

July 9, 2018

Sondra Martinkat  
New York State Department of Environmental Conservation  
Division of Environmental Remediation  
47-20 21<sup>st</sup> Street  
Long Island City, NY 11101  
sondra.martinkat@dec.ny.gov

**Re: Supplemental Remedial Investigation Work Plan No. 2  
ABC Block 26  
Long Island City, NY  
BCP Site No.: C241174  
Langan Project No.: 170340203**

Dear Ms. Martinkat:

Langan Engineering, Environmental, Survey and Landscape Architecture, D.P.C (Langan) presents this second supplemental remedial investigation (RI) work plan on behalf of PLAX B26, LLC for the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) Site No. C241174. As requested by the NYSDEC in a *Request for Sampling of Emerging Contaminants Letter*, dated April 17, 2018, additional groundwater samples will be collected and analyzed for 1,4-dioxane and per- and poly-fluoroalkyl substances (PFAS). The supplemental RI will include collection of six groundwater samples from previously installed monitoring wells (MW04S, MW04D, MW14S, MW14D, MW35S, MW35D) for analysis of 21 individual PFAS (see Table 1) and 1,4-dioxane. The supplemental RI will be completed in accordance with the procedures set forth in Langan's Remedial Investigation Work Plan (RIWP), dated August 5, 2016 and the revised Quality Assurance Project Plan (QAPP), dated April 18, 2018 (Attachment 1). The QAPP was revised to include protocols for sampling monitoring wells for 1,4-dioxane and PFAS analyses. The proposed groundwater monitoring well sampling locations are illustrated on Figure 1. The sampling will be started within 45 days of NYSDEC approval of this work plan and revised QAPP per the April 17, 2018 letter.

## Reporting

Langan will revise the draft remedial investigation report (April 20, 2017) to include sampling methodology, observations, sampling logs, analytical results, and conclusions for this supplemental RI.

If you have any questions, please call me at 212-479-5441.

Sincerely,

**Langan Engineering, Environmental, Surveying  
and Landscape Architecture, D.P.C.**



Mimi S. Raygorodetsky  
Senior Associate/Vice President

cc: T. Pfohl, M. Quigley, P. Kirby (Plaxall)  
M. Chertok, E. Knauer (SPR)  
M. Burke, G. Wyka, J. Leung (Langan)

Enclosures: Table 1 – PFAS Compound Analyte List for Groundwater Samples  
Figure 1 – Proposed Supplemental RI No. 2 Sample Location Plan  
Attachment 1 – Quality Assurance Project Plan

## TABLES

**Table 1**  
**PFAS Compound Analyte List for Groundwater Samples**

**ABC - Block 26**  
**BCP Site No. C241174**  
**Long Island City, NY**  
**Langan Project No.: 170340203**

| Compound Name  | Analytical Method |
|--|-------------------|
| Perfluorohexanoic acid (PFHxA)                           | USEPA Method 537  |
| Perfluoroheptanoic acid (PFHpA)                          |                   |
| Perfluorooctanoic acid (PFOA)                            |                   |
| Perfluorononanoic acid (PFNA)                            |                   |
| Perfluorodecanoic acid (PFDA)                            |                   |
| Perfluoroundecanoic acid (PFUdA)                         |                   |
| Perfluorododecanoic acid (PFDoA)                         |                   |
| Perfluorotridecanoic Acid (PRTrDA)                       |                   |
| Perfluorotetradecanoic acid (PFTA)                       |                   |
| Perfluorobutanesulfonic acid (PFBS)                      |                   |
| Perfluorohexanesulfonic acid (PFHxS)                     |                   |
| Perfluorooctanesulfonic acid (PFOS)                      |                   |
| Perfluorodecanesulfonic Acid (PFDS)                      |                   |
| Perfluorobutanoic Acid (PFBA)                            |                   |
| Perfluoropentanoic Acid (PFPeA)                          |                   |
| Perfluoroheptane Sulfonic Acid (PFHpS)                   |                   |
| 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2 FTS)          |                   |
| 1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2 FTS)       |                   |
| Perfluorooctanesulfonamide (FOSA)                        |                   |
| N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSAA) |                   |
| N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSAA)  |                   |

**Notes:**

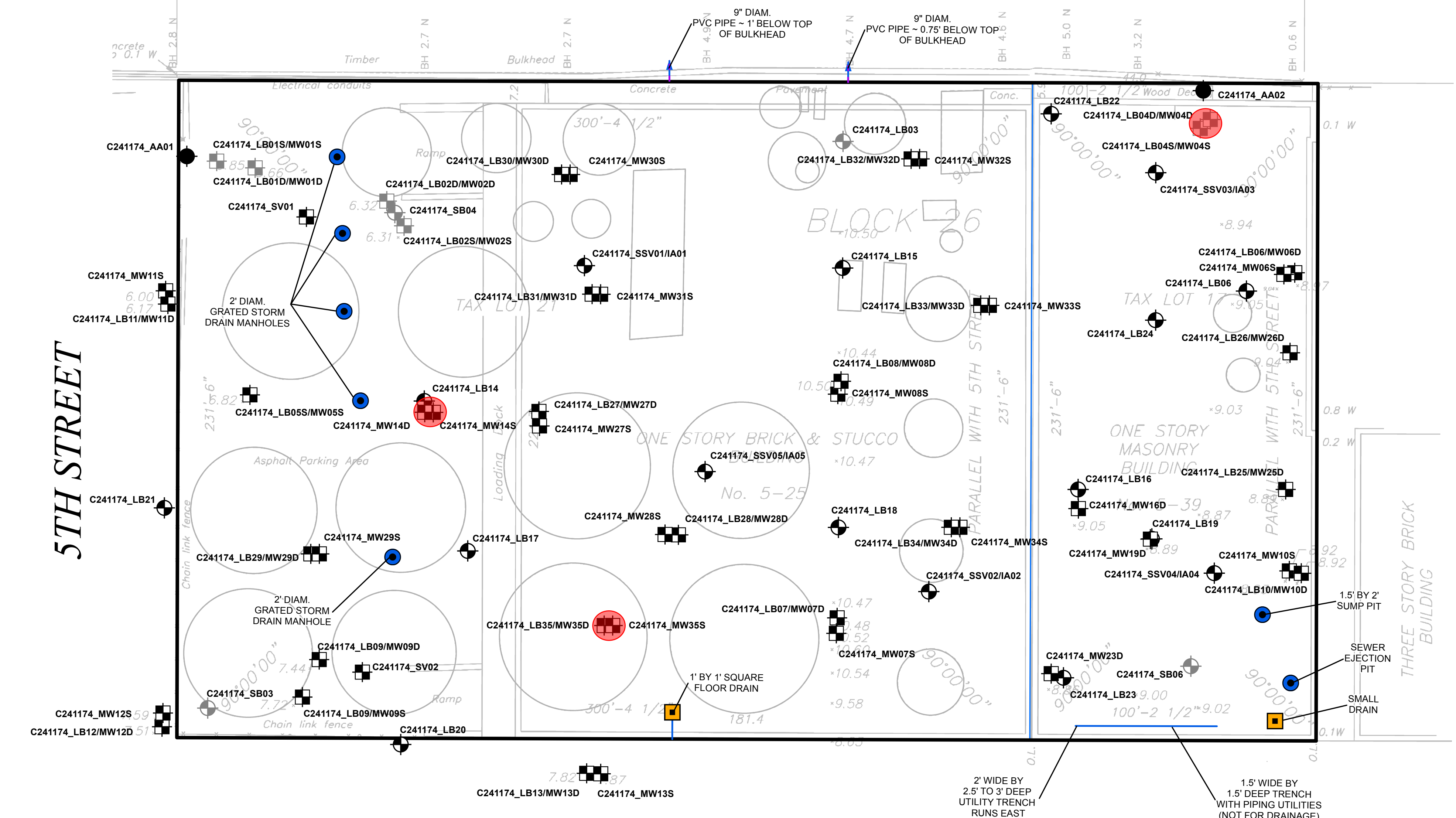
1. PFAS - per- and polyfluoroalkyl substances

## FIGURES

# ANABLE BASIN

### LEGEND

- C241174\_LB06 RI SOIL BORING LOCATION AND ID
- C241174\_SB04 PREVIOUS SOIL BORING LOCATION AND ID (LANGAN APRIL 2015)
- C241174\_LB03 PREVIOUS SOIL BORING LOCATION AND ID (LANGAN DECEMBER 2015)
- C241174\_LB04D/MW04D PREVIOUS SOIL BORING/MONITORING LOCATION AND ID (LANGAN DECEMBER 2015)
- C241174\_LB06/MW06D RI SOIL BORING/MONITORING WELL (DEEP) LOCATION AND ID
- C241174\_MW11S RI SOIL BORING/MONITORING WELL (SHALLOW) LOCATION AND ID
- C241174\_SV01 RI SOIL VAPOR POINT LOCATION AND ID
- C241174\_SSV03/IA03 RI SUB-SLAB SOIL VAPOR POINT/INDOOR AIR LOCATION AND ID
- C241174\_AA01 RI AMBIENT AIR SAMPLE LOCATION AND ID
- APPROXIMATE BCP SITE BOUNDARY
- APPROXIMATE TAX LOT BOUNDARY
- APPROXIMATE LOCATION OF HISTORICAL UNDERGROUND STORAGE TANK (UST) OR ABOVEGROUND STORAGE TANK (AST)
- FLOOR DRAIN OR DRAIN FEATURE - CIRCULAR (ACTIVE)
- FLOOR DRAIN OR DRAIN FEATURE - SQUARE/RECTANGULAR (CLOGGED)
- DRAINAGE PIPES THROUGH BULKHEAD INTO ANABLE BASIN (ACTIVE)
- UNDERGROUND UTILITY TRENCH (ACTIVE)
- GROUNDWATER MONITORING WELLS SELECTED FOR 1,4-DIOXANE AND PFAS SAMPLING



### GENERAL NOTES

1. BASE MAP SOURCE: SURVEY BY ALBERT W. TAY DATED SEPTEMBER 6, 2012.
2. ELEVATIONS ARE REFERENCED TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAV88) AND WERE OBTAINED FROM GROUND SURVEYS BY LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING AND LANDSCAPE ARCHITECTURE, D.P.C.
3. HISTORICAL UST AND AST LOCATIONS ARE APPROXIMATE AND ARE BASED ON AVAILABLE SANBORN MAPS (1898, 1915, AND 1936) AND 2005 PHASE I ESA PREPARED BY FLEMING LEE SHUE, INC.
4. RI = REMEDIAL INVESTIGATION

## LANGAN

21 Penn Plaza, 380 West 31st Street, 8th Floor, New York, NY 10001-2727  
 T 212-479-5400 F 212-479-5444 www.langan.com

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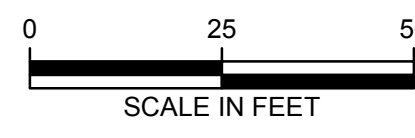
Langan Engineering & Environmental Services, Inc.  
 Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C.  
 Langan International LLC  
 Collectively known as Langan

Project  
**ABC - BLOCK 26**  
 BLOCK No. 26, LOT No. 17 and 21  
 LONG ISLAND CITY  
 QUEENS NEW YORK

Figure Title  
**PROPOSED SUPPLEMENTAL RI SAMPLE LOCATION PLAN**

|                 |            |        |          |
|-----------------|------------|--------|----------|
| Project No.     | 170340203  | Figure | <b>1</b> |
| Date            | 01/15/2018 |        |          |
| Scale           | 1" = 25'   |        |          |
| Drawn By        | MG         |        |          |
| Submission Date | 01/15/2018 |        |          |

WARNING: IT IS A VIOLATION OF THE NYS EDUCATION LAW ARTICLE 145 FOR ANY PERSON, UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS ITEM IN ANY WAY.



**ATTACHMENT 1**

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# Quality Assurance Project Plan

## Remedial Investigation ABC Block 26 Long Island City, New York NYSDEC BCP Site No. C241174

Prepared For:

**PLAX BL26, LLC**  
5-46 46<sup>th</sup> Avenue  
Long Island City, New York 11101

Prepared By:

**Langan Engineering, Environmental, Surveying, Landscape  
Architecture, and Geology D.P.C.**  
21 Penn Plaza  
360 West 31<sup>st</sup> Street, 8<sup>th</sup> Floor  
New York, New York 10001

**LANGAN**

July 9, 2018  
Langan Project No. 170340203



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### **ATTACHMENTS**

- Attachment A: Resumes
- Attachment B: Laboratory Reporting Limits and Method Detection Limits
- Attachment C: Analytical Methods/Quality Assurance Summary Table
- Attachment D: Sample Nomenclature
- Attachment E: PFAS Sampling Protocol

## **1.0 PROJECT DESCRIPTION**

### **1.1 INTRODUCTION**

This Quality Assurance Project Plan (QAPP) was prepared on behalf of Plastic Center Realty Sub, LLC (the Participant) for the property at 5-25 46<sup>th</sup> Drive in Long Island City, New York (the "Site"). The Site was accepted into the New York State Brownfield Cleanup Program (BCP) as a Participant and a Brownfield Cleanup Agreement (BCA) was executed on February 3, 2016. Additional Site information including Site maps and data collected previously by Langan is provided in the Remedial Investigation Work Plan (RIWP).

This QAPP specifies analytical methods to be used to ensure that data collected during the remedial investigation are precise, accurate, representative, comparable, complete, and meet the sensitivity requirements of the project.

### **1.2 PROJECT OBJECTIVES**

The objective of the RIWP is to investigate and characterize the nature and extent of on-site and off-site environmental impacts associated with areas of concern (AOC). This QAPP addresses sampling and analytical methods that may be necessary in support of the RIWP. These objectives were established in order to meet standards that will protect public health and the environment for the Site.

### **1.3 SCOPE OF WORK**

The scope of work covered in this QAPP is detailed in the RIWP. In general, the RIWP proposes soil boring installation and sampling, groundwater monitoring well installation and sampling, sub-slab and soil vapor sampling, and indoor air and ambient air sampling.

## 2.0 DATA QUALITY OBJECTIVES AND PROCESS

Data Quality Objectives (DQOs) are qualitative and quantitative statements to help ensure that data of known and appropriate quality are obtained during the project. The overall project objective is to investigate subsurface conditions associated with AOCs for the Site. The sampling program will provide for collection of soil, soil vapor, indoor air, and groundwater samples. DQOs for sampling activities are determined by evaluating five factors:

- Data needs and uses: The types of data required and how the data will be used after it is obtained.
- Parameters of Interest: The types of chemical or physical parameters required for the intended use.
- Level of Concern: Levels of constituents, which may require remedial actions or further investigations.
- Required Analytical Level: The level of data quality, data precision, and QA/QC documentation required for chemical analysis.
- Required Detection Limits: The detection limits necessary based on the above information.

The quality assurance and quality control objectives for all measurement data include:

- **Precision** – an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and/or matrix spike duplicates.
- **Accuracy** – a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. For soil and groundwater samples, accuracy will be determined through the assessment of the analytical results of equipment blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), internal standards, laboratory method blanks, instrument calibration, and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. For soil vapor or air samples, analytical accuracy will be assessed by examining the percent recoveries that are added to each sample, internal standards, laboratory method blanks, and instrument calibration.

- **Representativeness** – expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is dependent upon the adequate design of the sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory’s possession. This is accomplished by following all applicable methods, laboratory-issued standard operating procedures (SOPs), the laboratory’s Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.
- **Completeness** – the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- **Comparability** – expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis as documented in the QAPP, using standard reporting units and reporting formats, and data validation.
- **Sensitivity** – the ability of the instrument or method to detect target analytes at the levels of interest. The project manager will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection.

### **3.0 PROJECT ORGANIZATION**

All work included with implementing the NYSDEC-approved RIWP will be overseen by Langan, on behalf of Plastic Center Realty Sub, LLC. Langan will collect media samples and will subcontract with a qualified driller and an ELAP-certified laboratory. Data validation services will be performed by an approved data validator.

For the scope of work described in the RIWP, sampling will be conducted by Langan, the analytical services will be performed by Alpha Analytical of Westborough, Massachusetts (NYSDOH ELAP certification number 11148). Data validation services will be performed by Emily Strake; resume attached (Attachment A).

Key contacts for this project are as follows:

|   |  |
|---|--|
| Plastic Center Realty Sub, LLC:         | Ms. Paula C. Kirby<br>Telephone: (718) 784-4800          |
| Langan Project Manager:                 | Mrs. Mimi Raygorodetsky<br>Telephone: (212) 479-5441     |
| Langan Quality Assurance Officer (QAO): | Mr. Greg Wyka<br>Telephone: (212) 479-5476               |
| Program Quality Assurance Monitor:      | Ms. Julia Leung, PE<br>Telephone: (212) 479-5452         |
| Data Validator:                         | Ms. Emily Strake<br>Telephone: (215) 491-6526            |
| Laboratory Representative:              | Alpha Analytical<br>Ben Rao<br>Telephone: (201) 812-2633 |

#### **4.0 QUALITY ASSURANCE OBJECTIVES FOR COLLECTION OF DATA**

The overall quality assurance objective is to develop and implement procedures for sampling, laboratory analysis, field measurements, and reporting that will provide data of sufficient quality for the remedial investigation at the Site. The sample set, chemical analysis results, and interpretations must be based on data that meet or exceed quality assurance objectives established for the Site. Quality assurance objectives are usually expressed in terms of accuracy or bias, sensitivity, completeness, representativeness, comparability, and sensitivity of analysis. Variances from the quality assurance objectives at any stage of the investigation will result in the implementation of appropriate corrective measures and an assessment of the impact of corrective measures on the usability of the data.

#### **4.1 PRECISION**

Precision is a measure of the degree to which two or more measurements are in agreement. Field precision is assessed through the collection and measurement of field duplicates. Laboratory precision and sample heterogeneity also contribute to the uncertainty of field duplicate measurements. This uncertainty is taken into account during the data assessment process. For field duplicates, results less than 2x the reporting limit (RL) meet the precision criteria if the absolute difference is less than  $\pm 2x$  the RL and acceptable based on professional judgement. For results greater than 2x the RL, the acceptance criteria is a relative percent difference (RPD) of  $\leq 50\%$  (soil and air),  $< 30\%$  (water). RLs and method detection limits (MDL) are provided in Attachment B.

#### **4.2 ACCURACY**

Accuracy is the measurement of the reproducibility of the sampling and analytical methodology. It should be noted that precise data may not be accurate data. For the purpose of this QAPP, bias is defined as the constant or systematic distortion of a measurement process, which manifests itself as a persistent positive or negative deviation from the known or true value. This may be due to (but not limited to) improper sample collection, sample matrix, poorly calibrated analytical or sampling equipment, or limitations or errors in analytical methods and techniques.

Accuracy in the field is assessed through the use of equipment blanks and through compliance to all sample handling, preservation, and holding time requirements. All equipment blanks should be non-detect when analyzed by the laboratory. Any contaminant detected in an associated equipment blank will be evaluated against

laboratory blanks (preparation or method) and evaluated against field samples collected on the same day to determine potential for bias. Trip blanks are not required for non-aqueous matrices but are planned for non-aqueous matrices where high concentrations of VOCs are anticipated.

Laboratory accuracy is assessed by evaluating the percent recoveries of matrix spike/matrix spike duplicate (MS/MSD) samples, laboratory control samples (LCS), surrogate compound recoveries, and the results of method preparation blanks. MS/MSD, LCS, and surrogate percent recoveries will be compared to either method-specific control limits or laboratory-derived control limits. Sample volume permitting, samples displaying outliers should be reanalyzed. All associated method blanks should be non-detect when analyzed by the laboratory.

### **4.3 COMPLETENESS**

Laboratory completeness is the ratio of total number of samples analyzed and verified as acceptable compared to the number of samples submitted to the fixed-base laboratory for analysis, expressed as a percent. Three measures of completeness are defined:

- Sampling completeness, defined as the number of valid samples collected relative to the number of samples planned for collection;
- Analytical completeness, defined as the number of valid sample measurements relative to the number of valid samples collected; and
- Overall completeness, defined as the number of valid sample measurements relative to the number of samples planned for collection.

Air, soil vapor, soil, and groundwater data will meet a 90% completeness criterion. If the criterion is not met, sample results will be evaluated for trends in rejected and unusable data. The effect of unusable data required for a determination of compliance will also be evaluated.

### **4.4 REPRESENTATIVENESS**

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. Representativeness is dependent upon the adequate design of the



sampling program and will be satisfied by ensuring that the scope of work is followed and that specified sampling and analysis techniques are used. This is performed by following applicable standard operating procedures (SOPs) and this QAPP. All field technicians will be given copies of appropriate documents prior to sampling events and are required to read, understand, and follow each document as it pertains to the tasks at hand.

Representativeness in the laboratory is ensured by compliance to nationally-recognized analytical methods, meeting sample holding times, and maintaining sample integrity while the samples are in the laboratory's possession. This is performed by following all applicable EPA methods, laboratory-issued SOPs, the laboratory's Quality Assurance Manual, and this QAPP. The laboratory is required to be properly certified and accredited.

#### **4.5 COMPARABILITY**

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the sampling plan is followed and that sampling is performed according to the SOPs or other project-specific procedures. Analytical data will be comparable when similar sampling and analytical methods are used as documented in the QAPP. Comparability will be controlled by requiring the use of specific nationally-recognized analytical methods and requiring consistent method performance criteria. Comparability is also dependent on similar quality assurance objectives. Previously collected data will be evaluated to determine whether they may be combined with contemporary data sets.

#### **4.6 SENSITIVITY**

Sensitivity is the ability of the instrument or method to detect target analytes at the levels of interest. The project director will select, with input from the laboratory and QA personnel, sampling and analytical procedures that achieve the required levels of detection and QC acceptance limits that meet established performance criteria. Concurrently, the project director will select the level of data assessment to ensure that only data meeting the project DQOs are used in decision-making.

Field equipment will be used that can achieve the required levels of detection for analytical measurements in the field. In addition, the field sampling staff will collect and submit full volumes of samples as required by the laboratory for analysis, whenever

possible. Full volume aliquots will help ensure achievement of the required limits of detection and allow for reanalysis if necessary. The concentration of the lowest level check standard in a multi-point calibration curve will represent the reporting limit.

Analytical methods and quality assurance parameters associated with the sampling program are presented in Attachment C. The frequency of associated equipment blanks and duplicate samples will be based on the recommendations listed in DER-10, and as described in Section 5.3.

Site-specific MS and MSD samples will be prepared and analyzed by the analytical laboratory by spiking an aliquot of submitted sample volume with analytes of interest. Additional sample volume is not required by the laboratory for this purpose. An MS/MSD analysis will be analyzed at a rate of 1 out of every 20 samples, or one per analytical batch. MS/MSD samples are only required for soil and groundwater samples.

