not eat, drink or smoke when using the product. Do not taste or swallow. Never add water to acid! Never pour water into acid/base. Dilute by slowly pouring the product into water while stirring.

Conditions for safe storage, including any incompatibilities:

Do not store in metal containers. Store away from heat and light. Keep away from combustible material. Keep containers closed when not in use. Store in a cool, dry place. Keep container in a well-ventilated place.

8. Exposure controls/personal protection

Control Parameters

Occupational Exposure Limits

Chemical Identity	type	Exposure Limit Values		Source
NITRIC ACID	STEL	4 ppm		US. ACGIH Threshold Limit Values (2011)
	TWA	2 ppm		US. ACGIH Threshold Limit Values (2011)
	STEL	4 ppm	10 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	REL	2 ppm	5 mg/m3	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	PEL	2 ppm	5 mg/m3	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)
	STEL	4 ppm	10 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)
	TWA	2 ppm	5 mg/m3	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)

Appropriate Engineering Controls

Adequate ventilation should be provided so that exposure limits are not exceeded.

Individual protection measures, such as personal protective equipment

General information:	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.
Eye/face protection:	Wear safety glasses with side shields (or goggles) and a face shield.
Skin Protection	
Hand Protection:	Chemical resistant gloves
Other:	Wear suitable protective clothing.
Respiratory Protection:	In case of inadequate ventilation use suitable respirator. Chemical respirator with acid gas cartridge.
Hygiene measures:	Provide eyewash station and safety shower. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing to remove contaminants. Discard contaminated footwear that cannot be cleaned.

9. Physical and chemical properties

Appearance	
Physical state:	liquid
Form:	liquid
Color:	Colorless to slightly yellow
Odor:	Pungent
Odor threshold:	No data available.
pH:	1 (6.30 g/l,)
Melting point/freezing point:	-42 °C
Initial boiling point and boiling range:	122 °C
Flash Point:	not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	6.4 kPa
Vapor density:	2.5
Relative density:	1.41 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

10. Stability and reactivity

Reactivity:	Reacts violently with strong alkaline substances.
Chemical Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur. Decomposes on heating.
Conditions to avoid:	Reacts violently with strong alkaline substances. Avoid contact with strong reducing agents. Excessive heat. Contact with incompatible materials.
Incompatible Materials:	Alcohols. Reducing agents. Metals. Alkalies.
Hazardous Decomposition Products:	Nitrogen Oxides By heating and fire, corrosive vapors/gases may be formed.

11. Toxicological information

Information on likely routes of exposure

Ingestion:	May cause burns of the gastrointestinal tract if swallowed.
Inhalation:	May cause damage to mucous membranes in nose, throat, lungs and bronchial system.
Skin Contact:	Causes severe skin burns.
Eye contact:	Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral

Product:	No data available.

Dermal

Product:	No data available.

Inhalation

Product:	No data available.
Specified substance(s):	
NITRIC ACID	LC 50 (Rat, 1 h): 7 mg/l LC 50 (Rat, 4 h): 65 ppm

Repeated dose toxicity

Product:	No data available.

Skin Corrosion/Irritation

Product:	Causes severe skin burns.

Serious Eye Damage/Eye Irritation

Product:	Causes serious eye damage.

Respiratory or Skin Sensitization

Product:	Not a skin nor a respiratory sensitizer.

Carcinogenicity

Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure
Product: None known.

Aspiration Hazard
Product: Not classified

Other effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
NITRIC ACID LC 50 (Starfish (Asterias rubens), 48 h): 100 - 330 mg/l Mortality

Aquatic Invertebrates
Product: No data available.

Specified substance(s):
NITRIC ACID LC 50 (Cockle (Cerastoderma edule), 48 h): 330 - 1,000 mg/l Mortality
LC 50 (Green or European shore crab (Carcinus maenas), 48 h): 180 mg/l Mortality

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants

Product: No data available.

Persistence and Degradability

Biodegradation
Product: Expected to be readily biodegradable.

BOD/COD Ratio
Product: No data available.

Bioaccumulative Potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: No data available.

Mobility in Soil: The product is water soluble and may spread in water systems.

Other Adverse Effects: The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN Number:	UN 2031
UN Proper Shipping Name:	Nitric acid
Transport Hazard Class(es)	
Class(es):	8, 5.1
Label(s):	8, 5.1
Packing Group:	II
Marine Pollutant:	Not a Marine Pollutant
Special precautions for user:	–

IMDG

UN Number:	UN 2031
UN Proper Shipping Name:	NITRIC ACID
Transport Hazard Class(es)	
Class(es):	8, 5.1
Label(s):	8, 5.1
EmS No.:	F-A, S-Q
Packing Group:	II
Marine Pollutant:	Not a Marine Pollutant
Special precautions for user:	–

IATA

UN Number:	UN 2031
Proper Shipping Name:	Nitric acid
Transport Hazard Class(es):	
Class(es):	8, 5.1
Label(s):	8, 5.1
Marine Pollutant:	Not a Marine Pollutant
Packing Group:	II
Special precautions for user:	–

15. Regulatory information

US Federal Regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

Chemical Identity	Reportable quantity
NITRIC ACID	1000 lbs.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Acute (Immediate)
Chronic (Delayed)
Fire

SARA 302 Extremely Hazardous Substance

Chemical Identity	Reportable quantity	Threshold Planning Quantity
NITRIC ACID	1000 lbs.	1000 lbs.

SARA 304 Emergency Release Notification

Chemical Identity	Reportable quantity
NITRIC ACID	1000 lbs.

SARA 311/312 Hazardous Chemical

Chemical Identity	Threshold Planning Quantity
NITRIC ACID	500lbs

SARA 313 (TRI Reporting)

Chemical Identity	Reporting threshold for other users	Reporting threshold for manufacturing and processing
NITRIC ACID	10000 lbs	25000 lbs.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

Chemical Identity	Reportable quantity
NITRIC ACID	Reportable quantity: 1000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

Chemical Identity	Reportable quantity
NITRIC ACID	15000 lbs

US State Regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

Chemical Identity
NITRIC ACID

US. Massachusetts RTK - Substance List

Chemical Identity
NITRIC ACID

US. Pennsylvania RTK - Hazardous Substances

Chemical Identity
NITRIC ACID

US. Rhode Island RTK

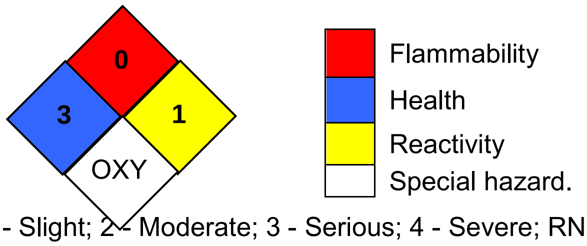
Chemical Identity
NITRIC ACID

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Japan (ENCS) List:	On or in compliance with the inventory
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

NFPA Hazard ID



Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible
OXY: Oxidizer

Issue Date:	12-06-2016
Revision Date:	No data available.
Version #:	3.1
Further Information:	No data available.

Disclaimer:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED “AS IS,” AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

APPENDIX I

Working Near Water SOP

1.0 Purpose

The purpose of this SOP is to establish safety guidelines for Working Near Water, to protect the health and safety of HRP staff and its subcontractors while in the field. These guidelines have been developed with the intent to provide workers with training, awareness, and knowledge of the equipment necessary to protect them from hazards associated with Working Near Water, and to provide HRP personnel with minimum recommendations when Working Near Water. It is expected that HRP offices utilizing these general guidelines will then develop office-specific written SOPs to supplement information within this document.

