VIA ELECTRONIC MAIL

September 1, 2022

Ms. Tara Rutland
Environmental Engineer, Div. of Environmental Remediation
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7015

Subject: **Operable Unit No. 2 Supplemental Investigation Work Plan – Revision 4**
Former TransTechnology Corporation Facility, Glen Head, New York

Dear Ms. Rutland,

WSP USA Inc., on behalf of our client, Breeze-Eastern LLC (Breeze-Eastern), is pleased to submit this *Operable Unit No. 2 Supplemental Investigation Work Plan* for the former TransTechnology Corporation (TTC) facility in Glen Head, New York (Sheet 1). The work plan is a follow-on to the recently approved *OU-2 Remedial Investigation Report* (OU-2[1] RI), dated April 2, 2018, which was primarily focused on the nature and extent of chlorinated volatile organic compound-affected (VOC-affected) groundwater detected at the site. The impacts detailed in the OU-2 RI included tetrachloroethene-affected (PCE-affected) groundwater beneath the southern end of the site, and trichloroethene-affected (TCE-affected) groundwater in the central portion of the property likely related to historical operations at the former TTC facility (Sheet 2[2]). The dissolved PCE was detected at site locations away from the historical manufacturing operations and was attributed to releases[3] at several dry cleaners located upgradient and sidegradient of the TTC property. The onsite portions of the two areas of affected groundwater, the PCE (regional) and TCE plumes, are discrete, but comingled at points downgradient of the former TTC site.

The groundwater evaluation for the OU-2 RI also included historical groundwater sampling results that dated to 1992 for the onsite (former TTC) monitoring wells; and, as early as 2000 for the 11 offsite (PCE plume) monitoring wells[4] installed by the New York State Department of Environmental Conservation (NYSDEC). Those results, when viewed over time, outlined a decrease in dissolved chlorinated VOC concentrations in samples from both plumes (PCE and TCE) that led to the interpretation (as presented in the OU-2 RI conceptual site model) that the chlorinated concentrations appeared to be decreasing under ambient conditions. Breeze-Eastern, recognizing the importance of this finding, elected to voluntarily (the work is not part of a prescribed program) continue groundwater monitoring of the expanded well network following submission of the OU-2 RI to the NYSDEC

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[1] Operable Unit No. 2.

[2] The 2012 extent of both the PCE and TCE plumes as interpreted (for the OU-2 RI) from onsite and offsite monitoring well sample data, and groundwater profile sample results collected from locations GP-1 through GP-13 installed in the neighborhoods downgradient of the former TTC facility.

[3] The New York State Department of Environmental Conservation, beginning in 2000, investigated several former and (then) active dry-cleaning facilities (the Fresh and Clean Cleaners, Station Valet Cleaners, Glen Head Cleaners, Charrell Cleaners, and others) known to have released PCE to the environment (the location of the cleaners relative to the former TTC site is shown on Sheet 1). See the New York State Department of Environmental Conservation's 2000 *Preliminary Site Assessment for the Glen Head Region Groundwater Plume* and the 2007 *Site Characterization Report, Glen Head Groundwater Plume* for additional information.

[4] The 11 New York State Department of Environmental Conservation-owned groundwater monitoring wells installed in the neighborhoods southeast (upgradient) of the former TTC site that were used by the Department to investigate the nature and extent of the PCE releases.

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in April 2018. The intent was to assess the ongoing water quality conditions and collect additional data to document the identified attenuation trends. Fourteen monitoring wells, including seven onsite[5], designated wells TT-MW-02R[6], TT-MW-04, TT-MW-05, and TT-MW-07 through TT-MW-10R; and seven NYSDEC-owned offsite groundwater monitoring wells, designated MW-01 and MW-03 through MW-08, installed in the neighborhoods southeast (upgradient) of the former TTC site were sampled for site-specific VOCs (PCE, TCE, *cis*- and *trans*-1,2-dichloroethene [DCE], and vinyl chloride; Sheet 1). The results of three groundwater monitoring events conducted between October 2018 and February 2020, which are detailed in the July 2020 *Periodic Groundwater Monitoring Results* report[7], revealed a continuation of chlorinated VOC mass reduction in the samples collected in wells from both plumes. The concentrations of PCE in most of the groundwater samples from the regional plume wells decreased between 30 and 75 percent over the 15-month reporting period, and, when compared to historical data detailed in the OU-2 RI, were up to 99-percent lower than the peak concentrations detected more than a decade earlier. Similar concentration reductions were noted in the samples collected from onsite monitoring wells screened in the TCE plume: the concentration decreases were up to two orders of magnitude (99 percent) below historical highs, with the February 2020 TCE concentrations in samples from onsite wells TT-MW-02R and TT-MW-10R (these two wells historically contained the highest concentrations of TCE at the former TTC facility) less than 100 micrograms per liter (µg/l).

The results from the post-investigation monitoring confirm the interpretation and conclusions presented in the OU-2 RI demonstrating that the previously identified attenuation continues in both the offsite (regional) PCE and the onsite TCE plumes. The magnitude of the changes observed in dissolved chlorinated VOC concentrations over time are striking; however, it is important to recognize that the water quality data alone are insufficient to characterize the site groundwater. The concern is not one of sampling frequency, but, rather, the location of wells within the existing (onsite) monitoring network and the specific analytes evaluated. Only two of the eight monitoring wells remaining at the site, TT-MW-02R and TT-MW-10R, are screened within the previously delineated bounds of the TCE plume, and both are positioned along the western (downgradient) property line (Sheets 2 and 3). No serviceable wells are located upgradient (east) of these two wells: historical wells TT-MW-01, TT-MW-03, and TT-MW-11, all three of which were positioned east of the former main building were inadvertently destroyed; and, prior to its demolition in 2016, the presence of the main building precluded the installation of monitoring wells between the two property lines. The result is that the *current* groundwater conditions between the historical source area (near the former vapor degreasing and chrome plating area) and the western property line is not fully characterized (i.e., the results from the wells are not necessarily representative of the upgradient portions of the onsite TCE plume). Understanding the scope of the affected groundwater in this portion of the site, including the geochemistry of the water-bearing zone, the level of post (soil) remediation attenuation in the groundwater, and the corresponding amount of dissolved chlorinated VOC mass remaining, will inform the development of the upcoming *OU-2 Feasibility Study*.

WSP developed this supplemental groundwater investigation to address the identified characterization gaps in the onsite portion of the TCE plume. The work, outlined below, includes direct-push-based groundwater profiling at locations along transect lines oriented perpendicular to the groundwater flow, and the concurrent collection of groundwater samples from select onsite wells (Sheet 3). The intent is to characterize both the horizontal and, through the collection of multiple samples per profile boring, vertical extent of TCE-affected groundwater at and near the site. The data from these profiles (and the wells) will be used to refine the delineation of the plume and the understanding of the groundwater geochemical environment, which, in turn, will aid in the identification and screening of potentially applicable remedial technologies and development of the proposed remedial alternative. The profiling will also allow any future onsite groundwater monitoring wells (if necessary) to be located within the areas of affected groundwater. No groundwater profiling will be targeted at the regional PCE plume overlapping the southern portion of

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[5] The groundwater monitoring wells installed by Geomatrix Engineering LLC (and others) during historical investigations at the site conducted before 2009. See the OU-2 RI for additional information.

[6] Onsite monitoring wells TT-MW-02 and TT-MW-10 were inadvertently destroyed during the 2018 building demolition activities. Both wells were replaced in September 2018 by wells with the same construction and approximate location as the original wells to maintain data continuity. The new wells are designated by the old well identification followed by an "R" suffix to indicate their status as replacement wells (e.g., TT-MW-02R and TT-MW-10R). See the July 2020 *Periodic Groundwater Monitoring Results* report for additional information.

[7] All the groundwater monitoring results, including those conducted after the *Periodic Groundwater Monitoring Results* report was submitted, will be included in the upcoming *OU-2 Feasibility Study*, as requested by the NYSDEC in their October 14, 2020, OU-2 *Remedial Investigation Report* approval letter.

the site. The dissolved PCE in the regional plume is not attributed to the former TTC operations and does not warrant additional evaluation.

The investigation work detailed below will be conducted following the procedures outlined in the NYSDEC's *Technical Guidance for Site Investigation and Remediation* (DER-10), dated May 2010; the approved 2011 *Residential Reclassification and Feasibility Study Work Plan;* the November 2015 *Community Air Monitoring Plan* (part of the NYSDEC-approved *Interim Site Management Plan*); the site-specific *Quality Assurance Project Plan* (QAPP; Enclosure A); the updated site-specific *Health and Safety Plan* that incorporates procedures related to the *Novel Coronavirus 2019* (i.e., COVID-19; Enclosure B); and WSP's Standard Operation Procedures (SOPs). A copy of the referenced SOPs is provided in Enclosure C. It is important to note that this letter work plan is intended as a follow-on to the OU-2 RI report and the subsequent *Periodic Groundwater Monitoring Results* report and, as such, is not intended to be comprehensive. Historical investigations, including the concurrent remedial investigations performed onsite and the NYSDEC evaluation of the upgradient dry-cleaning sites (as presented in the NYSDEC's 2000 *Preliminary Site Assessment for the Glen Head Region Groundwater Plume* and the 2007 *Site Characterization Report, Glen Head Groundwater Plume*); the 2011 groundwater profiling conducted as part of the OU-2 RI; and the corresponding delineation of the plumes of affected groundwater, are summarized, where appropriate, for context but are otherwise not detailed in this work plan. Likewise, information regarding the soil remediation activities (designated as Operable Unit No. 1), the soil gas evaluation (part of the OU-2 activities, but reported separately), and the post-closure[8] work (building demolition, subsurface drainage structure abandonment activities) at the site are not discussed in this document except to provide a setting for the analysis of the groundwater data.

APPROACH

The supplemental groundwater investigation will consist of 13 onsite groundwater profile locations installed in the central portion of the former TTC site with five additional groundwater profile locations directly west of the property. The onsite profile locations, designated GP-15 through GP-27, will be positioned in three section lines, A through C, oriented transverse to the west-northwest groundwater flow direction (Sheet 3). The intent is to create a relatively dense sampling grid over the previously delineated plume (the 2012 onsite delineation[9] of TCE groundwater is depicted on Sheet 3) that will allow the extent of affected groundwater to be refined. Five of the profiles will be located approximately 115 feet apart along Section A. The section line was positioned to allow the groundwater to be sampled directly beneath the former vapor degreasing and chrome plating operations at the facility (GP-16 and GP-17), and sidegradient locations to the south (GP-15) and north (GP-18 and GP-19). Locations GP-15 and GP-19 were positioned outside the previous delineation of the TCE-affected groundwater plume to aid in refining the delineation and assessing the background geochemical environment (see below). Five additional profile locations are located along Section B approximately 75 feet west (downgradient) of Section line A. The profiles are spaced approximately 125 feet apart but are offset to the north from those in Section A to account for the west-northwest groundwater flow direction and the shape of the 2012 TCE plume delineation. Profiles GP-20 and GP-24 are positioned at the southernmost and northernmost points, respectively, along the section line (outside of the 2012 TCE delineation) with profiles GP-21 through GP-23 located within the mapped extent of the plume.

Section C is located 75 feet further west (downgradient) and coincides with the location of the existing wells TT-MW-02R and TT-MW-10R (Sheet 3). The intent is to use the existing wells (TT-MW-02R and TT-MW-10R are approximately 125 feet apart) to augment the groundwater profile data. Three groundwater profiles, GP-25 through GP-27, are positioned along the section to provide data sidegradient (GP-25 and GP-27) and within (GP-26) the delineated extent of the plume.

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[8] The Operable Unit No. 1 remediation activities, including those associated with 40 subsurface drainage structures identified at the site, were completed in 2012 and later reported in the November 2015 *Operable Unit No. 1 (OU-1) Remedial Activities Construction Completion Report* (CCR). The NYSDEC reviewed and approved the CCR in a letter dated February 9, 2016. The approval acknowledged the completion (and closure) of the OU-1 soil remedial activities at the site.

[9] The contours on Sheet 3 depict 2012 TCE isoconcentrations of 100 µg/l or greater only for planning purposes. WSP concluded that, based on the periodic groundwater monitoring results, that the 100 µg/l line likely overestimates the current extent of the affected groundwater at the site.

The onsite investigation will be augmented by five groundwater profile locations in a section line (Section D) approximately 170 feet west of Section C along the right-of-way for Todd Drive East (i.e., beyond the former TTC property line). This section line is coincident with groundwater profiles collected in 2011 and is designed to provide additional information on the plume directly downgradient of the former facility. Profiles GP-28, GP-30, and GP-32 were located adjacent to 2011 profile locations GP-07, GP-05, and GP-04, respectively, with profile GP-29 and GP-31 positioned intermediate of those locations. All the planned onsite and offsite profile locations will be surveyed in advance by a New York-licensed land surveyor to ensure proper location during the sampling activities (see *Scope of Work* Section below).

A minimum of two water quality samples will be collected from each groundwater profile location to provide vertical delineation of the affected groundwater with additional monitored natural attenuation (MNA) parameters (detailed below) collected from onsite profiling locations GP-17, GP-19, GP-21, and GP-22; and offsite locations GP-28 and GP-30. These locations are within the 2012 delineation of the onsite portion of the plume and are positioned along the projected migration pathway from the suspected release area (i.e., the former vapor degreasing and chrome plating portion of TTC) west-northwest to the downgradient property line. The MNA samples from locations GP-19 and GP-28, which are outside the plume delineation, will provide an indication of the background (i.e., non-impacted) geochemical conditions.

The analytical samples at each profile location will be collected at depths of approximately 125 and 135 feet below ground surface (bgs), which corresponds to 10 and 20 feet below the upper groundwater surface, respectively. These depths were selected based on the average depth to groundwater (approximately 115 feet bgs, based on the February 2020 periodic groundwater sampling) determined from gauging the existing monitoring wells; and, the historical VOC sampling results, which indicated that the affected groundwater for onsite (and near site) is in the upper 10 to 15 feet of the water-bearing zone. The upper sample interval was set a few feet below the water table elevation to ensure that the 4-foot-long screen of the groundwater sampler is completely submerged and there is sufficient head to ensure the water flows into the sampler. The actual sample depths may be adjusted slightly by WSP's onsite hydrogeologist, based on the conditions (e.g., actual water table elevations, lack of groundwater flow, etc.) encountered during the profiling activities.

WSP will also collect groundwater samples from select monitoring wells concurrent with the profiling activities. Monitoring wells TT-MW-02R and TT-MW-10R, both of which are along Section C, will be sampled for site-specific VOCs and the MNA parameters (detailed below) using low flow sampling techniques rather than the passive diffusion bag (PDB) samplers used for the periodic site-wide groundwater monitoring (Sheet 3). This approach was adopted to allow the *in situ* measurements of the groundwater (e.g., specific conductance, oxygen-reduction potential [ORP], pH, etc.) and the collection of the geochemical samples (the PDB samplers are not suited for the collection of MNA parameters). The analytical groundwater samples will be collected in accordance with low flow sampling techniques specified in the U.S. Environmental Protection Agency's (EPA's) *Low-flow (Minimal Drawdown) Groundwater Sampling Procedures* (EPA 1996) and WSP's standard operating procedure 11 (Enclosure C).

The methods used for the hydraulic monitoring and analytical sampling are presented below.

SCOPE OF WORK

WSP will conduct the following work as part of the supplemental groundwater investigation activities:

- survey to mark out the proposed groundwater profile locations at the site;
- groundwater profiling at 18 proposed locations both on and offsite; and,
- collection of groundwater samples from monitoring wells TT-MW-02R and TT-MW-10R (concurrent with profiling; Sheet 3)

A New York-licensed land surveyor will mobilize to the site in advance of the planned groundwater profiling to facilitate the accurate placement of the 18 planned profile borings (Sheet 3). The onsite profile locations, all of which are in unpaved (grassy) areas of the site (the building has been demolished and all hardscaping removed from the site), will be marked by a wooden stake with the pre-assigned groundwater profiling location identification numbers (e.g., GP-15, GP-16, etc.) written on the wood or on

attached fluorescent flagging. The proposed offsite profile locations, which are located along Todd Drive East, will be marked by the surveyor with spray paint. All the profile locations will be measured to the nearest 0.1 foot relative to the New York State Plane Coordinates, North American Datum of 1983 (NAD83).

The surveyor will return after the profiling work is completed, if necessary, to survey the location(s) of any points that were moved due to conflicts with utilities or some other subsurface obstacle.

GROUNDWATER PROFILING

The 18 planned groundwater profile borings will be installed using a Geoprobe® 8000 series direct-push drilling rig (or equivalent) equipped with 2.25-inch diameter drilling rods, a Geoprobe® screen point 15 (SP-15) groundwater sampler, and an expendable drill point (Sheet 3). The drilling rods will be advanced from the ground surface to the bottom of the interval to be profiled: approximately 135 feet below ground surface (bgs; nominally 20 feet below the upper surface of the water table at 115 feet bgs). The rods will be retracted approximately 4 feet to expose the screen point sampler to the surrounding formation and allow groundwater to enter the drill string once the maximum depth has been achieved. A minimum of three rod-volumes of groundwater will be purged from the drilling/sampling apparatus using new polyethylene tubing fitted with a stainless-steel check-ball valve to ensure representative samples. Analytical samples will be collected using the same polyethylene tubing and stainless-steel check-ball valve once the purge is complete. At the completion of the purge and sample process for the bottom interval, drilling rods will be retracted approximately 10 feet (with the screen point sampler exposed) to the upper sample interval (125 feet bgs) and the purge and sample process repeated.

The analytical samples, including the appropriate quality assurance and quality control (QA/QC) samples (outlined below and detailed in the QAPP; Enclosure A), will be placed in the appropriate laboratory-supplied glassware, labeled, and packed in coolers with wet ice. The samples will be shipped via overnight express to an Environmental Laboratory Accreditation Program-certified (ELAP-certified) analytical laboratory for analysis of:

- site-specific VOCs (i.e., PCE, TCE, and their breakdown products, *cis*- and *trans*-1,2-DCE, and vinyl chloride) by U.S. EPA Method 8260D; and, for select locations, the following MNA parameters,
- Alkalinity by Method SM 2320B;
- Chloride, nitrate, nitrite, and sulfate by EPA Method 300;
- Dissolved gases ethane, ethene, methane, and carbon dioxide by Method AM20GAX;
- Ferrous iron by Method HACH 8146;
- Sulfide by EPA Method SM4500S2 F2011; and,
- Dissolved organic carbon by EPA Method SM 5310B.

All the samples will be handled and shipped in accordance with WSP's SOP 3 (Enclosure C).