## **5.0 SAMPLE COLLECTION AND FIELD DATA ACQUISITION PROCEDURES**

Soil and groundwater sampling, if necessary, will be conducted in accordance with the established NYSDEC protocols contained in DER-10/Technical Guidance for Site Investigation and Remediation (May 2010). Air sampling will be conducted in accordance with the established New York State Department of Health (NYSDOH) protocols contained in the Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006). The following sections describe procedures to be followed for specific tasks.

### **5.1 FIELD DOCUMENTATION PROCEDURES**

Field documentation procedures will include summarizing field observations in field books, logging soil borings and monitoring well construction, completing forms for groundwater and soil vapor sampling, and proper sample labeling. These procedures are described in the following sections.

#### **5.1.1 Field Data and Notes**

Field notebooks contain the documentary evidence regarding procedures conducted by field personnel. Hard cover, bound field notebooks will be used because of their compact size, durability, and secure page binding. The pages of the notebook will not be removed.

Entries will be made in waterproof, permanent blue or black ink. No erasures will be allowed. If an incorrect entry is made, the information will be crossed out with a single strike mark and the change initialed and dated by the team member making the change. Each entry will be dated. Entries will be legible and contain accurate and complete documentation of the individual or sampling team's activities or observations made. The level of detail will be sufficient to explain and reconstruct the activity conducted. Each entry will be signed by the person(s) making the entry.

The following types of information will be provided for each sampling task, as appropriate:

- Project name and number
- Reasons for being on-site or taking the sample
- Date and time of activity

- Sample identification numbers
- Geographical location of sampling points with references to the site, other facilities or a map coordinate system. Sketches will be made in the field logbook when appropriate
- Physical location of sampling locations such as depth below ground surface
- Description of the method of sampling including procedures followed, equipment used and any departure from the specified procedures
- Description of the sample including physical characteristics, odor, etc.
- Readings obtained from health and safety equipment
- Weather conditions at the time of sampling and previous meteorological events that may affect the representative nature of a sample
- Photographic information including a brief description of what was photographed, the date and time, the compass direction of the picture and the number of the picture on the camera
- Other pertinent observations such as the presence of other persons on the site, actions by others that may affect performance of site tasks, etc.
- Names of sampling personnel and signature of persons making entries

Field records will also be collected on field data sheets including boring logs, which will be used for geologic and drilling data during soil boring activities. Field data sheets will include the project-specific number and stored in the field project files when not in use. At the completion of the field activities, the field data sheets will be maintained in the central project file.

### **5.1.2 Sample Labeling**

Each sample collected will be assigned a unique identification number in accordance with the sample nomenclature guidance included in Attachment D, and placed in an appropriate sample container. Each sample container will have a sample label affixed to the outside with the date and time of sample collection and project name. In addition,

the label will contain the sample identification number, analysis required and chemical preservatives added, if any. All documentation will be completed in waterproof ink.

## **5.2 EQUIPMENT CALIBRATION AND PREVENTATIVE MAINTENANCE**

A photoionization detector (PID) will be used during the sampling activities to evaluate work zone action levels, collect pre- and post-sample readings for air samples, screen soil samples, and collect monitoring well headspace readings. Field calibration and/or field checking of the PID will be the responsibility of the field team leader and the site HSO, and will be accomplished by following the procedures outlined in the operating manual for the instrument. At a minimum, field calibration and/or field equipment checking will be performed once daily, prior to use. Field calibration will be documented in the field notebook. Entries made into the logbook regarding the status of field equipment will include the following information:

- Date and time of calibration
- Type of equipment serviced and identification number (such as serial number)
- Reference standard used for calibration
- Calibration and/or maintenance procedure used
- Other pertinent information

A water quality meter (Horiba U-52 or similar) will be used during purging of groundwater to measure pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every five minutes. Water-quality meters should be calibrated and the results documented before use each day using standardized field calibration procedures and calibration checks.

Equipment that fails calibration or becomes inoperable during use will be removed from service and segregated to prevent inadvertent utilization. The equipment will be properly tagged to indicate that it is out of calibration. Such equipment will be repaired and recalibrated to the manufacturer's specifications by qualified personnel. Equipment that cannot be repaired will be replaced.

Off-site calibration and maintenance of field instruments will be conducted as appropriate throughout the duration of project activities. All field instrumentation, sampling equipment and accessories will be maintained in accordance with the

manufacturer's recommendations and specifications and established field equipment practice. Off-site calibration and maintenance will be performed by qualified personnel. A logbook will be kept to document that established calibration and maintenance procedures have been followed. Documentation will include both scheduled and unscheduled maintenance.

### **5.3 SAMPLE COLLECTION**

#### *Soil Samples*

Soil samples will be collected with a dual-tube sampling system to prevent the collapse of sidewall material as the borings are advanced to collect a core representative of the depth interval advanced or a closed-point MacroCore sampler. Soil samples will be visually classified and field screened using a PID to assess potential impacts from VOCs and for health and safety monitoring. Grab soil samples collected for analysis of VOCs will be collected using either EnCore® or Terra Core® sampling equipment. For analysis of non-volatile parameters, samples will be homogenized in a sealable plastic bag and placed into laboratory-supplied glass jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at 4°C ±2°C until they are sent to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected soil samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected soil sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

#### *Groundwater Samples*

Groundwater sampling will be conducted using low-flow sampling procedures following USEPA guidance ("Low Stress [low flow] Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", EQASOP-GW 001, January 19, 2010 and revised September 19, 2017).

During purging, field parameters should be measured, including: water level drawdown, purge rate, pH, specific conductance, temperature, dissolved oxygen, turbidity and oxidation-reduction-potential (ORP), every five minutes using a water quality meter (Horiba U-52 or similar) and a depth-to-water interface probe that should be decontaminated between wells. Samples should generally not be collected until the field parameters have stabilized. Field parameters will be considered stable once three sets of measurements are within ±0.1 standard units for pH, ±3% for conductivity and

temperature,  $\pm 10$  millivolts for ORP, and  $\pm 10\%$  for turbidity and dissolved oxygen. Purge rates should be adjusted to keep the drawdown in the well to less than 0.3 feet, as practical. Additionally, an attempt should be made to achieve a stable turbidity reading of less than 10 Nephelometric Turbidity Units (NTU) prior to sampling. If the turbidity reading does not stabilize at reading of less than 10 NTU for a given well, then both filtered and unfiltered samples should be collected from that well. If necessary, field filtration should be performed using a 0.45 micron disposable in-line filter. Groundwater samples should be collected after parameters have stabilized as noted above or the readings are within the precision of the meter. Deviations from the stabilization and drawdown criteria, if any, should be noted on the sampling logs.

Samples should be collected directly into laboratory-supplied jars. After collection, all sample jars will be capped and securely tightened, and placed in iced coolers and maintained at  $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$  until they are transferred to the laboratory for analysis, in accordance with the procedures outlined in Section 5.4. Analysis and/or extraction and digestion of collected groundwater samples will meet the holding times required for each analyte as specified in Attachment C. In addition, analysis of collected groundwater sample will meet all quality assurance criteria set forth by this QAPP and DER-10.

Groundwater samples collected for analysis of per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane will be collected in accordance with the specialized protocol outlined in Attachment E.

#### *Air samples*

Prior to sample collection, a pre-sampling inspection will be conducted to document chemicals and potential subsurface pathways at the Site. The pre-sampling inspection will assess the potential for interference from chemical storage nearby or within the building. Air samples will be collected into laboratory-supplied, batch certified-clean 6-L Summa® canisters calibrated for a sampling rate of eight hours. The pressure gauges on each calibrated flow controller should be monitored throughout sample collection. Sample collection should be stopped when the pressure reading reaches -4 mmHg.

#### *Sample Equipment Blanks and Duplicates*

Equipment blanks will be collected for quality assurance purposes at a rate of one per 20 investigative samples per matrix (soil and groundwater only). Equipment blanks will be obtained by pouring laboratory-demonstrated analyte-free water on or through a

decontaminated sampling device following use and implementation of decontamination protocols. The water will be collected off of the sampling device into a laboratory-provided sample container for analysis. Equipment blank samples will be analyzed for the complete list of analytes on the day of sampling. Trip blanks will be collected at a rate of one per day if soil samples are analyzed for VOCs during that day.

Duplicate soil samples will be collected and analyzed for quality assurance purposes. Duplicate samples will be collected at a frequency of 1 per 20 investigative samples per matrix and will be submitted to the laboratory as "blind" samples. If less than 20 samples are collected during a particular sampling event, one duplicate sample will be collected.

#### **5.4 SAMPLE CONTAINERS AND HANDLING**

Certified, commercially clean sample containers will be obtained from the analytical laboratory. For soil and groundwater samples, the laboratory will also prepare and supply the required trip blanks and equipment blank sample containers and reagent preservatives. Sample bottle containers, including the equipment blank containers, will be placed into plastic coolers by the laboratory. These coolers will be received by the field sampling team within 24 hours of their preparation in the laboratory. Prior to the commencement of field work, Langan field personnel will fill the plastic coolers with ice in Ziploc® bags (or equivalent) to maintain a temperature of  $4^{\circ} \pm 2^{\circ}$  C.

Soil and groundwater samples collected in the field for laboratory analysis will be placed directly into the laboratory-supplied sample containers. Samples will then be placed and stored on-ice in laboratory provided coolers until shipment to the laboratory. The temperature in the coolers containing samples and associated equipment blanks will be maintained at a temperature of  $4^{\circ} \pm 2^{\circ}$  C while on-site and during sample shipment to the analytical laboratory.

Possession of samples collected in the field will be traceable from the time of collection until they are analyzed by the analytical laboratory or are properly disposed. Chain-of-custody procedures, described in Section 5.9, will be followed to maintain and document sample possession. Samples will be packaged and shipped as described in Section 5.6.



## **5.5 SAMPLE PRESERVATION**

Sample preservation measures will be used in an attempt to prevent sample decomposition by contamination, degradation, biological transformation, chemical interactions and other factors during the time between sample collection and analysis. Preservation will commence at the time of sample collection and will continue until analyses are performed. Should chemical preservation be required, the analytical laboratory will add the preservatives to the appropriate sample containers before shipment to the office or field. Samples will be preserved according to the requirements of the specific analytical method selected, as shown in Attachment C.

## **5.6 SAMPLE SHIPMENT**

### **5.6.1 Packaging**

Air samples canisters can be stored and transported without additional packaging. Soil and groundwater sample containers will be placed in plastic coolers. Ice in Ziploc® bags (or equivalent) will be placed around sample containers. Cushioning material will be added around the sample containers if necessary. Chains-of-custody and other paperwork will be placed in a Ziploc® bag (or equivalent) and placed inside the cooler. The cooler will be taped closed and custody seals will be affixed to one side of the cooler at a minimum. If the samples are being shipped by an express delivery company (e.g. FedEx) then laboratory address labels will be placed on top of the cooler.

### **5.6.2 Shipping**

Standard procedures to be followed for shipping environmental samples to the analytical laboratory are outlined below.

- All environmental samples will be transported to the laboratory by a laboratory-provided courier under the chain-of-custody protocols described in Section 5.9.
- Prior notice will be provided to the laboratory regarding when to expect shipped samples. If the number, type or date of shipment changes due to site constraints or program changes, the laboratory will be informed.

## **5.7 DECONTAMINATION PROCEDURES**

Decontamination procedures will be used for non-dedicated sampling equipment. Decontamination of field personnel is discussed in the site-specific sample Health and

Safety Plan (HASP) included in Appendix B of the RIWP. Field sampling equipment that is to be reused will be decontaminated in the field in accordance with the following procedures:

1. Laboratory-grade glassware detergent and tap water scrub to remove visual contamination
2. Generous tap water rinse
3. Distilled/de-ionized water rinse

## **5.8 RESIDUALS MANAGEMENT**

Debris (e.g., paper, plastic and disposable PPE) will be collected in plastic garbage bags and disposed of as non-hazardous industrial waste. Debris is expected to be transported to a local municipal landfill for disposal. If applicable, residual solids (e.g., leftover soil cuttings) will be placed back in the borehole from which it was sampled. If gross contamination is observed, soil will be collected and stored in Department of Transportation (DOT)-approved 55-gallon drums in a designated storage area at the Site. The residual materials stored in a designated storage area at the site for further characterization, treatment or disposal.

Residual fluids (such as purge water) will be collected and stored in DOT-approved (or equivalent) 55-gallon drums in a designated storage area at the site. The residual fluids will be analyzed, characterized and disposed off-site in accordance with applicable federal and state regulations. Residual fluids such as decontamination water may be discharged to the ground surface, however, if gross contamination is observed, the residual fluids will be collected, stored, and transported similar purge water or other residual fluids.

## **5.9 CHAIN OF CUSTODY PROCEDURES**

A chain-of-custody protocol has been established for collected samples that will be followed during sample handling activities in both field and laboratory operations. The primary purpose of the chain-of-custody procedures is to document the possession of the samples from collection through shipping, storage and analysis to data reporting and disposal. Chain-of-custody refers to actual possession of the samples. Samples are considered to be in custody if they are within sight of the individual responsible for their security or locked in a secure location. Each person who takes possession of the

samples, except the shipping courier, is responsible for sample integrity and safe keeping. Chain-of-custody procedures are provided below:

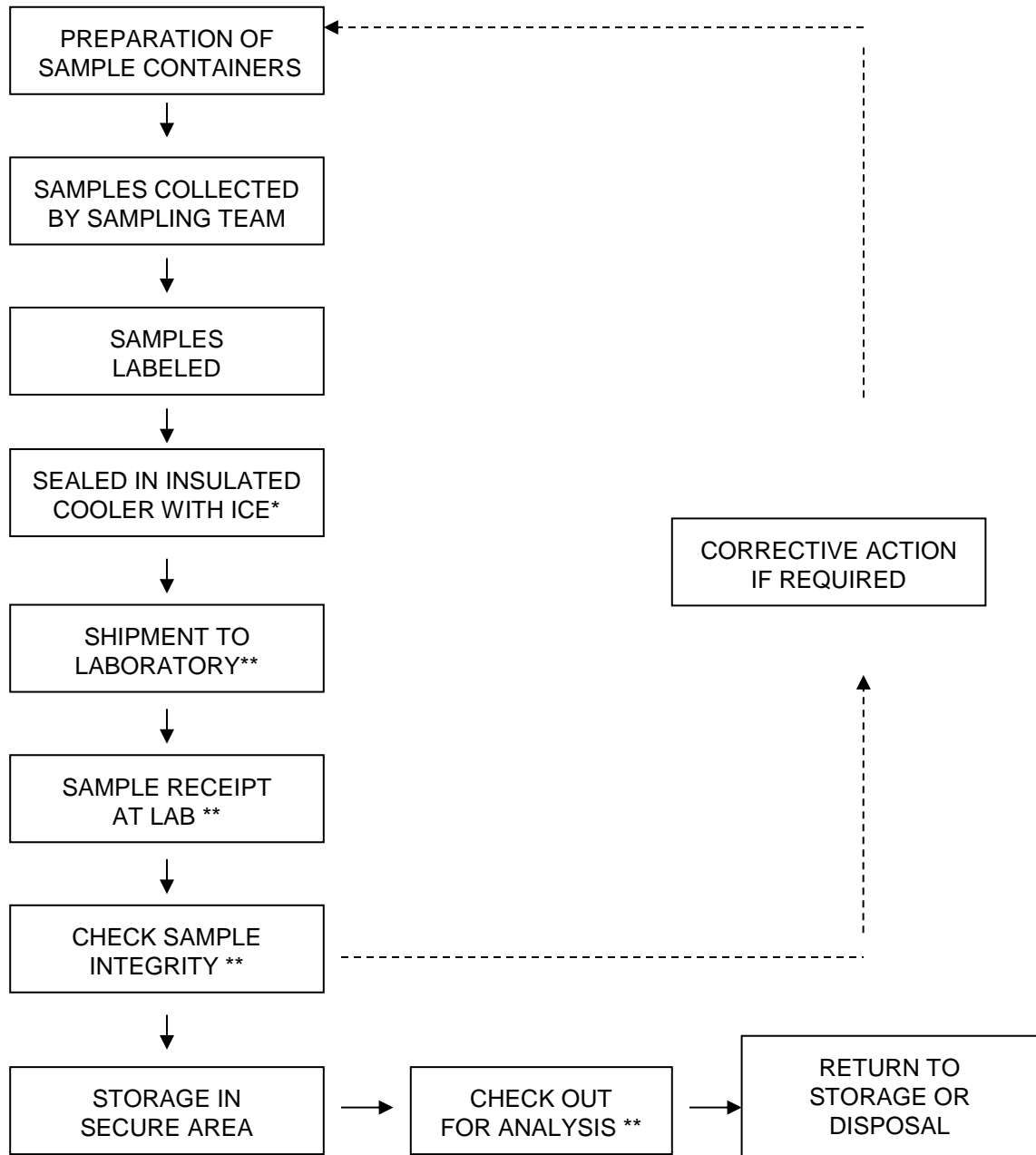
- Chain-of-custody will be initiated by the laboratory supplying the pre-cleaned and prepared sample containers. Chain-of-custody forms will accompany the sample containers.
- Following sample collection, the chain-of-custody form will be completed for the sample collected. The sample identification number, date and time of sample collection, analysis requested and other pertinent information (e.g., preservatives) will be recorded on the form. All entries will be made in waterproof, permanent blue or black ink.
- Langan field personnel will be responsible for the care and custody of the samples collected until the samples are transferred to another party, dispatched to the laboratory, or disposed. The sampling team leader will be responsible for enforcing chain-of-custody procedures during field work.
- When the form is full or when all samples have been collected that will fit in a single cooler, the sampling team leader will check the form for possible errors and sign the chain-of-custody form. Any necessary corrections will be made to the record with a single strike mark, dated, and initialed.

Sample coolers will be accompanied by the chain-of-custody form, sealed in a Ziploc® bag (or equivalent) and placed on top of the samples or taped to the inside of the cooler lid. If applicable, a shipping bill will be completed for each cooler and the shipping bill number recorded on the chain-of-custody form.

Samples will be packaged for shipment to the laboratory with the appropriate chain-of-custody form. A copy of the form will be retained by the sampling team for the project file and the original will be sent to the laboratory with the samples. Bills of lading will also be retained as part of the documentation for the chain-of-custody records, if applicable. When transferring custody of the samples, the individuals relinquishing and receiving custody of the samples will verify sample numbers and condition and will document the sample acquisition and transfer by signing and dating the chain-of-custody form. This process documents sample custody transfer from the sampler to the analytical laboratory. A flow chart showing a sample custody process is included as Figure 1.1. Blank chain-of-custody forms from Alpha are included as Figures 1.2 and 1.3.




Figure 1.1 Sample Custody



\*SUMMA CANISTERS SHOULD NOT BE ICED  
\*\* REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Figure 1.2 Sample Chain-of-Custody Form – Air Sample



**CHAIN OF CUSTODY**

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

**AIR ANALYSIS**

PAGE \_\_\_\_\_ OF \_\_\_\_\_

**Project Information**

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

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

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

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

ALPHA Quote #: \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_

These samples have been previously analyzed by Alpha

Other Project Specific Requirements/Comments: \_\_\_\_\_

Project-Specific Target Compound List:

**Date Rec'd in Lab:** \_\_\_\_\_

**Report Information - Data Deliverables**

FAX  
 ADEX  
 Criteria Checker: \_\_\_\_\_  
(Default based on Regulatory Criteria Indicated)

Other Formats: \_\_\_\_\_

EMAIL (standard pdf report)

Additional Deliverables: \_\_\_\_\_

Report to: (different than Project Manager) \_\_\_\_\_

**ALPHA Job #:** \_\_\_\_\_

**Billing Information**

Same as Client info

PO #: \_\_\_\_\_

**Turn-Around Time**

Standard  RUSH (only confirmed if pre-approved)

Date Due: \_\_\_\_\_ Time: \_\_\_\_\_

**Regulatory Requirements/Report Limits**

State/ Fed Program Res / Comm

**All Columns Below Must Be Filled Out**

| ALPHA Lab ID<br><small>(Lab Use Only)</small> | Sample ID | COLLECTION |            |          | Sample Matrix* | Sampler's Initials | Can Size | 1 D Can | 1 D - Flow Controller | TO-15 | TO-15 SIM | APH <small>Subtract Non-Petroleum HCs</small> | Fixed Gases | Sulfides & Mercaptans by TO-15 | Sample Comments (i.e. PID) |
|---|-----------|------------|------------|----------|----------------|--------------------|----------|---------|-----------------------|-------|-----------|---|-------------|--------------------------------|----------------------------|
|   |           | End Date   | Start Time | End Time |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |
|   |           |            |            |          |                |                    |          |         |                       |       |           |   |             |                                |                            |

**Container Type** \_\_\_\_\_

Relinquished By: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Received By: \_\_\_\_\_ Date/Time: \_\_\_\_\_

**\*SAMPLE MATRIX CODES**

AA = Ambient Air (Indoor/Outdoor)  
 SV = Soil Vapor/Landfill Gas/SVE  
 Other = Please Specify \_\_\_\_\_

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

Form No. 107-102 Rev. (25-Sep-15)

Figure 1.3 Sample Chain-of-Custody Form – Soil and Groundwater

|  |   |   |  |   |  |
|--|---|---|--|---|--|
| <b>NEW YORK CHAIN OF CUSTODY</b><br>Westborough, MA 01581<br>8 Walkup Dr.<br>TEL: 508-898-9220<br>FAX: 508-898-9193  | <b>Service Centers</b><br>Manhattan, NY 10745: 35 Whitey Rd, Suite 5<br>Albany, NY 12205: 14 Walk-e-Way<br>Townsends, NY 14150: 275 Cooper Ave, Suite 105 | Page<br>of  | <b>Project Information</b><br>Project Name:<br>Project Location:<br>Project #:<br>(Use Project Name as Project #) <input type="checkbox"/>   | <b>Date Rec'd in Lab</b><br>Deliverables<br><input type="checkbox"/> ASP-A<br><input type="checkbox"/> EQUIS (1 File)<br><input type="checkbox"/> Other | Billing Information<br><input type="checkbox"/> Same as Client Info<br>P.O.#   |
| Client Information<br>Address:<br>Phone:<br>Fax:<br>Email:   | Project Manager:<br>Turn-Around Time<br>Standard <input type="checkbox"/><br>Rush (only if pre-approved) <input type="checkbox"/>                         | Due Date:<br># of Days:   | Regulatory Requirement<br><input type="checkbox"/> NY TOGS<br><input type="checkbox"/> AWO Standards<br><input type="checkbox"/> NY Restricted Use<br><input type="checkbox"/> NY Unrestricted Use<br><input type="checkbox"/> NYC Sewer Discharge | Disposal Site Information<br>Please identify below location of applicable disposal facilities:<br>Disposal Facility:                                    | Disposal Site Information<br><input type="checkbox"/> NJ<br><input type="checkbox"/> NY<br><input type="checkbox"/> Other:   |
| These samples have been previously analyzed by Alpha <input type="checkbox"/>  |   |   |  |   |  |
| Other project specific requirements/comments:  |   |   |  |   |  |
| Please specify Metals or TAL.  |   |   |  |   |  |
| ALPHA Lab ID<br>(Lab Use Only)   | Sample ID   | Collection<br>Date  | Sample Matrix<br>Initials  | Container Type<br>Preservative  | Relinquished By:<br>Date/Time  |
| Preservative Code:<br>A = None<br>B = HCl<br>C = HNO <sub>3</sub><br>D = H <sub>2</sub> SO <sub>4</sub><br>E = NaOH<br>F = MeOH<br>G = NaHSO <sub>4</sub><br>H = Na <sub>2</sub> S <sub>2</sub> O <sub>8</sub><br>K/E = 2N AcNaOH<br>O = Other | Container Code<br>P = Plastic<br>A = Amber Glass<br>V = Vial<br>G = Glass<br>B = Beaker/ Cup<br>C = Cube<br>O = Other<br>E = Encore<br>D = BOD Bottle     | Westboro Certification No. MA935<br>Mansfield Certification No. MA015   |  | Received By:<br>Date/Time   | Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.) |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
|  |   |   |  |   |  |
| Sample Specific Comments<br>(Please Specify below)   |   | Sample Filtration<br><input type="checkbox"/> Done<br><input type="checkbox"/> Lab to do<br><input type="checkbox"/> Preservation<br><input type="checkbox"/> Lab to do |  |   |  |

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Laboratory chain-of-custody will be maintained throughout the analytical processes as described in the laboratory's Quality Assurance Manual. The analytical laboratory will provide a copy of the chain-of-custody in the analytical data deliverable package. The chain-of-custody becomes the permanent record of sample handling and shipment.