2.0 Scope / Objective

This document is a guide to general awareness of hazards related to Working Near Water. Due to the decentralized nature of HRP's regional offices and field locations, office-specific procedures for working near water, and response procedures, must be developed by individual departments or employees based on their specific needs and work environments. The provisions of this SOP apply to all employees.

3.0 Definitions

Buoyant Work Vests: per 46 CFR, section 169.556 (b) Approved buoyant work vests are items of safety apparel and may be carried aboard vessels to be worn by persons when working near or over the water under favorable working conditions. (c) the approved buoyant work vests must be stowed separately from personal flotation devices and must not be worn during drills and emergencies.

Immediately available (pertaining to lifesaving skiff): Per December 6, 1991 OSHA interpretation memo: "the interpretation of the requirement for a lifesaving skiff to be immediately available at locations where employees are working or adjacent to water, per 29 CFR 1926.106(d)is a performance orientated standard." Therefore… "it is appropriate for OSHA to hereby establish the following criteria for determining when a lifesaving skiff is to be considered as being "immediately available":

- The skiff must be in the water or capable of being quickly launched by one person.
- There must be at least one person present and specifically designated to respond to water emergencies and operate the skiff at all times when there are employees above water.
- When the operator is on break another operator must be designated to provide the requisite coverage while employees are above water.
- The designated operator must either man the skiff at all times or remain in the immediate area such that the operator can quickly reach the skiff and get underway.
- The skiff operator may be assigned other tasks provided the tasks do not interfere with the operator's ability to quickly reach the skiff and get underway.
- The communication system, such as a walkie-talkie, must be used to inform the operator where the skiff is needed.
- The skiff must be equipped with both motor and oars.

With regard to the number of skiffs required and the appropriate maximum response time, the following factors must be evaluated:

- The number of work locations where there is a danger of falling into the water;
- The distance to each of those locations;
- Water temperature;
- Currents;
- Other hazards such as, but not limited to, rapids, dams, and water intakes.
- The fact that, in the event a personal flotation device is not worn or malfunctions, permanent brain damage can occur within three to four minutes of oxygen deprivation.

In addition to the preceding, the employer is required to comply with all other applicable standards including, but not limited to, the requirements that the injured employee be promptly treated by medical personnel or an employee certified in first aid. This could mean that medical treatment might have to begin in the lifesaving skiff."

Lifesaving Skiff: A watercraft that is typically a shallow, flat-bottomed open boat with a sharp bow and a square stern, however the standard does not provide such a detailed description, so whether an aluminum rowboat or a rubber raft, it must be capable of being fitted with both motor and oars and can do the job of a rescue boat effectively.

Ring Buoys: Also known as: ring life buoy, lifebelt, lifebuoy, water wheely, life ring, lifesaver, life donut or life preserver, "kisby ring" or "perry buoy", is a lifesaving buoy designed to be thrown to a person in the water, to provide buoyancy and prevent drowning. Some modern ring buoys are fitted with one or more seawater-activated lights, to aid rescue at night.

Where the danger of drowning exists: This always includes working over water greater than 2 feet in depth and can also include water less than 2 feet in some circumstances.

OSHA's interpretation memo of August 24, 2004 calls for a life jacket/buoyant vest -when employees are working over water less than two feet deep if factors are present where a drowning danger could exist (see underlying excerpted paragraph for factors and example circumstance) as well as the requirement for a lifesaving skiff in shallow water as long as the water is navigable.

OSHA stance is as follows: "Section 1926.106(a) does not specify a minimum depth of water where a danger of drowning would exist. However several factors are relevant to determining whether a danger of drowning exists. These include the type (i.e., a pool, a river, a canal), depth, presence or absence of a current, height above the water surface, and the use of fall protection. Depending on the factors present, there are some circumstances where a drowning hazard could exist where workers are near or over water that is less than two feet in depth. For example, where workers are not using fall protection and are 10 feet above a river, a worker may fall and be knocked unconscious. Without the use of a life jacket or buoyant work vest, a worker in such a scenario could drown."

Likewise this provision does not state a minimum depth of water required before a lifesaving skiff is necessary. Unlike 1926(a), this provision does not include the phrase "where danger of drowning exists". The purpose of a skiff is to facilitate the rapid rescue of workers who fall into the water. Even in shallow water, a skiff will greatly reduce the amount of time it takes to reach an employee in the water (unless the employee is working in an area very near the water's edge). Of course, if the water were so shallow that the rescuers could simply run in (and a skiff would foul on the bottom anyway), a skiff would not be required."

U.S. Coast Guard-Approved Life Jacket: A personal floatation device (PFD). All life jackets must be Coast Guard-approved, in serviceable condition and the appropriate size for the intended user. Obviously, they are most effective when worn.

4.0 Responsibilities

- Affected Employees

Affected employees of this SOP are responsible for the following:

  - Understand the hazards of working near water and appropriate response procedures, and the responsibility to inform those working around you;
  - Attend training related to working near water and required responses;
  - Maintain the knowledge and/or experience to create, maintain, revise, implement, and enforce their office's location-specific Working Near Water SOPs;
  - Ensure that all relevant requirements of HRP's Working Near Water SOP are followed by all HRP personnel and subcontractors at all times; and,
  - Promptly report any known or suspected accidents, unsafe conditions or unsafe procedures related to working near water to your supervisor/project manager.

- Project Managers

Project Managers (PMs) are responsible for following the items under "Affected Employees" plus:

  - Identify personnel under your authority who require working near water training and ensure that they have received proper training before allowing work to commence;
  - Ensure that all project employees are familiar with the hazards and SOPs related to working near water;
  - Ensure that all appropriate equipment and materials for working near water are provided to, and used by project staff members;
  - Complete an incident report for any employee injuries that may have occurred as a result of working near water; and,
  - Promptly report any known or suspected accidents, unsafe conditions or unsafe procedures related to working near water to the Office Health and Safety Manager.

- Office Health and Safety Manager

The Office Health and Safety Manager (OHSM) is responsible for the following:

  - Ensure that all PMs, supervisors, and employees are notified of their responsibilities related to working near water;

  - Ensure that all employees are given adequate supervision and instruction on the hazards of working near water, and all related SOPs;
  - Ensure that procedures, equipment, and materials appropriate for working near water are provided to protect the health and safety of all employees in your regional office if/when personnel are in the field; and,
  - Ensure that all components of this SOP are implemented in your regional HRP office.
- <u>Corporate Environmental, Health, and Safety Committee (CEHSC)</u>

The CEHSC is responsible for the following:

  - Ensure that Working Near Water procedures at all HRP offices meet the requirements of this SOP and all applicable OSHA regulations;
  - Provide fiscal and administrative resources as needed to support the implementation of each regional office's individual Working Near Water SOP;
  - Help provide a safe workplace for all HRP employees with the realization that each employee is ultimately responsible for his or her own personal safety; and,
  - Periodically review, revise, and update this SOP to ensure that it communicates information on Working Near Water completely, clearly, and effectively.

5.0 Procedures

Employees working over or near water, where the danger of drowning exists, shall be provided with U.S. Coast Guard-approved life jacket or buoyant work vests.

Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects which would alter their strength or buoyancy. Defective units shall not be used.

Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet. As a best practice the ring buoys should be mounted or hung to be visible.

At least one lifesaving skiff shall be immediately available at locations where employees are working over or adjacent to water.

6.0 Supporting and Reference Documentation

December 6, 1991 OSHA interpretation memo 1926.106(a) – When a lifesaving skiff is to be considered "immediately available".

August 24, 2004 OSHA interpretation memo 1926.106(d) – Life jacket/buoyant work vest requirements for employees working over water < 2 feet deep; requirements for lifesaving skiffs.