The groundwater profile boreholes will be backfilled with clean sand (or bentonite for the offsite locations) and capped with material to match the surrounding ground cover (e.g., asphalt, concrete) in accordance with the procedures in DER-10 for Class 2 Inactive Hazardous Waste Sites. WSP does not anticipate moving the surveyed onsite groundwater profiling locations due to buried structures or other obstacles. The main and outbuildings at the site have been demolished and the subsurface infrastructure has been removed in preparation for the site sale and redevelopment. Relatively small relocations of up to 3 feet will be noted in the field notebook for later adjustment on the final drawings and in any groundwater analysis software. Relocations beyond 3 feet from the pre-surveyed location will be marked in the field with wooden stakes, as appropriate, for later location by a New York-certified land surveyor.

GROUNDWATER MONITORING WELL GAUGING AND SAMPLING

WSP is proposing to collect concurrent depth-to-groundwater measurements and water quality samples from the two onsite monitoring wells, TT-MW-02R and TT-MW-10R, along Section C near the western property line of the site (Sheet 3). Each well will be uncapped and allowed to stand for a minimum of 15 minutes (for equilibrium with the atmosphere) and then gauged using

an electronic water-level indicator. The depth-to-water measurements will be made to the nearest 0.01-foot using an electronic water level meter with the results recorded in the field notebook.

The purge and subsequent groundwater sampling of both monitoring wells will be conducted using a QED Environmental Systems, Inc., (QED) MP-15 Controller® (to adjust the flow rates) and Sample Pro® portable bladder pump equipped with disposable bladder and tubing (or equivalent). The bladder pump will be positioned at the midpoint of each monitoring well screen and purged at a rate between 0.2 and 0.5 liters per minute. The extracted groundwater will be monitored (during the purge) for temperature, specific conductance, dissolved oxygen (DO), pH, ORP, and turbidity using a Horiba U-52 water quality meter equipped with a flow-through cell (or equivalent). Purging will continue until water quality parameters stabilized (±10-percent for temperature, turbidity, DO, and ORP; ±0.1 unit for pH; ± 3-percent for specific conductance; and drawdown variance less than 0.3 feet).

Groundwater analytical samples (including those for QA/QC) will be collected directly from the pump's discharge tubing once the purge parameters have stabilized, and the flow-through cell removed. The samples will be placed in the appropriate laboratory-supplied, labeled glassware, packed on ice, and shipped (via overnight express) to the designated ELAP-certified analytical laboratory for analysis of site-specific VOCs and the MNA parameters, consistent with the groundwater profile work. All the samples will be handled and shipped in accordance with WSP's SOP 3 (Enclosure C).

QUALITY ASSURANCE/QUALITY CONTROL

Field QA/QC procedures for the proposed sampling activities will include the collection and analysis of blind duplicate samples, matrix spike and matrix spike duplicates (MS/MSDs), equipment rinsate blanks (for non-dedicated sample equipment), and trip blanks. The blind duplicate samples will be analyzed with the other samples to evaluate the reproducibility of the sample collection and analytical procedures, and the MS/MSD samples will be collected to evaluate the effect of the matrix on the analytical protocol. The equipment rinsate blanks will be collected by pouring analyte-free water over the decontaminated sampling equipment used to collect the groundwater samples. The rinsate blank is used to determine if contaminants are being inadvertently introduced from the sampling equipment or by the sampling procedures. Finally, a trip blank will accompany the sample containers from the laboratory to the field and the samples from the field to the laboratory. The trip blank is used to assess cross-contamination during transit. Quality assurance and quality control samples will be collected during the proposed activities in accordance with the QAPP and WSP's SOP 4 (Enclosures A and C, respectively).

DECONTAMINATION PROCEDURES AND WASTE MANAGEMENT

All downhole and non-dedicated equipment used for the investigation will be decontaminated before work begins, between each borehole, and at the end of site activities using a steam jenny or non-phosphate soap, as appropriate, in accordance with WSP's SOP 6 (Enclosure C). Investigation-derived waste generated during the drilling and sampling activities, including decontamination rinsate, residual soil cuttings, and other solid waste (e.g., poly sheeting, personal protective equipment, pump bladders, etc.) will be placed in Department of Transportation-compliant 55-gallon steel drums and managed during the investigation in accordance with WSP's SOP 5. The drums will be staged onsite after the field activities have been completed for later offsite disposal in accordance with state and federal regulations.

PROJECT SCHEDULE AND REPORTING

The planned groundwater profiling and monitoring well sampling field activities will be initiated approximately six weeks following the Department's approval of this work plan, depending on weather and subcontractor availability. The profiles and groundwater monitoring activities are anticipated to require up to 15 days to complete. Analytical samples collected during the onsite activities will be analyzed on a standard two-week turnaround-time, with the final data anticipated within four weeks of completing the field work. All final analytical results will be evaluated and assessed for data usability by a third-party validator. The validation will be completed within six weeks of receiving the results from the analytical laboratory.

The results of this supplemental groundwater investigation will be incorporated into the *OU-2 Feasibility Study*, which will be submitted within 90 days of receiving the final, validated groundwater data. This approach is consistent with the Department's request for the *OU-2 Feasibility Study* completion within 90 days of when supplemental monitoring has been finalized, as detailed in the October 14, 2020, OU-2 RI approval letter.

Breeze-Eastern is committed to completing the investigation and implementing an appropriate remedy to address the affected groundwater at the site. Please do not hesitate to contact me at (315) 374-8494 or John Simon at (202) 505-1906, if you have any questions or comments regarding this work plan.

Sincerely yours,

David P. Bouchard
Senior Project Director

DPB:rlo
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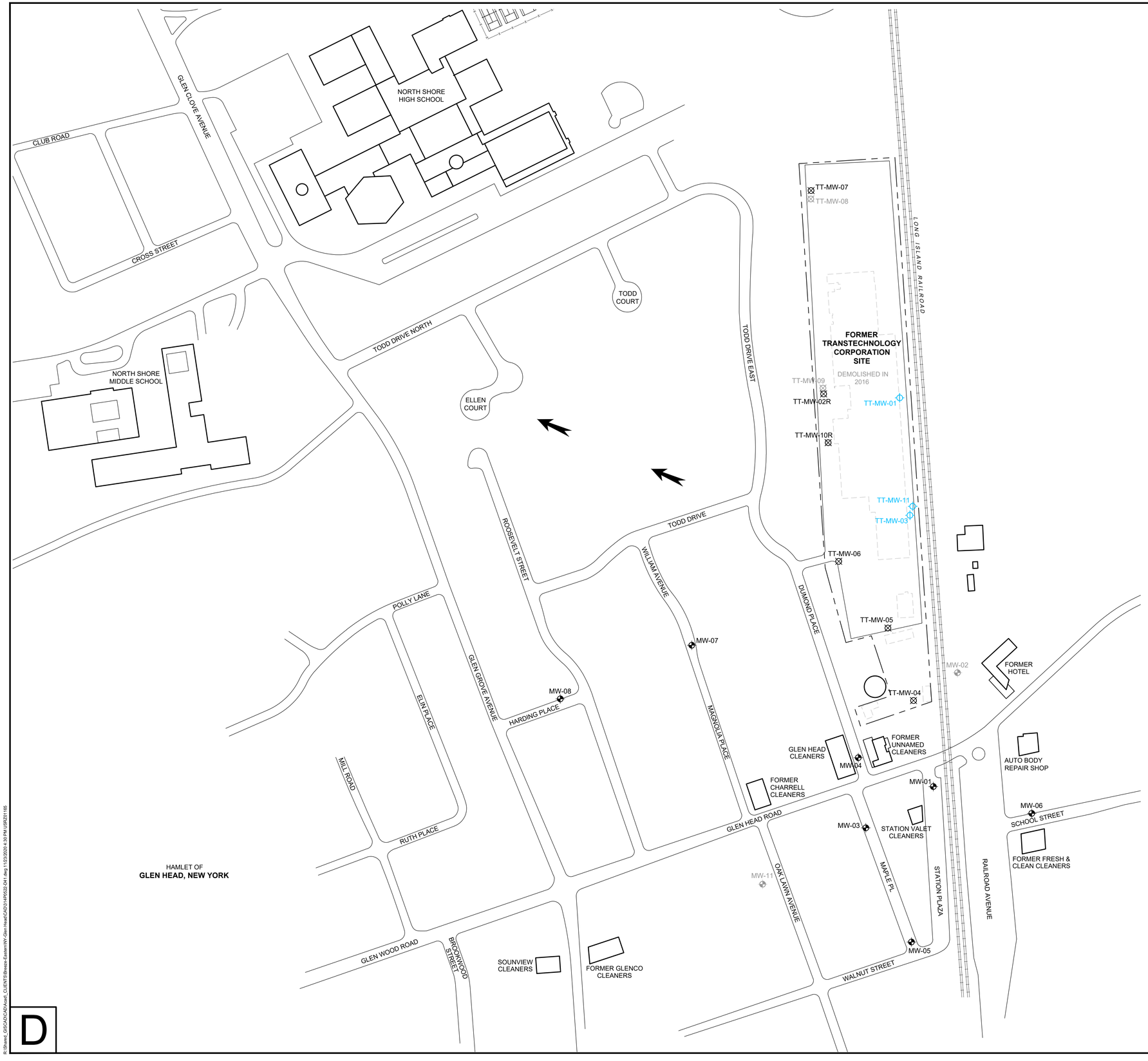
Enclosures

cc: Mr. Anthony C. Perretta, New York State Department of Health
Ms. Charlotte Bethoney, New York State Department of Health
Mr. Carlos Pareja, Nassau County Department of Health
Mr. John A. Simon, Gnarus Advisors LLC

SHEETS



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REVISIONS

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1	Revised:			
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DATE

DRAWN BY RAF 11/23/2020
CHECKED
APPROVED AM 11/23/2020

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER/LICENSED PROFESSIONAL LAND SURVEYOR/LICENSED PROFESSIONAL GEOLOGIST. ALTERATIONS TO THIS DRAWING BY ANY PARTY OTHER THAN THE ABOVE NOTED LICENSED PROFESSIONAL, UNLESS SUCH PARTY HAS OBTAINED THE WRITTEN CONSENT OF THE ABOVE NOTED LICENSED PROFESSIONAL, IS IN VIOLATION OF THE LAW.

SITE LOCATION AND GROUNDWATER MONITORING WELLS

FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE-EASTERN LLC
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SHEET 1

Drawing Number
314P0522.000-D41

LEGEND

- GP-01 ● GROUNDWATER PROFILE LOCATION
- TT-MW-04 ⊕ ONSITE GROUNDWATER MONITORING WELL
- MW-04 ⊕ OFFSITE GROUNDWATER MONITORING WELL
- TT-MW-11 ⊕ FORMER GROUNDWATER MONITORING WELL
- [38.3] PCE CONCENTRATIONS IN µg/l
- 25 PCE CONCENTRATION CONTOUR
- PROPERTY LINE
- ND PCE NOT DETECTED AT OR ABOVE REPORTING LIMIT
- NS WELL NOT SAMPLED
- GROUNDWATER FLOW DIRECTION

LEGEND

- GP-01 ● GROUNDWATER PROFILE LOCATION
- TT-MW-04 ⊕ ONSITE GROUNDWATER MONITORING WELL
- MW-04 ⊕ OFFSITE GROUNDWATER MONITORING WELL
- TT-MW-11 ⊕ FORMER GROUNDWATER MONITORING WELL
- [250] TCE CONCENTRATIONS IN µg/l
- 25 TCE CONCENTRATION CONTOUR
- PROPERTY LINE
- ND TCE NOT DETECTED AT OR ABOVE REPORTING LIMIT
- NS WELL NOT SAMPLED
- GROUNDWATER FLOW DIRECTION

NOTES:

1. TCE DATA FROM GROUNDWATER PROFILE SAMPLES THAT IS ATTRIBUTED TO THE REGIONAL PLUME (i.e., CO-LOCATED WITH LARGER PCE RESULTS) WERE OMITTED FROM THE CONTOURED DATA SET. SEE THE APRIL 2018 OU-2 REMEDIAL INVESTIGATION REPORT FOR ADDITIONAL INFORMATION.
2. TT-MW-09 WAS NOT USED FOR CONTOURING.

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3	Revised:	Chkd: Appr.:

SEAL

DATE

DRAWN BY	RAK	1/23/2020
CHECKED	KJM	1/23/2020
APPROVED		

PCE AND TCE CONCENTRATIONS IN GROUNDWATER (2012)

FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

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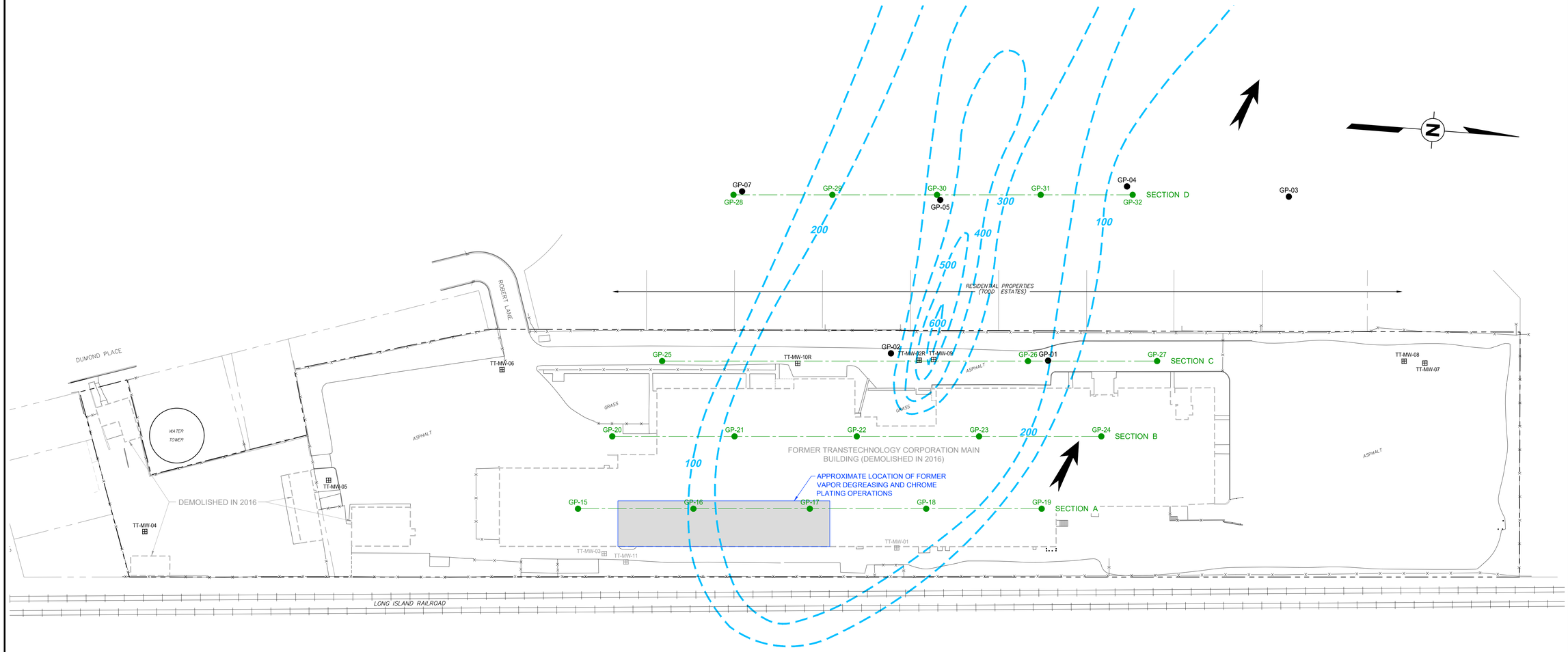
SHEET 2

Drawing Number
314P0522.000-D42



LEGEND

TT-MW-09	MONITORING WELL (1993–1996)
TT-MW-03	DAMAGED OR DESTROYED MONITORING WELL
	PROPERTY BOUNDARY
	FORMER BUILDING LOCATION
GP-05	OPERABLE UNIT NO. 2 REMEDIAL INVESTIGATION GROUNDWATER PROFILE SAMPLE (2011)
100	2012 TCE ISOCONCENTRATION CONTOUR IN µg/l
GP-22	PROPOSED PRE–DESIGN GROUNDWATER PROFILING LOCATION
	GROUNDWATER FLOW DIRECTION

NOTE:

HISTORICAL TRICHLOROETHENE ISOCONCENTRATION CONTOURS ARE DEVELOPED FROM GROUNDWATER PROFILE AND MONITORING WELL SAMPLES COLLECTED AS PART OF THE OPERABLE UNIT NO. 2 REMEDIAL INVESTIGATION AND ARE USED AS A GUIDE FOR PLANNING ONLY. SEE TEXT FOR ADDITIONAL INFORMATION.

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

50 0 50 100
SCALE, FEET

SAMPLING LOCATIONS ARE APPROXIMATE

D

REFERENCE:

REMEDIAL INVESTIGATION REPORT, TRANSTECHNOLOGY CORPORATION, GLEN HEAD, NEW YORK SITE, SITE NUMBER 1–30–101, PREPARED BY GEOMATRIX ENGINEERING, LLC, SEPTEMBER 2005.

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REVISIONS

REV	DESCRIPTION		
1	Revised:	Chkd:	Appr.:
2	Revised:	Chkd:	Appr.:
3	Revised:	Chkd:	Appr.:

SEAL

DATE

DRAWN BY

CHECKED

APPROVED

PROPOSED SUPPLEMENTAL GROUNDWATER INVESTIGATION SAMPLE LOCATIONS

FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE–EASTERN LLC
WHIPPANY, NEW YORK

WSP USA Inc.
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TEL: +1 617.426.7330

SHEET 3

Drawing Number
314P0522.000–D51

ENCLOSURE A – QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

BREEZE-EASTERN LLC

PROJECT NO.: 31400522.000
DATE: SEPTEMBER 1, 2022 (VERSION 3)

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APPENDICES

1 INTRODUCTION

WSP USA Corp., on behalf of Breeze-Eastern LLC, has prepared this *Quality Assurance Project Plan* (QAPP) for the former TransTechnology Corporation (TTC) facility at 1 Robert Lane, in the Hamlet of Glen Head[1], New York (Figure 1). The 7.75-acre site is in a mixed-use commercial and residential area in the western portion of Long Island (Sheet 1). The property was developed in the late 1950s and formerly consisted of a 96,000 square-foot main manufacturing building that was used to produce aircraft actuators, printed circuit boards, and other electronic components. The plant operated as Lundy Electronics Company and, after its purchase in 1984, as TTC[2] for more than 35 years before being decommission in 1994. The property is currently unoccupied, and all the onsite buildings have been razed.