#### **5.10 LABORATORY SAMPLE STORAGE PROCEDURES**

The subcontracted laboratory will use a laboratory information management system (LIMS) to track and schedule samples upon receipt by the analytical laboratories. Any sample anomalies identified during sample log-in must be evaluated on individual merit for the impact upon the results and the data quality objectives of the project. When irregularities do exist, the environmental consultant must be notified to discuss recommended courses of action and documentation of the issue must be included in the project file.

For samples requiring thermal preservation, the temperature of each cooler will be immediately recorded. Each sample and container will be assigned a unique laboratory identification number and secured within the custody room walk-in coolers designated for new samples. Samples will be, as soon as practical, disbursed in a manner that is functional for the operational team. The temperature of all coolers and freezers will be monitored and recorded using a certified temperature sensor. Any temperature excursions outside of acceptance criteria (i.e., below 2°C or above 6°C) will initiate an investigation to determine whether any samples may have been affected. Samples for VOCs will be maintained in satellite storage areas within the VOC laboratory. Following analysis, the laboratory's specific procedures for retention and disposal will be followed as specified in the laboratory's SOPs and/or QA manual.



## **6.0 DATA REDUCTION, VALIDATION, AND REPORTING**

### **6.1 INTRODUCTION**

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The methods for the laboratory analysis of soil, water, and air samples and the quantitation limits are presented in Attachment B. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

### **6.2 DATA REDUCTION**

The Analytical Services Protocol (ASP) Category B data packages and an electronic data deliverable (EDD) will be provided by the laboratory after receipt of a complete sample delivery group. The Project Manager will immediately arrange for archiving the results and preparation of result tables. These tables will form the database for assessment of the site contamination condition.

Each EDD deliverable must be formatted using a Microsoft Windows operating system and the NYSDEC data deliverable format for EQulS. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (LIMS). If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All EDDs must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

### **6.3 DATA VALIDATION**

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of the QC sample results,
- Verification of the identification of sample results (both positive hits and non-detects),
- Recalculation of 10% of all investigative sample results, and
- Preparation of Data Usability Summary Reports (DUSR).

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;
- ICP serial dilutions; and
- Results verification and reported detection limits.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected. The associated number indicates the approximate sample concentration necessary to be detected significantly greater than the level of the highest associated blank;
- "UJ" - Not detected. Quantitation limit may be inaccurate or imprecise;
- "J" - Analyte is present. Reported value may be associated with a higher level of uncertainty than is normally expected with the analytical method
- "N" – Tentative identification. Analyte is considered present in the sample;
- "R" – Unreliable result; data is rejected or unusable. Analyte may or may not be present in the sample; and
- No Flag - Result accepted without qualification.

## **7.0 QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS**

### **7.1 INTRODUCTION**

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the QAO. These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

### **7.2 SYSTEM AUDITS**

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may be performed.

### **7.3 PERFORMANCE AUDITS**

The laboratory may be required to conduct an analysis of Performance Evaluation samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

### **7.4 FORMAL AUDITS**

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management. Non-compliances will be logged, and documented through audit findings, which are attached to and are a part of the integral audit report. These audit-finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

## **8.0 CORRECTIVE ACTION**

### **8.1 INTRODUCTION**

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

### **8.2 PROCEDURE DESCRIPTION**

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the

normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (see next page). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

| <b>CORRECTIVE ACTION REQUEST</b>   |       |             |       |          |       |
|--|-------|-------------|-------|----------|-------|
| Number: _____  |       | Date: _____ |       |          |       |
| TO: _____<br>You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____ |       |             |       |          |       |
| CONDITION:   |       |             |       |          |       |
| REFERENCE DOCUMENTS:   |       |             |       |          |       |
| RECOMMENDED CORRECTIVE ACTIONS:  |       |             |       |          |       |
| _____  | _____ | _____       | _____ | _____    | _____ |
| Originator   | Date  | Approval    | Date  | Approval | Date  |
| RESPONSE   |       |             |       |          |       |
| CAUSE OF CONDITION   |       |             |       |          |       |
| CORRECTIVE ACTION  |       |             |       |          |       |
| (A) RESOLUTION   |       |             |       |          |       |
| (B) PREVENTION   |       |             |       |          |       |
| (C) AFFECTED DOCUMENTS   |       |             |       |          |       |
| C.A. FOLLOWUP:   |       |             |       |          |       |
| CORRECTIVE ACTION VERIFIED BY: _____ DATE: _____   |       |             |       |          |       |

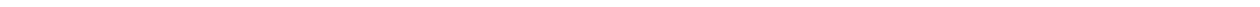


## **9.0 REFERENCES**

- NYSDEC. Division of Environmental Remediation. DER-10/Technical Guidance for Site Investigation and Remediation, dated May 3, 2010.
- NYSDOH. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006.
- Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan
- USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.
- USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7- U.S. Environmental Protection Agency, Washington, D.C.
- USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision #8, dated January 1992. USEPA Region II.
- USEPA, 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90. SOP No. HW-2, Revision XI, dated January 1992. USEPA Region II.
- USEPA. Hazardous Waste Support Section. Analysis of Volatile Organic Compounds in Air Contained in Canisters by Method TO-15. SOP No. HW-31, Revision #6, dated June 2014.

**ATTACHMENT A**

**RESUMES**



## Emily G. Strake

**Project Chemist/ Risk Assessor  
Human Health Risk Assessment  
Chemical Data Validation**



### 15 years in the industry ~ 2 years with Langan

Ms. Strake has fifteen years of environmental chemistry, risk assessment, auditing, and quality assurance experience. Most recently, she has focused her efforts on human health risk assessment, and has been the primary author or key contributor of risk assessment reports and screening evaluations for projects governed under RCRA, CERCLA, SWRCB, DTSC, DNREC, PADEP, NJDEP, CTDEEP, ODEQ, NYSDEC and MDE. She has experience in site-specific strategy development, which has enabled her to perform assessments to focus areas of investigation and identify risk-based alternatives for reducing remediation costs. Ms. Strake is a member of the Interstate Technology and Regulatory Council Risk Assessment Team responsible for the development and review of organizational risk assessment guidance documents and serves as a National Trainer in risk assessment for the organization.

Ms. Strake has over nine years of experience assessing potential adverse health effect to humans from exposure to hazardous contaminants in soil, sediment, groundwater, surface water, ambient and indoor air, and various types of animal, fish, and plant materials. She understands and applies environmental cleanup guidance and policies associated with multiple federal and state agencies. Additionally, she has broad experience in the development of preliminary remediation goals and site-specific action levels. She is proficient with the USEPA and Cal/EPA Johnson and Ettinger Model for Subsurface Vapor Intrusion into Buildings, USEPA's Adult Lead Methodology, DTSC's Leadsread 7 and 8, and statistical evaluation of data using USEPA's ProUCL software.

Ms. Strake has extensive experience in environmental data validation, focused on ensuring laboratory deliverables follow specific guidelines as described by regulatory agencies and the analytical methods employed. In addition, she has experience in EQUS chemical database management. She also has a broad range of environmental field experience and maintains current OSHA HAZWOPER certification.

Ms. Strake is experienced in auditing laboratory and field-sampling activities for compliance with Quality Assurance Project Plans (QAPPs), the National Environmental Laboratory Accreditation Conference Standards Quality Systems manual, and applicable USEPA Guidance. Ms. Strake has also audited on-site laboratories in support of groundwater treatment operations and implemented corrective actions. Her responsibilities include writing reports on the value of laboratory work, writing/editing QAPPs for clients and project-specific sites, peer reviewing colleague's work, and mentoring staff within the office. She has also served as the Quality Assurance officer for several long-term projects, responsible for the achievement of all forms of Quality Control/Quality Assurance by onsite personnel relating to sampling, analysis, and data evaluation.

Ms. Strake has several years' experience analyzing investigative samples, writing laboratory Standard Operating Procedures (SOPs), and managing all

#### Education

M.B.A., Business Administration  
The University of Scranton

B.S., Chemistry  
Cedar Crest College

#### Memberships

Interstate Technology and  
Regulatory Council

Society for Risk Analysis

#### Training

Candidate, Certified Industrial  
Environmental Toxicologist. National  
Registry of Environmental Professionals.

40 hr. OSHA HAZWOPER Training/Nov  
2002

8 hr. HAZWOPER Supervisor/June 2004

8 hr. OSHA HAZWOPER Refresher/Oct  
2012

American Red Cross First Aid & CPR  
certified

#### Publications/Presentations

*Decision Making at Contaminated  
Sites: Issues and Options in Human  
Health Risk Assessment.* Interstate  
Technology and Regulatory Council

*Alternate Approaches for Act 2 Risk  
Assessments Using Site-Specific  
Information.* Pennsylvania Brownfields  
Conference

*Tools from NJDEP's Attainment  
Guidance to Support Site Closure*  
LSRP Summit V

*EPA Region IX Vapor Intrusion Policy  
for Silicon Valley*  
2014 Environmental Workshop

**LANGAN**

## Emily G. Strake

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aspects of procedures and analyses for Optical Emission Spectrometry, X-Ray Fluorescence, Ignition analysis, and Atomic Absorption. Her experience also includes operating and performing routine instrument maintenance for GC/MS and IR. Ms. Strake has worked extensively on developing rapid soil characterization programs for PCB and pesticide analyses utilizing enzyme-linked immunosorbent assays, and was also involved in efforts to develop new instrumentation to quantify microbial nitrification of ammonium.

### Selected Project Experience

#### Human Health Risk Assessment

- Major League Soccer's San Jose Earthquakes Stadium – Utilized the Johnson and Ettinger advanced soil gas model to calculate risk and hazard associated with inhalation of chlorinated solvents for the redevelopment of a public soccer stadium. Soil gas data was modeled assuming three soil stratum and site-specific soil, building, and exposure parameters. The Earthquakes' stadium is set to open in 2015.
- Exelon - Developed a human health risk assessment for a utility-owned former Manufactured Gas Plant (MGP) site in Pennsylvania, under Pennsylvania's Act 2 Program. Used ProUCL 4.0 statistical software to determine upper limits for full data sets and non-detect data. Conducted vapor intrusion modeling (via the Johnson & Ettinger model) and prepared vapor intrusion reports showing that risks to volatile organic compounds in soils and groundwater were not impacting indoor air quality.
- Texas Instruments – Participated in a collaboration with Robert Ettinger and Geosyntec Consulting to develop comments to USEPA Region IX and the San Francisco Regional Water Quality Control Board regarding vapor intrusion at South Bay Superfund Sites. The focus of the response was to outline scientific and policy objections to EPA's recommended TCE interim short-term indoor air response action levels and guidelines, and to clarify the use of California-modified indoor air screening levels for assessing and responding to TCE and PCE subsurface vapor intrusion into indoor air.
- DuPont - Worked as a key participant in the human health risk evaluation of mercury associated with legacy contamination of the South River located in Waynesboro, Virginia.
- Veteran's Affairs - Completed a human health risk evaluation of the potential future risk associated with inhalation of indoor air for the Veteran's Administration. Soil, soil gas, and groundwater samples were collected as part of the site characterization. Achieved DTSC approval of the risk assessment approach and conclusions.
- Santa Clara Landfill – Developed a human health risk assessment to characterize risk associated with exposure to landfill gas at the Santa Clara All Purpose Landfill. The risk assessment evaluated specific compounds in landfill gas, their concentrations, spatial patterns, and extent throughout the site, and assessed the potential for vapor intrusion associated with a proposed future redevelopment.
- Avon - Completed a human health risk assessment in accordance with NYSDEC guidance for a redevelopment property located in Rye, New York. The objective of the evaluation was to characterize the risks associated with potential future human

exposures to soil and groundwater affected by a release from the Site's former No. 2 fuel oil UST. The intended future use of the Site was a playground to be utilized by the general public for open play on commercial recreational equipment.

- Golden Gate National Parks Conservancy – Peer reviewed a Preliminary Endangerment Assessment Report for the Battery East Trail. The assessment included a human health risk evaluation that estimated carcinogenic risk from exposure to PAHs and dioxin/furans in soil using toxic equivalency to benzo(a)pyrene and 2,3,7,8-TCDD.
- Sunoco Refineries – Derived site-specific soil PRGs for lead using the EPA's adult lead model for two former Sunoco refineries. Completed receptor evaluations in accordance with USEPA risk assessment guidance to develop exposure parameters under current and reasonably anticipated future land use scenarios.
- Honeywell - Completed a focused human health risk evaluation of PAH contaminants for under NJDEP's Site Remediation Program. Applied a blended approach of qualitative risk characterization and quantitative risk calculation to propose closure of AOCs following the remedial investigation.
- Delaware City Refinery - Performed comprehensive human health risk assessment for a petroleum refinery in Delaware City, Delaware. The risk assessment was the basis for a thorough characterization and assessment of potential risks posed by site-specific conditions. Developed various human exposure scenarios by using both Federal and State-Specific guidance for soil, groundwater, and surface water exposure.
- Occidental Chemical - Completed multiple AOC-specific risk assessments utilizing and applying the guidance set forth by the DTSC's Human Health Risk Assessment Note 1 (Default Exposure Factors for Use in Risk Assessment), Note 3 (Recommended Methodology for Use of USEPA Regional Screening Levels, and Note 4 (Screening Level Human Health Risk Assessments).
- Floreffe Terminal - Performed human health risk assessment for contamination resulting from a 3.9 million gallon diesel oil tank collapse along the Monongahela River. Evaluated potential impacts to human health via exposure to soil, groundwater, and surface water. Calculated site-specific standards for soil remediation.
- DOW Chemical - Calculated Medium Specific Concentrations (MSCs) for unregulated contaminants using the PADEP protocols to assist in the clean-up of a monomer tank explosion in Bristol, Pennsylvania. Selected appropriate surrogate toxicity data and evaluated novel on-site constituents by analogy.
- Ryder – Developed Alternative Direct Exposure Criteria for PAH-impacted fill material at a commercial facility. Site-specific soil screening levels for incidental ingestion of soil were calculated following a forward risk evaluation for current on-site receptors.
- Rohm and Haas - Prepared an Act 2 site-specific human health risk assessment for the oldest industrial facility in the United States, located in southeast Philadelphia. The objective of the risk assessment was to determine achievable possible future land-use options under Pennsylvania's Land Recycling Program. The risk assessment included evolution of multiple site-COPCs and constituent suites: VOCs, SVOCs, PCBs, pesticides, and metals

## Emily G. Strake

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(including lead). Evaluated the potential for indoor air inhalation through J&E modeling of soil gas and groundwater.

- Regency - Conducted vapor intrusion modeling for a dry cleaning facility in the Philadelphia area. Predictive modeling using the Johnson and Ettinger approach indicated that estimated contaminant levels would not adversely affect human receptors.

### Chemical Data Quality

- Audited multiple accredited laboratories in New Jersey and Pennsylvania on behalf of clients using USEPA Guidance on Technical Audits and Related Assessments for Environmental Data Operations. The audits included full-suite USEPA and SW-846 methodology; and included reviewing staff experience and training records, equipment and facilities, policies, practices, procedures, and documentation for sample receipt, analysis, instrument maintenance, standard preparation, calibration and traceability, control charting, corrective actions, data reduction and review, report generation, and waste disposal.
- Reviewed and validated data packages for RCRA Facilities Investigation at a Philadelphia-area chemical site; issued data validation reports to project personnel and regulatory agencies. The reviews included evaluation of quarterly groundwater, soil, and soil vapor matrices. Participated in RCRA groundwater sampling, developed and executed the investigation's QAPP, and coordinated with the laboratory to schedule and perform field-sampling events.
- Completed Data Usability Summary Reports in accordance with NYSDEC DER-10 guidance for soil, groundwater, sediment surface water, soil gas, ambient air and indoor air analytical results.
- Acted as the Quality Assurance Officer for several long-term projects in Pennsylvania, Maryland, and New Jersey, Delaware, responsible for the achievement of all forms of QA/QC as it related to sampling, analysis, and data evaluation.
- Participated in a CERCLA site investigation; assessed the usability of sample results for numerous matrices including dust, sediment, soils, and various aqueous matrices for a remedial investigation under the Contract Laboratory Program. Implemented an on-site pesticide immunoassay program to delineate soil contamination in real-time.
- EQUIS data manager for database migration of historical groundwater results associated with remediation activities; assisted with natural attenuation data evaluation and gained experience in geochemical trends associated with intrinsic biodegradation.
- Coordinated the collection of fish tissue samples and determined the validity of the analytical results associated with CERCLA and RCRA site characterizations. Assessed duck blood analytical results for the Connecticut Department of Energy and Environmental Protection Bureau of Natural Resources.

## Gregory C. Wyka, PG, LEED AP

**Project Geologist  
Environmental Engineering**



### 9 years in the industry

Mr. Wyka is a geologist with experience in regulatory government, brownfield development, and environmental liability consulting. His expertise includes site characterization, remedial investigation, waste characterization, conceptual site modeling, remedial design and implementation, construction management, GIS, and sustainability. Mr. Wyka's abilities integrate remediation with property redevelopment and he provides technical, regulatory, logistical, and risk management guidance to clients, including developers, owners, and environmental attorneys. He provides direct assistance for clients on construction and remediation projects in the New York State Inactive Hazardous Waste Disposal Site Program, New York State Spill Response Program, New York State Brownfield Cleanup Program, New York City E-Designation Program and New York City Voluntary Cleanup Program.

### Selected Projects

Greenpoint Landing Waterfront Residential Development, Phase I ESAs, remedial investigations, waste characterizations, remedial action work plans, remedial action implementation, construction management, e-designation management and closure, and agency coordination, Brooklyn, NY

Brownfield Cleanup Program, remedial investigations and agency coordination, ABC site, Long Island City, NY

Brownfield Cleanup Program, remedial investigations and agency coordination, City DPW Yard, New Rochelle, NY

160 Leroy Street, Phase I ESA, remedial investigations, waste characterizations, remedial action work plans, remedial action implementation, construction management, e-designation management, and agency/client coordination, New York, NY

2409 Jerome Avenue, phase I ESA, phase II ESI, remedial investigation, open spill management, and agency/client coordination, Bronx, NY

685 First Avenue, New York, NY – Waste characterization, construction management, and agency coordination, Bronx, NY

60 West Street, remedial investigation, waste characterization, remedial action work plan, and e-designation management, Brooklyn, NY

27-19 44<sup>th</sup> Drive, construction management and agency coordination, Long Island City, NY

82 King Street, e-designation management, New York, NY

515 West 42<sup>nd</sup> Street, e-designation management, New York, NY

421 Kent Avenue, remedial investigations, waste characterizations, remedial action work plans, remedial action implementation, construction management, e-designation management, and agency/client coordination, Brooklyn, NY

### Education

B.A., Geology, Chemistry and Environmental Studies  
Bowdoin College

### Professional Registrations

Professional Geologist (PG) in NY  
LEED AP Neighborhood Development  
40 Hour OSHA HAZWOPER  
10 Hour OSHA Construction Safety  
8 Hour OSHA Site Supervisor  
CPR and First Aid Certified

### Affiliations

New York State Council of Professional Geologists (NYSCPG)  
Urban Green Council  
New York City Brownfield Partnership



## Gregory C. Wyka, PG, LEED AP

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Brooklyn Bridge Park, Pierhouse, construction management and agency/client coordination, Brooklyn, NY  
550 Myrtle Avenue, construction management, e-designation management and closure, Brooklyn, NY  
310 Meserole Street, Phase I ESA, Brooklyn, NY  
13-17 Laight Street, Phase I ESA, New York, NY  
460 Mother Gaston Boulevard, Phase I ESA, Brooklyn, NY  
25 Kent Avenue, Phase I ESA, Brooklyn, NY  
1110 Oak Point Avenue, Phase I ESA, Bronx, NY  
859-863 Lexington Avenue, Phase I ESA, New York, NY  
49 East 21<sup>st</sup> Street, Phase I ESA, New York, NY  
1552-1560 Broadway, Phase I ESA, New York, NY  
287-291 East Houston Street, Phase I ESA, New York, NY  
205 Water Street, construction oversight and management, tank closure, e-designation management and closure, Brooklyn, NY  
29-01 Borden Avenue, remedial investigation and petroleum spill closure, Long Island City, NY  
29-10 Hunters Point Avenue, remedial investigation and tank closure, Long Island City, NY  
30-27 Greenpoint Avenue, remedial investigation and petroleum spill closure, Long Island City, NY –  
55 Water Street, emergency petroleum spill closure (Tropical Storm Sandy), New York, NY  
489 Great Neck Road, remedial investigation and remedial design, Great Neck, NY  
505 West 27<sup>th</sup> Street, remedial investigation and e-designation management, New York, NY  
144 East 201<sup>st</sup> Street, Phase I ESA, remedial investigation, construction oversight, and e-designation management, Bronx, NY  
Big River Study Area (Superfund), remedial investigation, Old Lead Belt, Park Hills and Desloge, MO  
Berry's Creek Study Area (Superfund Site), remedial investigation, Bergen County, NJ  
Everglades Restoration Project, remedial investigation, Clewiston, FL  
Marble River Wind Farm, wetland delineation, Ellenburg, NY



## Julia Leung, PE

Project Engineer

Environmental Engineering & Water Resources



### 5 years in the industry

Ms. Leung is an environmental engineer working in the New York Metro area. Her projects involve the investigation and assessment of environmental systems including physical/chemical processes, water chemistry, environmental system analysis, solid waste and water resources engineering, stormwater design and hydrology.