7.0 Document Owner and Revision Approval Log:

<u>Owner:</u> Engineering Practice Leader

REVISION APPROVAL LOG				
REV. #	PREPARED BY	REVIEWED BY	APPROVED BY	CHANGE SUMMARY
00	Date: 6/1/2020 Name: L.S. Frost Sign: L. Scott Frost	Date: 8/25/2020 Name: S. Stoll Sign: Steven H. Stoll	Date: 10/14/2020 Name: Tad Goetcheus Sign: Tad A. Goetcheus	Original version of this SOP.

APPENDIX C

Standard Operating Procedures (SOPs)

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE 01
for

Shoreline Observation for Potential Seeps on Newtown Creek

Revision Date:

LIST OF REVISIONS

Date	Summary of Changes	Approval
7/2021	Original document preparation	

1.0 Introduction

This standard operating procedure (SOP) describes general steps to be used while conducting shoreline observations to identify potential seeps. Collection of surface water and sheen-net environmental samples is outlined in SOP 02 *Sheen-Net and Surface Water Sampling on Newtown Creek*. This procedure is a general guideline and does not present all scenarios or variables which may present themselves during a site investigation.

Proper safety precautions must be observed while completing observations. Refer to the site-specific Health & Safety Plan and HRP's Corporate Health & Safety Plan for guidelines on safety precautions.

2.0 Equipment List

The following list of equipment and documents should be brought into the field at minimum to complete shoreline observations as described in this SOP.

- Logbook(s) or field observation form (see Attachment 1) and writing utensils
- Personal protection equipment (PPE) as identified in project health and safety plan (HASP)
- Global Position System (GPS) device set to project datum
- Digital camera capable of collecting georeferenced photographs
- Thermal camera (preferably a model capable of collecting georeferenced photographs)
- Spare batteries for camera(s) or power inverter and battery to use for charging
- Trash bags and container(s) for used PPE, as needed.
- Site plan; HASP and site-specific work plan or sampling plan
- Quality Assurance Project Plan (QAPP), as applicable

3.0 Procedure

The following steps will be completed to conduct shoreline observations for potential seeps.

1. Locations for observation will be identified prior to mobilization to the field. A field team or teams will be assigned an area to observe throughout the observation period.
2. The shoreline observations are to be made around the low-tide, when the most potential shoreline will be visible. Crews will plan their observation period to be the two hours before and the two hours after the predicted low-tide for a total of four hours of observation.
3. Crew(s) should plan to be on the water and within their assigned area more than two-hours before low-tide so they can begin observations promptly.

Crews in vessels will arrive within their observation area at least one hour prior to the start of the observation period.

4. Vessel(s) for shoreline observation should be operated by an experienced operator. Vessels should have a shallow draft with an operating engine, as well as oars/paddles for secondary propulsion.
5. Once observations have begun field crew(s) will traverse their assigned area throughout the observation period to identify potential seeps.
    a. A potential seep will be a location where water and/or other liquid is apparent emanating from the shoreline or some shoreline structure above the water's surface.
    b. Potential seeps may appear as discolored or turbid water or water with a sheen. Other liquids (e.g. nonaqueous phase liquid [NAPL]) may also be observed and should be noted as well.
    c. A potential seep may also be noted on the water's surface very close to the shoreline or shoreline structures but with no clear, identifiable source.
6. When a potential seep is identified, the observation form will be completed (Attachment 1). The potential seep will be assigned an ID, and the location noted in the GPS.
    a. Sheens identified with potential seeps will be described as outlined below.

Criteria for Describing Sheens

Relative Intensity	Sheen Color		*Description Components*
Trace, <25% of area covered Moderate, 25 to 75% of area covered Heavy, >75% of area covered	Rainbow	Multicolored	1. Intensity 2. Sheen color 3. Sheen distribution (e.g., continuous, present as 0.5-inch spots)
	Silver or Metallic	Metallic, silver/gray-colored	Distinguishing hydrocarbon-sheen from inorganic sheen: If disturbed, a hydrocarbon sheen will typically coalesce or swirl when disturbed; an inorganic sheen will break apart and has a blocky appearance when disturbed. Identify which type of sheen if obvious.

7. Digital photos of the potential seep will be taken to include:
    a. close-ups of the potential seep
    b. the water's surface
    c. a general area photograph showing the potential seep area, as well as a landmark
    d. videos (to be collected when appropriate)
8. Thermal imagery photographs and video will also be collected of the shoreline area where the potential seep is believed to be emanating from.
9. Following documentation, the field team will review the attached field form for completeness and photographs collected to ensure the written observation was captured. The field team will then continue observing within the area and repeat the above observation steps.

4.0 Field Quality Control

Quality control procedures will consist of following standard instrument operation procedures provided by manufacturer and standard operating procedures for data collection. Field equipment used for observations will include cameras and GPS devices. Field teams will review camera settings to ensure:

- high-resolution settings are enabled;
- settings are selected to georeferenced all collected photograph's; and
- for GPS and GPS enabled devices the project datum has been referenced to accurately record position.

All field notes in project logbook and on field observation forms will be checked by field teams to verify information entered is complete and accurate. Additionally, photographs and videos made should be reviewed in the field to make sure captured images are representative of potential seeps observed. It is the responsibility of the project manager to periodically review to ensure standard operating procedures are being followed and that data is being recorded as outlined in this SOP.

DOCUMENTATION

All field monitoring activities must be documented in a field log that includes thefollowing:

- Job Number
- Site location
- Date
- Weather conditions
- Field personnel
- Objective of visit
- Surface water body
- Field observations
- Photographs taken and stored to project server
- Equipment operation information

Any problems encountered should be identified, and methods taken to minimize or correct problems should be documented. All deviations from procedures outlined in the SOP and/or work plan,including rationale for any modifications and potential impact on data quality objectives must be documented. All data reporting must be completed in accordance with the project-specific QAPP and/or work plan.

Attachment 1

Field Observation Form

Potential Seep
Observation Form

HRP Associates, Inc.
1 Fairchild Square, Suite 110
Clifton Park, New York 12065
(518) 877-7101

Date: ______________________
Field Team Leader: ______________________
Team Members: ______________________
____

Site Background Information

Site Name: Newtown Creek
Job #: DEC1025.P3 Task 3
Weather: ______________________
Purpose of visit: ______________________

Visitors: ______________________

Observation Location Information

Station ID: ____________________ **Observation Time:** _____________ **Lat/Northing:** ________________
Forecast Low-Tide Time: _______________ **Long/Easting:** ______________
Yes/No: **Datum: NAD83 NYLI**

Sheen Observed:	Sheen on Shoreline:
Sheen on water surface?	Water turbid?
Organic? Inorganic? Unknown?	
Odor?	Water color?
PID Reading:	NAPL Observed?

Notes:

Shoreline Condition:

Shoreline Material (circle):	**Shoreline Condition** (circle):	**Soil/Debris Entering Water?**
Sheetpile Rip-rap Bare ground Pile w/cap Concrete	Excellent Fair Poor Notes:	Yes No Notes:

Other ______________________

Additional Notes

Photographs? (Y / N) Video? (Y / N) Thermal Images? (Y / N)

Notes:

HRP Associates, Inc.

STANDARD OPERATING PROCEDURE
02 for

Sheen-Net and Surface Water Sampling on Newtown Creek

LIST OF REVISIONS

Date	Summary of Changes	Approval
7/2021	Original document preparation	

This Standard Operating Procedure (SOP) provides the general procedures for Surface Water and Sheen-Net Sampling for environmental investigation and remediation-related activities at Newtown Creek

1.0 Introduction

This SOP describes a methodology for collecting surface water and sheen-net samples from a flowing water body such as Newtown Creek and its tributaries (Dutch Kills, Whale Creek, Maspeth Creek, East Branch, and English Kills herein referred to as Newtown Creek). Samples are to be collected from locations identified close to the shoreline throughout Newtown Creek where potential seeps are observed to evaluate environmental quality and potential impacts to Newtown Creek. Potential seeps will be identified and documented following *SOP 01 Shoreline Observation for Potential Seeps on Newtown Creek*. This SOP was developed in general accordance with the accepted industry protocols and guidance for surface water sampling, including federal and state guidance documents and scientific literature.