Environmental work conducted around the time of the facility closure, and during subsequent investigations, revealed chlorinated volatile organic compounds (VOCs), including trichloroethene (TCE), *cis*- and *trans*-1,2-dichloroethene (1,2-DCE) and vinyl chloride; metals (e.g., primarily chromium); and polycyclic aromatic hydrocarbons above their respective evaluation criteria in soil samples. The investigations also revealed an area of TCE-affected groundwater attributable to the operations at the former TTC facility comingled with a relatively large area of tetrachloroethene-affected (PCE-affected) groundwater extending from multiple dry-cleaning facilities southeast of the site (the extent of the TCE and PCE-affected groundwater is depicted on Sheet 2). The investigation findings led to a 2002 *Order on Consent*[3] and, following additional investigation, a 2006 *Record of Decision* (ROD[4]) for the remedial excavation and offsite disposal of affected soil, designated as Operable Unit No. 1 (OU-1). The soil remedy was completed in 2012 and OU-1 was closed by the New York State Department of Environmental Conservation (NYSDEC) in February 2016[5]. Investigation of chlorinated VOC-affected[6] groundwater and soil gas at the site, designated by the Department as Operable Unit No. 2 (OU-2), is ongoing.

This QAPP was prepared to provide guidance for the continuing investigation and remediation activities at the site detailed in this plan. Specifically, the document describes the quality assurance and quality control (QA/QC) sampling protocols that will be used to ensure representative and technically defensible data. The plan was prepared in accordance with the NYSDEC's *Technical Guidance for Site Investigation and Remediation* (DER-10), dated May 3, 2010, and WSP's Standard Operating Procedures (SOPs). The sampling activities detailed below are being performed in accordance with the 2006 ROD and the respective work plans, as indicated.

A copy of the approved QAPP will be kept at the site during implementation of investigation or remediation. All personnel involved in the implementation of sampling programs will be properly trained to ensure strict adherence to the QAPP and other relevant plans.

1.1 ORGANIZATION AND SCOPE

This document details the planned investigation activities at the site and the procedures and protocols designed to ensure the quality and representativeness of the samples collected during that work. The plan is divided into nine sections, including this introduction (Section 1):

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[1] Glen Head is an unincorporated area in the Town of Oyster Bay, Nassau County, New York.

[2] TransTechnology Corporation changed its name to Breeze-Eastern, the current owners of the site, in 2006.

[3] The 2002 *Order on Consent* (Index #WI-0913-02-02) required that TTC undertake remedial work to address site impacts to soil and groundwater.

[4] *Record of Decision*, TransTechnology, Operable Unit No. 1, Glen Head, Nassau County, New York, Site Number 1-30-101, dated June 2006.

[5] The OU-1 remedial activities were documented in the OU-1 *Remedial Action Construction Completion Report* (CCR), dated November 9, 2015. The report detailed not only the soil and structure remediation at the site but included the Interim Site Management Plan (SMP). This document, which includes detailed the soil management areas (depicted on Sheet 1); the characteristics of, and the procedures for, managing *Discovered Contamination* (as defined in the SMP); and an *Excavation Work Plan* for any onsite (intrusive) activities, is being used to govern the post-closure investigation and remediation conducted at the site to support the redevelopment of the property.

[6] The metal and polycyclic aromatic hydrocarbon-impacted soil identified at the site was addressed during the OU-1 remediation and the associated post-closure activities. Chlorinated VOCs are the only remaining chemicals of concern at the site and are the subject of the planned investigation and other activities detailed elsewhere in this plan.

- Section 2 presents the project organization including key members of both WSP's project team and the analytical laboratories selected for the work;
- Section 3 outlines the chemicals of concern at the former TTC facility, the planned onsite activities, and the associated field procedures, including the methods used for groundwater profiling and monitoring, vapor assessments, and surface soil sampling;
- Section 4 details the data quality objectives for the sampling work at the site, the anticipated analytical methods, and, as part of the field sampling requirements, the type and collection frequency for QA/QC samples;
- Section 5 discusses the documentation and the chain-of-custody requirements for the field work;
- Section 6 provides the calibration and preventative maintenance procedures for field equipment used at the site;
- Section 7 presents the methods for documenting field-based data, the requirements for the analytical laboratory internal quality control and deliverables, the steps for the validation of the investigation results, and the reporting (to the NYSDEC) and management of all project-related information;
- Section 8 outlines corrective action procedures for addressing field-based concerns or post-investigation quality issues; and,
- Section 9 presents a list of acronyms used in the document.

It is important to note that this document is not intended to be a comprehensive review of the work at the site but rather a *focused* plan that details the specific QA/QC procedures required to implement the planned sampling activities. Background information, including the site development history, operational background, and previous investigations, all of which are detailed in preceding reports, is not presented here (except for the summary in the *Introduction* Section above) for simplicity. Likewise, details regarding the overall approach for the OU-2 activities, the conceptual site model, and fate and transport of the affected groundwater are not discussed or presented on the included figures, except where necessary to provide context. References to the work plans, reports, or other documents relevant to the planned work are included in the text, where appropriate.

2 PROJECT TEAM

WSP is the principal consultant to Breeze-Eastern, the corporate owners of the former TTC site and, as such, will be responsible for performing all sampling, data management, and reporting. Mr. David P. Bouchard, a WSP Senior Project Director, is the Breeze-Eastern client manager and, for the purposes of this plan, the project manager (PM). Mr. Bouchard has the responsibility for ensuring the sampling and analysis activities for the site are conducted in accordance with this QAPP and that the work meets or exceeds Breeze-Eastern's expectations. Specifically, Mr. Bouchard will manage the coordination and implementation of the site investigation and remedial activities, provide senior technical and resource management support, and routinely evaluate program performance.

The project team also includes Ms. Amy Romano, a WSP Senior Technical Manager, who will serve as the project quality assurance officer (QAO). Ms. Romano, in this role, is responsible for all aspects of QA/QC related to the sampling activities. She will coordinate field work with the WSP PM; the laboratory QA managers (detailed below); and Ms. Christina Rink of Laboratory Data Consultants, Inc. (LDC) of Carlsbad, California[7], the third-part data validator. Ms. Romano will report directly to the PM when corrective action is required to address issues arising from project QA/QC reviews.

The balance of project team will consist of WSP professionals (i.e., the technical staff) with the training and experience necessary to conduct the planned work in accordance with the site-specific work plan and this QAPP. The qualifications for the identified individuals will be reviewed by the PM and onboarded for the work, as necessary. The PM will ensure that all members of the team are familiar with the QAPP and follow the procedures herein.

The names, addresses, and telephone numbers of the WSP project team (i.e., Mr. Bouchard and Ms. Romano) are listed in Table 2.1 below.

Table 2.1 WSP Project Team

Name	Responsibility	Contact Information
David P. Bouchard, WSP Senior Project Director	Project Manager	100 Summer Street, 13th Floor Boston, MA 02110 O: (774) 413-5109 C: (315) 374-8494
Amy M. Romano, WSP Senior Technical Manager	Quality Assurance Officer	7000 E Genesee Street Building D, 2nd Floor Fayetteville, NY 13066 O: (315) 655-3900 C: (315) 374-1175

2.1 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL TEAM

The project team also includes companies outside of WSP that will provide services for the planned work at the site. These WSP anticipates using two New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program-certified (ELAP-certified) analytical laboratories for the planned investigation and remediation activities at the site detailed below. Those laboratories include:

- **SGS North America Inc. – Dayton**, a commercial laboratory in Dayton, New Jersey; and,
- **Centek Laboratories, LLC**, a commercial laboratory in Syracuse, New York.

WSP has coordinated with each laboratory and identified Mr. Michael Earp, a SGS Vice President of Operations as the laboratory director; Ms. Tammy McCloskey, a SGS Senior Project Manager for Environment, Health, and Safety (EHS) as

[7] Laboratory Data Consultants, Inc. is an environmental chemistry QA/QC consulting firm that provides independent, third party data validation and data usability assessments for the sampling activities identified in this plan.

the project manager; and Ms. Olga Azarian, a SGS EHS Quality Manager, as the designated QA/QC manager for the former TTC site. Mr. Russell Pellegrino, the Centek Technical Director, was identified as the laboratory director with Mr. William Dobbin identified as the Centek Lead Technical Director for the TTC project, and Mr. Nick Scala as the QA/QC Control Officer for Centek. The contact information for the analytical laboratory (and data validator) project team members are presented in Table 2.2 below.

Table 2.2 Analytical Laboratory and Validation Team

Name	Responsibility	Contact Information
Tammy McCloskey, SGS Senior Project Manager - Environment, Health and Safety	SGS Project Manager	2235 Route 130 Dayton, New Jersey O: (732) 329-0200 C: (908) 421-3861
Russell Pellegrino, Centek Technical Director	Centek Project Manager	143 Midler Park Dive Syracuse, NY 13206 O: (315) 431-9730 C: (315) 416-2752
Christina Rink, LDC Inorganic Chemist/Project Manager	LDC Project Manager	2701 Loker Avenue West, Suite 220 Carlsbad, CA 92010-6641 O: (760) 827-1100

Both laboratory teams and LDC have agreed to work with WSP's PM and QAO to facilitate all planned sampling and chemical testing activities. The laboratory's QA/QC managers will be responsible for tracking the samples during analysis and ensuring the compliance the laboratory's internal protocols and procedures have been followed. The laboratory project managers, or their designees working under their direction, will serve as the representative for day-to-day contacts with WSP, and with LDC during the data validation. The laboratory project managers will be responsible for all matters relating to the sample analyses at their respective facilities.

Copies of the *Laboratory Quality Manuals* (LQMs) and their internal standard operating procedures for both SGS and Centek are provided in Appendix A.

3 ONSITE ACTIVITIES AND FIELD SAMPLING PROCEDURES

WSP has completed the onsite OU-1 soil remediation and select post-closure activities designed to prepare the site for sale and redevelopment. The current work at the site and the surrounding area (i.e., the study area) is focused on the chlorinated VOC-affected groundwater and soil gas as part of the OU-2 activities. The chemicals of concern (i.e., the site-specific chlorinated VOCs) for the groundwater and soil gas include PCE, TCE, *cis*- and *trans*-1,2 -DCE and vinyl chloride. The planned site activities also include limited surface soil sampling (for lead) associated with the replacement[8] of an elevated water tank on an adjacent parcel near the southern end of the former TTC site (Sheet 1).

The planned projected activities include:

Annual Vapor Monitoring Activities – Two homes in the Todd Estates neighborhood directly downgradient (west) of the former TTC facility were identified for annual indoor air monitoring. The annual activities include concurrent sub-slab, indoor, and ambient (outdoor) air sampling for chlorinated VOCs. The procedures for the annual sampling are detailed below.

Supplemental Groundwater Investigation Activities – The supplemental groundwater investigation includes groundwater profiling and concurrent low flow groundwater monitoring well sampling. The investigation is intended to evaluate the current water quality and geochemical conditions between the historical source area and the neighborhood downgradient of the property in advance of a groundwater focused feasibility study. The profiling will use a direct-push drill rig equipped groundwater sampling device. An outline of the scope of work is presented below.

Groundwater Monitoring – Periodic monitoring samples are collected from five onsite and seven offsite groundwater monitoring wells installed within the study area. The samples are collected for analysis of chlorinated VOCs and typically use passive diffusion bag samplers (PDBs). The PDB deployment and recovery methods and the associated sampling procedures are detailed below.

Surface Soil Sampling – Surface soil samples will be collected to address a potential lead impact to the site (from lead-based paint) due to the abandonment and disassembly of a New York American Water (NYAW) elevated water tank on the adjacent site. An overview of the soil sampling procedures is provided below.

The planned activities for the former TTC facility include the collection of soil, groundwater, and vapor samples. The procedures for the sample collection, including the equipment used and associated decontamination methods, are summarized below. All the work will be conducted in accordance with the site-specific work plans, the procedures in this QAPP, and WSP's SOPs. A copy of the SOPs cited in the text of this plan are presented in Appendix B for reference.

3.1 ANNUAL INDOOR AIR MONITORING

WSP is conducting annual vapor monitoring activities associated with the former TTC facility. The work includes indoor air, ambient (outdoor) air, and sub-slab soil gas monitoring in private residences near[9] the former TTC property (Sheet 2). These activities are a continuation of a 2012 offsite vapor evaluation, which identified the *potential* for impacts to the indoor air quality in two nearby homes due to the presence of chlorinated VOCs in the underlying soil gas. The homeowners agreed that, although no significant concentrations of chlorinated VOCs were detected in the indoor air, the presence of these compounds beneath their home warranted periodic (annual) vapor monitoring as a precautionary measure.

[8] The Sea Cliff Operations District of New York American Water abandoned and replaced a 500,000-gallon elevated steel water tank (on the 0.25-acre lot located on 8 Dumond Place) in 2019 and 2020 using a leased portion of the former TTC property.

[9] The location of the homes with SSDs installed, and those where annual indoor air monitoring is conducted is not shown on the maps associated with this plan. See the *Offsite Indoor Air Evaluation Work Plan (Revision 1)*, dated March 1, 2012 for additional information regarding these private residences.

The vapor sampling activities will be performed in accordance with the NYSDEC-approved the *Offsite Indoor Air Evaluation Work Plan (Revision 1),* dated March 1, 2012; the NYSDOH's *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated May 2017; and WSP's SOPs 13 and 14 (Appendix B). The specific procedures[10] for the work, including the pre-sampling activities (e.g., homeowner interview, building inventory, leak testing for sub-slab soil gas sampling, etc.) that are outside the scope of this QAPP are detailed in the *Offsite Indoor Air Evaluation Work Plan*. The annual sampling work is summarized below.

3.1.1 SUB-SLAB, INDOOR, AND AMBIENT AIR SAMPLE COLLECTION

The annual vapor sampling will occur at the two homes near the former TTC facility once the pre-sampling activities have been completed. Sub-slab soil gas samples will be collected from each home by attaching an appropriately sized section of Teflon® or Teflon®-lined tubing to a previously installed[11] Vapor Pin® and conducting a pre-sample purge to remove dilution air from the tubing and probe assembly. One to three probe volumes of air will be evacuated from each sample location at a rate not exceeding 0.2 liter per minute using hand pump or syringe. The purged air will be collected in a Tedlar® bag to prevent vapors from being released into the indoor air where they could interfere with the sampling process.

Indoor air samples will be collected from the basement and living space of each residence, as appropriate. Concurrent ambient (i.e., outdoor) air samples will be collected using a tripod (or similar device) to suspend the canister approximately 3 to 5 feet above the ground (away from wind obstructions, if possible) in accordance with the NYSDOH Guidance.

All the vapor samples will be collected using evacuated 1-liter Entech Instruments, Inc., (Entech®) canisters, or equivalent, fitted with a 24-hour sample flow regulator pre-set by the analytical laboratory. The canister will be closed (after the sample time has elapsed) and the flow regulator will be removed from the canister to complete the sample collection. The Vapor Pin® sampling probes used for the sub-slab soil gas samples will be capped, and the flush-mounted protective covers replaced after the sampling activities have been completed.

The vapor canisters, including the appropriate QA/QC samples (described in Section 4 – *Quality Assurance Objectives and Criteria*), will be shipped, or transported by courier, under ambient conditions to Centek Laboratories in accordance with WSP's SOP 3 (Appendix B). The samples will be analyzed for site-related chlorinated VOCs (i.e., PCE, TCE, *cis*- and *trans*-1,2-DCE, and vinyl chloride) by U.S. Environmental Protection Agency (EPA) Method TO-15. The data will be provided by Centek as a NYSDEC's Analytical Services Protocols (ASP) Category B deliverable (see *Laboratory Data* Section 7.2 for additional information regarding the specifications for the data package).

3.2 SUPPLEMENTAL GROUNDWATER INVESTIGATION

WSP will conduct supplemental groundwater investigation activities at the former TTC facility. The work includes direct-push-based groundwater profiling at onsite locations along transect lines[12] oriented perpendicular to the groundwater flow, and the concurrent collection of groundwater samples from select onsite wells. The intent is to characterize the geochemical environment, and both the horizontal and (through the collection of multiple samples per profile boring) vertical extent of TCE-affected groundwater at the site. The data from these profiles (and the wells) will be used to refine the understanding of the plume and aid in the identification and screening of potentially applicable remedial technologies.

[10] The annual sampling includes conducting a pre-sampling interview, a building inspection, and materials inventory. The integrity of the sub-slab probes probe seals may also be verified using a tracer gas (in accordance with the NYSDOH guidelines) prior to sampling. These activities are not detailed in this QAPP for clarity. See the 2012 *Offsite Indoor Air Evaluation Work Plan* for additional information.

[11] Sub-slab vapor samples historically collected by installing a temporary probe through the home's concrete floor slab, as detailed in the 2012 *Offsite Indoor Air Evaluation Work Plan*. The conversion to Vapor Pins®, manufactured by Cox-Colvin of Plain City, Ohio, was implemented in 2018. WSP does not anticipate installing temporary probes for future sub-slab sampling.

[12] The groundwater profiles will be collected from onsite locations that correspond to the extent of TCE-affected groundwater depicted on Sheet 1. The sample points, which are detailed in the approved *Operable Unit No. 2 Supplemental Groundwater Investigation Work Plan*, are not shown on the figure for simplicity.

The activities will be performed in accordance with the approved *Operable Unit No. 2 Supplemental Groundwater Investigation Work Plan* and WSP's SOPs. The groundwater profiling and monitoring well sampling scope of work is presented below.

3.2.1 GROUNDWATER PROFILING

The planned onsite groundwater profile borings will be installed using a direct-push drilling rig equipped with 2.25-inch diameter drilling rods, a Geoprobe® screen point 15 groundwater sampler (or equivalent), and an expendable drill point. The drilling rods will be advanced from the ground surface to the bottom of the interval to be profiled: approximately 135 feet below ground surface (bgs; nominally 20 feet below the upper surface of the water table at 115 feet bgs). The rods will be retracted approximately 4 feet to expose the screen point sampler to the surrounding formation and allow groundwater to enter the drill string once the maximum depth has been achieved. A minimum of three rod-volumes of groundwater will be purged from the drilling/sampling apparatus using new polyethylene tubing fitted with a stainless-steel check-ball valve. Analytical samples will be collected using the same polyethylene tubing and stainless-steel check-ball valve once the purge is complete in accordance with WSP's SOP 11 (Appendix B). The drilling rods will then be retracted approximately 10 feet (with the screen point sampler exposed) to the upper sample interval (125 feet bgs) and the purge and sample process repeated.