### Selected Projects

Phase I ESA, Various Locations, NYC and Westchester County, NY  
Phase II ESI, 412 East 90<sup>th</sup> Street, New York, NY  
420 Kent Avenue, Brooklyn, NY  
West and Watts Development, New York, NY  
Mixed-Use Building (203 East 92nd Street), New York, NY  
BAM North Tower, Brooklyn, NY  
Phase II ESI, FedEx Distribution Facility (830 Fountain Avenue),  
Brooklyn, NY  
Waste Classification and Lead Delineation Investigation (261 Hudson Street),  
New York, NY  
Waste Classification Investigation (41-43 East 22nd Street), New York, NY  
Columbia University, Manhattanville Campus, New York, NY  
Riverside Building 5, New York, NY  
Condominium at 200 East 79th Street, New York, NY  
Mercedes Benz of Manhattan (536 West 41<sup>st</sup> Street), New York, NY  
Phase II ESI (627 Smith Street), Brooklyn, NY  
340 Court Street, Brooklyn, NY

### Education

M.E., Environmental Engineering  
Cornell University

B.S., Biological Engineering  
(Concentration: Environmental Studies)  
Cornell University

### Professional Registration

Professional Engineer (PE) in NY

10-Hour OSHA

# Mimi Raygorodetsky

**Senior Associate  
Environmental Engineering**



## 16 years in the industry

Ms. Raygorodetsky sources and directs large, complex environmental remediation and redevelopment projects from the earliest stages of pre-development diligence, through the remediation/construction phase, to long-term operation and monitoring of remedial systems and engineering controls. She has a comprehensive understanding of federal, state and local regulatory programs and she uses this expertise to guide her clients through a preliminary cost benefit analysis to select the right program(s) given the clients' legal obligations, development desires and risk tolerance. She is particularly strong at integrating the requirements of selected programs and client development needs to develop and design targeted and streamlined diligence programs and remediation strategies. Ms. Raygorodetsky is also highly skilled in integrating remediation with construction on large urban waterfront projects, which tend to more complex than landside projects.

## Selected Projects

- 25 Kent Avenue, Due Diligence for Purchase of a Brownfields Location, Brooklyn, NY
- Ferry Point Waterfront Park, Redevelopment of a Former Landfill into a Park, Bronx, NY
- Battery Maritime Building (10 South Street), Phase I ESA, New York, NY
- Residential Development at 351-357 Broadway, Phase 1 ESA, New York, NY
- 450 Union Street, Phase I and Phase II Remediation (NYS DEC Brownfield Cleanup Program), New York, NY
- Echo Bay Center, NYS DEC Brownfield Cleanup Program, New York, NY
- 420 Kent Avenue, NYS DEC Brownfield Cleanup Program, Brooklyn, NY
- 416 Kent Avenue, NYS DEC Brownfield Cleanup Program, Brooklyn, NY
- 264 Fifth Avenue, Phase I ESA, New York, NY
- 262 Fifth Avenue, Phase I ESA, New York, NY
- ABC Blocks 25-27 (Mixed-Use Properties), Brownfield Cleanup Program, Long Island City, NY
- Residences at 100 Barrow Street, Phase I ESA, New York, NY
- Residences at 22-12 Jackson Avenue, Due Diligence for Building Sale, Long Island City, NY
- Residences at 2253-2255 Broadway, Phase I and Phase II Services, New York, NY
- Prince Point, Phase I ESA, Staten Island, NY
- 787 Eleventh Avenue (Office Building Renovation), Phase I UST Closure, New York, NY
- 218 Front Street/98 Gold Street, Planning and Brownfield Consulting, Brooklyn, NY

## Education

B.A., Biology and Spanish Literature  
Colby College

## Affiliations

Committee Member – New York Building  
Congress, Council of Industry Women

Founding Member and Current President  
– New York City Brownfield Partnership

Committee Member – NYC Office of  
Environmental Remediation Technical  
Task Force

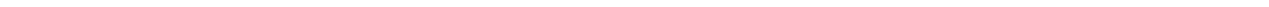
## Mimi Raygorodetsky

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- Mark JCH of Bensonhurst, Phase I and HazMat Renovation, Brooklyn, NY
- 39 West 23<sup>rd</sup> Street, E-Designation Brownfield, New York, NY
- 250 Water Street, Phase I and Phase II Property Transaction, New York, NY
- 27-19 44<sup>th</sup> Drive, Residential Redevelopment, Long Island City, NY
- 515 West 42<sup>nd</sup> Street, E-Designation, New York, NY
- 310 Meserole Street, Due Diligence Property Purchase, Brooklyn, NY
- Former Georgetown Heating Plant, HazMat and Phase I ESA, Washington D.C.
- 80-110 Flatbush Avenue, Brooklyn, NY
- 132 East 23<sup>rd</sup> Street, New York, NY
- 846 Sixth Avenue, New York, NY
- Greenpoint Landing, Remediation/Redevelopment, Brooklyn, NY
- 711 Eleventh Avenue, Due Diligence/Owner's Representative, New York, NY
- Brooklyn Bridge Park, Pier 1, Waste Characterization and Remediation, Brooklyn, NY
- Post-Hurricane Sandy Mold Remediation, Various Private Homes, Far Rockaway, NY
- Brooklyn Bridge Park, One John Street Development, Pre-Construction Due Diligence and Construction Administration, Brooklyn, NY
- 7 West 21<sup>st</sup> Street, Brownfields Remediation, New York, NY
- 546 West 44<sup>th</sup> Street, Brownfields Remediation, New York, NY
- Post-Hurricane Sandy Mold Remediation, Various Private Homes, Nassau and Suffolk Counties, Long Island, NY
- 55 West 17<sup>th</sup> Street, Brownfield Site Support, New York, NY
- Pratt Institute, 550 Myrtle Avenue Renovations, Environmental Remediation, Brooklyn, NY
- 42-02 Crescent Street Redevelopment, Phase I and II Environmental, Long Island City, NY
- IAC Building (555 West 18<sup>th</sup> Street), New York, NY
- Retirement Communities on 100-acre Parcels in ME, NJ, MA, CT, and NJ
- 363-365 Bond Street/400 Carroll Street, Brooklyn, NY
- 160 East 22<sup>nd</sup> Street, New York, NY
- 110 Third Avenue, New York, NY
- Lycee Francais (East 76<sup>th</sup> Street & York Avenue), New York, NY
- Winchester Arms Munitions Factory, New Haven, CT

**ATTACHMENT B**

**LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS**



## ATTACHMENT B

GROUNDWATER SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                            | Matrix      | Analyte                               | RL   | MDL    | Units |
|-----------------------------------|-------------|---------------------------------------|------|--------|-------|
| <b>Volatile Organic Compounds</b> |             |                                       |      |        |       |
| EPA 8260C                         | Groundwater | 1,1,1,2-Tetrachloroethane             | 0.5  | 0.164  | ug/L  |
| EPA 8260C                         | Groundwater | 1,1,1-Trichloroethane                 | 0.5  | 0.158  | ug/L  |
| EPA 8260C                         | Groundwater | 1,1,2,2-Tetrachloroethane             | 0.5  | 0.144  | ug/L  |
| EPA 8260C                         | Groundwater | 1,1,2-Trichloro-1,2,2-Trifluoroethane | 10   | 0.148  | ug/L  |
| EPA 8260C                         | Groundwater | 1,1,2-Trichloroethane                 | 0.75 | 0.144  | ug/L  |
| EPA 8260C                         | Groundwater | 1,1-Dichloroethane                    | 0.75 | 0.21   | ug/L  |
| EPA 8260C                         | Groundwater | 1,1-Dichloroethene                    | 0.5  | 0.142  | ug/L  |
| EPA 8260C                         | Groundwater | 1,1-Dichloropropene                   | 2.5  | 0.173  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2,3-Trichlorobenzene                | 2.5  | 0.234  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2,3-Trichloropropane                | 5    | 0.176  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2,4,5-Tetramethylbenzene            | 2    | 0.542  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2,4-Trichlorobenzene                | 2.5  | 0.22   | ug/L  |
| EPA 8260C                         | Groundwater | 1,2,4-Trimethylbenzene                | 2.5  | 0.191  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2-Dibromo-3-chloropropane           | 2.5  | 0.327  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2-Dibromoethane                     | 2    | 0.193  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2-Dichlorobenzene                   | 2.5  | 0.184  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2-Dichloroethane                    | 0.5  | 0.132  | ug/L  |
| EPA 8260C                         | Groundwater | 1,2-Dichloropropane                   | 1.75 | 0.133  | ug/L  |
| EPA 8260C                         | Groundwater | 1,3,5-Trimethylbenzene                | 2.5  | 0.174  | ug/L  |
| EPA 8260C                         | Groundwater | 1,3-Dichlorobenzene                   | 2.5  | 0.186  | ug/L  |
| EPA 8260C                         | Groundwater | 1,3-Dichloropropane                   | 2.5  | 0.212  | ug/L  |
| EPA 8260C                         | Groundwater | 1,4-Dichlorobenzene                   | 2.5  | 0.187  | ug/L  |
| EPA 8260C                         | Groundwater | 1,4-Diethylbenzene                    | 2    | 0.392  | ug/L  |
| EPA 8260C                         | Groundwater | 2,2-Dichloropropane                   | 2.5  | 0.204  | ug/L  |
| EPA 8260C                         | Groundwater | 2-Butanone                            | 5    | 1.94   | ug/L  |
| EPA 8260C                         | Groundwater | 2-Hexanone                            | 5    | 0.515  | ug/L  |
| EPA 8260C                         | Groundwater | 4-Ethyltoluene                        | 2    | 0.34   | ug/L  |
| EPA 8260C                         | Groundwater | 4-Methyl-2-pentanone                  | 5    | 0.416  | ug/L  |
| EPA 8260C                         | Groundwater | Acetone                               | 5    | 1.46   | ug/L  |
| EPA 8260C                         | Groundwater | Acrolein                              | 5    | 0.633  | ug/L  |
| EPA 8260C                         | Groundwater | Acrylonitrile                         | 5    | 0.43   | ug/L  |
| EPA 8260C                         | Groundwater | Benzene                               | 0.5  | 0.159  | ug/L  |
| EPA 8260C                         | Groundwater | Bromobenzene                          | 2.5  | 0.152  | ug/L  |
| EPA 8260C                         | Groundwater | Bromochloromethane                    | 2.5  | 0.138  | ug/L  |
| EPA 8260C                         | Groundwater | Bromodichloromethane                  | 0.5  | 0.192  | ug/L  |
| EPA 8260C                         | Groundwater | Bromoform                             | 2    | 0.248  | ug/L  |
| EPA 8260C                         | Groundwater | Bromomethane                          | 1    | 0.256  | ug/L  |
| EPA 8260C                         | Groundwater | Carbon disulfide                      | 5    | 0.299  | ug/L  |
| EPA 8260C                         | Groundwater | Carbon tetrachloride                  | 0.5  | 0.134  | ug/L  |
| EPA 8260C                         | Groundwater | Chlorobenzene                         | 0.5  | 0.178  | ug/L  |
| EPA 8260C                         | Groundwater | Chloroethane                          | 1    | 0.134  | ug/L  |
| EPA 8260C                         | Groundwater | Chloroform                            | 0.75 | 0.182  | ug/L  |
| EPA 8260C                         | Groundwater | Chloromethane                         | 2.5  | 0.176  | ug/L  |
| EPA 8260C                         | Groundwater | cis-1,2-Dichloroethene                | 0.5  | 0.187  | ug/L  |
| EPA 8260C                         | Groundwater | cis-1,3-Dichloropropene               | 0.5  | 0.144  | ug/L  |
| EPA 8260C                         | Groundwater | Cyclohexane                           | 10   | 0.271  | ug/L  |
| EPA 8260C                         | Groundwater | Dibromochloromethane                  | 0.5  | 0.149  | ug/L  |
| EPA 8260C                         | Groundwater | Dibromomethane                        | 5    | 0.363  | ug/L  |
| EPA 8260C                         | Groundwater | Dichlorodifluoromethane               | 5    | 0.245  | ug/L  |
| EPA 8260C                         | Groundwater | Ethyl ether                           | 2.5  | 0.15   | ug/L  |
| EPA 8260C                         | Groundwater | Ethylbenzene                          | 0.5  | 0.168  | ug/L  |
| EPA 8260C                         | Groundwater | Hexachlorobutadiene                   | 0.5  | 0.217  | ug/L  |
| EPA 8260C                         | Groundwater | Isopropylbenzene                      | 0.5  | 0.187  | ug/L  |
| EPA 8260C                         | Groundwater | Methyl Acetate                        | 10   | 0.234  | ug/L  |
| EPA 8260C                         | Groundwater | Methyl cyclohexane                    | 10   | 0.396  | ug/L  |
| EPA 8260C                         | Groundwater | Methyl tert butyl ether               | 1    | 0.16   | ug/L  |
| EPA 8260C                         | Groundwater | Methylene chloride                    | 3    | 0.289  | ug/L  |
| EPA 8260C                         | Groundwater | Naphthalene                           | 2.5  | 0.216  | ug/L  |
| EPA 8260C                         | Groundwater | n-Butylbenzene                        | 0.5  | 0.192  | ug/L  |
| EPA 8260C                         | Groundwater | n-Propylbenzene                       | 0.5  | 0.173  | ug/L  |
| EPA 8260C                         | Groundwater | o-Chlorotoluene                       | 2.5  | 0.17   | ug/L  |
| EPA 8260C                         | Groundwater | o-Xylene                              | 1    | 0.33   | ug/L  |
| EPA 8260C                         | Groundwater | p/m-Xylene                            | 1    | 0.332  | ug/L  |
| EPA 8260C                         | Groundwater | p-Chlorotoluene                       | 2.5  | 0.185  | ug/L  |
| EPA 8260C                         | Groundwater | p-Isopropyltoluene                    | 0.5  | 0.188  | ug/L  |
| EPA 8260C                         | Groundwater | sec-Butylbenzene                      | 0.5  | 0.181  | ug/L  |
| EPA 8260C                         | Groundwater | Styrene                               | 1    | 0.359  | ug/L  |
| EPA 8260C                         | Groundwater | tert-Butyl Alcohol                    | 10   | 0.899  | ug/L  |
| EPA 8260C                         | Groundwater | tert-Butylbenzene                     | 2.5  | 0.185  | ug/L  |
| EPA 8260C                         | Groundwater | Tetrachloroethene                     | 0.5  | 0.181  | ug/L  |
| EPA 8260C                         | Groundwater | Toluene                               | 0.75 | 0.161  | ug/L  |
| EPA 8260C                         | Groundwater | trans-1,2-Dichloroethene              | 0.75 | 0.163  | ug/L  |
| EPA 8260C                         | Groundwater | trans-1,3-Dichloropropene             | 0.5  | 0.164  | ug/L  |
| EPA 8260C                         | Groundwater | trans-1,4-Dichloro-2-butene           | 2.5  | 0.173  | ug/L  |
| EPA 8260C                         | Groundwater | Trichloroethene                       | 0.5  | 0.175  | ug/L  |
| EPA 8260C                         | Groundwater | Trichlorofluoromethane                | 2.5  | 0.161  | ug/L  |
| EPA 8260C                         | Groundwater | Vinyl acetate                         | 5    | 0.311  | ug/L  |
| EPA 8260C                         | Groundwater | Vinyl chloride                        | 1    | 0.0699 | ug/L  |
| EPA 8260C                         | Groundwater | Xylenes, Total                        | 1    | 0.33   | ug/L  |

## ATTACHMENT B

GROUNDWATER SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                                | Matrix      | Analyte                        | RL   | MDL    | Units |
|---------------------------------------|-------------|--------------------------------|------|--------|-------|
| <b>Semivolatile Organic Compounds</b> |             |                                |      |        |       |
| EPA 8270D                             | Groundwater | 1,2,4,5-Tetrachlorobenzene     | 10   | 0.357  | ug/L  |
| EPA 8270D                             | Groundwater | 1,2,4-Trichlorobenzene         | 5    | 0.21   | ug/L  |
| EPA 8270D                             | Groundwater | 1,2-Dichlorobenzene            | 2    | 0.302  | ug/L  |
| EPA 8270D                             | Groundwater | 1,3-Dichlorobenzene            | 2    | 0.35   | ug/L  |
| EPA 8270D                             | Groundwater | 1,4-Dichlorobenzene            | 2    | 0.323  | ug/L  |
| EPA 8270D                             | Groundwater | 2,3,4,6-Tetrachlorophenol      | 5    | 0.59   | ug/L  |
| EPA 8270D                             | Groundwater | 2,4,5-Trichlorophenol          | 5    | 0.748  | ug/L  |
| EPA 8270D                             | Groundwater | 2,4,6-Trichlorophenol          | 5    | 0.775  | ug/L  |
| EPA 8270D                             | Groundwater | 2,4-Dichlorophenol             | 5    | 0.564  | ug/L  |
| EPA 8270D                             | Groundwater | 2,4-Dimethylphenol             | 5    | 0.578  | ug/L  |
| EPA 8270D                             | Groundwater | 2,4-Dinitrophenol              | 20   | 1.4081 | ug/L  |
| EPA 8270D                             | Groundwater | 2,4-Dinitrotoluene             | 5    | 1.05   | ug/L  |
| EPA 8270D                             | Groundwater | 2,6-Dinitrotoluene             | 5    | 0.89   | ug/L  |
| EPA 8270 SIM Isotope Dilution         | Groundwater | 1,4-Dioxane                    | 0.35 | 0.075  | ug/L  |
| EPA 8270D                             | Groundwater | 2-Chloronaphthalene            | 2    | 0.455  | ug/L  |
| EPA 8270D                             | Groundwater | 2-Chlorophenol                 | 2    | 0.58   | ug/L  |
| EPA 8270D                             | Groundwater | 2-Methylnaphthalene            | 2    | 0.355  | ug/L  |
| EPA 8270D                             | Groundwater | 2-Methylphenol                 | 5    | 0.703  | ug/L  |
| EPA 8270D                             | Groundwater | 2-Nitroaniline                 | 5    | 0.956  | ug/L  |
| EPA 8270D                             | Groundwater | 2-Nitrophenol                  | 10   | 1.05   | ug/L  |
| EPA 8270D                             | Groundwater | 3,3'-Dichlorobenzidine         | 5    | 0.478  | ug/L  |
| EPA 8270D                             | Groundwater | 3-Methylphenol/4-Methylphenol  | 5    | 0.72   | ug/L  |
| EPA 8270D                             | Groundwater | 3-Nitroaniline                 | 5    | 0.668  | ug/L  |
| EPA 8270D                             | Groundwater | 4,6-Dinitro-o-cresol           | 10   | 1.36   | ug/L  |
| EPA 8270D                             | Groundwater | 4-Bromophenyl phenyl ether     | 2    | 0.428  | ug/L  |
| EPA 8270D                             | Groundwater | 4-Chloroaniline                | 5    | 0.835  | ug/L  |
| EPA 8270D                             | Groundwater | 4-Chlorophenyl phenyl ether    | 2    | 0.355  | ug/L  |
| EPA 8270D                             | Groundwater | 4-Nitroaniline                 | 5    | 0.83   | ug/L  |
| EPA 8270D                             | Groundwater | 4-Nitrophenol                  | 10   | 1.09   | ug/L  |
| EPA 8270D                             | Groundwater | Acenaphthene                   | 2    | 0.284  | ug/L  |
| EPA 8270D                             | Groundwater | Acenaphthylene                 | 2    | 0.372  | ug/L  |
| EPA 8270D                             | Groundwater | Acetophenone                   | 5    | 0.428  | ug/L  |
| EPA 8270D                             | Groundwater | Anthracene                     | 2    | 0.2    | ug/L  |
| EPA 8270D                             | Groundwater | Atrazine                       | 10   | 0.794  | ug/L  |
| EPA 8270D                             | Groundwater | Azobenzene                     | 2    | 0.537  | ug/L  |
| EPA 8270D                             | Groundwater | Benzaldehyde                   | 5    | 0.986  | ug/L  |
| EPA 8270D                             | Groundwater | Benzidine                      | 20   | 5.24   | ug/L  |
| EPA 8270D                             | Groundwater | Benzolanthracene               | 2    | 0.323  | ug/L  |
| EPA 8270D                             | Groundwater | Benzolapyrene                  | 2    | 0.658  | ug/L  |
| EPA 8270D                             | Groundwater | Benzofluoranthene              | 2    | 0.371  | ug/L  |
| EPA 8270D                             | Groundwater | Benzoghiperylene               | 2    | 0.574  | ug/L  |
| EPA 8270D                             | Groundwater | Benzokifluoranthene            | 2    | 0.3    | ug/L  |
| EPA 8270D                             | Groundwater | Benzoic Acid                   | 50   | 1.0104 | ug/L  |
| EPA 8270D                             | Groundwater | Benzyl Alcohol                 | 2    | 0.677  | ug/L  |
| EPA 8270D                             | Groundwater | Biphenyl                       | 2    | 0.237  | ug/L  |
| EPA 8270D                             | Groundwater | Bis(2-chloroethoxy)methane     | 5    | 0.596  | ug/L  |
| EPA 8270D                             | Groundwater | Bis(2-chloroethoxy)ether       | 2    | 0.409  | ug/L  |
| EPA 8270D                             | Groundwater | Bis(2-chloroisopropyl)ether    | 2    | 0.597  | ug/L  |
| EPA 8270D                             | Groundwater | Bis(2-Ethylhexyl)phthalate     | 3    | 0.928  | ug/L  |
| EPA 8270D                             | Groundwater | Butyl benzyl phthalate         | 5    | 1.13   | ug/L  |
| EPA 8270D                             | Groundwater | Caprolactam                    | 10   | 0.3895 | ug/L  |
| EPA 8270D                             | Groundwater | Carbazole                      | 2    | 0.374  | ug/L  |
| EPA 8270D                             | Groundwater | Chrysene                       | 2    | 0.304  | ug/L  |
| EPA 8270D                             | Groundwater | Dibenzofluoranthene            | 2    | 0.438  | ug/L  |
| EPA 8270D                             | Groundwater | Dibenzofuran                   | 2    | 0.218  | ug/L  |
| EPA 8270D                             | Groundwater | Diethyl phthalate              | 5    | 0.393  | ug/L  |
| EPA 8270D                             | Groundwater | Dimethyl phthalate             | 5    | 0.333  | ug/L  |
| EPA 8270D                             | Groundwater | Di-n-butylphthalate            | 5    | 0.768  | ug/L  |
| EPA 8270D                             | Groundwater | Di-n-octylphthalate            | 5    | 1.2    | ug/L  |
| EPA 8270D                             | Groundwater | Fluoranthene                   | 2    | 0.401  | ug/L  |
| EPA 8270D                             | Groundwater | Fluorene                       | 2    | 0.32   | ug/L  |
| EPA 8270D                             | Groundwater | Hexachlorobenzene              | 2    | 0.396  | ug/L  |
| EPA 8270D                             | Groundwater | Hexachlorobutadiene            | 2    | 0.417  | ug/L  |
| EPA 8270D                             | Groundwater | Hexachlorocyclopentadiene      | 20   | 0.585  | ug/L  |
| EPA 8270D                             | Groundwater | Hexachloroethane               | 2    | 0.298  | ug/L  |
| EPA 8270D                             | Groundwater | Indenol(1,2,3-cd)Pyrene        | 2    | 0.433  | ug/L  |
| EPA 8270D                             | Groundwater | Isophorone                     | 5    | 0.787  | ug/L  |
| EPA 8270D                             | Groundwater | Naphthalene                    | 2    | 0.332  | ug/L  |
| EPA 8270D                             | Groundwater | Nitrobenzene                   | 2    | 0.401  | ug/L  |
| EPA 8270D                             | Groundwater | NitrosoDiPhenylAmine(NDPA/DPA) | 2    | 0.34   | ug/L  |
| EPA 8270D                             | Groundwater | n-Nitrosodimethylamine         | 2    | 0.498  | ug/L  |
| EPA 8270D                             | Groundwater | n-Nitrosodi-n-propylamine      | 5    | 0.645  | ug/L  |
| EPA 8270D                             | Groundwater | p-Chloro-M-Cresol              | 2    | 0.543  | ug/L  |
| EPA 8270D                             | Groundwater | Pentachlorophenol              | 10   | 3.22   | ug/L  |
| EPA 8270D                             | Groundwater | Phenanthrene                   | 2    | 0.23   | ug/L  |
| EPA 8270D                             | Groundwater | Phenol                         | 5    | 0.27   | ug/L  |
| EPA 8270D                             | Groundwater | Pyrene                         | 2    | 0.524  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | 2-Chloronaphthalene            | 0.2  | 0.035  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | 2-Methylnaphthalene            | 0.2  | 0.045  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Acenaphthene                   | 0.2  | 0.035  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Acenaphthylene                 | 0.2  | 0.035  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Anthracene                     | 0.2  | 0.035  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Benzolanthracene               | 0.2  | 0.016  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Benzolapyrene                  | 0.2  | 0.039  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Benzofluoranthene              | 0.2  | 0.016  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Benzoghiperylene               | 0.2  | 0.042  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Benzokifluoranthene            | 0.2  | 0.042  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Chrysene                       | 0.2  | 0.038  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Dibenzofluoranthene            | 0.2  | 0.039  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Fluoranthene                   | 0.2  | 0.038  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Fluorene                       | 0.2  | 0.037  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Hexachlorobenzene              | 0.8  | 0.032  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Hexachlorobutadiene            | 0.5  | 0.036  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Hexachloroethane               | 0.8  | 0.03   | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Indenol(1,2,3-cd)Pyrene        | 0.2  | 0.04   | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Naphthalene                    | 0.2  | 0.043  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Pentachlorophenol              | 0.8  | 0.22   | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Phenanthrene                   | 0.2  | 0.015  | ug/L  |
| EPA 8270D-SIM                         | Groundwater | Pyrene                         | 0.2  | 0.04   | ug/L  |