2.0 Equipment List

The following list of equipment and documents should be brought into the field at minimum to complete sampling described in this SOP.

- Logbook(s) or field sampling form (see Attachment 1) and writing utensils
- Sample bottles – appropriate for the analyses to be conducted
- Sample preservation supplies (as required by the analytical methods), if not pre- supplied by laboratory in sampling containers.
- Container labels
- Sheen-net(s) (TFE-fluorocarbon polymer net) and sampling ring
- Personal protection equipment (PPE) as identified in project health and safety plan (HASP)
- Cooler with ice or ice packs
- Global Position System (GPS) device set to project datum
- Digital camera
- Lead-line or electronic depth sounder
- Trash bags and container(s) for used PPE, as needed.
- Site plan; HASP and site-specific work plan or sampling plan
- Quality Assurance Project Plan (QAPP), as applicable
- Chain of custody record

3.0 PROCEDURE

The following steps will be completed to collect sheen-net and surface water samples of potential seeps.

1. Sampling locations will be identified prior to sampling. Potential seeps will be identified, observations made, in accordance with SOP 01 Shoreline Observations of potential seeps made will be identified following *SOP 01 Shoreline Observation for Potential Seeps on Newtown Creek.* The locations for seeps targeted for follow-up observation and sampling will be identified prior to initiation of the sampling effort.

2. Samples from potential seeps will be collected from a vessel operated by an experienced operator. To the extent practical, surface water sample locations will be sampled from downstream to upstream (or travelling into current). Navigate the vessel to the target location and secure via anchor or line to shore so that the vessel is stable during sample collection.

3. Sheen-net samples will be collected using a TFE-Fluorocarbon net that is temporarily attached to a ring with handle. The ring with handle allows the sheen-net to be moved through the water's surface and any observed sheen. Sheen-nets should be moved through the sheen until an area approximately one square meter has been covered.

4. Once sampling with the sheen-net has completed, remove the net and place the next within the provided laboratory sample container.

5. Following sheen-net sample collection, a surface water sample will be collected and placed into laboratory provided sample containers. Laboratory containers without preservative will be used to sample water by lowering the sample collection container to just below the water's surface. Once filled, the container will have its lid secured and be placed in a secure storage location. Laboratory containers with preservatives (e.g. HCl) will be filled from containers without preservative where surface water will be transferred to the preserved container.

6. After all surface water containers were filled, samples will be placed in appropriate sample containers and lids sealed tightly. The samples will be labeled, handled, and packaged following the procedures described in the project-specific work plan and SOP # 108, *Sample Handling*. Surface water samples will be submitted to the project laboratory for analysis.

7. Following collection of surface water samples, a surface water quality measurement will be collected.

- Place calibrated water quality sonde into the water just below the water’s surface.
- Ensure that the water quality sonde does not touch the sediment surface.
- Allow the sonde to run for 1 to 3 minutes and record parameters once values appear to have stabilized.

8. Collection of QA/QC samples for each sampling event will follow guidelines outlined in the project work plan. At a minimum, QA/QC sampling will include collecting one duplicate sample for every 20 samples collected. If VOCs are collected, then one trip blank per cooler perday will be submitted. Additional QA/QC sampling could include equipment blanks and field blanks, with the specific samples to be collected and collection frequency specified in the project work plan.

8. For each sample collected, the location of the sample and GPS coordinates will be noted on the field sampling form, and the GPS coordinates saved to the GPS device. The water depth will be measured with a weighted-tape (i.e. lead line) or electronic sounder. Be sure to note any visual observations (sample color, presence of sheen, any unusual characteristics [odor, turbidity, etc.]) on the field sample form.

9. Following completion of field measurements, rinse instrument with clean, distilled water and store between locations. Remove and properly dispose of any PPE. At the end of the day, all PPE used will be placed in appropriate container for disposal.

10. Safely untie the vessel from the shore or recover the anchor, and once all equipment is stowed properly and personnel are ready, the vessel may move to the next sample location.

4.0 FIELD QUALITY CONTROL

Quality control procedures will consist of following standard instrument operation procedures as provided by manufacturer and applicable standard operating procedures for data collection, including field QA/QC procedures specified in those SOPs. All field notes in the project logbook and on field sampling forms will be checked by field teams to verify that the information entered is complete and accurate. It is the responsibility of the project manager to periodically review field documentation to ensure procedures are being followed and that data are being recorded as outlined in this SOP.

DOCUMENTATION

All field monitoring activities must be documented in a field log that includes thefollowing:

- Job number
- Site location
- Date of sampling
- Weather conditions
- Field personnel
- Objective of visit
- Surface water body and sample point identification
- Sample location sequence and time of collection for each sample
- Types of sample bottles used and sample identification numbers
- Parameters requested for analysis
- Field observations during sampling event
- Recording of measurements for field parameters specified in this SOP and/or project-specific work plan
- Name of sample collector(s)
- Description of all sampling equipment used
- Equipment cleaning and calibration information
- QA/QC data for field instruments

Any problems encountered should be identified, and methods taken to minimize or correct problems should be documented. All deviations from sampling procedures outlined in the SOP and/or work plan, including rationale for any modifications and potential impact on data quality objectives for the sample(s), must be documented. All data reporting must be completed in accordance with the project-specificQAPP and/or work plan.

5.0 REFERENCES FOR SURFACE WATER SAMPLING PROCEDURES

U.S. Environmental Protection Agency (USEPA). 2017. *Standard Operating Procedure Calibration of Field Instruments (temperature, pH, dissolved oxygen, conductivity/specific conductance, oxidation/reduction potential [ORP], and turbidity)*,USEPA, Region 1, Quality Assurance Unit, Revision Number 3, Revised March 23, 2017.

USEPA. 2015. *Operating Procedure: Field Equipment Cleaning and Decontamination*. USEPA Region 4, Science and Ecosystem Support Division. SESDPROC-205-R3.

USEPA. 2013. *Surface Water Supply Sampling*, USEPA Region 4, Science and Ecosystem Support Division, SESDPROC-201-R3, February 28, 2013.

USEPA. 2002. *Surface Water Sampling*, Scientific Engineering Response and AnalyticalServices SOP #2013, February 2002.

Attachment 1

Field Sampling Form

Sheen-Net and Surface Water
Sample Collection Form

HRP Associates, Inc.
1 Fairchild Square, Suite 110
Clifton Park, New York 12065
(518) 877-7101

Date: ____________________
Field Team Leader: ____________________
Team Members: ____________________
____

Site Background Information

Site Name: Newtown Creek
Job #: DEC1025.P3 Task 3
Weather: ____________________
Purpose of visit: ____________________

Visitors: ____________________

Sample Location Information

Sample ID:____________________ **Sample Time:**________________ **Lat/Northing:**________________
Observation Form Completed? (Y / N) **Long/Easting:**______________
Yes/No: **Datum: NAD83 NYLI**

Sheen-Net Collected:____________	Surface Water Collected:____________
Sheen on water surface? ________________	Water turbid? ________________
Odor? ________________	Water color? ________________

Surface Water Analyses (circle):

PAH + Alkyl PAH	**Metals**	**TPH**	**EPH**
DRO	**PCB Congener**	**Dioxin/Furan**	

Sheen-Net Samples Analyses (circle):

PAH + Alkyl PAH	**n-alkanes & isoprenoids**	**EPH**	**Oil & Grease**

Other/Notes:

Field Parameters

Parameter	**Units**	**Value**
Temp.		
pH		
Conductivity		
Turbidity		
DO		
ORP		

Notes:

APPENDIX D

Resumes of Key Project Personnel

PROJECT MANAGER

MATTHEW P. CAVAS, P.G.