The analytical samples, including those for QA/QC, will be placed in the appropriate laboratory-supplied glassware (with the method-appropriate preservative), labeled, and packed in coolers with wet ice[13]. The samples will be shipped via overnight express to an analytical laboratory for analysis of:

- site-specific VOCs (i.e., PCE, TCE, and their breakdown products, *cis*- and *trans*-1,2-dichloroethene, and vinyl chloride) by EPA Method 8260C; and, for select locations, the following monitored natural attenuation (MNA) parameters,
- Alkalinity by Method SM 2320B;
- Chloride, nitrate, nitrite, and sulfate by EPA Method 300;
- Dissolved gases ethane, ethene, methane, and carbon dioxide by Method AM20GAX;
- Ferrous iron by Method HACH 8146;
- Sulfide by EPA Method SM4500S2 F2011; and,
- Dissolved organic carbon by EPA Method SM 5310B.

The samples will be handled and shipped in accordance with WSP's SOP 3 (Appendix B). The data will be provided by SGS as a Category B deliverable.

3.2.2 MONITORING WELL SAMPLING

WSP will also collect groundwater samples from select monitoring wells concurrent with the profiling activities. Monitoring wells TT-MW-02R and TT-MW-10R will be sampled for site-specific VOCs and the MNA parameters (detailed above) using low flow sampling techniques rather than the PDB samplers used for the periodic site-wide groundwater monitoring outlined below (Sheet 1). The low flow sampling will allow *in situ* measurements of the groundwater (e.g., specific conductance, oxygen-reduction potential [ORP], pH, etc.) and the collection of the geochemical samples (the PDB samplers are not suited for the collection of MNA parameters). The analytical groundwater samples will be collected in accordance with low flow sampling techniques specified in the EPA's *Low-flow (Minimal Drawdown) Groundwater Sampling Procedures* (EPA 1996) and WSP's SOP 11 (Appendix B).

The purge[14] and subsequent groundwater sampling of both monitoring wells will be conducted using a QED Environmental Systems, Inc., (QED) MP-15 Controller® (to adjust the flow rates) and Sample Pro® portable bladder pump equipped with disposable bladder and tubing (or equivalent). The bladder pump will be positioned at the midpoint of each monitoring well

[13] Groundwater, soil, and waste characterization samples (if collected) will be immediately placed on ice to maintain a temperature of approximately 4°C in accordance with WSP's SOP 3 (Appendix B).

[14] The groundwater elevations will be measured in advance of low flow groundwater purge (i.e., at static conditions). The procedures for the groundwater gauging are omitted from this plan for clarity.

screen and purged at a rate between 0.2 and 0.5 liters per minute. The extracted groundwater will be monitored (during the purge) for temperature, specific conductance, dissolved oxygen (DO), pH, ORP, and turbidity using a Horiba U-52 water quality meter equipped with a flow-through cell (or equivalent). Purging will continue until water quality parameters stabilized (±10-percent for temperature, turbidity, DO, and ORP; ±0.1 unit for pH; ± 3-percent for specific conductance; and drawdown variance less than 0.3 feet).

Groundwater analytical samples (including those for QA/QC) will be collected directly from the pump's discharge tubing once the purge parameters have stabilized, and the flow-through cell removed. The samples will be placed in the appropriate laboratory-supplied, labeled glassware, packed on ice, and shipped (via overnight express) to the designated analytical laboratory for analysis of site-specific VOCs and the MNA parameters, consistent with the groundwater profile work detailed above. All the samples will be handled and shipped in accordance with WSP's SOP 3 (Enclosure B). The data will be provided by SGS as a Category B deliverable.

3.3 GROUNDWATER MONITORING

The periodic groundwater monitoring includes sampling select onsite (Breeze-Eastern owned) and offsite (NYSDEC-owned) groundwater monitoring wells. The current[15] monitoring approach uses no-purge sampling techniques, as detailed in the *Revised Supplemental Remedial Investigation Report for Operable Unit No. 2*, dated June 16, 2016; the approved *Operable Unit No. 2 Supplemental Groundwater Investigation Work Plan*; and WSPs SOP 11 (Appendix B). The sampling procedures, including the deployment of PDB samplers, the monitoring well gauging[16], and PDB recovery are the same for both onsite and offsite monitoring wells.

3.3.1 PASSIVE DIFFUSION BAG GROUNDWATER SAMPLING

Water quality samples will be collected[17] from each monitoring well using PDB samplers. The PDBs consist of 24-inch long, 1.25-inch diameter, heat-sealed, low-density polyethylene bags that are pre-filled by the laboratory with 220 milliliters of laboratory-grade analyte-free, de-ionized water. The samplers will be suspended at the midpoint of the screened interval in each well a minimum of two weeks in advance of the sample recovery to allow equilibration with the surrounding formation water. Upon retrieval, each bag will be sliced open at one end using decontaminated field scissors, and the contents poured into the appropriate laboratory-supplied, pre-cleaned and preserved sample vials.

The samples (including those for QA/QC) will be labeled, packed on ice, and shipped to the analytical laboratory for analysis of site-specific VOCs (i.e., PCE, TCE, and their breakdown products, *cis*- and *trans*-1,2-DCE, and vinyl chloride) by EPA Method 8260C. The samples will be handled and shipped in accordance with WSP's SOP 3 (Appendix B). The data will be provided by SGS as a Category B deliverable.

3.4 SURFACE SOIL SAMPLING

WSP will implement a soil sampling program at the site to address the concern of potential lead impact to the soil at the site associated with the water tank replacement. The sampling will include the collection of five composite surface soil samples after the tower deconstruction activities have been completed. These data will be compared to the soil baseline (established during an earlier phase of soil sampling that preceded the water tower work) to assess the potential release of lead. All the

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[15] The periodic groundwater monitoring is focused on evaluating water quality and does not includes samples for geochemical or other parameters (e.g., isotopic analyses or ecology assays). Future groundwater assessments that include these analyses may be collected using low flow sampling techniques rather than PDBs. The sampling will follow the methods outlined in the Supplemental Groundwater *Investigation* Section of this document.

[16] The groundwater elevations will be measured in advance of the PDB sampler recovery and the collection of the analytical samples to ensure the water levels are at equilibrium with the formation (i.e., they were at static conditions) before the sampler is removed. The procedures for the groundwater gauging are omitted from this plan for clarity.

[17] The samplers will be deployed and collected in accordance with the methods outlined in Vroblesky's 2001 *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells*, the approved 2011 *Residential Reclassification and Feasibility Study Work Plan*, and WSP's SOPs.

work will be conducted in accordance with the *Scope of Work for Surface Soil Sampling in Support of Water Tower Replacement*, dated August 30, 2019, and WSP's SOPs. The procedures for the soil sampling at the site are presented below.

3.4.1 SOIL SAMPLING

WSP will collect composite surface soil samples at five locations[18] within the NYAW staging area at the southern end of the site. The samples (including the appropriate QA/QC samples; see below) will be collected from the selected locations using single-use (dedicated) stainless-steel hand tools (spoons or trowels), placed in a stainless-steel mixing bowl, and homogenized in accordance with WSP SOP 9 (Appendix B). All the surface soil samples will be collected from the 0 to 0.5-foot depth interval of the staging area. The homogenized samples will then be transferred into labeled laboratory-supplied glassware, placed on wet ice (for preservation), and shipped (along with the appropriate QA/QC samples) to the analytical laboratory for analysis of lead by EPA Method 6010/7000 series. The samples will be handled and shipped in accordance with WSP's SOP 3. The soil data will be provided by SGS as a Category B deliverable.

3.5 DECONTAMINATION AND WASTE MANAGEMENT

The sampling equipment for the activities listed above use dedicated, single-use materials; reusable equipment such as the water level meter or screen point sampler; or a combination of the two. The annual indoor air monitoring work, for example, is not anticipated to require decontamination: disposable tubing and fittings are used to connect the Vapor Pin® to the canister (for the sub-slab soil gas collection). No other equipment requiring decontamination is used for the indoor air samples. The soil sampling for lead analysis associated with the water tank removal will likewise be performed with single-use stainless-steel spoons and mixing bowls that will not require decontamination.

The groundwater monitoring and profiling work will include decontamination for portions of the activities. The submersible (bladder) pumps used for low flow groundwater sampling will be disassembled between wells, decontaminated using non-non-phosphate soap (e.g., Alconox®, or equivalent) followed by a laboratory-supplied analyte-free deionized water rinse in accordance with WSP's SOP 6 (Appendix B). The pumps will then be reassembled using single-use bladders. The PDBs used to collect groundwater samples for the planned monitoring are single-use bags dedicated to each well and are suspended using previously installed lift lines. The bags once emptied of their contents are ready for disposal (see below). The associated groundwater gauging will use a water-level meter that will require decontamination before use and between each well. The probe and tape (when wetted) will be decontaminated using a non-phosphate soap and a laboratory-supplied analyte-free deionized water rinse in accordance with WSP's SOP 6. The decontaminated components of the meter will be allowed to air dry before being used in the next monitoring well.

The groundwater profiling activities will require more extensive decontamination. All downhole and non-dedicated sampling equipment, including the direct-push drilling rods and the Geoprobe® screen point 15 groundwater sampler, will be decontaminated before work begins, between each borehole, and at the end of site activities. The equipment will be decontaminated using a steam jenny or non-phosphate soap, as appropriate, in accordance with WSP's SOP 6 (Appendix B).

The rinsate generated from the decontamination activities will be contained in a subcontractor-constructed decontamination pad, as detailed in the associated work plans.

3.5.1 WASTE MANAGEMENT

Investigation-derived waste generated during the sampling, including decontamination rinsate, purge water (from groundwater profiling activities), residual soil cuttings, and other solid waste (e.g., poly sheeting from temporary decontamination pads, pump bladders, personal protective equipment, etc.) will be placed in Department of Transportation-compliant 55-gallon steel drums and managed during the investigation work in accordance with WSP's SOP 5 (Appendix B).

[18] The sample locations, selected to provide a representative assessment of the post-deconstruction lead content of the soil, are detailed in the *Scope of Work for Surface Soil Sampling in Support of Water Tower Replacement*, dated August 30, 2019. The locations are not shown or discussed for clarity.

The drums will be staged onsite after the field activities have been completed for later offsite disposal in accordance with state and federal regulations.

WSP anticipates that all investigation-derived waste will use existing waste profiles established during earlier phases of work for the proper offsite disposal.

4 QUALITY ASSURANCE OBJECTIVES AND CRITERIA

The development of the data quality objectives (DQOs) includes establishing performance and assurance (or acceptance) criteria for a project. They aid in detailing the overall project objectives, and the appropriate type, quantity, and quality of data will be necessary to complete those goals. The DQOs are generally quantitative with associated (qualitative) statements specifying the quality of environmental data required to support the decision-making process. They define the total uncertainty in the data (both human and instrumentation) that is within an acceptable range that will not limit the intended use in support of the overall project objective. Specifically, the DQOs establish the detection limits necessary for the samples, criteria[19] for accuracy and precision, data comparability, and data completeness.

The data quality requirements and the associated assessments for the analytical laboratories are presented below.

4.1 CHEMICAL ANALYSES AND QUALITY ASSURANCE PROTOCOLS

Samples collected during or after the investigation and remediation activities at the former TTC site will be analyzed using approved EPA analytical methods listed in the *Test Methods for Evaluating Soil Waste: Physical/Chemical Methods Compendium* (SW-846, 5th Edition, dated July 2014), other EPA-approved manuals, promulgated regulations, or industry recognized procedures. The analytical methods for all the investigation and remediation samples identified in *Onsite Activities and Field Sampling Procedures* (Section 3) above, including appropriate laboratory-supplied containers[20], preservatives, and holding times for each analysis, are summarized in Table 4.1 below.

Table 4.1 Laboratory Analytical Methods

Media	Analytical Parameters	Analytical Methods	Container	Preservatives	Maximum Holding Time
Groundwater	TCL VOCs	EPA Method 8260C	40 mL glass vials	HCL; Cool to 4° Celsius	14 days from collection
Groundwater	Alkalinity	Method SM2320B	Plastic/glass	Cool to 4° Celsius	14 days from collection
Groundwater	Chloride, nitrate, nitrite, and sulfate	EPA Method 300	Plastic/glass	Cool to 4° Celsius	28 days from collection
Groundwater	Ethane, ethene, methane, and carbon dioxide	Method AM20GAX	20 ml glass vials	None	7 days from collection
Groundwater	Sulfide	Method SM4500S2 F2011	Plastic/glass	None	28 days from collection
Groundwater	Dissolved organic carbon	EPA Method SM 5310B	Glass	H_2SO_4 or HCl (pH < 2); Cool to 4° Celsius	28 days from collection
Soil gas, indoor air, ambient air	VOCs	EPA Method TO-15	1 L (evacuated canister)	None	30 days from collection
Soil	TAL Metals	EPA Method 6010c	4 oz. glass jar	Cool to 4° Celsius	6 months from collection

Notes: TCL = target compound list; TAL = target analyte list; EPA = U.S. Environmental Protection Agency; mL = milliliter; L = liter; oz. = ounces; H_2SO_4 = Sulfuric acid; HCl = hydrochloric acid.

[19] The precision is a measure of the reproducibility of analyses under a set of given conditions while the accuracy is a determination of the bias that exists in a measurement system. Representativeness is defined as the degree to which sampling data accurately and precisely represent selected characteristics; completeness as an evaluation of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions; and comparability is the degree of confidence with which one data set can be compared to another.

[20] Sample containers for the soil and groundwater investigations will be prepared and supplied by the designated analytical laboratory, SGS. These containers will be new and certified to be contaminant-free by the manufacturer for each lot number used. The vapor samples will be collected using Entech® (evacuated) canisters supplied by Centek that are all (100-percent) certified clean (not batch certified) and leak tested.

The DQOs for precision, accuracy, and completeness will be based on the QC requirements stipulated by the analytical methods listed in SW-846. These include analytical techniques and instrument calibration (and the associated calibration standards). Laboratory QC reference samples are integrated into the analytical scheme to assess accuracy and precision. All laboratory QC samples are to be analyzed according to the same protocols as the investigative samples, including all dilutions, spikes, and processing. Quality control reference samples will be evaluated based on the EPA acceptance criteria specified in SW-846. Laboratory blanks are to be analyzed with each run to detect container, sample preparation, reagent, or system contamination.

4.1.1 FIELD SAMPLING QUALITY REQUIREMENTS

The sampling for all the activities will also include additional field-based QA/QC samples designed to act as quality control checks (i.e., the QA/QC samples will aid in ascertaining the integrity of the analyses) for the project. The objective is to maximize the confidence in the data in terms of precision, accuracy, completeness, and comparability. The additional field-based QA/QC samples, which will be collected in accordance with WSP's SOP 4 (Appendix B), include:

Duplicates – Environmental media collected at the former TTC will include replicate samples that are used for measuring the variability and documenting the precision of the sampling process[21]. This duplicate will be collected at the same location (and using the same techniques) as the primary analytical sample either in tandem or simultaneously (using alternating aliquots), depending on the collection methodology. Duplicates will be assigned a false sample identification and collection time to generate a sample that is *blind* to the laboratory (i.e., the laboratory does not know by sample identification, which of the primary samples was duplicated). Blind duplicates will be collected at a rate of 1 for every 20 primary samples collected.

Field blanks – Field blanks are designed to assess and document any potential contamination to the primary environmental attributable to the ambient field conditions. The sample is collected by pouring laboratory-supplied analyte-free deionized water into the appropriate glassware (with preservative) during the field event. This procedure exposes the deionized water to the same conditions in the atmosphere as those present when the primary environmental samples were collected. Field blanks, if required (not all field events at the former TTC site include their collection), are detailed in the site-specific work plan. They should be collected at a frequency of 1 for every 20 primary samples. The samples are typically identified with the label with the prefix *FB* followed by the 6-digit date.

Equipment (rinsate) blanks – Equipment blanks are used to document contamination attributable to using equipment that must be decontaminated after each use (i.e., non-dedicated sampling apparatus). The sampling equipment can include but is not limited to direct-push cutting shoes, screen point samplers, and submersible pumps. The equipment blank is prepared in the field by either filling (if appropriate) or rinsing the *decontaminated* equipment with laboratory-supplied analyte-free deionized water and collecting the rinsate in laboratory-supplied containers. The samples must be preserved and filtered (if required) in the same manner as the primary environmental samples. Equipment blanks should be collected for all non-dedicated sampling equipment used at the former TTC facility at a rate of 1 per type of sampling equipment per day. The samples are not blind to the lab and, instead, are identified with the label with the prefix *EB* followed by the 6-digit date.

Trip blanks – Trip blanks are used to assess potential VOC contamination to the primary samples that may be attributable to shipping and field handling procedures. Trip blanks for sampling at the former TTC facility are *only* required when the environmental sampling includes VOCs. The trip blanks are typically prepared[22] by the analytical laboratory and accompany the (empty) sample containers in the cooler or other shipping container. They should remain with the empty laboratory-supplied glassware before sampling, with the primary samples during collection, and in each container (e.g., cooler) when shipped to the analytical laboratory. The samples are typically identified with the label with the prefix *TB* followed by the 6-digit date.

Matrix spike and matrix spike duplicate – Matrix spike and matrix spike duplicate samples (MS/MSDs) are used to evaluate the effect of specific matrices (e.g., groundwater, soil, vapor) on the requested analyses. Specifically, the

[21] Analytical laboratory duplicates will also be analyzed, as appropriate, in accordance with each laboratory's LQM. See Appendix A for the LQMs for both SGS and Centek Laboratories.

[22] Trip blanks can be generated by using store-grade distilled water poured into empty VOC sample bottles if insufficient trip blanks are provided or there are no laboratory-supplied blanks.

MS/MSD allows the analytical laboratory to determine the accuracy and precision of an analytical method for each sample matrix. The MS/MSDs associated with the investigation activities at the former TTC facility should be collected in a manner consistent with the procedures for collecting *Duplicates* detailed above. The samples are typically identified with the primary environmental sample identification number followed by the suffix MS and MSD. The MS/MSDs, when specified in the site-specific work plan, should be collected at a frequency of 1 MS and 1 MSD for every 20 primary samples collected.

The DQO for the completeness of data, with respect to sampling, is 100 percent. WSP anticipates that there will be deficiencies in implementing the planned activities at the site; however, every effort will be made to obtain valid data for all sampling points. Deficiencies will be discussed with appropriate personnel and a determination will be made as to whether they affect the numerical accuracy of the data and the objectives of the project.

4.2 DATA QUALITY ASSURANCE ASSESSMENT

All analytical data associated with the former TTC facility will be reported to the NYSDEC. No data will be omitted unless an error occurred in the analyses or the analytical process was invalidated because of inadequate QC sample recovery or poor precision. The data precision is evaluated (by the validator) based on the results of the samples analyzed in duplicate. The range is calculated and then divided by the average of the two analyses. When multiplied by 100, this value equals the relative percent difference (RPD) between the duplicate samples. The RPD of duplicates in each data set will be compared with method-specific precision requirements to determine the accuracy of the data.