ATTACHMENT B

GROUNDWATER SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                           | Matrix      | Analyte                                    | RL      | MDL       | Units    |
|----------------------------------|-------------|--|---------|-----------|----------|
| <b>Pesticides</b>                |             |  |         |           |          |
| EPA 8081B                        | Groundwater | 4,4'-DDD                                   | 0.04    | 0.00464   | ug/L     |
| EPA 8081B                        | Groundwater | 4,4'-DDE                                   | 0.04    | 0.00381   | ug/L     |
| EPA 8081B                        | Groundwater | 4,4'-DDT                                   | 0.04    | 0.00432   | ug/L     |
| EPA 8081B                        | Groundwater | Aldrin                                     | 0.02    | 0.00216   | ug/L     |
| EPA 8081B                        | Groundwater | Alpha-BHC                                  | 0.02    | 0.00439   | ug/L     |
| EPA 8081B                        | Groundwater | Beta-BHC                                   | 0.02    | 0.0056    | ug/L     |
| EPA 8081B                        | Groundwater | Chlordane                                  | 0.2     | 0.0463    | ug/L     |
| EPA 8081B                        | Groundwater | cis-Chlordane                              | 0.02    | 0.00666   | ug/L     |
| EPA 8081B                        | Groundwater | Delta-BHC                                  | 0.02    | 0.00467   | ug/L     |
| EPA 8081B                        | Groundwater | Dieldrin                                   | 0.04    | 0.00429   | ug/L     |
| EPA 8081B                        | Groundwater | Endosulfan I                               | 0.02    | 0.00345   | ug/L     |
| EPA 8081B                        | Groundwater | Endosulfan II                              | 0.04    | 0.00519   | ug/L     |
| EPA 8081B                        | Groundwater | Endosulfan sulfate                         | 0.04    | 0.00481   | ug/L     |
| EPA 8081B                        | Groundwater | Endrin                                     | 0.04    | 0.00429   | ug/L     |
| EPA 8081B                        | Groundwater | Endrin aldehyde                            | 0.04    | 0.0081    | ug/L     |
| EPA 8081B                        | Groundwater | Endrin ketone                              | 0.04    | 0.00477   | ug/L     |
| EPA 8081B                        | Groundwater | Heptachlor                                 | 0.02    | 0.0031    | ug/L     |
| EPA 8081B                        | Groundwater | Heptachlor epoxide                         | 0.02    | 0.00415   | ug/L     |
| EPA 8081B                        | Groundwater | Lindane                                    | 0.02    | 0.00434   | ug/L     |
| EPA 8081B                        | Groundwater | Methoxychlor                               | 0.2     | 0.00684   | ug/L     |
| EPA 8081B                        | Groundwater | Toxaphene                                  | 0.2     | 0.0627    | ug/L     |
| EPA 8081B                        | Groundwater | trans-Chlordane                            | 0.02    | 0.00627   | ug/L     |
| <b>Polychlorinated Biphenyls</b> |             |  |         |           |          |
| EPA 8082A                        | Groundwater | Aroclor 1016                               | 0.083   | 0.05478   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1221                               | 0.083   | 0.05312   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1232                               | 0.083   | 0.03071   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1242                               | 0.083   | 0.05976   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1248                               | 0.083   | 0.05063   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1254                               | 0.083   | 0.03403   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1260                               | 0.083   | 0.03154   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1262                               | 0.083   | 0.02905   | ug/L     |
| EPA 8082A                        | Groundwater | Aroclor 1268                               | 0.083   | 0.03735   | ug/L     |
| EPA 8082A                        | Groundwater | PCBs, Total                                | 0.083   | 0.02905   | ug/L     |
| <b>Herbicides</b>                |             |  |         |           |          |
| EPA 8151A                        | Groundwater | 2,4,5-T                                    | 2       | 0.531     | ug/L     |
| EPA 8151A                        | Groundwater | 2,4,5-TP (Silvex)                          | 2       | 0.539     | ug/L     |
| EPA 8151A                        | Groundwater | 2,4-D                                      | 10      | 0.498     | ug/L     |
| <b>Metals</b>                    |             |  |         |           |          |
| EPA 6010A                        | Groundwater | Aluminum, Dissolved                        | 0.01    | 0.00169   | mg/L     |
| EPA 6010A                        | Groundwater | Aluminum, Total                            | 0.01    | 0.00169   | mg/L     |
| EPA 6010A                        | Groundwater | Antimony, Dissolved                        | 0.0005  | 0.0000699 | mg/L     |
| EPA 6010A                        | Groundwater | Antimony, Total                            | 0.0005  | 0.0000699 | mg/L     |
| EPA 6010A                        | Groundwater | Arsenic, Dissolved                         | 0.0005  | 0.000123  | mg/L     |
| EPA 6010A                        | Groundwater | Arsenic, Total                             | 0.0005  | 0.000123  | mg/L     |
| EPA 6010A                        | Groundwater | Barium, Dissolved                          | 0.0005  | 0.0000625 | mg/L     |
| EPA 6010A                        | Groundwater | Barium, Total                              | 0.0005  | 0.0000625 | mg/L     |
| EPA 6010A                        | Groundwater | Beryllium, Dissolved                       | 0.0005  | 0.00015   | mg/L     |
| EPA 6010A                        | Groundwater | Beryllium, Total                           | 0.0005  | 0.00015   | mg/L     |
| EPA 6010A                        | Groundwater | Cadmium, Dissolved                         | 0.0002  | 0.00005   | mg/L     |
| EPA 6010A                        | Groundwater | Cadmium, Total                             | 0.0002  | 0.00005   | mg/L     |
| EPA 6010A                        | Groundwater | Calcium, Dissolved                         | 0.1     | 0.032     | mg/L     |
| EPA 6010A                        | Groundwater | Calcium, Total                             | 0.1     | 0.032     | mg/L     |
| EPA 6010A                        | Groundwater | Chromium, Dissolved                        | 0.001   | 0.000253  | mg/L     |
| EPA 6010A                        | Groundwater | Chromium, Total                            | 0.001   | 0.000253  | mg/L     |
| EPA 7196A                        | Groundwater | Chromium, Hexavalent, Dissolved            | 0.01    | 0.003     | mg/L     |
| EPA 7196A                        | Groundwater | Chromium, Hexavalent, Total                | 0.01    | 0.003     | mg/L     |
| EPA 6010A                        | Groundwater | Cobalt, Dissolved                          | 0.0002  | 0.0000621 | mg/L     |
| EPA 6010A                        | Groundwater | Cobalt, Total                              | 0.0002  | 0.0000621 | mg/L     |
| EPA 6010A                        | Groundwater | Copper, Dissolved                          | 0.001   | 0.000262  | mg/L     |
| EPA 6010A                        | Groundwater | Copper, Total                              | 0.001   | 0.000262  | mg/L     |
| EPA 6010A                        | Groundwater | Iron, Dissolved                            | 0.05    | 0.012     | mg/L     |
| EPA 6010A                        | Groundwater | Iron, Total                                | 0.05    | 0.012     | mg/L     |
| EPA 6010A                        | Groundwater | Lead, Dissolved                            | 0.001   | 0.000129  | mg/L     |
| EPA 6010A                        | Groundwater | Lead, Total                                | 0.001   | 0.000129  | mg/L     |
| EPA 6010A                        | Groundwater | Magnesium, Dissolved                       | 0.07    | 0.0223    | mg/L     |
| EPA 6010A                        | Groundwater | Magnesium, Total                           | 0.07    | 0.0223    | mg/L     |
| EPA 6010A                        | Groundwater | Manganese, Dissolved                       | 0.001   | 0.000302  | mg/L     |
| EPA 6010A                        | Groundwater | Manganese, Total                           | 0.001   | 0.000302  | mg/L     |
| EPA 7470A                        | Groundwater | Mercury, Dissolved                         | 0.0002  | 0.000066  | mg/L     |
| EPA 7470A                        | Groundwater | Mercury, Total                             | 0.0002  | 0.000066  | mg/L     |
| EPA 6010A                        | Groundwater | Nickel, Dissolved                          | 0.0005  | 0.0000865 | mg/L     |
| EPA 6010A                        | Groundwater | Nickel, Total                              | 0.0005  | 0.0000865 | mg/L     |
| EPA 6010A                        | Groundwater | Potassium, Dissolved                       | 0.1     | 0.0193    | mg/L     |
| EPA 6010A                        | Groundwater | Potassium, Total                           | 0.1     | 0.0193    | mg/L     |
| EPA 6010A                        | Groundwater | Selenium, Dissolved                        | 0.005   | 0.001     | mg/L     |
| EPA 6010A                        | Groundwater | Selenium, Total                            | 0.005   | 0.001     | mg/L     |
| EPA 6010A                        | Groundwater | Silver, Dissolved                          | 0.00025 | 0.0000779 | mg/L     |
| EPA 6010A                        | Groundwater | Silver, Total                              | 0.00025 | 0.0000779 | mg/L     |
| EPA 6010A                        | Groundwater | Sodium, Dissolved                          | 0.1     | 0.0161    | mg/L     |
| EPA 6010A                        | Groundwater | Sodium, Total                              | 0.1     | 0.0161    | mg/L     |
| EPA 6010A                        | Groundwater | Thallium, Dissolved                        | 0.0002  | 0.0000566 | mg/L     |
| EPA 6010A                        | Groundwater | Thallium, Total                            | 0.0002  | 0.0000566 | mg/L     |
| EPA 6010A                        | Groundwater | Vanadium, Dissolved                        | 0.005   | 0.000551  | mg/L     |
| EPA 6010A                        | Groundwater | Vanadium, Total                            | 0.005   | 0.000551  | mg/L     |
| EPA 6010A                        | Groundwater | Zinc, Dissolved                            | 0.01    | 0.00256   | mg/L     |
| EPA 6010A                        | Groundwater | Zinc, Total                                | 0.01    | 0.00256   | mg/L     |
| <b>Other</b>                     |             |  |         |           |          |
| SM21 5210B                       | Groundwater | Biological Oxygen Demand                   | 2       | 1.1       | mg/L     |
| SM21 5220C                       | Groundwater | Chemical Oxygen Demand                     | 20      | 5.7       | mg/L     |
| SM21 5310B, SW8469060            | Groundwater | Total Organic Carbon                       | 1       | 0.35      | mg/L     |
| ASTM516-90.02                    | Groundwater | Sulfate                                    | 5       | 1.1       | mg/L     |
| SM21 4500 S F                    | Groundwater | Sulfide                                    | 2       | 0.94      | mg/L     |
| EPA 353.2                        | Groundwater | Nitrate                                    | 0.1     | 0.018     | mg/L     |
| SM 21 4500 NO2 B                 | Groundwater | Nitrite                                    | 0.1     | 0.001     | mg/L     |
| EPA 365.4/4500PE                 | Groundwater | Total Phosphorous                          | 0.1     | 0.04      | mg/L     |
| SM18 4500 NH3F                   | Groundwater | Ammonia                                    | 0.1     | 0.034     | mg/L     |
| N/A                              | Groundwater | Naphthalene Dioxygenase (NAH)              | 100     | 5000      | cells/mL |
| N/A                              | Groundwater | Naphthalene Inducible Dioxygenase (NIDA)   | 100     | 5000      | cells/mL |
| N/A                              | Groundwater | Phenol Hydroxylase (PHE)                   | 100     | 5000      | cells/mL |
| N/A                              | Groundwater | Naphthyl-2-methyl-succinate synthase (NMS) | 100     | 5000      | cells/mL |
| N/A                              | Groundwater | Naphthalene Carboxylase (ANC)              | 100     | 5000      | cells/mL |

ATTACHMENT B

GROUNDWATER SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                | Matrix      | Analyte  | RL | MDL    | Units |
|-----------------------|-------------|--|----|--------|-------|
| <b>PFAS Compounds</b> |             |  |    |        |       |
| EPA 537 Rev 1.15      | Groundwater | Perfluorohexanoic acid (PFHxA)                           | 2  | 0.1264 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluoroheptanoic acid (PFHpA)                          | 2  | 0.0924 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorooctanoic acid (PFOA)                            | 2  | 0.0504 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorononanoic acid (PFNA)                            | 2  | 0.1008 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorodecanoic acid (PFDA)                            | 2  | 0.1904 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluoroundecanoic acid (PFUdA)                         | 2  | 0.1912 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorododecanoic acid (PFDoA)                         | 2  | 0.0916 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorotridecanoic Acid (PRTDA)                        | 2  | 0.0904 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorotetradecanoic acid (PFTA)                       | 2  | 0.072  | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorobutanesulfonic acid (PFBS)                      | 2  | 0.11   | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorohexanesulfonic acid (PFHxS)                     | 2  | 0.1076 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorooctanesulfonic acid (PFOS)                      | 2  | 0.1116 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorodecanesulfonic Acid (PFDS)                      | 2  | 0.2224 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorobutanoic Acid (PFBA)                            | 2  | 0.1312 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluoropentanoic Acid (PFPeA)                          | 2  | 0.0856 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluoroheptanoic Sulfonic Acid (PFHpS)                 | 2  | 0.1552 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2 FTS)          | 2  | 0.194  | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | 1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2 FTS)       | 2  | 0.2908 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | Perfluorooctanesulfonamide (FOSA)                        | 2  | 0.2268 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | N-methyl perfluorooctanesulfonamidoacetic acid (MeFOSAA) | 2  | 0.2504 | ng/L  |
| EPA 537 Rev 1.15      | Groundwater | N-ethyl perfluorooctanesulfonamidoacetic acid (EtFOSAA)  | 2  | 0.3728 | ng/L  |



## APPENDIX B

SOIL SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                            | Matrix | Analyte                               | RL     | MDL       | Units |
|-----------------------------------|--------|---------------------------------------|--------|-----------|-------|
| <b>Volatile Organic Compounds</b> |        |                                       |        |           |       |
| EPA 8260C/5035                    | Soil   | 1,1,1,2-Tetrachloroethane             | 0.001  | 0.000318  | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,1,1-Trichloroethane                 | 0.001  | 0.0001108 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,1,2,2-Tetrachloroethane             | 0.001  | 0.0001008 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,1,2-Trichloro-1,2,2-Trifluoroethane | 0.02   | 0.000274  | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,1,2-Trichloroethane                 | 0.0015 | 0.000304  | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,1-Dichloroethane                    | 0.0015 | 0.0000856 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,1-Dichloroethene                    | 0.001  | 0.000262  | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,1-Dichloropropene                   | 0.005  | 0.0001414 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2,3-Trichlorobenzene                | 0.005  | 0.0001476 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2,3-Trichloropropane                | 0.01   | 0.0001626 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2,4,5-Tetramethylbenzene            | 0.004  | 0.0001302 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2,4-Trichlorobenzene                | 0.005  | 0.0001818 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2,4-Trimethylbenzene                | 0.005  | 0.0001414 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2-Dibromo-3-chloropropane           | 0.005  | 0.000396  | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2-Dibromoethane                     | 0.004  | 0.0001744 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2-Dichlorobenzene                   | 0.005  | 0.0001532 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2-Dichloroethane                    | 0.001  | 0.0001134 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,2-Dichloropropane                   | 0.0035 | 0.000228  | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,3,5-Trimethylbenzene                | 0.005  | 0.0001434 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,3-Dichlorobenzene                   | 0.005  | 0.000135  | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,3-Dichloropropane                   | 0.005  | 0.0001452 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,4-Dichlorobenzene                   | 0.005  | 0.0001384 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,4-Diethylbenzene                    | 0.004  | 0.0001598 | mg/kg |
| EPA 8260C/5035                    | Soil   | 1,4-Dioxane                           | 0.1    | 0.01442   | mg/kg |
| EPA 8260C/5035                    | Soil   | 2,2-Dichloropropane                   | 0.005  | 0.000226  | mg/kg |
| EPA 8260C/5035                    | Soil   | 2-Butanone                            | 0.01   | 0.000272  | mg/kg |
| EPA 8260C/5035                    | Soil   | 2-Hexanone                            | 0.01   | 0.000666  | mg/kg |
| EPA 8260C/5035                    | Soil   | 4-Ethyltoluene                        | 0.004  | 0.000124  | mg/kg |
| EPA 8260C/5035                    | Soil   | 4-Methyl-2-pentanone                  | 0.01   | 0.000244  | mg/kg |
| EPA 8260C/5035                    | Soil   | Acetone                               | 0.01   | 0.001036  | mg/kg |
| EPA 8260C/5035                    | Soil   | Acrolein                              | 0.025  | 0.00806   | mg/kg |
| EPA 8260C/5035                    | Soil   | Acrylonitrile                         | 0.01   | 0.000514  | mg/kg |
| EPA 8260C/5035                    | Soil   | Benzene                               | 0.001  | 0.000118  | mg/kg |
| EPA 8260C/5035                    | Soil   | Bromobenzene                          | 0.005  | 0.000208  | mg/kg |
| EPA 8260C/5035                    | Soil   | Bromochloromethane                    | 0.005  | 0.000276  | mg/kg |
| EPA 8260C/5035                    | Soil   | Bromodichloromethane                  | 0.001  | 0.0001732 | mg/kg |
| EPA 8260C/5035                    | Soil   | Bromoform                             | 0.004  | 0.000236  | mg/kg |
| EPA 8260C/5035                    | Soil   | Bromomethane                          | 0.002  | 0.000338  | mg/kg |
| EPA 8260C/5035                    | Soil   | Carbon disulfide                      | 0.01   | 0.001102  | mg/kg |
| EPA 8260C/5035                    | Soil   | Carbon tetrachloride                  | 0.001  | 0.00021   | mg/kg |
| EPA 8260C/5035                    | Soil   | Chlorobenzene                         | 0.001  | 0.000348  | mg/kg |
| EPA 8260C/5035                    | Soil   | Chloroethane                          | 0.002  | 0.000316  | mg/kg |
| EPA 8260C/5035                    | Soil   | Chloroform                            | 0.0015 | 0.00037   | mg/kg |
| EPA 8260C/5035                    | Soil   | Chloromethane                         | 0.005  | 0.000294  | mg/kg |
| EPA 8260C/5035                    | Soil   | cis-1,2-Dichloroethene                | 0.001  | 0.0001428 | mg/kg |
| EPA 8260C/5035                    | Soil   | cis-1,3-Dichloropropene               | 0.001  | 0.0001176 | mg/kg |
| EPA 8260C/5035                    | Soil   | Cyclohexane                           | 0.02   | 0.000146  | mg/kg |
| EPA 8260C/5035                    | Soil   | Dibromochloromethane                  | 0.001  | 0.0001536 | mg/kg |
| EPA 8260C/5035                    | Soil   | Dibromomethane                        | 0.01   | 0.0001636 | mg/kg |
| EPA 8260C/5035                    | Soil   | Dichlorodifluoromethane               | 0.01   | 0.0001908 | mg/kg |
| EPA 8260C/5035                    | Soil   | Ethyl ether                           | 0.005  | 0.00026   | mg/kg |
| EPA 8260C/5035                    | Soil   | Ethylbenzene                          | 0.001  | 0.0001274 | mg/kg |
| EPA 8260C/5035                    | Soil   | Hexachlorobutadiene                   | 0.005  | 0.000228  | mg/kg |
| EPA 8260C/5035                    | Soil   | Isopropylbenzene                      | 0.001  | 0.0001038 | mg/kg |
| EPA 8260C/5035                    | Soil   | Methyl Acetate                        | 0.02   | 0.00027   | mg/kg |
| EPA 8260C/5035                    | Soil   | Methyl cyclohexane                    | 0.004  | 0.0001546 | mg/kg |
| EPA 8260C/5035                    | Soil   | Methyl tert butyl ether               | 0.002  | 0.0000844 | mg/kg |
| EPA 8260C/5035                    | Soil   | Methylene chloride                    | 0.01   | 0.001104  | mg/kg |
| EPA 8260C/5035                    | Soil   | Naphthalene                           | 0.005  | 0.0001384 | mg/kg |
| EPA 8260C/5035                    | Soil   | n-Butylbenzene                        | 0.001  | 0.0001148 | mg/kg |
| EPA 8260C/5035                    | Soil   | n-Propylbenzene                       | 0.001  | 0.0001092 | mg/kg |
| EPA 8260C/5035                    | Soil   | o-Chlorotoluene                       | 0.005  | 0.0001598 | mg/kg |
| EPA 8260C/5035                    | Soil   | o-Xylene                              | 0.002  | 0.0001718 | mg/kg |
| EPA 8260C/5035                    | Soil   | p/m-Xylene                            | 0.002  | 0.0001978 | mg/kg |
| EPA 8260C/5035                    | Soil   | p-Chlorotoluene                       | 0.005  | 0.0001328 | mg/kg |
| EPA 8260C/5035                    | Soil   | p-Isopropyltoluene                    | 0.001  | 0.000125  | mg/kg |
| EPA 8260C/5035                    | Soil   | sec-Butylbenzene                      | 0.001  | 0.000122  | mg/kg |
| EPA 8260C/5035                    | Soil   | Styrene                               | 0.002  | 0.000402  | mg/kg |
| EPA 8260C/5035                    | Soil   | tert-Butyl Alcohol                    | 0.06   | 0.00292   | mg/kg |
| EPA 8260C/5035                    | Soil   | tert-Butylbenzene                     | 0.005  | 0.0001354 | mg/kg |
| EPA 8260C/5035                    | Soil   | Tetrachloroethene                     | 0.001  | 0.0001402 | mg/kg |
| EPA 8260C/5035                    | Soil   | Toluene                               | 0.0015 | 0.0001948 | mg/kg |
| EPA 8260C/5035                    | Soil   | trans-1,2-Dichloroethene              | 0.0015 | 0.000212  | mg/kg |
| EPA 8260C/5035                    | Soil   | trans-1,3-Dichloropropene             | 0.001  | 0.0001208 | mg/kg |
| EPA 8260C/5035                    | Soil   | trans-1,4-Dichloro-2-butene           | 0.005  | 0.000392  | mg/kg |
| EPA 8260C/5035                    | Soil   | Trichloroethene                       | 0.001  | 0.000125  | mg/kg |
| EPA 8260C/5035                    | Soil   | Trichlorofluoromethane                | 0.005  | 0.000388  | mg/kg |
| EPA 8260C/5035                    | Soil   | Vinyl acetate                         | 0.01   | 0.0001322 | mg/kg |
| EPA 8260C/5035                    | Soil   | Vinyl chloride                        | 0.002  | 0.0001174 | mg/kg |
| EPA 8260C/5035                    | Soil   | Xylenes, Total                        | 0.002  | 0.0001978 | mg/kg |