IDENTIFIED WORK ELEMENTS EXPERIENCE

- Site Characterization
- Phased Remedial Investigation/Feasibility Study (RI/FS)
- Soil Vapor Intrusion (SVI) Investigations
- Remedial Design (RD)
- Engineering Services During Remedial Action/Construction Management (RA)
- Site Response Activities/Interim Remedial Measures (IRM)
- Site Management (SM)
- Analytical Quality Assurance/Quality Control Activities (QA/QC)
- Citizen Participation (CP) Activities
- Health and Safety Plan (HASP) Development
- Potentially Responsible Parties (PRP) and Third-Party Oversight

SUMMARY OF QUALIFICATIONS

Mr. Cavas has several years of experience as a managing geoscientist at an environmental consulting company and has been serving as a project or task manager lead for a variety of projects located within New York State. Mr. Cavas' experience includes completing and leading all manner of site investigations and feasibility studies, and developing innovative data collection programs to investigate groundwater-surface water interactions and non-aqueous phase liquid (NAPL) mobility. As part of his work, Mr. Cavas has written work plans and procedures for investigations under oversight of state and federal regulators as well as associated quality assurance plans. He has also been responsible for preparation of health and safety plans, review of subcontractor plans and incorporation of safe work practices. Work products range from simple data summary letter reports to large remedial investigation and feasibility study reports submitted to clients and regulatory agencies.

EXPERIENCE

Mr. Cavas has extensive experience on manufactured gas plant sites (MGP's) throughout the State of New York, the State of Ohio, and through the Northeast. While Mr. Cavas began his career performing field data collection and supported report writing, more recently he has served as the Project Manager on six former MGP Sites within New York State and lead a team working on feasibility studies, remedial design and operations and maintenance.

Mr. Cavas as served as field team leader and as Project Manager on New York Brownfield and Spill sites, with experience along Newtown Creek. As a Project Manager, Mr. Cavas leads works with other project managers and clients on day-to-day details for project execution, project budget development and tracking, and developing long-term strategies for site management or closure.

Field Investigations – Proficient in and wrote standard operating procedures for:

- Ground and surface water sampling
- Porewater sampling using a variety of methods
- Transition zone hydrogeologic investigations
- Hydrogeologic tests/investigations
- Emerging contaminant sampling
- Drilling oversight (soil and bedrock)
- Nonaqueous phase liquid (NAPL) mobility investigations and characterization
- Small vessel captain for sediment and surface water sampling
- Seepage measurement

NSPE LEVEL

VI

EDUCATION

- Ohio University, B.S. Geological Sciences 2000
- Ohio University, M.S. Geological Sciences 2003

PROFESSIONAL REGISTRATIONS/ CERTIFICATIONS

- New Hampshire Professional Geologist, No. 787 New York
- Professional Geologist, No. 626

TRAINING

- 40-Hour OSHA HazWOPR - Current OSHA Hazardous Site
- Supervisor Training
- Adult CPR and Advanced First Aid Training
- New York State Safe Boating Certification

BASE OFFICE LOCATION

Clifton Park, NY

EXPERIENCE

- Down-hole geophysical logging
- Test pitting
- Geotechnical data collection
- Sediment/soil sampling using a variety of methods
- Seepage analyses

Data Analysis and Reporting – Proficient in:

- Co-authoring site investigation, remedial investigation and feasibility reports
- Assisting with feasibility cost estimating and selection of remedial alternatives
- Preparing and leading presentations for clients and regulatory agencies on results and future plans.
- Preparation of cross-sections, boring and well-logs, and groundwater flow maps
- Hydrologic data interpretation using AQTESOLV and other standard software packages
- Evaluation and management of environmental data including comparison to regulatory criteria
- Use of GIS to prepare maps of analytical results as well as display of additional site data

PROJECT MANAGER

JESSICA R. KRUCZEK, PE, LEP

ROLE AND RESPONSIBILITY

As a Project Manager for this contract, Ms. Kruczek will be responsible for the administration of work required by the Work Assignment. The management of each work assignment may include development of work scope and cost assessments, procurement of supporting subcontractors and/or consultants, coordination of work scope items from resource management to scheduling and implementation. Ms. Kruczek will work with the Quality Assurance Officer to develop site-specific quality assurance plans, as pertinent to the Work Assignment and will act as the primary point of contact for each assigned project.

IDENTIFIED WORK ELEMENTS EXPERIENCE

- Site Characterization
- Phased Remedial Investigation/Feasibility Study (RI/FS)
- Soil Vapor Intrusion (SVI) Investigations
- Remedial Design (RD)
- Site Response Activities/Interim Remedial Measures (IRM)
- Site Management (SM)
- Analytical Quality Assurance/Quality Control Activities (QA/QC)
- Citizen Participation (CP) Activities
- Health and Safety Plan (HASP) Development
- Potentially Responsible Parties (PRP) and Third-Party Oversight

SUMMARY OF QUALIFICATIONS

Ms. Kruczek has over 20 years of experience with project management, design, construction oversight, and operation of site investigation and remediation projects involving remediation of chlorinated solvents, gasoline-related compounds, polynuclear aromatic hydrocarbons, polychlorinated biphenyls, metals and various explosive compounds using both traditional and innovative technologies. Jessica has served as Project Manager for over a decade assisting scores of commercial, industrial, residential, and quasi-governmental agencies perform due diligence to assess environmental liabilities in support of property transactions in accordance with ASTM and state-specific standards. Jessica has supported clients both large (Fortune 50) and small (local homeowners) for their environmental needs, as wells as state and Federal entities.

Jessica has experience with environmental regulations associated with the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and USEPA Regions I, III, VI, IX and X. Projects of note include the investigation and remediation of petroleum hydrocarbons, metals and chlorinated solvents beneath active manufacturing facilities, vapor intrusion assessment of commercial properties, industrial lagoon and surface impoundment remediation, and midstream (distribution terminal) and downstream (retail) oil and gas facilities. Jessica has also coordinated several environmental investigations which took place at various military installations in Maryland, New Jersey, and Oregon. Technical duties include consultation, project management, and oversight of tasks relating to site investigation, remediation, voluntary cleanup contracts, state and federally mandated cleanup contracts (Property Transfer Act [Connecticut], Consent Orders, and Stipulated Judgments, RCRA Corrective Action sites), risk-based assessments, and feasibility studies.

NSPE LEVEL

VII

EDUCATION

- MS, Civil and Environmental Engineering, Rutgers University, 2005
- BCE, Civil and Environmental Engineering, Georgia Institute of Technology, 1997

PROFESSIONAL REGISTRATIONS/ CERTIFICATIONS

- PE, #24GE04587600, NJ
- PE, #31031, CT
- Licensed Environmental Professional, #590, CT

PROFESSIONAL ORGANIZATIONS

- Society of Women Environmental Professionals
- Environmental Professionals of Connecticut
- Connecticut Main Street Center

TRAINING

- OSHA 40 Hour Health and Safety for Hazardous Waste Site
- OSHA 8 Hour Supervisor of Hazardous Waste Operation

BASE OFFICE LOCATION

Farmington, CT

EXPERIENCE

MANAGEMENT OF INACTIVE HAZARDOUS WASTE, HAZARDOUS SUBSTANCE AND PETROLEUM SPILL SITES

Site Characterization and Remediation of a Petroleum Release Site Containing VOCs, Former Fafnir Bearing Facility, Newington, CT