4.3 DATA REPRESENTATIVENESS

All proposed field testing and measurement procedures are designed to maximize the goal that the data will reflect the conditions (and the sample matrix) found at the former TTC site. The associated analytical activities are likewise designed to produce data representative of the samples submitted for analysis. The main tool for ensuring data representativeness is the analytical laboratory QA/QC protocol described elsewhere in this QAPP and in the LQMs for each laboratory.

A copy of the LQMs for each of the identified analytical laboratories is presented in Appendix A.

4.4 DATA COMPARABILITY

The data collection mechanisms proposed in the site-specific work plans for the former TTC site, and the procedures detailed in this document are designed to produce comparable data. Sampling will be conducted at the site using accepted methods in a consistent manner between locations and include appropriate quality procedures (i.e., instrument calibration) to ensure the validity of the data. Any limits on the comparability of test data will be noted and test results will be evaluated on that basis.

All samples will be analyzed by the analytical laboratories using the protocols for sample preservation, holding times, sample preparation, analytical methodology, and QC as described in SW-846 and other EPA-approved manuals or industry recognized procedures as detailed in *Chemical Analyses and Quality Assurance Protocols* in Section 4.1 above. Data will be reduced, reported, and documented in a consistent manner (e.g., water quality data will be reported using a consistent set of units). Any deviations from established protocols will be noted so that data comparability can be maintained.

4.5 DATA COMPLETENESS

The data generated by the field sampling are intended to be complete. Analytical and field data completeness will be addressed by applying data quality checks and assessments described in this section to ensure that the data collected are valid.

4.6 DATA MANAGEMENT

All aspects of the field sampling (e.g., design, collection, shipment, analysis, use, and decisions) will be performed in conjunction with rigorous QA/QC documentation (as noted throughout this plan) designed to:

- generate environmental media (data) that thoroughly characterizes the former TTC site; and,
- provide an indication of the intrinsic variability in the overall system.

Separate data quality requirements for field sampling and laboratory analysis will also allow any problems in the system to be isolated and resolved.

5 DOCUMENTATION AND CHAIN-OF-CUSTODY

The custody of environmental samples collected at the former TTC will be controlled through an established set of procedures designed ensure the safekeeping of the samples during the onsite work and document their transfer to the analytical laboratories at the end of the investigation work. These chain-of-custody procedures, which include responsibilities for both the onsite personnel collecting the samples at the source (i.e., in the field) and the analytical laboratory are detailed below.

5.1 FIELD SAMPLING OPERATIONS

WSP personnel will be responsible for the custody of samples from the time they are collected until they are hand-delivered to the laboratory or transferred to the shipping company for delivery to the laboratory. The soil and groundwater samples, once collected, will be placed in a thermal shipping container with wet ice (as a preservative) as detailed in WSP's SOP 3 (Appendix B). Indoor air, sub-slab soil gas, and outdoor air samples collected as part of the annual vapor monitoring activities do not need to be placed on ice for preservation and, instead, should be placed in the appropriate shipping container (typically dedicated cardboard boxes) and maintained at ambient conditions. All sample containers will remain within the view or locked in the onsite vehicle for temporary storage and transported to the designated sample staging area (i.e., in the custody of the sampler). A chain-of-custody form should be completed with the sample identification number, the time collected, and the analyses requested as each sample is added to the containers.

The onsite sampler, after the samples have been collected, logged, and packaged, will record the date and time and sign in the appropriate block of the chain-of-custody form to relinquish custody. The original chain-of-custody form will be sealed inside a plastic bag and placed in the shipping container (the form will accompany the samples to the analytical laboratory) with a second (carbon) copy retained as a permanent record in the project files. The shipping container will then be sealed with custody seals (used to indicate tampering with the container during transit) and secured with the appropriate strapping tape. WSP personnel with then ship or otherwise deliver the samples to the designated analytical laboratory for analysis.

The custody of the samples will shift to the analytical laboratory once the samples have been received. A designated laboratory sample coordinator will record the date and time and sign the chain-of-custody form upon receipt. The sample coordinator will immediately inspect the shipment for damage and completeness and will report any problems to the WSP QAO. The laboratory sample coordinator will then complete the appropriate lab tracking forms and logs.

5.2 LABORATORY OPERATIONS

The laboratory sample coordinator is responsible for custody of the samples from the time of sample receipt to the time of discard. Custody procedures are outlined in the individual LQM and at a minimum will include the following:

- identification of the responsible party (sample custodian) who is authorized to sign for incoming field samples, obtain documents of shipment, and verify the data entered onto the sample chain-of-custody records;
- provision for an internal laboratory sample custody log consisting of serially numbered lab-tracking report sheets; and,
- specification of laboratory sample custody procedures for sample handling, storage, and disbursement for analysis.

6 INSTRUMENT CALIBRATION AND PREVENTATIVE MAINTENANCE

Calibration and maintenance procedures and schedules have been established for all test and measuring equipment to be used at the site[23]. The accuracy of instruments will be maintained and documented by following the in-field methods detailed below.

6.1 FIELD INSTRUMENTS

Field measurement devices anticipated for use during the planned sampling activities at the former TTC facility include an electronic water level indicator, a photoionization detector (PID), vacuum gauges (for the vapor sampling activities), and a water quality meter (e.g., a Horiba® U-22 water quality meter, or equivalent meter) designed to measure the pH, temperature, turbidity, and conductivity. Calibration for each device (i.e., field quality control checks) will be checked at the beginning and periodically during the sampling event, as necessary, in accordance with the manufacturer's recommendations. All calibration, maintenance, repair, and equipment usage will be recorded in the field notebook. The WSP PM will implement periodic audits of the field notebook to ensure that the field data is being properly recorded and the instruments calibrated, as per this plan.

The field monitoring equipment and measuring devices are rented on an as-needed basis. These devices are maintained by the instrument suppliers under a routine schedule, thereby minimizing the potential for unscheduled downtime. Nevertheless, WSP sampling personnel will verify that the instruments are working as designed before use. This verification process will include determining if the batteries are fresh (for instruments that use disposable batteries) or are fully charged for devices that use rechargeable batteries. Instruments that are found to be inoperative or otherwise damaged should be replaced by the equipment supplier before proceeding with the sampling event. Most equipment rental suppliers will have replacement instruments delivered the following day, if necessary.

[23] The calibration and maintenance schedule for the laboratory analytical instruments, along with the internal QC checks, are described in the SGS and Centek LQMs, which are included in Appendix A.

7 DATA REDUCTION, VALIDATION, AND REPORTING

The reporting scheme from sample collection to data validation is described in this section. Analytical samples, as described above, will be collected, and sent by overnight carrier or delivered to the laboratory with the proper chain-of-custody documentation. Data packages meeting the requirements specified in this section will be compiled after laboratory personnel have reviewed the analytical data.

7.1 FIELD DATA

Direct reading field instruments will be used as part of the planned investigation and other activities at the site. The field instruments, as indicated above, will include a PID for health and safety, water level and quality indicators, and, for the annual vapor investigations, dedicated vacuum gauges. The direct reading data, water elevations, pH, temperature, initial vacuums, etc., will be recorded in the field logbook and, for data relevant information, tabulated and presented in the investigation reports to the NYSDEC. All instrument calibration data (i.e., the field quality control checks) will be included in field notebooks, which will be, as indicated above, periodically audited by the WSP PM.

7.2 LABORATORY DATA

The laboratories will be required to provide a full data deliverables package (designated by the NYSDEC[24] as Category B) to support the performance of SW-846 methods for all samples, except those for waste characterization (if collected). The data packages will provide all the necessary information for validation (described below) and will contain at a minimum:

- a cover page that details the site name and address, the laboratory credentials, the report date, and the laboratory director's signature;
- a list of field and corresponding laboratory sample identification numbers;
- a list of analytical methods used, including matrix cleanup method;
- the method detection and practical quantitation limits for each analyte (per analytical method);
- sample results, including date of the analysis;
- method blank results; and,
- chain-of-custody documentation.

The procedures used to calculate concentrations of the chemicals of concern by the analytical laboratories will be consistent with those presented in the analytical methods (i.e., the laboratories will follow SW-846).

Analytical data will be reviewed by the laboratory's QA/QC manager in advance of delivery to WSP. This review will include method-appropriate equations for precision, accuracy (bias), and completeness the results of which will be incorporated in the QA/QC deliverables for the data delivery package. The laboratory data reduction and QA/QC review will follow the internal standard operating procedures, the LQM, or other appropriate document.

A copy of the LQMs for SGS and Centek are included in Appendix A.

[24] The as defined in the NYSDEC's Analytical Services Protocols program, which is modeled on the EPA Superfund program. Participation in the ASP program is limited to NYSDOH ELAP laboratories.

7.3 DATA VALIDATION

The data packages will be reviewed thoroughly by WSP's QAO and then sent to LDC[25] for validation of the analytical data. LDC will verify that all necessary paperwork (such as chain-of-custody forms, analytical reports, and laboratory personnel signatures) and deliverables are present; and then review the analytical data packages and ensure that the results (and the laboratory internal QA/QC measures) meet the criteria outlined in the EPA *Contract Laboratory Program* (CLP) *National Functional Guidelines*. The criteria for both organic and inorganic parameters include:

- holding times;
- gas chromatography/mass spectrometry (GC/MS) and/or GC instrument performance check;
- initial and continuing calibration of the laboratory equipment;
- laboratory blank sample results;
- surrogate recoveries;
- MS/MSD sample results;
- field duplicates, where applicable;
- internal standards;
- target compound identification;
- analyte quantitation and reporting limits; and,
- an overall assessment of the data.

LDC will coordinate with the designated project managers or QA/QC officers at the respective laboratories during the review, as needed.

A data usability summary report (DUSR) will be provided by LDC once the validation is complete. The DUSR will include a narrative of the work completed and the specific guidelines used for the evaluation; qualifying statements (e.g., data completeness, laboratory calibration results, the findings associated with the blanks, etc.) for the analytical results; and any potential usability issues. Based on the QA review, CLP qualifier codes will be placed next to specific sample results on the data summary table(s) that will be included in the report to the NYSDEC. These qualifier codes will serve as an indication of the qualitative and quantitative reliability of the reported analytical results.

When the review has been completed, the QAO (or designated data validation subcontractor) will submit the DUSR report and the validated data to the Project Manager for subsequent evaluation and interpretation. If field or laboratory data are determined to be unusable, corrective action will be implemented as outlined in Section 8 of this document.

7.4 DATA REPORTING AND MANAGEMENT

The validated analytical data will be tabulated once the validation is complete. The tabulation will include the sample identification, the sample matrix (i.e., groundwater, soil, vapor), and the analyses and their corresponding detected concentrations with CLP qualifiers where appropriate. The results from the sampling activities will be incorporated into reports as data tables and maps showing sampling locations and analyte concentrations.

WSP will implement a data control program to ensure that all documentation associated with the planned activities, including field-based sampling descriptions and site observations, are secured, and maintained following the completion of the work. The project documentation will include field notebooks[26] and data record sheets, laboratory data packages, photographs of the work, and the final report of the activities to the NYSDEC reports. The WSP PM will be responsible for maintaining a

[25] All analytical data collected during the planned activities, except waste characterization data (if required), will be independently validated by a third party not affiliated with Breeze-Eastern, WSP, or the analytical laboratories listed in Section 2.

[26] Field activities, including the sampling, will be recorded using indelible ink in bound field notebooks, in accordance with WSP's SOP 1 (Appendix B). The notes should be sufficiently detailed as to allow a reconstruction of the field event and should include, at a minimum, the site name, sample identification and collection methods, and field measurements (e.g., water elevations, PID measurements, etc.) and observations. The records will be accurate, complete, legible, identifiable, retrievable, and protected against deterioration or loss.

centralized file for this project-related information. Other field records, such as personnel training forms and a site-specific health and safety plan, will be kept onsite.

8 CORRECTIVE ACTION

WSP will implement corrective action[27] to address field-based concerns requiring modification of the investigation plan, or for quality issues identified following the completion of the onsite activities. Corrective action for problems that occur during any stage of the investigation (i.e., during field activities, laboratory analyses, data validation, or data assessment) will be implemented only after approval by Mr. David P. Bouchard, WSP's PM. Approvals for the actions, including those secured by telephone from Mr. Bouchard during field work, will be documented and the changes to the approach reported to the NYSDEC.

Any nonconformance or noncompliance with the established QC procedures in the QAPP or work plans will be identified and corrected in accordance with the QAPP. Mr. Bouchard, or his designee, will issue a nonconformance report for each identified condition and implement the corrective action, as described below.

8.1 FIELD CORRECTIVE ACTION

Corrective action in the field may be required when the planned sampling program is changed (e.g., more/less samples, sampling locations other than those specified), or when sampling procedures (or the corresponding analyses) require modification due to unexpected conditions. The field team leader will, once the unexpected conditions have been identified, consult with WSP's PM and QAO regarding potential corrective action that may be appropriate to address the concerns. WSP's PM will approve any recommended corrective measure that will be implemented by the field team. The field team leader will be responsible for documenting and implementing the change the sampling plan or other corrective actions.

If corrective actions result in fewer samples, alternate locations, or other changes that may cause project QA objectives not to be achieved, it will be necessary that all levels of project management, including the NYSDEC project manager, concur with the proposed action.

Corrective action resulting from internal field reviews will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. WSP's QAO will identify deficiencies and recommend corrective action to WSP's PM. WSP field team leader and field team will implement the recommended corrective action, document activities completed in the field notebook, and report the activities to the entire project management team. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be temporarily stopped until appropriate revisions are made.

8.2 CORRECTIVE ACTION DURING DATA VALIDATION AND DATA ASSESSMENT

WSP may identify the need for corrective action during either data validation or data assessment. Potential types of corrective action may include resampling by the field team or reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, and whether the data to be collected are necessary to meet the required QA objectives. WSP's PM will be responsible for approving and coordinating any corrective action recommended by the QAO or LDC as part of the data review. The QAO or WSP's PM will document all corrective actions in a centralized file system established for the project (see Section 7.4 above).

[27] Corrective action is defined, for the purposes of this QAPP, as the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or project performance that can affect data quality.

9 ACRONYMS

1,2-DCE	1,2-dichoroethene
ASP	Analytical Services Protocol
bgs	below ground surface
CLP	Contract Laboratory Program
DQO	data quality objective
DUSR	data usability summary report
EHS	Environment, Health, and Safety
EPA	U.S. Environmental Protection Agency
GC/MS	gas chromatography/mass spectrometry
L	liter
LDC	Laboratory Data Consultants, Inc.
LQM	laboratory quality manual
mL	milliliters
MS	matrix spike
MSD	matrix spike duplicate
NYAW	New York American Water
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OU-1	Operable Unit No. 1
OU-2	Operable Unit No. 2
Oz	ounces
PCE	tetrachloroethene
PDB	passive diffusion bag
PID	photoionization detector
PM	project manager
QAO	quality assurance officer
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
ROD	Record of Decision
RPD	relative percent difference
SGS	SGS North America Inc.
SOPs	standard operating procedures
SWPPP	Storm Water Pollution Prevention Plan
TAL	target analyte list

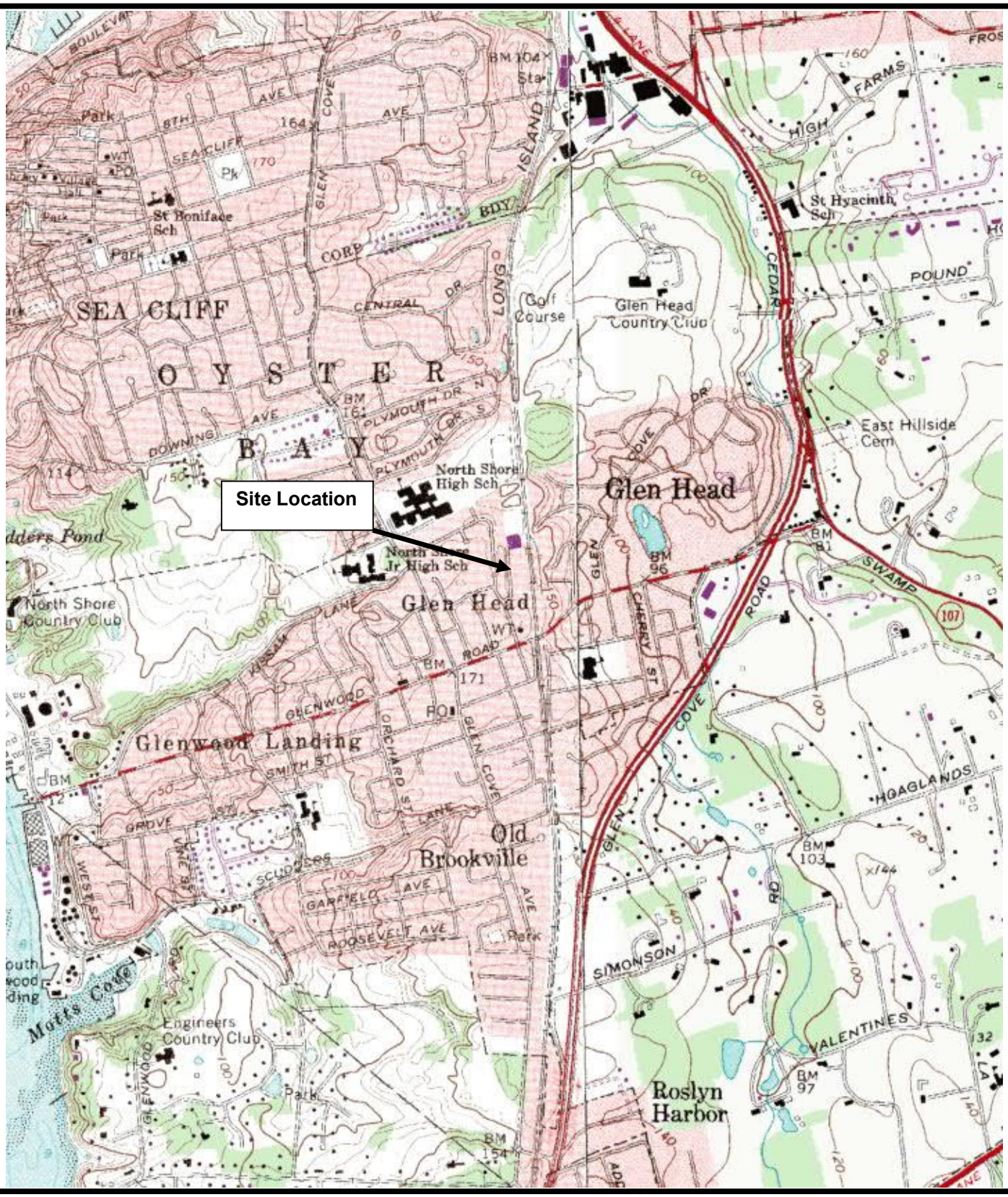
TCE	trichloroethene
TCL	target compound list
TTC	TransTechnology Corporation
VOC	volatile organic compound
VTSM	verified time of sample receipt