## APPENDIX B

SOIL SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                                | Matrix | Analyte                        | RL      | MDL       | Units |
|---------------------------------------|--------|--------------------------------|---------|-----------|-------|
| <b>Semivolatile Organic Compounds</b> |        |                                |         |           |       |
| EPA 8270D                             | Soil   | 1,2,4,5-Tetrachlorobenzene     | 0.1665  | 0.0515817 | mg/kg |
| EPA 8270D                             | Soil   | 1,2,4-Trichlorobenzene         | 0.1665  | 0.0545787 | mg/kg |
| EPA 8270D                             | Soil   | 1,2-Dichlorobenzene            | 0.1665  | 0.0546453 | mg/kg |
| EPA 8270D                             | Soil   | 1,3-Dichlorobenzene            | 0.1665  | 0.0524808 | mg/kg |
| EPA 8270D                             | Soil   | 1,4-Dichlorobenzene            | 0.1665  | 0.050616  | mg/kg |
| EPA 8270D                             | Soil   | 2,3,4,6-Tetrachlorophenol      | 0.1665  | 0.028305  | mg/kg |
| EPA 8270D                             | Soil   | 2,4,5-Trichlorophenol          | 0.1665  | 0.053946  | mg/kg |
| EPA 8270D                             | Soil   | 2,4,6-Trichlorophenol          | 0.0999  | 0.0314019 | mg/kg |
| EPA 8270D                             | Soil   | 2,4-Dichlorophenol             | 0.14985 | 0.053946  | mg/kg |
| EPA 8270D                             | Soil   | 2,4-Dimethylphenol             | 0.1665  | 0.049617  | mg/kg |
| EPA 8270D                             | Soil   | 2,4-Dinitrophenol              | 0.7992  | 0.227772  | mg/kg |
| EPA 8270D                             | Soil   | 2,4-Dinitrotoluene             | 0.1665  | 0.0359307 | mg/kg |
| EPA 8270D                             | Soil   | 2,6-Dinitrotoluene             | 0.1665  | 0.042624  | mg/kg |
| EPA 8270D                             | Soil   | 2-Chloronaphthalene            | 0.1665  | 0.054279  | mg/kg |
| EPA 8270D                             | Soil   | 2-Chlorophenol                 | 0.1665  | 0.050283  | mg/kg |
| EPA 8270D                             | Soil   | 2-Methylnaphthalene            | 0.1998  | 0.0531801 | mg/kg |
| EPA 8270D                             | Soil   | 2-Methylphenol                 | 0.1665  | 0.053613  | mg/kg |
| EPA 8270D                             | Soil   | 2-Nitroaniline                 | 0.1665  | 0.046953  | mg/kg |
| EPA 8270D                             | Soil   | 2-Nitrophenol                  | 0.35964 | 0.051948  | mg/kg |
| EPA 8270D                             | Soil   | 3,3'-Dichlorobenzidine         | 0.1665  | 0.044289  | mg/kg |
| EPA 8270D                             | Soil   | 3-Methylphenol/4-Methylphenol  | 0.23976 | 0.054612  | mg/kg |
| EPA 8270D                             | Soil   | 3-Nitroaniline                 | 0.1665  | 0.045954  | mg/kg |
| EPA 8270D                             | Soil   | 4,6-Dinitro-o-cresol           | 0.4329  | 0.060939  | mg/kg |
| EPA 8270D                             | Soil   | 4-Bromophenyl phenyl ether     | 0.1665  | 0.038295  | mg/kg |
| EPA 8270D                             | Soil   | 4-Chloroaniline                | 0.1665  | 0.043956  | mg/kg |
| EPA 8270D                             | Soil   | 4-Chlorophenyl phenyl ether    | 0.1665  | 0.0506493 | mg/kg |
| EPA 8270D                             | Soil   | 4-Nitroaniline                 | 0.1665  | 0.044955  | mg/kg |
| EPA 8270D                             | Soil   | 4-Nitrophenol                  | 0.2331  | 0.053946  | mg/kg |
| EPA 8270D                             | Soil   | Acenaphthene                   | 0.1332  | 0.034299  | mg/kg |
| EPA 8270D                             | Soil   | Acenaphthylene                 | 0.1332  | 0.0311355 | mg/kg |
| EPA 8270D                             | Soil   | Acetophenone                   | 0.1665  | 0.051615  | mg/kg |
| EPA 8270D                             | Soil   | Anthracene                     | 0.0999  | 0.0277056 | mg/kg |
| EPA 8270D                             | Soil   | Atrazine                       | 0.1332  | 0.0377289 | mg/kg |
| EPA 8270D                             | Soil   | Azobenzene                     | 0.1665  | 0.044622  | mg/kg |
| EPA 8270D                             | Soil   | Benzaldehyde                   | 0.21978 | 0.067266  | mg/kg |
| EPA 8270D                             | Soil   | Benzidine                      | 0.54945 | 0.130203  | mg/kg |
| EPA 8270D                             | Soil   | Benzo(a)anthracene             | 0.0999  | 0.0326007 | mg/kg |
| EPA 8270D                             | Soil   | Benzo(a)pyrene                 | 0.1332  | 0.0407259 | mg/kg |
| EPA 8270D                             | Soil   | Benzo(b)fluoranthene           | 0.0999  | 0.033633  | mg/kg |
| EPA 8270D                             | Soil   | Benzo(ghi)perylene             | 0.1332  | 0.034632  | mg/kg |
| EPA 8270D                             | Soil   | Benzo(k)fluoranthene           | 0.0999  | 0.0317682 | mg/kg |
| EPA 8270D                             | Soil   | Benzoic Acid                   | 0.53946 | 0.168498  | mg/kg |
| EPA 8270D                             | Soil   | Benzyl Alcohol                 | 0.1665  | 0.051282  | mg/kg |
| EPA 8270D                             | Soil   | Biphenyl                       | 0.37962 | 0.0549117 | mg/kg |
| EPA 8270D                             | Soil   | Bis(2-chloroethoxy)methane     | 0.17982 | 0.0504162 | mg/kg |
| EPA 8270D                             | Soil   | Bis(2-chloroethyl)ether        | 0.14985 | 0.0466866 | mg/kg |
| EPA 8270D                             | Soil   | Bis(2-chloroisopropyl)ether    | 0.1998  | 0.058608  | mg/kg |
| EPA 8270D                             | Soil   | Bis(2-Ethylhexyl)phthalate     | 0.1665  | 0.043623  | mg/kg |
| EPA 8270D                             | Soil   | Butyl benzyl phthalate         | 0.1665  | 0.0325341 | mg/kg |
| EPA 8270D                             | Soil   | Caprolactam                    | 0.1665  | 0.045954  | mg/kg |
| EPA 8270D                             | Soil   | Carbazole                      | 0.1665  | 0.0357975 | mg/kg |
| EPA 8270D                             | Soil   | Chrysene                       | 0.0999  | 0.0327006 | mg/kg |
| EPA 8270D                             | Soil   | Dibenzo(a,h)anthracene         | 0.0999  | 0.0322344 | mg/kg |
| EPA 8270D                             | Soil   | Dibenzofuran                   | 0.1665  | 0.0555777 | mg/kg |
| EPA 8270D                             | Soil   | Diethyl phthalate              | 0.1665  | 0.0351981 | mg/kg |
| EPA 8270D                             | Soil   | Dimethyl phthalate             | 0.1665  | 0.042291  | mg/kg |
| EPA 8270D                             | Soil   | Di-n-butylphthalate            | 0.1665  | 0.0321345 | mg/kg |
| EPA 8270D                             | Soil   | Di-n-octylphthalate            | 0.1665  | 0.040959  | mg/kg |
| EPA 8270D                             | Soil   | Fluoranthene                   | 0.0999  | 0.0305694 | mg/kg |
| EPA 8270D                             | Soil   | Fluorene                       | 0.1665  | 0.0477189 | mg/kg |
| EPA 8270D                             | Soil   | Hexachlorobenzene              | 0.0999  | 0.0310356 | mg/kg |
| EPA 8270D                             | Soil   | Hexachlorobutadiene            | 0.1665  | 0.046953  | mg/kg |
| EPA 8270D                             | Soil   | Hexachlorocyclopentadiene      | 0.47619 | 0.106893  | mg/kg |
| EPA 8270D                             | Soil   | Hexachloroethane               | 0.1332  | 0.0302697 | mg/kg |
| EPA 8270D                             | Soil   | Indeno(1,2,3-cd)Pyrene         | 0.1332  | 0.036963  | mg/kg |
| EPA 8270D                             | Soil   | Isophorone                     | 0.14985 | 0.044289  | mg/kg |
| EPA 8270D                             | Soil   | Naphthalene                    | 0.1665  | 0.055278  | mg/kg |
| EPA 8270D                             | Soil   | Nitrobenzene                   | 0.14985 | 0.039627  | mg/kg |
| EPA 8270D                             | Soil   | NitrosoDiPhenylAmine(NDPA)/DPA | 0.1332  | 0.034965  | mg/kg |
| EPA 8270D                             | Soil   | n-Nitrosodimethylamine         | 0.333   | 0.0539127 | mg/kg |
| EPA 8270D                             | Soil   | n-Nitrosodi-n-propylamine      | 0.1665  | 0.049617  | mg/kg |
| EPA 8270D                             | Soil   | p-Chloro-m-Cresol              | 0.1665  | 0.048285  | mg/kg |
| EPA 8270D                             | Soil   | Pentachlorophenol              | 0.1332  | 0.035631  | mg/kg |
| EPA 8270D                             | Soil   | Phenanthrene                   | 0.0999  | 0.0325674 | mg/kg |
| EPA 8270D                             | Soil   | Phenol                         | 0.1665  | 0.049284  | mg/kg |
| EPA 8270D                             | Soil   | Pyrene                         | 0.0999  | 0.0323676 | mg/kg |

## APPENDIX B

SOIL SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                           | Matrix | Analyte                        | RL       | MDL        | Units |
|----------------------------------|--------|--------------------------------|----------|------------|-------|
| <b>Pesticides</b>                |        |                                |          |            |       |
| EPA 8081B                        | Soil   | 4,4'-DDD                       | 0.007992 | 0.00285048 | mg/kg |
| EPA 8081B                        | Soil   | 4,4'-DDE                       | 0.007992 | 0.00184815 | mg/kg |
| EPA 8081B                        | Soil   | 4,4'-DDT                       | 0.014985 | 0.0064269  | mg/kg |
| EPA 8081B                        | Soil   | Aldrin                         | 0.007992 | 0.00281385 | mg/kg |
| EPA 8081B                        | Soil   | Alpha-BHC                      | 0.00333  | 0.00094572 | mg/kg |
| EPA 8081B                        | Soil   | Beta-BHC                       | 0.007992 | 0.0030303  | mg/kg |
| EPA 8081B                        | Soil   | Chlordane                      | 0.064935 | 0.0264735  | mg/kg |
| EPA 8081B                        | Soil   | cis-Chlordane                  | 0.00999  | 0.00278388 | mg/kg |
| EPA 8081B                        | Soil   | Delta-BHC                      | 0.007992 | 0.0015651  | mg/kg |
| EPA 8081B                        | Soil   | Dieldrin                       | 0.004995 | 0.0024975  | mg/kg |
| EPA 8081B                        | Soil   | Endosulfan I                   | 0.007992 | 0.00188811 | mg/kg |
| EPA 8081B                        | Soil   | Endosulfan II                  | 0.007992 | 0.00267066 | mg/kg |
| EPA 8081B                        | Soil   | Endosulfan sulfate             | 0.00333  | 0.00158508 | mg/kg |
| EPA 8081B                        | Soil   | Endrin                         | 0.00333  | 0.0013653  | mg/kg |
| EPA 8081B                        | Soil   | Endrin aldehyde                | 0.00999  | 0.0034965  | mg/kg |
| EPA 8081B                        | Soil   | Endrin ketone                  | 0.007992 | 0.00205794 | mg/kg |
| EPA 8081B                        | Soil   | Heptachlor                     | 0.003996 | 0.00179154 | mg/kg |
| EPA 8081B                        | Soil   | Heptachlor epoxide             | 0.014985 | 0.0044955  | mg/kg |
| EPA 8081B                        | Soil   | Lindane                        | 0.00333  | 0.00148851 | mg/kg |
| EPA 8081B                        | Soil   | Methoxychlor                   | 0.014985 | 0.004662   | mg/kg |
| EPA 8081B                        | Soil   | Toxaphene                      | 0.14985  | 0.041958   | mg/kg |
| EPA 8081B                        | Soil   | trans-Chlordane                | 0.00999  | 0.00263736 | mg/kg |
| <b>Polychlorinated Biphenyls</b> |        |                                |          |            |       |
| EPA 8082A                        | Soil   | Aroclor 1016                   | 0.0335   | 0.0026465  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1221                   | 0.0335   | 0.0030887  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1232                   | 0.0335   | 0.0039262  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1242                   | 0.0335   | 0.0041004  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1248                   | 0.0335   | 0.0028274  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1254                   | 0.0335   | 0.0027537  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1260                   | 0.0335   | 0.0025527  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1262                   | 0.0335   | 0.0016616  | mg/kg |
| EPA 8082A                        | Soil   | Aroclor 1268                   | 0.0335   | 0.0048575  | mg/kg |
| EPA 8082A                        | Soil   | Total PCBs                     | 0.0335   | 0.0016616  | mg/kg |
| <b>Herbicides</b>                |        |                                |          |            |       |
| EPA 8151A                        | Soil   | 2,4-D                          | 0.1665   | 0.0051615  | mg/kg |
| EPA 8151A                        | Soil   | 2,4,5-TP (Silvex)              | 0.1665   | 0.0044289  | mg/kg |
| EPA 8151A                        | Soil   | 2,4,5-T                        | 0.1665   | 0.0104895  | mg/kg |
| <b>Metals</b>                    |        |                                |          |            |       |
| EPA 6010C                        | Soil   | Aluminum                       | 4        | 0.8        | mg/kg |
| EPA 6010C                        | Soil   | Antimony                       | 2        | 0.32       | mg/kg |
| EPA 6010C                        | Soil   | Arsenic                        | 0.4      | 0.08       | mg/kg |
| EPA 6010C                        | Soil   | Barium                         | 0.4      | 0.12       | mg/kg |
| EPA 6010C                        | Soil   | Beryllium                      | 0.2      | 0.04       | mg/kg |
| EPA 6010C                        | Soil   | Cadmium                        | 0.4      | 0.028      | mg/kg |
| EPA 6010C                        | Soil   | Calcium                        | 4        | 1.2        | mg/kg |
| EPA 6010C                        | Soil   | Chromium                       | 0.4      | 0.08       | mg/kg |
| EPA 7196A                        | Soil   | Hexvalent Chromium             | 0.8      | 0.16       | mg/kg |
| EPA 6010C                        | Soil   | Cobalt                         | 0.8      | 0.2        | mg/kg |
| EPA 6010C                        | Soil   | Copper                         | 0.4      | 0.08       | mg/kg |
| EPA 6010C                        | Soil   | Iron                           | 2        | 0.8        | mg/kg |
| EPA 6010C                        | Soil   | Lead                           | 2        | 0.08       | mg/kg |
| EPA 6010C                        | Soil   | Magnesium                      | 4        | 0.4        | mg/kg |
| EPA 6010C                        | Soil   | Manganese                      | 0.4      | 0.08       | mg/kg |
| EPA 7473                         | Soil   | Mercury                        | 0.08     | 0.016896   | mg/kg |
| EPA 6010C                        | Soil   | Nickel                         | 1        | 0.16       | mg/kg |
| EPA 6010C                        | Soil   | Potassium                      | 100      | 16         | mg/kg |
| EPA 6010C                        | Soil   | Selenium                       | 0.8      | 0.12       | mg/kg |
| EPA 6010C                        | Soil   | Silver                         | 0.4      | 0.08       | mg/kg |
| EPA 6010C                        | Soil   | Sodium                         | 80       | 12         | mg/kg |
| EPA 6010C                        | Soil   | Thallium                       | 0.8      | 0.16       | mg/kg |
| EPA 6010C                        | Soil   | Vanadium                       | 0.4      | 0.04       | mg/kg |
| EPA 6010C                        | Soil   | Zinc                           | 2        | 0.28       | mg/kg |
| <b>Other</b>                     |        |                                |          |            |       |
| ASTM D422-63                     | Soil   | Grain Size                     | N/A      | N/A        | N/A   |
| SM21 5210B                       | Soil   | Biological Oxygen Demand (BOD) | N/A      | N/A        | N/A   |
| SM21 5220C                       | Soil   | Chemical Oxygen Demand (COD)   | 100      | 28         | mg/kg |
| EPA 9040C                        | Soil   | pH                             | N/A      | N/A        | N/A   |
| SM21 5310B,<br>SW8469060         | Soil   | Total Organic Carbon (TOC)     | 1000     | 160        | mg/kg |
| ASTM516-90,02                    | Soil   | Sulfate                        | 50       | 7          | mg/kg |
| SM21 4500 S F                    | Soil   | Sulfide                        | 4        | 1.5        | mg/kg |
| EPA 351.2                        | Soil   | Total Kjeldahl Nitrogen (TKN)  | 5        | 1.2        | mg/kg |
| EPA 365.4/4500PE                 | Soil   | Total Phosphorous              | 10       | 0.24       | mg/kg |
| SM18 4500 NH3F                   | Soil   | Ammonia                        | 5        | 1.8        | mg/kg |