Served as the Senior Project Manager for a series of Ingersoll-Rand historic properties where HRP has assisted with site investigation, remediation, and site verification. Over the past 31 years, HRP has served as the primary environmental consultant for this Ingersoll-Rand historic property assisting with site investigation and remediation. For this particular project, responsibilities included installation of a Varsol recovery system in December 1987 pursuant to CT DEP Order No. WC-9010, and following the discontinuation of operations in 1993, a series of subsurface investigations and remediation activities including:

- Interior investigations in 1995 consisting of a soil gas survey and sub-floor soil sampling.
- Soil remediation (i.e., excavation and off-site disposal) was conducted in 1995/1996 in several areas inside the building, including the former waste transfer pump pit. Successful removal of impacted soil in each of these areas was demonstrated by confirmatory soil sampling.
- Extensive soil remediation (i.e., excavation and off-site disposal) was also conducted in 1996 in a former wastewater lagoon area located west of the building and in a small area west of the building.
- Another soil gas survey was conducted in the northern portion of the building in early 2001 to investigate possible sources of volatile organic compounds (VOCs) beneath that portion of the building. That study did not identify any significant sources of VOCs.
- System upgrade and redesign to re-route treatment water from municipal discharge to surface water discharge, including associated permitting activities, saving the client more than $1M per year in discharge fees.
- To date, over 17,200 gallons of Varsol have been recovery by the treatment system in the shallow bedrock aquifer.
- Recently, HRP coordinated a review of the site program and spear-headed an effort at the client's request to collaborate with other experts on the best approach to site closure.

Ms. Kruczek has personally been responsible for the following work elements for this project, including: site characterization with respect to investigation of Varsol source areas, remedial investigation/feasibility study to review alternatives for discharge treatment, remedial design for treatment of system discharge , engineering services during remedial action/construction management including oversight of operations and maintenance of the Varsol recovery system, site management, analytical quality assurance/quality control activities, citizen participation activities associated with wetland permitting, health and safety plan development. Responsibilities include scoping of investigative locations, coordination with site stakeholders, performance of sample collection or oversight of sample collection, development of remedial alternatives, development of bid materials for subcontractors, selection and oversight of subcontractors, review of budgets, analysis of laboratory data, and preparation of summary reports for decision-making purposes.

Site Characterization, Phased Remedial Investigation, Site Response Activities/Interim Remedial Measures, Former ExxonMobil and British Petroleum/Atlantic Richfield Petroleum Distributors, New York and New Jersey, US

Served as Project Manager for fifty-three (53) former and current retail gasoline stations throughout New York and New Jersey. Responsible for project execution while monitoring contract scope of work against proposed cost-to-close budgets and schedules, maintaining client relationships and correspondence, meeting regulatory requirements for milestone reporting, and completing site remediation within the budget and schedule specified in the scopes of work. Project challenges include fixed budget for scope of work, completion of remediation to New York State Department of Environmental Conservation (NYSDEC) standards, and working in the NYC area including permitting, union, and site-specific challenges including, but not limited to buried utilities overhead canopies, unknown subsurface structures, urban fill, and co-mingled plumes. Performed vapor intrusion investigations in accordance with ITRC guidance and NYSDOH requirements. Technical expert for remedial alternative assessment, similar to performing an abbreviated feasibility study including a detailed analysis of upland and lowland/shoreline conditions to mitigate sheen, and recover LNAPL to the extent practicable. Produced a conceptual site model, proposed conceptual alternatives, and provided high-level cost estimates for comparison. Prepared the technical sections for the Alternatives Analysis Report for submittal to New York State Department of Environmental Conservation (NYSDEC) using the Interstate Technology and Regulatory Council (ITRC) guidance for LNAPL assessment.

Ms. Kruczek has personally been responsible for the following work elements for these projects, including: site characterization, phase remedial investigation/feasibility study, remedial design, engineering services during remedial action/construction management, analytical quality assurance/quality control activities, site response activities/interim remedial measures, health and safety plan development, and soil vapor intrusion investigations. Responsibilities include scoping of investigative locations,

EXPERIENCE

coordination with site stakeholders, performance of sample collection or oversight of sample collection, development of remedial alternatives, development of bid materials for subcontractors, selection and oversight of subcontractors, review of budgets, analysis of laboratory data, and preparation of summary reports for decision-making purposes.

Site Characterization and Remediation of Petroleum Spill and Hazardous Waste Site, hercules, MidAtlantic US
Served as Project Manager and Lead Project Engineer for pilot-scale demonstration of bioaugmentation using proprietary direct compound degrading bacteria for the enhanced biodegradation of tert-butyl alcohol (TBA) for a manufacturer of explosive compounds. Responsible for assisting in the oxygen manifold delivery system design and work plan preparation, including production of process and instrumentation diagrams and specifications. Provided oversight for the installation of 44 injection wells ranging from 50 to 70 feet below grade using direct-push drilling techniques. Responsibilities also included the supervision of the fabrication of an oxygen delivery manifold, supervision of electrical subcontractors, fabrication of control panels for the monitoring of oxygen delivery to the subsurface, supervision of roadway and fencing installation, operations and maintenance activities, groundwater sampling, data management and analysis and project management tasks such as budget review and client correspondence. Ms. Kruczek has personally been responsible for the following work elements for this project, including: site characterization, phase remedial investigation/feasibility study, remedial design, engineering services during remedial action/construction management, analytical quality assurance/quality control activities, and health and safety plan development.

Site Characterization and Remediation of Petroleum Spill and Hazardous Waste Site, Former Gasoline Service Station Site, Southern New England
Ms. Kruczek acts as the Senior Project Manager for the operation of remediation systems to address smear zone petroleum contamination under the Connecticut Voluntary Remediation Program (VRP). HRP was brought onto the project following a long tenure by another consultant after excavation and in-situ chemical oxidation failed to yield results that met client expectations. Following a series of supplemental remedial investigations in pre-existing areas of concern, and evaluating alternate treatment options, HRP designed and developed a remedial approach that combined soil vapor extraction (SVE) with an in-situ oxygen curtain (iSOC) to enhance biodegradation of weathered gasoline constituents in the soil and groundwater. The 5-well SVE system operated in combined vapor extraction/bioventing mode that removed/degraded over 700-lbs of petroleum in the first 12 months of operation. The groundwater contaminant plume contracted in size after 9-months operation of the iSOC system and 3 iSOC wells were removed from service. After 20-months of iSOC aerobic treatment, groundwater contaminant levels were below applicable standards and the SVE/iSOC systems were shutdown to pursue further contaminant reduction using monitored natural attenuation. Recently, following post-remediation groundwater monitoring and soil sampling, HRP developed a path to closure for the site for the client's purposes. Services are ongoing.

Ms. Kruczek has personally been responsible for the following work elements for this project, including: site characterization, site management, site response activities, and engineering services during remedial action. Ms. Kruczek was responsible for oversight of system operations and maintenance, and ensuring that permitting requirements of testing and reporting have been met. Ms. Kruczek confirmed that site access notifications have been made, acting as a liaison between the current site owner and operator, and the client who is the Certifying Party for the site. Ms. Kruczek provides proposals for services each year, and presents annual reviews for client representative's management, and supports annual reserve estimates for the client. Ms. Kruczek manages the production of annual reports on system operations and remedial progress are provided to the CT DEEP. Recently, Ms. Kruczek offered the client an alternate pathway to closure for the site, resulting in production of a "Capstone" report in lieu of a formal Verification.