FIGURES

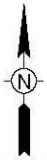
DWG Name:

Checked: Approved:

Drawn By: A



Reference
7.5 Minute Series Topographic Quadrangle
Sea Cliff, New York
Photorevised 1979; Scale 1:24,000



0 1000 2000 4000
SCALE, FEET

WSP USA Inc.
100 SUMMER STREET, 13TH FLOOR
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TEL: +1 617.426.7330

FIGURE 1

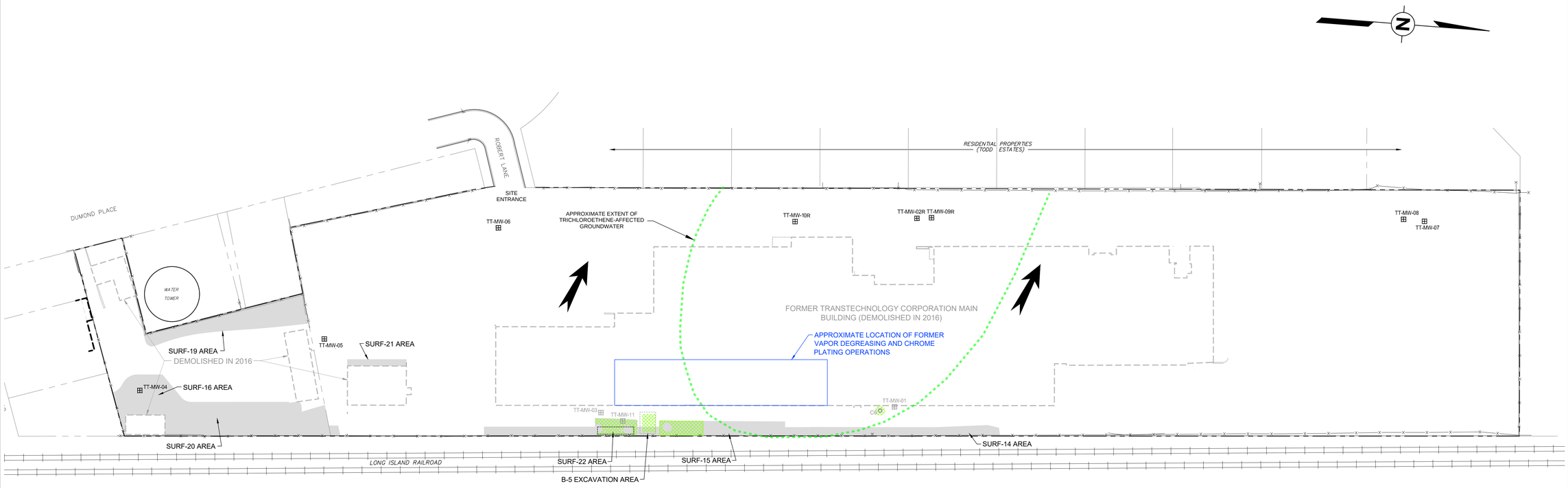
SITE LOCATION MAP

FORMER TRANSTECHNOLOGY CORPORATION
FACILITY — GLEN HEAD, NEW YORK

PREPARED FOR

Breeze-Eastern LLC
Whippany, New Jersey

SHEETS



LEGEND

- TT-MW-09 ⊞ MONITORING WELL (1993–1996)
- TT-MW-03 ⊞ DAMAGED OR DESTROYED MONITORING WELL
- C6 ○ CESSPOOL LOCATION (2001)
- OPERABLE UNIT NO. 1 – SURFACE SOIL EXCAVATION AREA (APPROXIMATE)
- RESIDUAL IMPACTED SOIL OR SEDIMENT (SOIL MANAGEMENT AREA)
- PROPERTY BOUNDARY
- FORMER BUILDING LOCATION
- GROUNDWATER FLOW DIRECTION

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

50 0 50 100
SCALE, FEET

SAMPLING LOCATIONS ARE APPROXIMATE

REFERENCE:

REMEDIAL INVESTIGATION REPORT, TRANSTECHNOLOGY CORPORATION, GLEN HEAD, NEW YORK SITE, SITE NUMBER 1-30-101, PREPARED BY GEOMATRIX ENGINEERING, LLC, SEPTEMBER 2005.

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REVISIONS

REV	DESCRIPTION							
1	Revised:	Chkd:	Appr.:	Revised:	Chkd:	Appr.:	Revised:	Chkd:	Appr.:

SEAL

DATE

DRAWN BY

CHECKED

APPROVED

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT IN ANY WAY.

SITE LAYOUT

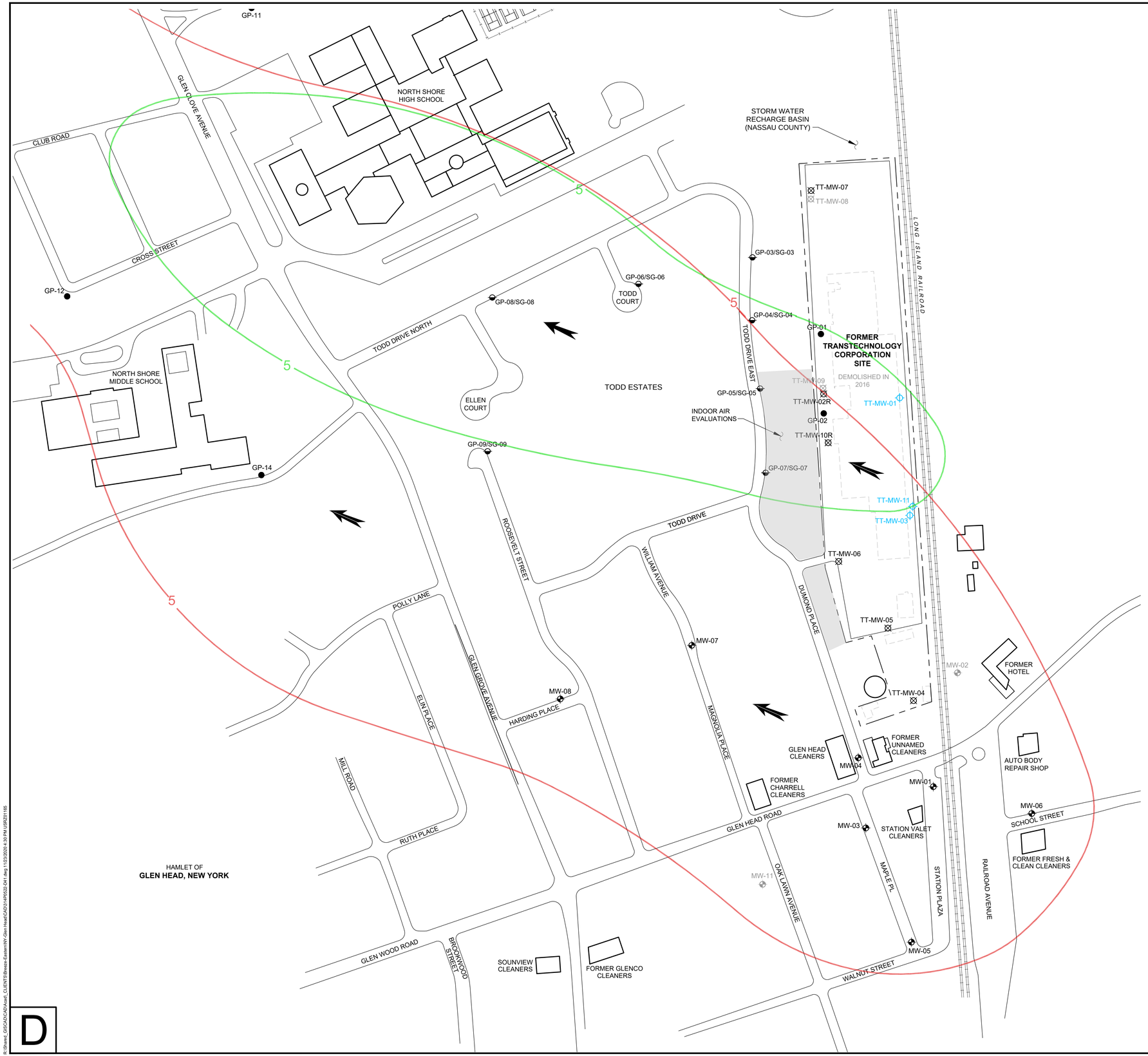
FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE–EASTERN LLC
WHIPPANY, NEW YORK

WSP USA Inc.
100 SUMMER STREET, 13th FLOOR
BOSTON, MA 02110
TEL: +1 617.426.7330

SHEET 1

Drawing Number
314P0522–D28



LEGEND

- NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION GROUNDWATER MONITORING WELL (HALFTONE WHEN NOT SAMPLED)
- TRANSTECHNOLOGY CORPORATION GROUNDWATER MONITORING WELL (HALFTONE WHEN NOT SAMPLED)
- MONITORING WELL DESTROYED
- CO–LOCATED GROUNDWATER PROFILE AND SOIL GAS SAMPLE
- GROUNDWATER PROFILE LOCATION
- STRUCTURE DEMOLISHED IN 2016
- GROUNDWATER FLOW DIRECTION
- 5 TCE CONCENTRATION COUNTOUR IN MICROGRAMS PER LITER (2012)
- 5 PCE CONCENTRATION COUNTOUR IN MICROGRAMS PER LITER (2012)
- INDOOR AIR EVALUATIONS (2012)

NOTES:

1. ONSITE GROUNDWATER MONITORING WELLS TT–MW–01, TT–MW–03, AND TT–MW–11 WERE INADVERTENTLY DESTROYED DURING THE OPERABLE UNIT NO. 1 REMEDIAL EXCAVATION ACTIVITIES ALONG THE WESTERN PROPERTY LINE IN 2011; ONSITE MONITORING WELLS TT–MW–06, TT–MW–08, AND TT–MW–09 WERE NOT SAMPLED AS PART OF THE OPERABLE UNIT NO. 2 REMEDIAL INVESTIGATION REPORT FOLLOW–UP MONITORING CONDUCTED BETWEEN 2018 AND 2020.
2. OFFSITE GROUNDWATER MONITORING WELL MW–02 IS DAMAGED BELOW THE GROUND SURFACE AND COULD NOT BE ACCURATELY GAUGED OR SAMPLED.

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SCALE, FEET

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

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REVISIONS

REV	DESCRIPTION			
1	Revised:	Chkd:	Appr.:	
2	Revised:	Chkd:	Appr.:	
3	Revised:	Chkd:	Appr.:	

SEAL

DATE

DRAWN BY RKF 11/23/2020
CHECKED
APPROVED AM 11/23/2020

SITE LOCATION AND GROUNDWATER MONITORING WELLS

FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE–EASTERN LLC
WHIPPANY, NEW YORK

WSP USA Inc.
100 SUMMER STREET, 13th FLOOR
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SHEET 2

Drawing Number
314P0522.000–D41

APPENDIX

A LABORATORY QUALITY MANUALS

NY Laboratory ID #11830
ISO/IEC 17025 - AiHA-LLC #182993
NJDEP – NY018

Laboratory Quality Manual

Russell J. Pellegrino, Jr.
(315) 431-9730

Approved: _____
Lead Technical Director Name

Approved: _____
Quality Assurance Name

Approved: _____
Quality Control Name

Distribution List:
Russell J. Pellegrino, Jr., Quality Assurance / Nick Scala, Quality Control
William Dobbin, Lead Technical Director / Russell J. Pellegrino, Jr., Technical Director

Acronyms

NELAP-National Environmental Laboratory

AIHA-LAP-American Industrial Hygiene Association Laboratory Accreditation Programs, LLC

NELAC- National Environmental Laboratory Accreditation Committee

NELAP- National Environmental Laboratory Accreditation Program

NYSELAP-New York State Environmental Laboratory Approval Program

VOC-Volatile Organic Compounds

QA/QC-Quality Assurance / Quality Control

LOD-Limit of Detection

LOQ- Limit of Quantitation

LQM-Laboratory Quality Control Manual

SOP-Standard Operating Procedures

EPC-Environmental Project Coordinator

APC-Administrative Project Coordinator

NIST-National Institute of Standards and Technology

MDL-Method Detection Limits

USEPA-United States Environmental Protection Agency

LCS-Laboratory Control Sample

LCSD- Laboratory Control Sample Dupe

MS/MSD-Matrix Spike / Matrix Spike Duplicate

RL-Reporting Limit

RPD-Relative Percent Difference

DOC-Demonstration of Capability

QAO-Quality Assurance Officer

Table of Contents

1. Quality Policy

Centek Laboratories, LLC (Centek) strives to provide technically valid laboratory test results that accurately and precisely represent the quality of a client's sample being analyzed. Centek is committed to comply with requirements of ISO 17025, the National Environmental Laboratory Accreditation Program (NELAP), and American Industrial Hygiene Association (AIHA) Laboratory Accreditation Programs, LLC (AIHA-LAP). All Centek personnel involved with testing and/or calibration activities must familiarize themselves with this Laboratory Quality Manual (LQM) and all associated quality management system documents and must implement in their work the policies and procedures in these documents in conformance with ISO/IEC 17025. We aim to continually improve the effectiveness of our quality management system. Centek's management provides evidence of commitment to the development and implementation of its quality management system and demonstration of continually improving the management system's effectiveness. The Laboratory Quality Manual is updated whenever necessary and is reviewed and approved by management at least annually. All documents issued to personnel in the laboratory as part of the quality management system are reviewed and approved for use by authorized personnel prior to being issued. A master list, or an equivalent document control procedure, identifying the current revision status and the distribution of documents in the quality management system is readily available to preclude the use of invalid and/or obsolete documents. The procedure(s) adopted ensure that documents are at least annually reviewed and, when necessary, revised to ensure continuing suitability and compliance with applicable requirements. Quality management system documents generated by the laboratory are uniquely identified. Such identification includes the date of issue and/or revision identification, page numbering, the total number of pages or a mark to signify the end of the document and the issuing authority(ies). Centek strives to perform laboratory work that is in conformance with the NELAC, ISO/IEC 17025, and AIHA-LAP laboratory quality assurance program policy document standards, resulting in the overall improvement of the laboratory's quality over time. Demonstration of the laboratory's commitment to reach this goal results in the following:

- An adequately staffed and equipped facility
- Successful participation when available in the proficiency testing programs operated by the New York State Environmental Laboratory Approval Program (NYSELAP), AIHA-LAP, the National Institute for Occupational Safety and Health (NIOSH), and the U.S. Environmental Protection Agency (EPA).
- Successful implementation of a National Environmental Laboratory Accreditation Conference (NELAC), ISO/IEC 17025, and AIHA-LAP laboratory quality assurance program policy document quality system
- Annual internal audit (using both the NELAC and AIHA-LAP checklists) with management review and yearly review for updating and maintenance of this Laboratory Quality Manual and all Centek SOPs
- Successful once-every-other-year assessments by the New York State ELAP
- Timely reporting of laboratory test results to the regulating authorities

- Laboratory test results that are supported by quality control data and documented laboratory testing procedures

A copy of the Laboratory Quality Manual, including Centek's quality policy, is given to employees during the training of new hires. Centek's quality policy as embodied in the Laboratory Quality Manual is understood, implemented, and maintained by employees at all levels. Management documents this process through employee evaluations, training, internal auditing, and document control.

2. Accredited Test Methods

Test	Method	Reference / Certification
Volatile Organic Compounds by GC/MS:		
EPA Method TO-15	TO-15	1 - NELAP/ ISO17025
EPA Method TO-14	TO-14 a	2 - NELAP/ ISO17025
EPA Method TO-17	TO-17	3 - ISO17025
Gravimetric:		
Particulate Matter (PM2.5)	PM2.5	4 - ISO17025
Particulate Matter (PM10)	PM10	5 - ISO17025

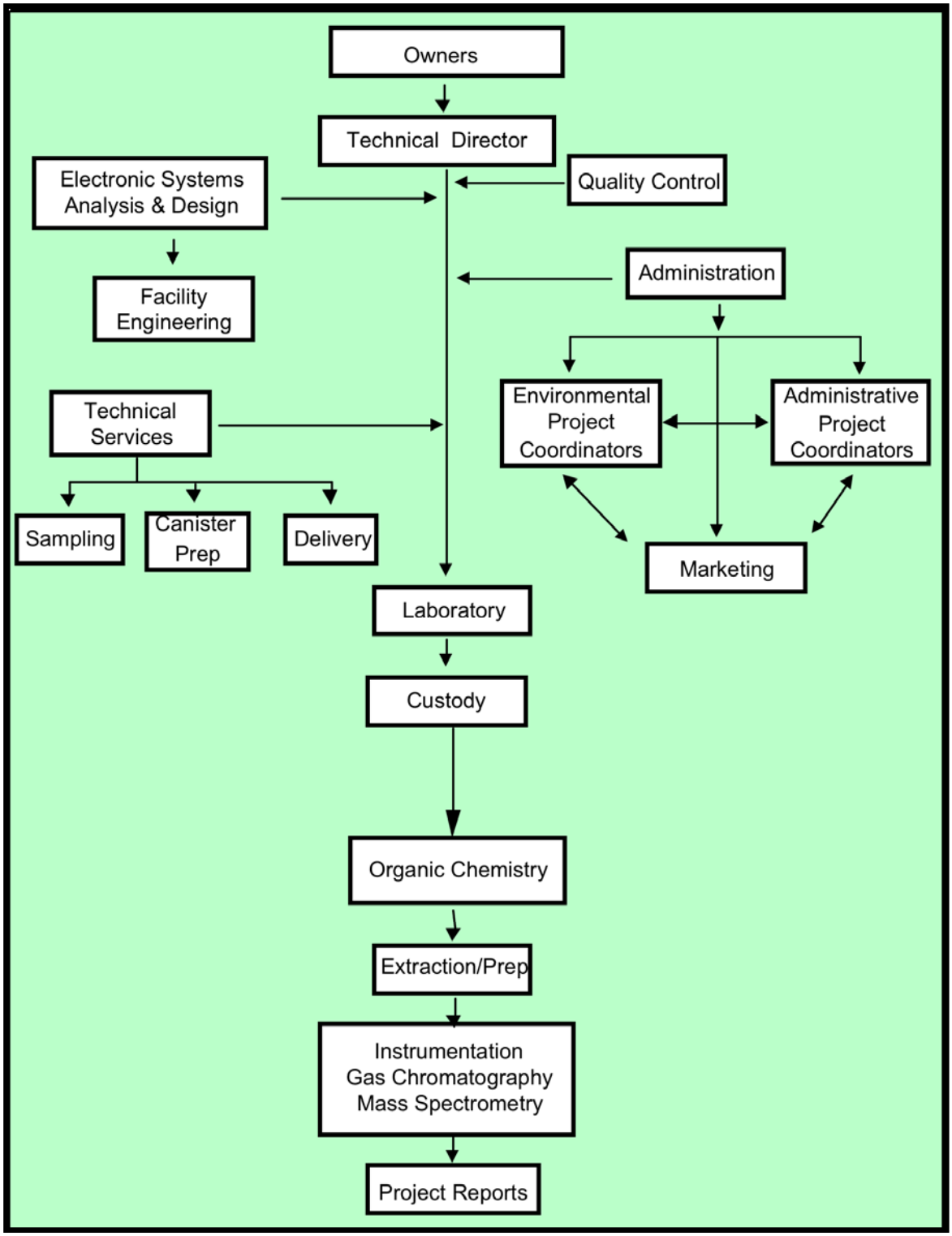
References:

1) ***Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition.*** **USEPA Center for Environmental Research Information, Office of Research and Development. Cincinnati: EPA 625/R-96/010B. Revised January 1999.**

2) ***Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition.*** **USEPA Center for Environmental Research Information, Office of Research and Development. Cincinnati: EPA 625/R-96/010B. Revised January 1999.**

3) Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air Second Edition Compendium Method TO-17 Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes

3. Quality Management System Organization Flow Chart



4. Relationship between Management, Technical Operations, Support Services, and the Quality Management System

A. The lead technical director has the overall responsibility for the technical operations of Centek Laboratories. The lead technical director is also responsible for arranging and overseeing support services, including instrument service contracts, subcontracting sample analysis, and maintaining the laboratory's physical premises.