## APPENDIX B

AIR SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method                            | Matrix | Analyte                                | RL   | MDL  | Units             | RL  | MDL    | Units |
|-----------------------------------|--------|--|------|------|-------------------|-----|--------|-------|
| <b>Volatile Organic Compounds</b> |        |  |      |      |                   |     |        |       |
| EPA TO-15                         | Air    | 1,1,1,2-Tetrachloroethane              | 1.37 | 0.38 | ug/m <sup>3</sup> | 0.2 | 0.0547 | ppbV  |
| EPA TO-15                         | Air    | 1,1,1-Trichloroethane                  | 1.09 | 0.31 | ug/m <sup>3</sup> | 0.2 | 0.057  | ppbV  |
| EPA TO-15                         | Air    | 1,1,2,2-Tetrachloroethane              | 1.37 | 0.38 | ug/m <sup>3</sup> | 0.2 | 0.0548 | ppbV  |
| EPA TO-15                         | Air    | 1,1,2-Trichloro-1,2,2-Trifluoroethane  | 1.53 | 0.39 | ug/m <sup>3</sup> | 0.2 | 0.0511 | ppbV  |
| EPA TO-15                         | Air    | 1,1,2-Trichloroethane                  | 1.09 | 0.36 | ug/m <sup>3</sup> | 0.2 | 0.0667 | ppbV  |
| EPA TO-15                         | Air    | 1,1-Dichloroethane                     | 0.81 | 0.31 | ug/m <sup>3</sup> | 0.2 | 0.0771 | ppbV  |
| EPA TO-15                         | Air    | 1,1-Dichloroethene                     | 0.79 | 0.22 | ug/m <sup>3</sup> | 0.2 | 0.0566 | ppbV  |
| EPA TO-15                         | Air    | 1,1-Dichloropropene                    | 0.91 | 0.32 | ug/m <sup>3</sup> | 0.2 | 0.0715 | ppbV  |
| EPA TO-15                         | Air    | 1,2,3-Trichlorobenzene                 | 1.48 | 0.32 | ug/m <sup>3</sup> | 0.2 | 0.0436 | ppbV  |
| EPA TO-15                         | Air    | 1,2,3-Trichloropropane                 | 1.21 | 0.46 | ug/m <sup>3</sup> | 0.2 | 0.0767 | ppbV  |
| EPA TO-15                         | Air    | 1,2,3-Trimethylbenzene                 | 0.98 | 0.37 | ug/m <sup>3</sup> | 0.2 | 0.0751 | ppbV  |
| EPA TO-15                         | Air    | 1,2,4,5-Tetramethylbenzene             | 1.1  | 0.44 | ug/m <sup>3</sup> | 0.2 | 0.0795 | ppbV  |
| EPA TO-15                         | Air    | 1,2,4-Trichlorobenzene                 | 1.48 | 0.45 | ug/m <sup>3</sup> | 0.2 | 0.0611 | ppbV  |
| EPA TO-15                         | Air    | 1,2,4-Trimethylbenzene                 | 0.98 | 0.34 | ug/m <sup>3</sup> | 0.2 | 0.0694 | ppbV  |
| EPA TO-15                         | Air    | 1,2-Dibromo-3-chloropropane            | 1.93 | 0.72 | ug/m <sup>3</sup> | 0.2 | 0.0744 | ppbV  |
| EPA TO-15                         | Air    | 1,2-Dibromoethane                      | 1.54 | 0.6  | ug/m <sup>3</sup> | 0.2 | 0.0779 | ppbV  |
| EPA TO-15                         | Air    | 1,2-Dichloro-1,1,2,2-tetrafluoroethane | 1.4  | 0.29 | ug/m <sup>3</sup> | 0.2 | 0.0419 | ppbV  |
| EPA TO-15                         | Air    | 1,2-Dichlorobenzene                    | 1.2  | 0.37 | ug/m <sup>3</sup> | 0.2 | 0.0614 | ppbV  |
| EPA TO-15                         | Air    | 1,2-Dichloroethane                     | 0.81 | 0.22 | ug/m <sup>3</sup> | 0.2 | 0.0552 | ppbV  |
| EPA TO-15                         | Air    | 1,2-Dichloroethene (total)             | 0.79 | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0587 | ppbV  |
| EPA TO-15                         | Air    | 1,2-Dichloropropane                    | 0.92 | 0.32 | ug/m <sup>3</sup> | 0.2 | 0.0697 | ppbV  |
| EPA TO-15                         | Air    | 1,3,5-Trimethylbenzene                 | 0.98 | 0.29 | ug/m <sup>3</sup> | 0.2 | 0.0584 | ppbV  |
| EPA TO-15                         | Air    | 1,3-Butadiene                          | 0.44 | 0.18 | ug/m <sup>3</sup> | 0.2 | 0.0799 | ppbV  |
| EPA TO-15                         | Air    | 1,3-Dichlorobenzene                    | 1.2  | 0.38 | ug/m <sup>3</sup> | 0.2 | 0.0637 | ppbV  |
| EPA TO-15                         | Air    | 1,3-Dichloropropane                    | 0.92 | 0.36 | ug/m <sup>3</sup> | 0.2 | 0.0776 | ppbV  |
| EPA TO-15                         | Air    | 1,3-Dichloropropene, Total             | 0.91 | 0.31 | ug/m <sup>3</sup> | 0.2 | 0.0693 | ppbV  |
| EPA TO-15                         | Air    | 1,4-Dichlorobenzene                    | 1.2  | 0.25 | ug/m <sup>3</sup> | 0.2 | 0.0418 | ppbV  |
| EPA TO-15                         | Air    | 1,4-Dioxane                            | 0.72 | 0.28 | ug/m <sup>3</sup> | 0.2 | 0.078  | ppbV  |
| EPA TO-15                         | Air    | 1-Methylnaphthalene                    | 5.82 | 1.66 | ug/m <sup>3</sup> | 1   | 0.286  | ppbV  |
| EPA TO-15                         | Air    | 2,2,4-Trimethylpentane                 | 0.93 | 0.31 | ug/m <sup>3</sup> | 0.2 | 0.0659 | ppbV  |
| EPA TO-15                         | Air    | 2,2-Dichloropropane                    | 0.92 | 0.27 | ug/m <sup>3</sup> | 0.2 | 0.0581 | ppbV  |
| EPA TO-15                         | Air    | 2-Butanone                             | 1.47 | 0.15 | ug/m <sup>3</sup> | 0.5 | 0.0522 | ppbV  |
| EPA TO-15                         | Air    | 2-Ethylthiophene                       | 0.92 | 0.26 | ug/m <sup>3</sup> | 0.2 | 0.0571 | ppbV  |
| EPA TO-15                         | Air    | 2-Hexanone                             | 0.82 | 0.25 | ug/m <sup>3</sup> | 0.2 | 0.0604 | ppbV  |
| EPA TO-15                         | Air    | 2-Methylnaphthalene                    | 5.82 | 0.16 | ug/m <sup>3</sup> | 1   | 0.0273 | ppbV  |
| EPA TO-15                         | Air    | 2-Methylthiophene                      | 0.8  | 0.32 | ug/m <sup>3</sup> | 0.2 | 0.0789 | ppbV  |
| EPA TO-15                         | Air    | 3-Chloropropene                        | 0.63 | 0.25 | ug/m <sup>3</sup> | 0.2 | 0.0812 | ppbV  |
| EPA TO-15                         | Air    | 3-Methylthiophene                      | 0.8  | 0.27 | ug/m <sup>3</sup> | 0.2 | 0.0669 | ppbV  |
| EPA TO-15                         | Air    | 4-Ethyltoluene                         | 0.98 | 0.38 | ug/m <sup>3</sup> | 0.2 | 0.0776 | ppbV  |
| EPA TO-15                         | Air    | 4-Methyl-2-pentanone                   | 2.05 | 0.25 | ug/m <sup>3</sup> | 0.5 | 0.0607 | ppbV  |
| EPA TO-15                         | Air    | Acetaldehyde                           | 4.5  | 0.99 | ug/m <sup>3</sup> | 2.5 | 0.547  | ppbV  |
| EPA TO-15                         | Air    | Acetone                                | 2.38 | 0.64 | ug/m <sup>3</sup> | 1   | 0.289  | ppbV  |
| EPA TO-15                         | Air    | Acetonitrile                           | 0.34 | 0.13 | ug/m <sup>3</sup> | 0.2 | 0.0761 | ppbV  |
| EPA TO-15                         | Air    | Acrolein                               | 1.15 | 0.26 | ug/m <sup>3</sup> | 0.5 | 0.114  | ppbV  |
| EPA TO-15                         | Air    | Acrylonitrile                          | 1.09 | 0.17 | ug/m <sup>3</sup> | 0.5 | 0.079  | ppbV  |
| EPA TO-15                         | Air    | Benzene                                | 0.64 | 0.17 | ug/m <sup>3</sup> | 0.2 | 0.0537 | ppbV  |
| EPA TO-15                         | Air    | Benzothiophene                         | 2.74 | 0.26 | ug/m <sup>3</sup> | 0.5 | 0.0468 | ppbV  |
| EPA TO-15                         | Air    | Benzyl chloride                        | 1.04 | 0.33 | ug/m <sup>3</sup> | 0.2 | 0.0645 | ppbV  |
| EPA TO-15                         | Air    | Bromobenzene                           | 0.79 | 0.31 | ug/m <sup>3</sup> | 0.2 | 0.079  | ppbV  |
| EPA TO-15                         | Air    | Bromodichloromethane                   | 1.34 | 0.44 | ug/m <sup>3</sup> | 0.2 | 0.0656 | ppbV  |
| EPA TO-15                         | Air    | Bromoform                              | 2.07 | 0.54 | ug/m <sup>3</sup> | 0.2 | 0.0523 | ppbV  |
| EPA TO-15                         | Air    | Bromomethane                           | 0.78 | 0.27 | ug/m <sup>3</sup> | 0.2 | 0.0696 | ppbV  |
| EPA TO-15                         | Air    | Butane                                 | 0.48 | 0.11 | ug/m <sup>3</sup> | 0.2 | 0.0442 | ppbV  |
| EPA TO-15                         | Air    | Butyl Acetate                          | 2.38 | 0.54 | ug/m <sup>3</sup> | 0.5 | 0.114  | ppbV  |
| EPA TO-15                         | Air    | Carbon disulfide                       | 0.62 | 0.11 | ug/m <sup>3</sup> | 0.2 | 0.0345 | ppbV  |
| EPA TO-15                         | Air    | Carbon tetrachloride                   | 1.26 | 0.3  | ug/m <sup>3</sup> | 0.2 | 0.0471 | ppbV  |
| EPA TO-15                         | Air    | Chlorobenzene                          | 0.92 | 0.36 | ug/m <sup>3</sup> | 0.2 | 0.0789 | ppbV  |
| EPA TO-15                         | Air    | Chlorodifluoromethane                  | 0.71 | 0.22 | ug/m <sup>3</sup> | 0.2 | 0.0626 | ppbV  |

## APPENDIX B

AIR SAMPLES  
LABORATORY REPORTING LIMITS AND METHOD DETECTION LIMITS

| Method    | Matrix | Analyte                    | RL    | MDL  | Units             | RL  | MDL    | Units |
|-----------|--------|----------------------------|-------|------|-------------------|-----|--------|-------|
| EPA TO-15 | Air    | Chloroethane               | 0.53  | 0.2  | ug/m <sup>3</sup> | 0.2 | 0.0767 | ppbV  |
| EPA TO-15 | Air    | Chloroform                 | 0.98  | 0.22 | ug/m <sup>3</sup> | 0.2 | 0.0452 | ppbV  |
| EPA TO-15 | Air    | Chloromethane              | 0.41  | 0.2  | ug/m <sup>3</sup> | 0.2 | 0.0958 | ppbV  |
| EPA TO-15 | Air    | cis-1,2-Dichloroethene     | 0.79  | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0587 | ppbV  |
| EPA TO-15 | Air    | cis-1,3-Dichloropropene    | 0.91  | 0.34 | ug/m <sup>3</sup> | 0.2 | 0.0745 | ppbV  |
| EPA TO-15 | Air    | Cyclohexane                | 0.69  | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0656 | ppbV  |
| EPA TO-15 | Air    | Decane (C10)               | 1.16  | 0.28 | ug/m <sup>3</sup> | 0.2 | 0.0484 | ppbV  |
| EPA TO-15 | Air    | Dibromochloromethane       | 1.7   | 0.64 | ug/m <sup>3</sup> | 0.2 | 0.0747 | ppbV  |
| EPA TO-15 | Air    | Dibromomethane             | 1.42  | 0.34 | ug/m <sup>3</sup> | 0.2 | 0.0476 | ppbV  |
| EPA TO-15 | Air    | Dichlorodifluoromethane    | 0.99  | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0466 | ppbV  |
| EPA TO-15 | Air    | Dichlorofluoromethane      | 0.84  | 0.24 | ug/m <sup>3</sup> | 0.2 | 0.0572 | ppbV  |
| EPA TO-15 | Air    | Dodecane (C12)             | 1.39  | 0.39 | ug/m <sup>3</sup> | 0.2 | 0.0564 | ppbV  |
| EPA TO-15 | Air    | Ethyl Acetate              | 1.8   | 0.47 | ug/m <sup>3</sup> | 0.5 | 0.131  | ppbV  |
| EPA TO-15 | Air    | Ethyl Alcohol              | 4.71  | 1.02 | ug/m <sup>3</sup> | 2.5 | 0.542  | ppbV  |
| EPA TO-15 | Air    | Ethyl ether                | 0.61  | 0.18 | ug/m <sup>3</sup> | 0.2 | 0.0591 | ppbV  |
| EPA TO-15 | Air    | Ethylbenzene               | 0.87  | 0.24 | ug/m <sup>3</sup> | 0.2 | 0.0555 | ppbV  |
| EPA TO-15 | Air    | Ethyl-Tert-Butyl-Ether     | 0.84  | 0.22 | ug/m <sup>3</sup> | 0.2 | 0.0515 | ppbV  |
| EPA TO-15 | Air    | Heptane                    | 0.82  | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0553 | ppbV  |
| EPA TO-15 | Air    | Hexachlorobutadiene        | 2.13  | 0.78 | ug/m <sup>3</sup> | 0.2 | 0.0732 | ppbV  |
| EPA TO-15 | Air    | Indane                     | 0.97  | 0.38 | ug/m <sup>3</sup> | 0.2 | 0.0795 | ppbV  |
| EPA TO-15 | Air    | Indene                     | 0.95  | 0.29 | ug/m <sup>3</sup> | 0.2 | 0.0668 | ppbV  |
| EPA TO-16 | Air    | iso-Propyl Alcohol         | 1.23  | 0.28 | ug/m <sup>3</sup> | 0.5 | 0.114  | ppbV  |
| EPA TO-17 | Air    | Isopropyl Ether            | 0.84  | 0.27 | ug/m <sup>3</sup> | 0.2 | 0.0656 | ppbV  |
| EPA TO-18 | Air    | Isopropylbenzene           | 0.98  | 0.21 | ug/m <sup>3</sup> | 0.2 | 0.043  | ppbV  |
| EPA TO-19 | Air    | Methanol                   | 6.55  | 0.96 | ug/m <sup>3</sup> | 5   | 0.736  | ppbV  |
| EPA TO-20 | Air    | Methyl Methacrylate        | 2.05  | 0.61 | ug/m <sup>3</sup> | 0.5 | 0.148  | ppbV  |
| EPA TO-21 | Air    | Methyl tert butyl ether    | 0.72  | 0.16 | ug/m <sup>3</sup> | 0.2 | 0.0452 | ppbV  |
| EPA TO-22 | Air    | Methylene chloride         | 1.74  | 0.65 | ug/m <sup>3</sup> | 0.5 | 0.188  | ppbV  |
| EPA TO-23 | Air    | Naphthalene                | 1.05  | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0432 | ppbV  |
| EPA TO-24 | Air    | n-Butylbenzene             | 1.1   | 0.35 | ug/m <sup>3</sup> | 0.2 | 0.0639 | ppbV  |
| EPA TO-25 | Air    | n-Heptane                  | 0.82  | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0553 | ppbV  |
| EPA TO-26 | Air    | n-Hexane                   | 0.7   | 0.18 | ug/m <sup>3</sup> | 0.2 | 0.0518 | ppbV  |
| EPA TO-27 | Air    | Nonane (C9)                | 1.05  | 0.34 | ug/m <sup>3</sup> | 0.2 | 0.0644 | ppbV  |
| EPA TO-28 | Air    | n-Propylbenzene            | 0.98  | 0.27 | ug/m <sup>3</sup> | 0.2 | 0.0559 | ppbV  |
| EPA TO-29 | Air    | o-Chlorotoluene            | 1.04  | 0.25 | ug/m <sup>3</sup> | 0.2 | 0.0487 | ppbV  |
| EPA TO-30 | Air    | Octane                     | 0.93  | 0.2  | ug/m <sup>3</sup> | 0.2 | 0.0421 | ppbV  |
| EPA TO-31 | Air    | o-Xylene                   | 0.87  | 0.27 | ug/m <sup>3</sup> | 0.2 | 0.0631 | ppbV  |
| EPA TO-32 | Air    | p/m-Xylene                 | 1.74  | 0.6  | ug/m <sup>3</sup> | 0.4 | 0.139  | ppbV  |
| EPA TO-33 | Air    | p-Chlorotoluene            | 1.04  | 0.4  | ug/m <sup>3</sup> | 0.2 | 0.0764 | ppbV  |
| EPA TO-34 | Air    | Pentane                    | 0.59  | 0.14 | ug/m <sup>3</sup> | 0.2 | 0.0475 | ppbV  |
| EPA TO-35 | Air    | p-Isopropyltoluene         | 1.1   | 0.33 | ug/m <sup>3</sup> | 0.2 | 0.0608 | ppbV  |
| EPA TO-36 | Air    | Propane                    | 0.9   | 0.21 | ug/m <sup>3</sup> | 0.5 | 0.114  | ppbV  |
| EPA TO-37 | Air    | Propylene                  | 0.86  | 0.16 | ug/m <sup>3</sup> | 0.5 | 0.0929 | ppbV  |
| EPA TO-38 | Air    | sec-Butylbenzene           | 1.1   | 0.4  | ug/m <sup>3</sup> | 0.2 | 0.0731 | ppbV  |
| EPA TO-39 | Air    | Styrene                    | 0.85  | 0.34 | ug/m <sup>3</sup> | 0.2 | 0.0799 | ppbV  |
| EPA TO-40 | Air    | tert-Butyl Alcohol         | 1.52  | 0.18 | ug/m <sup>3</sup> | 0.5 | 0.0599 | ppbV  |
| EPA TO-41 | Air    | tert-Butylbenzene          | 1.1   | 0.22 | ug/m <sup>3</sup> | 0.2 | 0.0402 | ppbV  |
| EPA TO-42 | Air    | Tertiary-Amyl Methyl Ether | 0.84  | 0.33 | ug/m <sup>3</sup> | 0.2 | 0.0795 | ppbV  |
| EPA TO-43 | Air    | Tetrachloroethene          | 1.36  | 0.51 | ug/m <sup>3</sup> | 0.2 | 0.0758 | ppbV  |
| EPA TO-44 | Air    | Tetrahydrofuran            | 1.47  | 0.18 | ug/m <sup>3</sup> | 0.5 | 0.0622 | ppbV  |
| EPA TO-45 | Air    | Thiophene                  | 0.69  | 0.18 | ug/m <sup>3</sup> | 0.2 | 0.0528 | ppbV  |
| EPA TO-46 | Air    | Toluene                    | 0.75  | 0.24 | ug/m <sup>3</sup> | 0.2 | 0.0628 | ppbV  |
| EPA TO-47 | Air    | Total HC As Hexane         | 39.34 | 0.2  | ug/m <sup>3</sup> | 10  | 0.0518 | ppbV  |
| EPA TO-48 | Air    | Total VOCs As Toluene      | 37.69 | 0.24 | ug/m <sup>3</sup> | 10  | 0.0628 | ppbV  |
| EPA TO-49 | Air    | trans-1,2-Dichloroethene   | 0.79  | 0.29 | ug/m <sup>3</sup> | 0.2 | 0.074  | ppbV  |
| EPA TO-50 | Air    | trans-1,3-Dichloropropene  | 0.91  | 0.31 | ug/m <sup>3</sup> | 0.2 | 0.0693 | ppbV  |
| EPA TO-51 | Air    | Trichloroethene            | 1.07  | 0.38 | ug/m <sup>3</sup> | 0.2 | 0.071  | ppbV  |
| EPA TO-52 | Air    | Trichlorofluoromethane     | 1.12  | 0.23 | ug/m <sup>3</sup> | 0.2 | 0.0416 | ppbV  |
| EPA TO-53 | Air    | Undecane                   | 1.28  | 0.34 | ug/m <sup>3</sup> | 0.2 | 0.0528 | ppbV  |
| EPA TO-54 | Air    | Vinyl acetate              | 3.52  | 0.2  | ug/m <sup>3</sup> | 1   | 0.0567 | ppbV  |
| EPA TO-55 | Air    | Vinyl bromide              | 0.87  | 0.31 | ug/m <sup>3</sup> | 0.2 | 0.0699 | ppbV  |
| EPA TO-56 | Air    | Vinyl chloride             | 0.51  | 0.14 | ug/m <sup>3</sup> | 0.2 | 0.0533 | ppbV  |
| EPA TO-57 | Air    | Xylene (Total)             | 0.87  | 0.27 | ug/m <sup>3</sup> | 0.2 | 0.0631 | ppbV  |

**ATTACHMENT C**

**ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE**

ATTACHMENT C  
ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

| Matrix Type                                | Field Parameters                              | Laboratory Parameters                      | Analytical Methods                             | Sample Preservation                       | Sample Container Volume and Type            | Sample Hold Time  | Field Duplicate Samples      | Equipment Blank Samples      | Trip Blank Samples            | Ambient Air Samples | MS/MSD Samples   |
|--|---|--|--|---|---|---|------------------------------|------------------------------|-------------------------------|---------------------|------------------|
| Groundwater                                | Temperature, Turbidity, pH, ORP, Conductivity | Part 375 + TCL VOCs                        | EPA 8260C                                      | Cool to 4°C; HCl to pH <2, no headspace   | Three 40-mL VOC vials with Teflon-lined cap | Analyze within 14 days of collection                    | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | 1 per shipment of VOC samples | NA                  | 1 per 20 samples |
|  |   | 1,4-dioxane                                | 8270D SIM isotope dilution                     | Cool to 4°C                               | One 1-Liter Amber Glass                     | 7 days to extract, 40 days after extraction to analysis |                              |                              |                               |                     |                  |
|  |   | Part 375 + TCL SVOCs                       | EPA 8270D                                      | Cool to 4°C                               | Two 1-Liter Amber Glass                     | 7 days to extract, 40 days after extraction to analysis |                              |                              |                               |                     |                  |
|  |   | Part 375 + TAL Metals                      | EPA 6020B, EPA 7470A                           | Cool to 4°C; HNO <sub>3</sub>             | 250 ml plastic                              | 6 months, except Mercury 28 days                        |                              |                              |                               |                     |                  |
|  |   | Hexavalent Chromium                        | EPA 7196A                                      | Cool to 4°C                               | 250 ml plastic                              | 24 hours  |                              |                              |                               |                     |                  |
|  |   | Cyanide                                    | EPA 9010C/9012B                                | Cool to 4°C; NaOH plus 0.6g ascorbic acid | 250 ml plastic                              | 14 days   |                              |                              |                               |                     |                  |
|  |   | Part 375 + TCL Herbicides                  | EPA 8151A                                      | Cool to 4°C                               | Two 1-Liter Amber Glass                     | 7 days to extract, 40 days after extraction to analysis |                              |                              |                               |                     |                  |
|  |   | Part 375 + TCL Pesticides                  | EPA 8081B                                      | Cool to 4°C                               | Two 1-Liter Amber Glass for Pesticides/PCB  | 7 days to extract, 40 days after extraction to analysis |                              |                              |                               |                     |                  |
|  |   | PCBs                                       | EPA 8082A                                      | Cool to 4°C                               |   | 7 days to extract, 40 days after extraction to analysis |                              |                              |                               |                     |                  |
|  |   | Biological Oxygen Demand                   | SM 5210B                                       | None                                      | One 500mL plastic                           | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Chemical Oxygen Demand                     | SM 5220D                                       | H2SO4                                     | 250mL plastic                               | 28 days   | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Total Organic Carbon                       | SM 5310C, SW846 9060A                          | H3PO4                                     | Three 40mL VOA vials                        | 28 days   | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Sulfate (SO <sub>4</sub> <sup>2-</sup> )   | EPA 300.0, SM 4500SO4-E, EPA 9038              | None                                      | 250mL plastic                               | 28 days   | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Sulfide (S <sup>2-</sup> )                 | SM 4500S2-AD, EPA 9030B                        | NaOH, Zinc Acetate                        | Two 250mL                                   | 7 days  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Nitrate (NO <sub>3</sub> <sup>-</sup> )    | EPA 300.0, SM4500NO <sub>3</sub> -F, EPA 353.2 | H2SO4                                     | Two 250mL plastic                           | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Nitrite (NO <sub>2</sub> <sup>-</sup> )    | EPA 353.2, SM 4500NO <sub>2</sub> -B           | H2SO4                                     | Two 250mL plastic                           | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Total Phosphorus                           | SM 4500P-E                                     | H2SO4                                     | 250 mL plastic                              | 28 days   | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Ammonia                                    | SM 4500NH3-BH, EPA 350.1                       | H2SO4                                     | 250 mL plastic                              | 28 days   | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Naphthalene Dioxygenase (NAH)              | N/A  | Cool to 4°C                               | 1-2 liters                                  | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Napthalene Inducible Dioxygenase (NIDA)    | N/A  | Cool to 4°C                               | 1-2 liters                                  | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Phenol Hydroxylase (PHE)                   | N/A  | Cool to 4°C                               | 1-2 liters                                  | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Naphthyl-2-methyl-succinate synthase (NMS) | N/A  | Cool to 4°C                               | 1-2 liters                                  | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
|  |   | Naphthalene Carboxylase (ANC)              | N/A  | Cool to 4°C                               | 1-2 liters                                  | 48 hours  | N/A                          | N/A                          | N/A                           | N/A                 | N/A              |
| Per- and polyfluoroalkyl substances (PFAS) | EPA 537(IM) Rev 1.1                           | Cool to 4°C, Trizma                        | Two 250 mL plastic                             | 14 days                                   | 1 per 20 samples (minimum 1)                | 1 per 20 samples (minimum 1)                            | N/A                          | N/A                          | 1 per 20 samples (minimum 1)  |                     |                  |