Site Characterization of Petroleum Spill and Hazardous Waste Site, Various Locations US
Served as Project Manager for scoping and full performance (mobilization, field investigation, data management, risk assessment and final reporting) of dozens of Phase II ESAs at active and vacant residential, commercial, and industrial properties, including Brownfield sites receiving funding through state or federal grants for assessment and remediation. Routinely coordinated and performed groundwater sampling in accordance with state and federal guidelines using passive diffusion bags, low-flow techniques for natural attenuation, as well as traditional purge and sample techniques. Managed and performed soil identification and sampling at numerous sites in a wide range of geologic settings including basalt, flowing sands, sandstones, gneiss, shale, and a variety of overburden geologies. Sampling methods utilized include hand auger, hollow-stem auger with split-spoon samplers, sonic, and direct-push drilling methods for collection of soil samples. Clients include commercial and industrial clients, private prospective purchasers, and quasi-governmental and state agencies. Results of soil, soil vapor, and groundwater investigations were used to assess potential risks to various redevelopment scenarios.

EXPERIENCE

Ms. Kruczek has personally been responsible for the following work elements for these projects, including: site characterization and analytical quality assurance/quality control activities. Responsibilities include scoping of investigative locations, coordination with site stakeholders, performance of sample collection or oversight of sample collection, analysis of laboratory data, preparation of summary reports for decision making purposes.

<u>Site Characterization of Petroleum Spill and Hazardous Waste Site, Various Locations US</u>
Due Diligence; Multiple States (New Jersey, Portland Oregon Metro Area, Oregon, Washington, New York, Massachusetts and Connecticut. Served as Project Manager responsible for performing Phase I and Phase II ESAs at scores of subject properties in various states over 18 years in accordance with the American Society for Testing and Materials Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process the local regulatory agency requirements and guidelines for site investigation. Responsibilities included performing site reconnaissance visits, interviewing owners and occupants, public records research, file reviews, database reviews, and report preparation for commercial entities including home improvement and big box stores, public agencies such as Portland Development Commission and Tri-County Metropolitan Transportation District of Oregon (TriMet), for lenders' clients, and for both buyers and sellers. Acted as a primary author or senior reviewer of Phase I ESAs for more than 100 subject properties throughout the United States, including in the State of Connecticut in support of the Property Transfer Program.

Served as Project Manager for scoping and full performance (mobilization, field investigation, data managements, risk assessment and final reporting) of scores of Phase II ESAs at active and vacant residential, commercial, and industrial properties for commercial and industrial clients, private prospective purchasers, and state agencies. Results of soil, soil vapor, and groundwater investigations were used to assess potential risks to various redevelopment scenarios.

Ms. Kruczek has personally been responsible for the following work elements for these projects, including: site characterization and analytical quality assurance/quality control activities. Responsibilities include scoping of investigative locations, coordination with site stakeholders, performance of sample collection or oversight of sample collection, analysis of laboratory data, preparation of summary reports for decision making purposes.

<u>Site Characterization, Phased Remedial Investigation, Site Response Activities/Interim Remedial Measures, Former Drum Handling Site, West Coast US</u>
Served as Project Manager and Lead Project Engineer for performance evaluation of the interim groundwater pump-and-treat system and evaluation of final site remedial alternatives for a former drum handling site with complex hydrogeologic characteristics contributing to a complex distribution of chlorinated solvent and pentachlorophenol contamination in site soils and groundwater. Led the design and implementation of a successful in-situ enhanced reductive dechlorination pilot test. Prepared the focused feasibility study (FS) that was used to establish the Record of Decision, as well as the Remedial Design/Remedial Action Work Plan. Responsible for full-scale system design and implementation. Led the groundwater treatment system construction of 35 injection wells, 13 extraction wells, and over 1,500 linear feet of conveyance lines. The system began full-scale operations in January 2011 and concentrations were found to be below standards before October 2011.

Ms. Kruczek has personally been responsible for the following work elements for this project, including: site characterization, phase remedial investigation/feasibility study, remedial design, engineering services during remedial action/construction management, analytical quality assurance/quality control activities, health and safety plan development, and soil vapor intrusion investigations. Responsibilities include scoping of investigative locations, coordination with site stakeholders, performance of sample collection or oversight of sample collection, development of remedial alternatives, development of bid materials for subcontractors, selection of subcontractors, review of budget, analysis of laboratory data, and preparation of summary reports for decision-making purposes.

SENIOR PROJECT SCIENTIST (STAFF)

ALISA M. WERST

IDENTIFIED WORK ELEMENTS EXPERIENCE

- Site Characterization
- Phased Remedial Investigation/Feasibility Study (RI/FS)
- Analytical Quality Assurance/Quality Control Activities (QA/QC)
- Citizen Participation (CP) Activities
- Health and Safety Plan (HASP) Development
- Potentially Responsible Parties (PRP) and Third-Party Oversight

SUMMARY OF QUALIFICATIONS

Ms. Werst has more than ten years of experience in the environmental consulting industry. Ms. Werst also possesses strong knowledge of the regulatory environment with experience working in a variety of capacities including due diligence, sample collection, regulatory reporting, and subcontractor oversight. Ms. Werst's project experience includes execution and oversight of field work, report writing, building inspections for hazardous materials such as lead, asbestos, mold, PCBs, and project monitoring of asbestos and hazardous materials abatement projects. Ms. Werst has conducted numerous asbestos containing material surveys, lead paint surveys, and miscellaneous hazardous material surveys, and has also completed microbial/mold surveys and radon surveys.

Her project experience includes regulations associated with the Asbestos Hazards Emergency Response Act (AHERA), National Emission Standards for Hazardous Air Pollutants (NESHAPs) and State Department of Public Health regulations. Ms. Werst has participated in AHERA three year re-inspections for school buildings and has the ability to create or update an Asbestos Management Plan for clients. She has performed several NESHAP inspections for buildings prior to renovation or demolition and produced an Asbestos Inspection Report for the client.

Her project experience also includes regulations associated with Housing and Urban Development (HUD) guidelines, Title X, the Residential Lead-based Paint Hazard Reduction Act, and the Toxic Substance Control Act (TSCA). Ms. Werst has performed inspections of residential dwellings and commercial spaces for lead based paint prior to renovation or demolition. These inspections included paint analyses with an X-Ray Fluorescence (XRF) device, collection of soil samples, dust wipe, and TCLP samples. Ms. Werst has also created Lead-based Paint Management Plans for clients with existing lead-based paint and provided letters to applicable town or state agencies prior to demolition.

Ms. Werst has performed Indoor Air Quality (IAQ) inspections in office and residential buildings. IAQ inspections may include real time measurements of temperature, relative humidity, carbon dioxide, carbon monoxide, and additional measurements of what the constituent of concern may be for that project. Ms. Werst's experience with hazardous materials surveys and project oversite has been a valuable asset for our clients. She ensures that hazardous materials have been properly identified and quantified prior to the client's abatement projects.

NSPE LEVEL

VI

EDUCATION

- B.S. Environmental Science, UCONN, 2006
- B.S. Geology, UCONN, 2006

PROFESSIONAL REGISTRATIONS/ CERTIFICATIONS

- Asbestos Consultant-Project Monitor: #602
- Asbestos Consultant-Inspector: #736
- Asbestos Consultant-Project Designer: #343
- Asbestos Consultant Inspector-Management Planner: #343
- Asbestos Inspector: #AI900764
- Asbestos Inspector: #057605
- Lead Inspector/Risk Assessor: #2278
- NRPP Residential Measurement Provider-#109544 RT
- Associate Safety Professional: ASP-29497

TRAINING

- OSHA 40 Hour Hazardous Waste Operations & Emergency Response
- OSHA 8 Hour Refresher Hazardous Waste Operations & Emergency Response

BASE OFFICE LOCATION

Farmington, CT

SENIOR PROJECT ENGINEER

KRISTEN M. AMODEO

IDENTIFIED WORK ELEMENTS EXPERIENCE

- Site Characterization
- Phased Remedial Investigation/Feasibility Study (RI/FS)
- Soil Vapor Intrusion (SVI) Investigations
- Remedial Design (RD)
- Site Response Activities/Interim Remedial Measures (IRM)
- Site Management (SM)
- Analytical Quality Assurance/Quality Control Activities (QA/QC)
- Citizen Participation (CP) Activities
- Health and Safety Plan (HASP) Development
- Potentially Responsible Parties (PRP) and Third-Party Oversight