B. The laboratory director is responsible for supervising all laboratory personnel to ensure compliance with documented laboratory procedures. When the director is not present in the lab, he or she appoints one employee from each area who is familiar with the calibration or test procedures, the objective of the calibration or test, and the assessment of calibration or test results.

C. The laboratory director certifies that personnel with the appropriate educational and/or technical background perform all tests for which the lab is accredited. Documentation includes college transcripts, work experience, and on-site and off-site certified training.

D. The section supervisor responsibility is to oversee day to day management of laboratory and supervise laboratory staff of his/her section. Review analytical data to ensure accuracy and compliance with quality standards. Prepare and deliver analytical reports in a timely manner. Continually look for ways to improve efficiency and productivity in lab and to ensure compliance with company policies and SOPs. Motivate staff and promote high level of morale.

E. The quality assurance/quality control (QA/QC) officer is responsible for ensuring compliance with ISO/IEC 17025. He or she also ensures that the lab's policies and objectives for quality of testing services are documented in the LQM. The QA/QC officer also ensures that the LQM is distributed to, understood, and implemented by all relevant personnel. Documentation includes signed statements in each analyst's training file.

F. The QA/QC officer is responsible for the quality system and its implementation. He or she has direct access to the highest level of management responsible for lab policy and/or resources. When the QA/QC officer is not present, a deputy is appointed.

5. Job Descriptions and Qualifications of Staff

Lead Technical Director — the technical director has the overall responsibility for the technical operations of Centek Laboratories. The technical director is also responsible for arranging and overseeing support services, including instrument service contracts, subcontracting sample analysis, and maintaining the laboratory's physical premises. The technical director must possess a minimum of a Bachelor of Science degree in chemistry or an allied field. He or she must be proficient and knowledgeable in complying with the requirements of NYSELAP, NIOSH, EPA

Methods, NELAC, ISO/IEC 17025, and AIHA-LAP. He / She are authorized to approve test results when QC Officer is absent.

Laboratory Director – The laboratory director has overall responsibility for the technical operation of the lab. He or she is also responsible for arranging and overseeing support services, including instrument service contracts, subcontracting sample analyses, and maintaining the laboratory's physical premises. The laboratory director also interacts with department heads as needed per project requirements. The laboratory director is responsible for supervising all laboratory personnel to ensure compliance with documented laboratory procedures. When the laboratory director is not present in the lab, he or she appoints one employee from each area who is familiar with the calibration or test procedures, the objective of the calibration or test, and the assessment of calibration or test results. The laboratory director certifies that personnel with the appropriate educational and/or technical background perform all tests for which the lab is accredited. The laboratory director must possess a minimum of an associate of science degree in chemistry or an allied field with at least 24 credit hours in chemistry. He or she must be proficient and knowledgeable in complying with the requirements of NYSELAP, NIOSH, EPA Methods, NELAC, ISO/IEC 17025, and AIHA-LAP. He / She are authorized to approve test results when QC Officer is absent.

Section Supervisor – The section supervisor has responsibility for the technical operation in a particular section of the lab. He or she is responsible for arranging and overseeing instrument service, sample analyses, and maintaining the laboratory's physical premises. The section supervisor also interacts with the employee per project requirements. The section supervisor is responsible for section personnel to ensure compliance with documented laboratory procedures. The section supervisor must possess a minimum of an associate's degree in chemistry or an allied field, and a minimum of three years' experience. He or she must be familiar with the requirements of NYSELAP, NIOSH, EPA Methods, NELAC, ISO/IEC 17025, and AIHA-LAP. He / She are authorized to approve test results when QC Officer is absent.

QA/QC Officer – The QA/QC officer is responsible for the quality system and its implementation and is responsible for ensuring compliance with ISO/IEC 17025. This includes, but is not limited to, the writing and revising of standard operating procedures (SOPs), twice yearly internal audits, annual quality review meeting with management, and preparation of laboratory control charts. The QA/QC officer has direct access to the highest level of management responsible for lab policy and/or resources. When the QA/QC officer is not present, a deputy is appointed. The QA/QC officer must possess a minimum of an associate's degree in chemistry or an allied field and must be trained in applying statistics or mathematics. He or she must be proficient and knowledgeable in complying with the requirements of NYSELAP, NIOSH, EPA Methods, NELAC, ISO/IEC 17025, and AIHA-LAP. He / She are authorized to approve test results.

Environmental Project Coordinator (EPC) – The EPC serves as a liaison between laboratory and clients. Duties include, but are not limited to, organizing sampling schedules and sample pickup, writing work orders, writing price quotations, using data request forms to retrieve test results from the laboratory, and verifying test results. The EPC must possess a minimum of a high school education and a minimum of five years' laboratory experience. He or she must have a general understanding of the requirements of NYSELAP, NIOSH, EPA Methods, NELAC, ISO/IEC 17025, and AIHA-LAP.

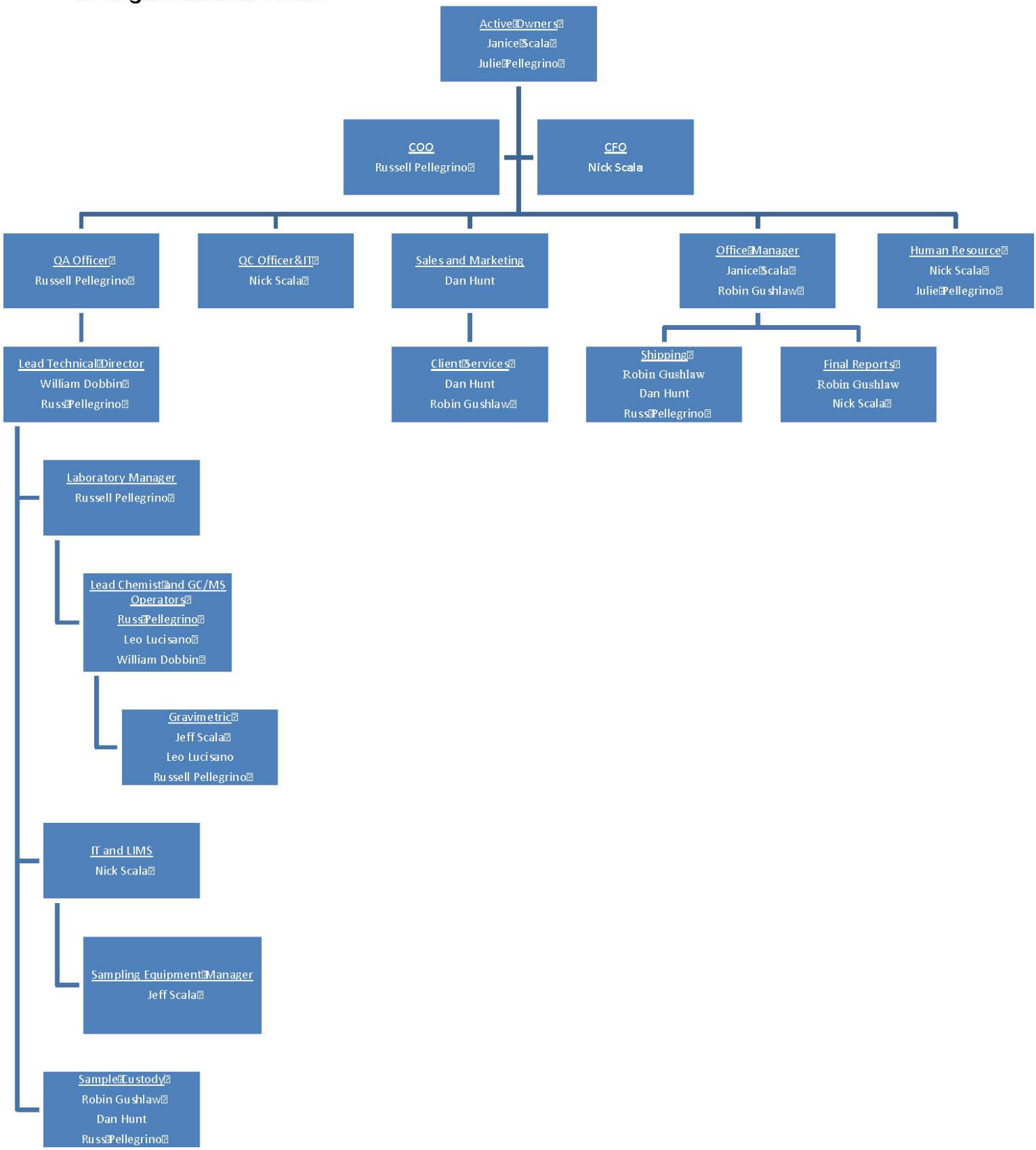
Administrative Project Coordinator (APC) – The APC compiles data from test results into draft or final reports for clients, prepares invoices for completed projects, and performs other administrative tasks, as needed. The APC must possess a minimum of a high school education and preferably an associate's degree, or equivalent experience.

Analyst – The analyst performs routine analysis of samples in accordance with Centek's quality system, its SOPs, and applicable EPA Methods. The analyst must possess a minimum of an associate's degree in the sciences. He or she must be familiar with the requirements of NYSELAP, NIOSH, EPA Methods, NELAC, ISO/IEC 17025, and AIHA-LAP.

Laboratory Technician – The laboratory technician is responsible for performing day-to-day tests on samples in accordance with the laboratory's quality system and SOPs as well as applicable EPA Methods. The laboratory technician must possess a minimum of a high school education and a minimum of two years' experience in a laboratory environment. He or she must be familiar with the requirements of NYSELAP, NIOSH, EPA Methods, NELAC, ISO/IEC 17025, and AIHA-LAP.

Sample Custodian – The sample custodian is responsible for properly accepting samples, assigning each sample a unique Centek Laboratories sample number, storing samples in a secure area under conditions that ensure regulatory compliance, logging samples into database according to the chain of custody, and disposing of samples in an environmentally sound manner. The sample custodian must possess a minimum of a high school education and should be familiar with a laboratory environment and its protocols. He or she must be detail-oriented, organized, and proficient in record keeping.

6. Organizational Chart



A. Deputy List in Case of Absence

In the absence of key personnel, the following substitutions will occur:

Lead Technical Director –William Dobbin
Deputy Replacement – Russell J. Pellegrino, Jr.

Laboratory Manager –Russell J. Pellegrino, Jr.
Deputy replacement – Leo S. Lucisano

Quality Assurance–Russell J. Pellegrino, Jr.
Deputy replacement(s) – Leo S. Lucisano, William Dobbin

Quality Control – Nick Scala
Deputy replacement – Leo S. Lucisano

Section Supervisors- Russell Pellegrino, Nick Scala, Jan Scala
Deputy replacements- Leo Lucisano, Jeff Scala,

IT Project Coordinator Manager – Nick Scala
Deputy replacement(s) – Russell J. Pellegrino, Jr.

Sample Custody Manager – Robin Gushlaw
Deputy replacement – Russ Pellegrino

Administrative Office Manager – Robin Gushlaw, Janice Scala
Deputy replacement – Nick Scala, Russell J. Pellegrino, Jr.

Chief Finical Officer – Nick Scala
Deputy replacement – Russell J. Pellegrino, Jr.

Chief Operation Officer – Russell J. Pellegrino, Jr.
Deputy replacement – Nick Scala

Maintenance Engineer – Subcontract

7. Document Control

All SOPs, manuals (including this LQM), and documents are subject to document control. Distribution of controlled documents is limited to those indicated on the document distribution list. Controlled documents are indicated by database location located in the footer of each page. Uncontrolled copies are indicated by reproduction on any other type of paper.

The purpose of the document control system is to ensure that only the most recent revisions are available to the appropriate personnel. *****If revisions are needed, they are done by hand pending reissues in ink and are initialed and dated at the time of change; such revisions are subject to required approvals. The final revisions are added to the document on a timely basis. All internal regulatory documents, SOPs, work instructions, service manuals, and product instructions are under document control.

The QA/QC officer is responsible for the document control system. The QA/QC officer establishes and maintains document control via Centek's computerized systems, storing all controlled documents on Centek's "F" drive, in the Controlled Documents folder. Only current versions of controlled documents are stored in the Controlled Documents folder; older versions are archived in the Discontinued Documents folder. The QA/QC officer keeps a master list of the current revision and location of all controlled documents in the laboratory. The laboratory director and the QA/QC officer approve all newly released documents and revised documents. Any employee can request to change a document or policy. The QA/QC officer may store retained obsolete documents, which may be kept for legal reasons or knowledge preservation. Each page of documents produced by the laboratory must specify the effective date, revision number, document number, and document title. Controlled documents must have an approval signature page, a revision history page, and a distribution page.

***This revision does not apply to Ohio VAP. You must inform Ohio in writing before you can revise.**

8. Traceability of Measurements / Purchase of Services and Supplies

Verification and/or validation of equipment, such as balances, thermometers, and spectrophotometers, is analyzed by means of National Institute of Standards and Technology (NIST) traceable standards. Calibration certificates must indicate NIST traceability along with measured results and the associated uncertainty. Reference standards, such as Class S weights and NIST traceable thermometers, are used for calibration only and are calibrated by a company that can provide traceability to NIST.

In accordance with ISO/IEC 17025 4.6.1 and AIHA-LAP H5.2 and H5.3, Centek requires that all purchased services and supplies that may affect the quality of testing or calibration, including but not limited to reagents and consumables, are not used until they have been inspected and evaluated. Centek maintains records of these

inspections and evaluations, and maintains a list of approved providers of services and supplies. See Evaluation/Inspection of Suppliers of Consumables or Services Form in SOP AD-20.

9. Review of All New Work

All new work is initiated by the technical director, who assigns responsibilities for the new work to supporting staff members. Affected staff meets prior to initiation of new work in order to determine if the appropriate facilities, manpower, and time for analysis are available. The laboratory director reviews and approves planning for any new projects before the project starts. For any new testing method, the designated employee writes an SOP and demonstrates capability to perform the tests prior to reporting results. The SOP(s) must be under document control and a Demonstration of Capability Statement(s) must be on file.

10. Calibration/Verification of Test Procedures

A. Calibration and/or verification procedures are designed to ensure that the data are of known quality and are appropriate for a given regulation or task. Details of instrument calibration and/or test verification procedures including calibration range, standardizations, calculations, and acceptance criteria are included or referenced in each test method SOP.
B. Sufficient raw data are retained to reconstruct the calibration used to calculate the sample results.
C. All calibrations are verified with a second source standard, which is traceable to an NIST standard, when available.
D. Calibration standards include a concentration at or below the regulatory/decision level, but above the laboratory's MDL detection limit/(RL).
E. Results of samples must be within the calibration range (bracketed by standards) or the results must be flagged as having less certainty. For Ohio VAP samples must be quantitate within the linear range of the compound
F. No data associated with a calibration that is out-of-control can be reported.
G. Method Detection Limit (MDL) – The MDL is determined by the laboratory and documented for each analyte where spiking solutions are available. MDL is determined by the procedure presented in 40 CFR Part 136, Appendix B, Procedure Revision 2 (2016). All sample-processing steps of the analytical methods are included in the determination of the MDL. The standard deviation of the analysis of seven portions of spiked ultra-high-purity nitrogen is calculated. The spiked nitrogen is at an estimated concentration between the actual MDL and 5 times the actual MDL. The MDL is the product of 3.14 times the calculated standard deviation. The MDL is approximately one-fifth of the practical and routinely achievable detection level that can be reported with relatively good certainty that any reported value is reliable.

Procedure Revision 2 (2016)
Process a minimum of seven spiked samples and seven method blank samples through all steps of the method. The samples used for the MDL must

be prepared in at least three batches on three separate calendar dates and analyzed on three separate calendar dates. (Preparation and analysis may be on the same day.) Existing data may be used, if compliant with the requirements for at least three batches, and generated within the last twenty four months. The most recent available data for method blanks and spiked samples must be used. Statistical outlier removal procedures should not be used to remove data for the initial MDL determination, since the total number of observations is small and the purpose of the MDL procedure is to capture routine method variability. However, documented instances of gross failures (e.g., instrument malfunctions, mislabeled samples, cracked vials) may be excluded from the calculations, provided that at least seven spiked samples and seven method blanks are available. (The rationale for removal of specific outliers must be documented and maintained on file with the results of the MDL determination.) (i) If there are multiple instruments that will be assigned the same MDL, then the sample analyses must be distributed across all of the instruments. (ii) A minimum of two spiked samples and two method blank samples prepared and analyzed on different calendar dates is required for each instrument. Each analytical batch may contain one spiked sample and one method blank sample run together. A spiked sample and a method blank sample may be analyzed in the same batch, but are not required to be. (iii) The same prepared extract may be analyzed on multiple instruments so long as the minimum requirement of seven preparations in at least three separate batches is maintained.