ATTACHMENT C  
ANALYTICAL METHODS/QUALITY ASSURANCE SUMMARY TABLE

| Matrix Type                | Field Parameters                           | Laboratory Parameters                      | Analytical Methods                               | Sample Preservation | Sample Container Volume and Type   | Sample Hold Time   | Field Duplicate Samples      | Equipment Blank Samples      | Trip Blank Samples            | Ambient Air Samples          | MS/MSD Samples   |
|----------------------------|--|--|--|---------------------|--|--|------------------------------|------------------------------|-------------------------------|------------------------------|------------------|
| Soil                       | Total VOCs via PID                         | Part 375 + TCL VOCs                        | EPA 8260C  | Cool to 4°C         | Two 40-ml VOC vials with 5ml H <sub>2</sub> O, one with MeOH (separate container for % solids) | 48 hours after sampling if samples are not frozen to -70°F, 14 days after extraction to analysis | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | 1 per shipment of VOC samples | NA                           | 1 per 20 samples |
|                            |  | Part 375 + TCL SVOCs                       | EPA 8270D  | Cool to 4°C         | 4 oz. amber glass jar  | 14 days extract, 40 days after extraction to analysis  |                              |                              |                               |                              |                  |
|                            |  | Part 375 + TAL Metals                      | EPA 6010D, EPA 7471B, EPA 7196A, EPA 9010C/9012B | Cool to 4°C         | 2 oz. amber glass jar  | 6 months, except mercury 28 days   |                              |                              |                               |                              |                  |
|                            |  | Part 375 + TCL Pesticides                  | EPA 8081B  | Cool to 4°C         | 4 oz. amber glass jar  | 14 days extract, 40 days after extraction to analysis  |                              |                              |                               |                              |                  |
|                            |  | Part 375 + TCL Herbicides                  | EPA 8151A  | Cool to 4°C         | 4 oz. amber glass jar  | 14 days extract  |                              |                              |                               |                              |                  |
|                            |  | Part 375 + TCL PCBs                        | EPA 8082A  | Cool to 4°C         | 4 oz. amber glass jar  | 14 days extract, 40 days after extraction to analysis  |                              |                              |                               |                              |                  |
|                            |  | Grain Size                                 | ASTM D6913-04, ASTM D7928-16                     | N/A                 | Quart Ziplock Bag  | N/A  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Biological Oxygen Demand                   | SM 5210B   | None                | 4 oz. glass jar  | 48 hours   | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Chemical Oxygen Demand                     | SM 5220D(M)                                      | None                | 4 oz. glass jar  | 28 days  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | pH   | EPA 9040C  | None                | 4 oz. glass jar  | immediate  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Total Organic Carbon                       | SW846 9060A, Lloyd Kahn                          | None                | 2 oz. glass jar  | 28 days  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Sulfate                                    | EPA 9038   | None                | 4 oz. glass jar  | 28 days  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Sulfide                                    | EPA 9030B  | None                | 4 oz. glass jar  | 7 days   | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Total Kjeldahl Nitrogen (TKN)              | SM 4500NH3-H                                     | None                | 4 oz. glass jar  | 28 days  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
| Total Phosphorous          | SM 4500P-E                                 | None                                       | 4 oz. glass jar                                  | 28 days             | N/A  | N/A  | N/A                          | N/A                          | N/A                           |                              |                  |
| Ammonia                    | SM 4500NH3-BH                              | None                                       | 4 oz. glass jar                                  | 28 days             | N/A  | N/A  | N/A                          | N/A                          | N/A                           |                              |                  |
| Product                    | N/A  | Petroleum Hydrocarbon Identification (PHI) | EPA 8015D(M)                                     | Cool to 4°C         | 4 oz. amber glass jar  | 14 days extract, 40 days after extraction to analysis  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Density                                    | ASTM D1475                                       | Cool to 4°C         | 4 oz. amber glass jar  | N/A  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
|                            |  | Viscosity                                  | ASTM D445  | Cool to 4°C         | 4 oz. amber glass jar  | N/A  | N/A                          | N/A                          | N/A                           | N/A                          | N/A              |
| Soil Vapor                 | Total VOCs and Methane with MultiGas Meter | TO-15 Listed VOCs                          | TO-15  | Ambient Temperature | 6-Liter Summa Canister   | Analyze within 30 days of collection   | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | NA                            | 1 per 10 samples (minimum 1) | NA               |
| Indoor Air and Ambient Air | Total VOCs via PID                         | TO-15 Listed VOCs                          | TO-15  | Ambient Temperature | 6-Liter Summa Canister   | Analyze within 30 days of collection   | 1 per 20 samples (minimum 1) | 1 per 20 samples (minimum 1) | NA                            | 1 per 10 samples (minimum 1) | NA               |

**Notes:**  
1. PID - Photoionization Detector  
2. VOC - Volatile organic compound  
3. EPA - Environmental Protection Agency  
4. TCL - Target compound list  
5. TAL - Target analyte list



**ATTACHMENT D**  
**SAMPLE NOMENCLATURE**

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## SAMPLE NOMENCLATURE

The sample nomenclature outlined below provides consistency between sample events and projects but, most importantly, establish unique sample IDs that will avoid confusion months or years after the sample has been collected. Furthermore, unique sample IDs are required for any data submitted to the NYSDEC in EDD format or being uploaded to an EQulS database.

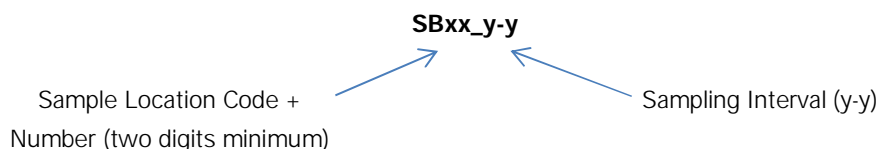
### 1.0 INVESTIGATION LOCATION CODES

|      |                               |     |                             |
|------|-------------------------------|-----|-----------------------------|
| SB   | Soil Boring                   | SV  | Soil Vapor Point            |
| WC   | Waste Characterization Boring | IA  | Indoor Air                  |
| TP   | Test Pit                      | AA  | Ambient Air                 |
| EPSW | Endpoint Location (Sidewall)  | SVE | Vapor Extraction Well       |
| EPB  | Endpoint Location (Bottom)    | DS  | Drum                        |
| MW   | Monitoring Well               | IDW | Investigation Derived Waste |
| TMW  | Temporary Monitoring Well     | SL  | Sludge                      |
| SW   | Surface Water                 | FP  | Free Product                |

### 2.0 SAMPLE NOMENCLATURE

Each sample at a site must have a unique value.

- Soil/Sediment Samples:**

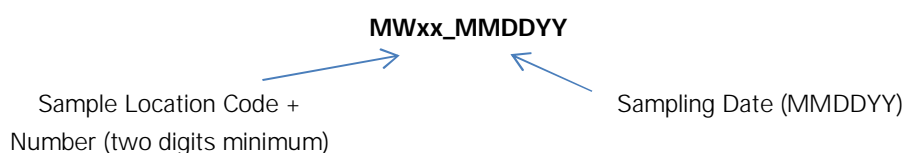


| Sample Type   | Sample Location Code         | Sampling Depth or Interval<br>(feet bgs or approx. elevation) | Sample Name |
|---|------------------------------|---|-------------|
| <b>Phase II/Remedial Investigation</b>                  |                              |   |             |
| <b>Grab</b> Soil Sample                                 | SB01                         | 2 to 4  | SB01_2-4    |
|   | SB02                         | 4   | SB02_4      |
| <b>Waste Characterization</b>                           |                              |   |             |
| <b>Grab</b> Soil Sample                                 | WC01                         | 2 to 4  | WC01_2-4    |
|   | WC02                         | 4   | WC02_4      |
| <b>Composite</b> Soil Sample from one or more locations | COMP01 or<br>COMP02 + COMP03 | 0 to 10<br>(Fill)   | COMP01_0-10 |

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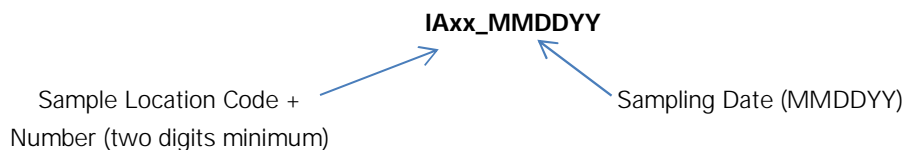
| Sample Type              | Sample Location Code | Sampling Depth or Interval<br>(feet bgs or approx. elevation) | Sample Name |
|--------------------------|----------------------|---|-------------|
| <b>Endpoint Sampling</b> |                      |   |             |
| <b>Grab</b> Soil Sample  | EPSW01_N             | 5   | EPSW01_N_5  |
|                          | EPSW01_S             | 5   | EPSW01_S_5  |
|                          | EPSW01_E             | 5   | EPSW01_E_5  |
|                          | EPSW01_W             | 5   | EPSW01_W_5  |
|                          | EPB01                | 6   | EPB01_6     |

- Groundwater/Surface Water Samples:**



| Sample Type        | Sample Location Code | Sampling Date | Sample Name |
|--------------------|----------------------|---------------|-------------|
| Groundwater Sample | MW01                 | 02/21/2013    | MW01_022113 |

- Air/Soil Vapor Samples:**



| Sample Type                  | Sample Location Code             | Date       | Sample Name   |
|------------------------------|----------------------------------|------------|---|
| Air Sample                   | IA01                             | 02/21/2013 | IA01_022113   |
| Soil Vapor Sample            | SV01                             | 02/21/2013 | SV01_022113   |
| Vapor Extraction Well Sample | SVE01<br>(INLET/MIDPOINT/OUTLET) | 02/21/2013 | SVE01_IN_022113<br>SVE01_MID_022113<br>SVE01_OUT_022113 |

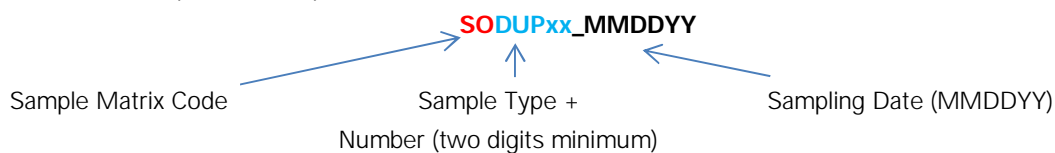
- QA/QC Samples:**

### Sample Matrix Codes

|    |               |    |              |
|----|---------------|----|--------------|
| SO | Soil          | AS | Air          |
| SE | Sediment      | SV | Soil Vapor   |
| GW | Groundwater   | SL | Sludge       |
| SW | Surface Water | FP | Free Product |

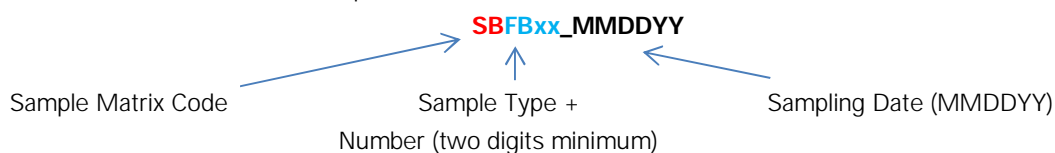
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- o Duplicates Samples



| Sample Type                        | Parent Sample Code | Date       | Sample Name      |
|------------------------------------|--------------------|------------|------------------|
| Groundwater Duplicate Sample (DUP) | MW01_022113        | 02/21/2013 | GWDUP01_022113   |
| Soil boring Duplicate Sample (DUP) | SBP01_022113       | 02/21/2013 | SODUP01_022113   |
| Grab Waste Characterization        | WC01               | 02/21/2013 | WCDUP01_022113   |
| Composite Waste Characterization   | COMP01             | 02/21/2013 | COMPDUP01_022113 |

- o Field Blanks and Trip Blanks



| Sample Type                  | Date       | Sample Name   |
|------------------------------|------------|---------------|
| Groundwater Field Blank (FB) | 02/21/2013 | GWFB01_022113 |
| Groundwater Trip Blank (TB)  | 02/21/2013 | GWTB01_022113 |
| Soil Field Blank             | 02/21/2013 | SOFB01_022113 |
| Soil Trip Blank              | 02/21/2013 | SOTB01_022113 |

- o Matrix Spike/Matrix Spike Duplicate (MS/MSD)

**Parent Sample Name\_MS or MSD**

| Sample Type                       | Sample Location | Parent Sample Name | Sample Name  |
|-----------------------------------|-----------------|--------------------|--------------|
| Matrix Spike Soil (MS)            | SB01            | SB01_2-4           | SB01_2-4_MS  |
| Matrix Spike Soil Duplicate (MSD) | SB01            | SB01_2-4           | SB01_2-4_MSD |
| Matrix Spike GW (MS)              | MW01            | MW01               | MW01_MS      |
| Matrix Spike GW Duplicate (MSD)   | MW01            | MW01               | MW01_MSD     |

### 3.0 NOTES

1. The sample location code should not exceed 20 characters and the sample name should not exceed 40 characters.
2. Sample location code (**SB01, MW01, etc.**) is a sequential number (starting with 01) and should be a minimum of two digits.
3. Sample Interval (**SB01\_0-5**) is separated from the sample location code with an underscore, and the top and bottom interval with a dash. Soil and sediment sample intervals should always be in

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- feet. Soil and sediment sample intervals should contain no "/" or "()" or unit.
4. Sample date (MW01\_022113) is separated from the sample location code with an underscore and should be provided in MMDDYY format [the date should contain no "/" or "-"].
  5. If groundwater samples are collected from multiple intervals within one well, you may assign a letter designation (in lower case) to the well ID to differentiate between intervals (i.e., MW01a\_022113, MW01b\_022113, and MW01c\_022113). The letter "a" would indicate the shallowest interval and "c" the deepest. The actual depth intervals should be documented in the project field book or field sheets and the letter designations should be used consistently between sampling events.
  6. According to USEPA's Contract Laboratory Program (CLP) Guidance for Field Samplers (January 2011), field duplicate samples should remain "blind" to the laboratory (i.e., they should have separate CLP Sample numbers). Assign two separate (unique) CLP sample numbers (i.e., one number to the field sample and one to the duplicate). Submit blind to the laboratory. (<http://www.epa.gov/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf>)

**ATTACHMENT E**  
**PFAS SAMPLING PROTOCOL**

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# Collection of Groundwater Samples for Perfluorooctanoic Acid (PFOA) and Perfluorinated Compounds (PFCs) from Monitoring Wells Sample Protocol

**Samples collected using this protocol are intended to be analyzed for perfluorooctanoic acid (PFOA) and other perfluorinated compounds by Modified (Low Level) Test Method 537.**

The procedure used must be consistent with the NYSDEC March 1991 Sampling Guidelines and Protocols [http://www.dec.ny.gov/docs/remediation\\_hudson\\_pdf/sgpsect5.pdf](http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf) with the following materials limitations.

At this time acceptable materials for sampling include: stainless steel, high density polyethylene (HDPE), PVC, silicone, acetate and polypropylene. Equipment blanks should be generated at least daily. Additional materials may be acceptable if pre-approved by NYSDEC. Requests to use alternate equipment should include clean equipment blanks. **NOTE: Grunfos pumps and bladder pumps are known to contain PFC materials (e.g. Teflon™ washers for Grunfos pumps and LDPE bladders for bladder pumps).** All sampling equipment components and sample containers should not come in contact with aluminum foil, low density polyethylene (LDPE), glass or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer. Standard two step decontamination using detergent and clean water rinse will be performed for equipment that does come in contact with PFC materials. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFC materials must be avoided. Many food and drink packaging materials and “plumbers thread seal tape” contain PFCs.

All clothing worn by sampling personnel must have been laundered multiple times. The sampler must wear nitrile gloves while filling and sealing the sample bottles.

Pre-cleaned sample bottles with closures, coolers, ice, sample labels and a chain of custody form will be provided by the laboratory.

1. Fill two pre-cleaned 500 mL HDPE or polypropylene bottle with the sample.
2. Cap the bottles with an acceptable cap and liner closure system.
3. Label the sample bottles.
4. Fill out the chain of custody.
5. Place in a cooler maintained at  $4 \pm 2^{\circ}$  Celsius.

Collect one equipment blank for every sample batch, not to exceed 20 samples.

Collect one field duplicate for every sample batch, not to exceed 20 samples.

Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, not to exceed 20 samples.

Request appropriate data deliverable (Category A or B) and an electronic data deliverable.

# Groundwater Sampling for Emerging Contaminants

February 2018

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Issue: NYSDEC has committed to analyzing representative groundwater samples at remediation sites for emerging contaminants (1,4-dioxane and PFAS) as described in the below guidance.

## Implementation

NYSDEC project managers will be contacting site owners to schedule sampling for these chemicals. Only groundwater sampling is required. The number of samples required will be similar to the number of samples where “full TAL/TCL sampling” would typically be required in a remedial investigation. If sampling is not feasible (e.g., the site no longer has any monitoring wells in place), sampling may be waived on a site-specific basis after first considering potential sources of these chemicals and whether there are water supplies nearby.

Upon a new site being brought into any program (i.e., SSF, BCP), PFAS and 1,4-dioxane will be incorporated into the investigation of groundwater as part of the standard “full TAL/TCL” sampling. Until an SCO is established for PFAS, soil samples do not need to be analyzed for PFAS unless groundwater contamination is detected. Separate guidance will be developed to address sites where emerging contaminants are found in the groundwater. The analysis currently performed for SVOCs in soil is adequate for evaluation of 1,4-dioxane, which already has an established SCO.

## Analysis and Reporting

Labs should provide a full category B deliverable, and a DUSR should be prepared by a data validator.

The work plan should explicitly describe analysis and reporting requirements.

PFAS sample analysis: Samples should be analyzed by an environmental laboratory certified by ELAP to use EPA method 537 or ISO 25101. ELAP does not currently offer certification for PFAS analysis of non-drinking water samples (including groundwater, soil and sediment), so there is no requirement to use an ELAP certified method. The preferred method is the modified EPA Method 537. Labs have been able to achieve reporting limits for PFOA and PFOS of 2 ng/l (part per trillion). If labs are not able to achieve similar reporting limits, the NYSDEC project manager will make case-by-case decisions as to whether the analysis can meet the needs for the specific site.

PFAS sample reporting: DER has developed a PFAS target analyte list (below) with the intent of achieving reporting consistency between labs for commonly reportable analytes. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. This list may be updated in the future as new information is learned and as labs develop new capabilities. If lab and/or matrix specific issues are encountered for any particular compounds, the NYSDEC project manager will make case-by-case decisions as to whether particular analytes may be temporarily or permanently discontinued from analysis for each site. Any technical lab issues should be brought to the attention of a NYSDEC chemist.

Some sampling using this full PFAS target analyte list is needed to understand the nature of contamination. It may also be critical to differentiate PFAS compounds associated with a site from other sources of these chemicals. Like routine refinements to parameter lists based on investigative findings, the full PFAS target analyte list may not be needed for all sampling intended to define the extent of



contamination. Project managers may approve a shorter analyte list (e.g., just the UCMR3 list) for some reporting on a case by case basis.

1,4-Dioxane Analysis and Reporting: The method detection limit (MDL) for 1,4-dioxane should be no higher than 0.28 µg/l (ppb). ELAP offers certification for both EPA Methods 8260 and 8270. In order to get the appropriate detection limits, the lab would need to run either of these methods in “selective ion monitoring” (SIM) mode. DER is advising PMS to use 8270, since this method provides a more robust extraction procedure, uses a larger sample volume, and is less vulnerable to interference from chlorinated solvents (we acknowledge that 8260 has been shown to have a higher recovery in some studies).

### Full PFAS Target Analyte List

| Group                                   | Chemical Name                                  | Abbreviation   | CAS Number       |
|---|--|----------------|------------------|
| Perfluoroalkyl sulfonates               | <b>Perfluorobutanesulfonic acid</b>            | <b>PFBS</b>    | <b>375-73-5</b>  |
|   | <b>Perfluorohexanesulfonic acid</b>            | <b>PFHxS</b>   | <b>355-46-4</b>  |
|   | Perfluoroheptanesulfonic acid                  | PFHpS          | 375-92-8         |
|   | <b>Perfluorooctanesulfonic acid</b>            | <b>PFOS</b>    | <b>1763-23-1</b> |
|   | 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         |
|   | <b>Perfluoroheptanoic acid</b>                 | <b>PFHpA</b>   | <b>375-85-9</b>  |
|   | <b>Perfluorooctanoic acid</b>                  | <b>PFOA</b>    | <b>335-67-1</b>  |
|   | <b>Perfluorononanoic acid</b>                  | <b>PFNA</b>    | <b>375-95-1</b>  |
|   | Perfluorodecanoic acid                         | PFDA           | 335-76-2         |
|   | Perfluoroundecanoic acid                       | PFUA/PFUdA     | 2058-94-8        |
|   | Perfluorododecanoic acid                       | PFDoA          | 307-55-1         |
|   | Perfluorotridecanoic acid                      | PFTriA/PFTTrDA | 72629-94-8       |
| Perfluorotetradecanoic acid             | PFTA/PFTeDA                                    | 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       |
| Perfluorooctane-sulfonamides            | Perfluorooctanesulfonamide                     | FOSA           | 754-91-6         |
| Perfluorooctane-sulfonamidoacetic acids | N-methyl perfluorooctanesulfonamidoacetic acid | N-MeFOSAA      | 2355-31-9        |
|   | N-ethyl perfluorooctanesulfonamidoacetic acid  | N-EtFOSAA      | 2991-50-6        |

Bold entries depict the 6 original UCMR3 chemicals