SUMMARY OF QUALIFICATIONS

Kristen Amodeo has over 8 years of experience in the environmental consulting industry. Specifically, Kristen has been involved in the following activities:

Field work associated with site investigation and delineation of contamination include:

- Groundwater sampling
- Soil sampling
- Soil vapor installation and sampling
- Radionuclide sampling
- PFAS sampling
- Oversight of installation of monitoring wells, multi-level monitoring well and bedrock wells
- Groundwater sampling with use of packers in bedrock wells
- Pumping test to determine pump influence along with data analysis
- Installation of pressure transducers in wells and download of data and data reduction

Reports and forms associated with site investigation and remediation include:

- Phase I, II, and III Environmental Site Assessments
- Remedial Action Plans
- Remedial Action Reports
- Verification Reports
- Environmental Condition Assessment Forms (ECAF)
- Form III Property Transfer
- Completion of Investigation (COI)
- Environmental Land Use Restriction (ELUR)
- Additional Polluting Substances Request
- Wrote SOP for transducer installation and data download

Oversight of remediation projects include:

- Hot spot excavations
- Injections of bioaugmentation substrates
- Pump and treat system at DNAPL site and maintenance
- LNAPL skimmer system
- TSCA regulated excavation
- Soil Vapor Extraction wells
- Capping of contaminated area

NSPE LEVEL

VI

EDUCATION

- Graduate Certificate in Hydrology, Certificate, New Mexico Institute of Mining and Technology, Department of Earth and Environmental Sciences, Prominent Coursework: GeoMicroBiology with publication on sciworthy.com, Microbial Contaminant, Transportation with research involving metagenomics (Spring 2020)
- Masters of Arts Earth and Planetary Sciences, Western Connecticut State University, Department of Physics, Astronomy, and Meteorology, 2015
- Bachelors of Science Natural Resources with concentration in Environmental Conservation, University of Connecticut, College of Agriculture, Health and Natural Resources, 2010

PROFESSIONAL ORGANIZATIONS

- Connecticut Society for Women Environmental Professionals
- Environmental Professionals of Connecticut- Young Environmental Professionals, Education Committee

TRAINING

- Certified in Project Management
- Certified in Hazardous Waste Operations and Emergency Response 40 Hr - 8 Hr Recertification
- Certified in Green Infrastructures/Best Practices
- Certified in OSHA 30 Hr General Industry - GHS and OSHA Hazardous Communication
- Certificate of ESRI training for ArcGIS
- Certified Environmental Specialist - Focus on Environmental Law

SENIOR PROJECT GEOLOGIST

VINCENT L. DELEONE

IDENTIFIED WORK ELEMENTS EXPERIENCE

- Site Characterization
- Phased Remedial Investigation/Feasibility Study (RI/FS)
- Soil Vapor Intrusion (SVI) Investigations
- Remedial Design (RD)
- Site Response Activities/Interim Remedial Measures (IRM)
- Site Management (SM)
- Analytical Quality Assurance/Quality Control Activities (QA/QC)
- Citizen Participation (CP) Activities
- Health and Safety Plan (HASP) Development
- Potentially Responsible Parties (PRP) and Third-Party Oversight

SUMMARY OF QUALIFICATIONS

Mr. DeLeone is an accomplished geologist with expertise in project and program management, data management, technical report writing, personnel management, high resolution site characterization, field processes and technology. Mr. DeLeone has over 15 years of experience and a proven track record of demonstrated success. His core competencies include: project and program management, staff training and mentoring, problem solving, multitasking, presentations, technical report writing, proposals / cost estimates, field work, client relations, implementation of field programs, OSHA 40 hr. with site supervisor training.

NSPE LEVEL

III

EDUCATION

- Bachelor of Science, Geology, University of Connecticut, 1998

PROFESSIONAL ORGANIZATIONS

- Environmental Professionals Organization of Connecticut (EPOC)

TRAININGS

- OSHA 40HR Hazardous Waste Operations & Emergency Response, 1998
- OSHA 10-Hour Construction Safety, 2019
- OSHA 8-hour HAZWOPER refresher training, 1999-2019
- Amtrak Contractor Orientation

BASE OFFICE LOCATION

Farmington, CT

EXPERIENCE

Newtown Creek – July-August 2014 (Stone Environmental)
Hydraulic conductivity profiling of sediment and groundwater sampling beneath Newtown Creek with the Waterloo Advanced Profiling System (APS) using direct-push drilling techniques via a barge. The drill rods were lowered through the water column via a hole in the barge until competent sediment was reached, then the tooling was advanced with the Geoprobe to the sample interval. Responsibilities included:

- Work Plan development and implementation
- Worked with oversight on approaches, sampling locations within the Creek channel and sample depth intervals to achieve project goals
- Management of field staff
- Data management (Waterloo APS)
- Health and Safety Plan development, which included working with the barge captain and oversight to develop safe practices for loading and unloading equipment and crew on to the barge (both at project set up and daily), safe operation of crew on the barge, and working with the drill rig and tooling.

Phase I Environmental Site Assessments
Mr. DeLeone has performed Phase I Environmental Site Assessments on a wide variety of industrial, commercial, retail and residential sites including: presently operating machine shops, supermarkets, gas stations, auto repair shops, medical offices and warehouses. Responsibilities include reviewing publically-available information (historical records, municipal file and regulatory databases), researching geologic and hydrologic data, performing facility inspections and conducting interviews with site-related personnel.

Phase II and III Subsurface Investigations
Mr. DeLeone has performed numerous subsurface investigations involving various property types, contaminants and geologic setting. Many sites required several phases of investigation to determine the degree and extent of contamination. Specific tasks performed on these projects included:

- Development of work scope to evaluate recognized environmental conditions (RECs) and areas of concern (AOCs) at sites based on contaminants of concern, release mechanisms, migration pathways, and exposure routes
- Identification of types of contaminants and potential contamination source areas based on current and historical site use
- Performance of field investigations using various drilling and soil sample collection technologies to evaluate site-specific constituents of concern (COCs) and subsurface conditions
- Design and installation of bedrock and overburden groundwater monitoring wells to evaluate hydrogeologic conditions and contaminant transport
- Sampling of monitoring wells using EPA prescribed low flow methodology and more traditional bailing techniques
- Evaluation of potential receptors and exposure routes
- Interpretation of subsurface conditions based on collected data, and preparation of reports detailing the fate and transport of contaminants through porous and fractured media
- Installing, leak testing and sampling soil vapor points.
- Oversight for the installation of soil vapor extraction wells
- Oversight and soil sampling related to impacted soil excavation

Technical Writing

- Proposals, work plans
- Health and Safety Plans (HASPs)
- Completion of Investigation Reports (COIs)
- Verification Reports
- Phase II Summary Reports
- Remedial Action Plans and Reports

PFAS Experience

Groundwater sampling with the Waterloo Advanced Profiling System (APS) on projects located in Hoosick Falls, New York, Merrimack, New Hampshire, and Bennington, Vermont – 2014-2017

- Project manager and field sampler for projects where PFAS were the main contaminants of concern.

EXPERIENCE

- Modified a proprietary groundwater sampling technology to remove any PFAS related materials from the system.
- Extensive QA/QC to ensure the groundwater sampler was not introducing PFAS into the samples.
- Worked with clients to develop proper procedures for field work including PPE, work attire, drilling and sampling materials and sample collection and preservation protocols to ensure PFAS was not introduced into the samples.