(1) Results are tabulated and the standard deviation of the data set is taken:

$$s^2 = \frac{1}{n-1}\left[\sum_{i=1}^{n}\left(x_i - \overline{x}\right)^2\right]$$

(2) Using the degrees of freedom from the data set and the appropriate confidence level (usually 1%), the critical t-value is looked up using reference tables:

$$t_{\nu,\alpha} = (\text{look - up value})$$

(3) The MDL is computed as the product of the standard deviation and the critical t-value:

$$MDL = t_{\nu,\alpha} \times s$$

11. Sample Handling

A. Sample Acceptance Policy – The sample custodian is responsible for the receipt of all samples collected, field technicians, and the clients themselves. All samples are checked to see that they arrive accompanied by a complete chain of custody form, are received intact, and are sampled in the correct container with the proper volume for the parameter(s) requested. A sample receipt checklist is completed for all projects, and any problems with the samples is documented and brought to the attention of the Environmental Project Coordinator (EPC). The EPC then contacts the client to determine if the samples need to be re-collected or if the laboratory should continue with the analysis. Each sample container is uniquely identified with a durable label. The sample collection policy is available to all sample collectors.

Obtaining sample aliquots from a submitted sample as part of the test methods is carried out using procedures as written in each method SOP. Appropriate techniques to obtain representative subsamples are employed and documented in the method SOP.

The samples must be submitted to the laboratory with records of field ID, location, date and time of collection, collector's name, preservation, sample type, and remarks. Complete handling instructions are furnished to the sample collectors.

Summary of Sampling and Handling Requirements

Analyte	Container	Preservation	Max. Holding Time
ENVIRONMENTAL ANALYSES/AIR REQUIREMENTS: Organic Tests:			Both Analysis and hold times
Polar and Non-polar Organics	Summa Cans	None	30 days from Collection
Polar and Non-polar Organics	Tedlar Bag	None	48 hours until transfer, 30 days from sample collection

B. Sample Receipt Protocol – Upon receipt, the sample custodian checks and records the condition of the samples; this includes a review of all items specified in the sample acceptance policy noted immediately above.

Sample records are linked to the sample ID and include all required information specified by the sample acceptance policy. Samples are stored according to conditions specified in each test SOP. The laboratory has documented procedures (see Centek SOPs SR-10, SR-20, SR-30, SR-40, or other Custody Division SOPs, as needed) and appropriate facilities to avoid deterioration, contamination, or damage to samples during storage, handling, preparation, and testing. Storage conditions are maintained, monitored, and recorded.

C. Procedures for Handling Submitted Samples

1. In accordance with procedures in each EPA Method, obtain sample aliquots from a submitted sample. Follow Method-appropriate techniques to obtain representative subsamples.
2. Each sample container is uniquely identified using a durable label. Identify all samples by noting a C (for Centek), then the last two digits of the year, then digits denoting the month, then the sample ID number (also written on the chain of custody). For example, a sample received on December 1, 2003, and was the 65th sample batch for that month and the fifth sample of that batch would have the sample ID of C0312065-005.
3. The sample acceptance policy is documented and available to the sample collectors. If any samples do not meet any of the requirements of the acceptance policy, the data are flagged in a clear manner that defines the nature of the problem.
4. The sample receipt protocol is documented. The condition of the sample, including any abnormalities or departures from standard condition as described in the relevant test method, is recorded.
5. Receipt of all samples is recorded on the accompanying chain of custody form. This form contains the project name, date and time of collection and laboratory receipt, client ID, laboratory ID, and sample custodian's signatures.
6. Sample records, which are also available and linked to the sample ID, include all required information specified by the sample acceptance policy. These records are kept in the project draft folder with the chain of custody form.
7. Samples are stored according to conditions specified in each test method SOP. Centek Laboratories has documented procedures and appropriate facilities to avoid deterioration, contamination, or damage to samples during storage, handling, preparation and testing. Storage conditions are maintained, monitored, and recorded, as needed. Sample canisters are recycled/cleaned after use and are not stored for possible subsequent reanalysis.

D. Transferring Samples from Tedlar Bags

Due to the holding time of compounds in a tedlar bag the usual holding time is 48 hour from collection. To increase the hold time of a sample in a tedlar, transfer the sample to a certified canister. This will increase hold

time to 30 days of collection. Record canister number an date of transfer on final report. See SOP TS-100.

E. Disposal of Standards and Samples

All waste disposal procedures must comply with federal and state laws and regulations. See SOP-TS-80 and TS-100

F. Transfers and storage of reference material

All transport and storage of reference material shall be done in accordance to manufactures specifications. SOP LP-30

12. Laboratory Environment

A. Calibration and testing occur only within the laboratory in spaces designed, built, and maintained as laboratory space. The operations staff maintains the laboratory space in accordance with the specifications required for laboratory space. See Centek SOP TS-70. Laboratory space is segregated from neighboring test areas or areas of incompatible activities. Specific work areas are defined, and access to these areas is controlled. (Only authorized laboratory personnel and escorted signed-in visitors may enter the work area.) Smoking is prohibited throughout the entire building. Work areas include entries to the laboratory, sample custody area, sample storage area, laboratory analysis area, chemical and waste storage area, data handling and storage area.
B. All equipment and reference materials required for the accredited tests are available in the laboratory. Records are maintained for all equipment, reference measurement materials, and services used by the laboratory.
C. Reference materials, such as Mass Flow Controllers, shall use materials provided and traceable by a competent supplier such as an ISO/IEC 17025 supplier or to National Standard reference materials. They are stored away from heavy use areas or major equipment that may affect the proper operation of the materials. Certificates of traceability are available for the reference thermometer and the Class S weights. The reference materials are used only for calibration to maintain the validity of performance. Any further storage or transportation of reference materials will follow manufactures recommended procedures.

13. Procedures for Calibration, Verification, and Maintenance of Equipment

A. Equipment is maintained, inspected, and cleaned according to the Equipment Maintenance SOPs found in the Technical Services Division Manual. Any defective equipment item is clearly marked and taken out of service until it is shown to perform satisfactorily.
B. Each equipment item or reference material is labeled to show its calibration status.
C. Equipment and reference material records include:
    1. Name of equipment item or reference material

2. Manufacturer, identification, serial number
3. Date received and placed in service
4. Current location
5. Condition when received
6. Copy of manufacturer's instructions or manuals
7. Dates and results of calibrations/verifications and date of next calibration/verification
8. Details of maintenance carried out to date and planned for the future
9. History of any damage, malfunction, modification, or repair

D. Service of equipment is analyzed by qualified personal and/or service organizations. When using external calibration services, traceability of measurement shall be assured by the use of calibration services from laboratories that can demonstrate competence, measurement capability and traceability. All records and certificates from service calls are retained. Any preventive maintenance done on the instruments or changes in hardware or software will be documented into each instrument maintenance logbook. The information will show date of service, problem with system and person who repaired. When possible, any external calibration service used must be a calibration laboratory accredited to ISO/IEC 17025 by a recognized accreditation body.

14. Use of Reference Materials and Proficiency Testing Participation

The laboratory purchases external reference samples that will have traceability to NIST standards if the following conditions are met:

- An unbroken chain of measurements back to NIST standards is maintained.
- Each step of the chain has known and documented uncertainties.

A. All reference samples are certified. The laboratory retains the manufacturer's Certificate of Analysis. The purchase of these standards should be as pure as we can get and will have a manufacture shelf life listed on the container.

B. When a source is available, the laboratory participates in third-party proficiency testing or in a round-robin program to demonstrate competency. In the meantime the laboratory implements an internal quality control (QC) program. The laboratory prepares and collects data from QC samples or from laboratory control sample (LCSs). The data points are charted to determine upper and lower control limits at two standard deviations, or 2sd. A minimum of 20 data points is required.

15. Internal Quality Control Procedures

The data acquired from QC procedures are used to estimate the quality of analytical data, to determine the need for corrective action, and to interpret results after corrective actions are implemented. QC procedures and QC limits are clearly defined in each method SOP. QC limits are generated when no method limits exist. The QC limits for LCSs and matrix spikes (MSs) are based on the historical mean recovery plus or minus three standard deviation units, or

3sd. Duplicate limits for precision range from zero to 3.27 times the mean of the historical differences or relative percent differences.

All QC measures are assessed and evaluated on a continuous basis. The laboratory presents summaries of LCSs and laboratory control sample duplicate (LCSD) recoveries on control charts to monitor laboratory quality and to map trends in results.

Method blanks are analyzed at a frequency of one per batch of samples. The results are used to determine batch acceptance. When blanks exceed the method criteria, steps are taken to determine the source of contamination, and measures are implemented to minimize or eliminate the problem.

LCS is analyzed at a frequency of one per batch of 20 or fewer samples or 5% of the analytical run sequence. The results are used to determine batch acceptance.

MS and matrix spike duplicates (MSD) are analyzed whenever requested by the client. The results are used to identify matrix interferences in the spike sample. Matrix interference is indicated when the LCS data are within limits but the MS data exceed QC criteria.

LCSD are analyzed at a frequency of one per 20 or fewer samples. MSD are run for organic parameters. Both LCSD and MSD are a measure of precision. If a duplicate result falls outside QC limits, the original sample and the duplicate sample are regarded as unreliable.

Relative Percent Difference (RPD) Replicate Precision: The measure of replicate precision used for this quality management program is the absolute value of the difference between replicate measurements of the sample, divided by the average value expressed as a percent, as follows:

$$RPD = \frac{|a-b|}{(a+b) \div 2} \times 100$$

16. Testing Discrepancies

Specific corrective action procedures for handling QC limit exceedances are detailed in each Centek method SOP. In addition, general procedures are followed to determine when departures from QC have occurred. The protocol for documentation of such deviations is determined by the Corrective Action Procedure in Centek SOP TS-80. If not all QC measures are found to be acceptable, it is not always possible to repeat the analysis owing to sample scheduling times and sample holding times. Therefore, when data must be reported, the laboratory uses data qualifiers (in the form of flags on the final

report) to notify clients when their samples are associated with outlying QC measures.

17. Preventive/Corrective Action Policy

Preventive/corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable departures from policies and procedures or out of control QC performance prior to and after an issue that can affect data quality. Each method SOP details QC acceptance criteria and specific protocols for corrective actions. Any QC measure that falls outside of acceptable limits needs a immediate corrective action. This immediate action may be analyzed by the laboratory technician (as defined in the method SOP) and/or by the QA/QC officer. All corrective actions are required to identify and the associated sample data is flagged. The QA/QC officer conducts an investigation to the root / cause(s) of the discrepancy and implements the corrective action. With each corrective action is documented in a log, and each log entry must be reviewed, signed, and dated by the QA/QC officer. Corrective actions must be analyzed by the QC officer prior to the reporting of the affected data. Samples QC should be evaluated the day before the next analytical running day to insure QC criteria is met. Closing of the corrective action must be done before the release of the final report. However, in cases where the discrepancy is discovered after the results are released, a corrective action is filed and an amended report may be sent to the client with the reanalysis results (if applicable).

18. Permitted Departures from Standard Specifications or Documented Policies and Procedures

The technical director and QA/QC officer are responsible for ensuring compliance with the laboratory's policies and procedures. Arrangements for known and controlled departures from documented policies and procedures are allowed by technical director and QA/QC. Planned and controlled departures from documented policies do not require audits; however, the departure must be fully documented and include the reason for the departure, the affected SOP(s), the intended results of the departure, and the actual results. If the data reported to the client are adversely affected, the client must be notified in writing and corrective action report filed. The procedures used to document any departure from documented policies are the same as the corrective action procedure (see Centek SOP PM-70).

This revision does not apply to Ohio VAP. You must inform Ohio in writing before you can revise.

19. Complaints

All complaints about the laboratory's activities received from clients or other parties are documented on a Client complaint Form and filed in the client complaint folder maintained by the laboratory. The file documents the date and person filing the complaint, a description of the complaint, source of the complaint, the resolution, and any written material accompanying the complaint.

The QA/QC officer and/or Technical Directors investigate all complaints by conducting an internal audit. All areas of the laboratory associated with the complaint are investigated, and the written results of the investigation, including corrective actions taken by the laboratory, are reviewed by the technical director. The QA/QC officer signs and dates the results of the investigation.

20. Internal Audit and Data Review

A. Data Review – All data, calculations, derived data, calibration records, QC records, and an electronic copy of the test report are kept for five years to allow historical reconstruction of the final result. All original observations and calculations are reviewed by the QA/QC officer before the data is reported. The data are reviewed to ensure that all calculations are correct and to detect transcription errors. The second analyst (laboratory section supervisor or laboratory director) signs and dates all reviewed data packages. The QA/QC officer evaluates the sample(s) results, dates and sample ID's for preliminary results. Errors detected in the review process are referred to the second analyst for immediate action. The quality control office documents all immediate actions taken. The final report is than reviewed by the Lead Technical Director that is signed and dated to the client. For Category B packages that are sent off for validation, the validator will check final calculated results

B. Internal Quality System Audits – The QA/QC officer conducts once a year internal audits on the laboratory's quality management system. The QA/QC officer, who is independent of the activities being audited, conducts these audits. The QA/QC officer uses the requirements of the ELAP manual or AIHA-LAP and ISO/IEC 17025 guidance to evaluate the laboratory procedures and SOPs. All audit results are documented, along with any excursions. If any client data is compromised then the client will be contacted within 10 working days and a corrective action will be completed.

C. Managerial Review – The laboratory director and technical director review the laboratory quality management system and its testing and calibration activities annually to introduce any changes or improvements. The review incorporates outcomes of recent internal audits, assessments by external bodies (AIHA-LAP, NYSDOH, USEPA, NYSDEC), the results of proficiency tests, any changes in the volume or type of work analyzed, client feedback, corrective actions, suitability of policies and procedures, reports from managerial and supervisory personnel, outcome of the recent internal audits and assessments by external bodies, and other relevant factors, such as QA/QC activities, resources, and staff training. The overall objectives shall be

established and reviewed. Findings from the management reviews and the actions that arise from them shall be recorded. The Management reviews shall take into account recommendations for improvement. The management shall ensure that those actions are carried out with and appropriate and agreed timescale. At least bi-annually, the Quality manager shall provide reports to laboratory management regarding quality assurance matters. These reports shall include information on internal audits, proficiency program performance, nonconformities and corrective/preventative actions taken. All departments will have 90 days to complete and submit recommendations to department manager.

D. At least quarterly, the quality manager shall provide reports to the laboratory management regarding quality assurance matters. These reports shall include information on internal audits, proficiency program performances, nonconformities and corrective/preventive actions taken.

21. Training and Review of Personnel Qualifications

Laboratory management reviews an applicant's level of qualification, experience, and skills against the laboratory's job description requirements before assigning an employee to the laboratory. Each analyst must possess adequate experience and education in the appropriate field. All laboratory technicians must possess a minimum of a two-year degree in chemistry or a related field, with general knowledge of laboratory operations, test methods, QC procedures, and records management. The QA/QC officer keeps the following personnel records:

A. The laboratory maintains a training file that contains:
   1. A statement from each employee that he or she has read, understood, and is using the latest version of the Laboratory Quality Manual and SOPs. The statement is signed and dated.
   2. Resumes kept on record showing education and past working history experience
   3. A statement from each employee that he or she has read, acknowledges, and understands his or her individual ethical and legal responsibilities, including the potential punishments and penalties for improper, unethical, or illegal actions. The statement is signed and dated.
   4. A Demonstration of Capability (DOC) for each employee for each accredited method that the employee performs. When applicable proficiency testing with blind dupes or purchased PT standard.
   5. Documentation of any training courses, seminars and/or workshops.
   6. Documentation of each employee's continued proficiency to perform each test method by one of the following annually:
      i. acceptable performance of a blind sample for each accredited method;
      ii. another DOC;

iii. at least four consecutive laboratory control samples with acceptable levels of precision and accuracy.

iv. if items i through iii cannot be analyzed, analysis of authentic samples that have been analyzed by another trained analyst with statistically precise results.

B. Demonstration of Capability (DOC) – A DOC must be analyzed prior to using any test method, and any time there is a change in instrument type. The procedure must follow ISO/IEC 17025, AIHA-LAP, ELAP Certification Manual, and the DOC Certificate included in this procedure; the DOC is completed for each analyst for each test method, and a DOC must be completed every six months.

22. Education and Training in Ethical and Legal Responsibilities, Including the Potential Punishments and Penalties for Improper, Unethical, or Illegal Actions

All new employees performing laboratory testing are trained by the section supervisor and QA/QC officer within the first two weeks of employment. A copy of the laboratory's Code of Ethical Conduct is given to each employee (see Appendix A). A record of training is signed, indicating the employee has read and understands the material presented to him or her. These signed records are kept in the employee's training file. If an employee feels that data integrity and/or ethics needs to be communicated the employee can discuss with their supervisors, technical director, President or DOH without repercussions.

23. Reporting Analytical Results

The results of each test carried out by the laboratory are reported accurately, clearly, unambiguously, and objectively. For a treatment facility laboratory, the following information shall be made available on request. Commercial providers of laboratory services and facility laboratories providing services to outside clients shall include this information for the client in the report of laboratory analysis:

1. Title;
   2. Name and address of laboratory, and location where the test was carried out if different from the address of the laboratory and phone number with name of contact person for questions;
   3. Unique identification of report and each page, including the total number of pages;
   4. Name and address of client, where appropriate and project name, if applicable
   5. Description and unambiguous identification of the tested sample including the client identification code;

6. Identification of results derived from any sample that did not meet sample acceptance requirements, such as, improper container, holding time, or temperature;
7. Date of receipt of sample, date and time of sample collection, date(s) of performance test, and time of sample preparation and/or analysis if the required holding time for either activity is less than or equal to 72 hours.
8. Identification of test method used, or unambiguous description of any non-standard method used;
9. If the laboratory collected the sample, reference to the sampling procedure;
10. Any deviations from (such as failed QC), additions to or exclusions from the test method (such as environmental conditions), and any non-standard conditions that may have affected the quality of the results, including the use and definitions of data qualifiers;
11. Measurements, examinations and derived results, supported by tables, graphs, sketches and photographs as appropriate, and any failures identified; reporting units on a wet or dry basis;
12. When required a statement of the estimated uncertainty of the result
13. A signature and title, or an equivalent electronic identification of the person(s) accepting responsibility for the content of the of the report, and date of issue;
14. Clear indication of data provided by outside sources, such as subcontracted laboratories, clients etc; and,
15. Clear identification of numerical results with values outside of quantitation limits.

Report Levels

Level 1 Report	Sample results only.
Level 2 Report	Sample results and QC.
Level 4 Report	NYSDEC ASP Category B *and NJ Deliverable Package* **A full deliverable package for an independent data validator.**
Note:	When these reports are requested assume that the data that is being used is for evidentiary or legal purpose

Subcontracted laboratories are identified by name and accreditation number on the report.

If errors are detected in the report, a subsequent revised report will be issued. The updated report will be titled " Revised Report".

If the laboratory discovers equipment used to derive results in any report casts doubt on the validity of the result it shall notify the client(s) in writing.

The test results could be expressed in terms of measurement uncertainty, if requested. To take into account all components of variability, the standard deviation (SD) from the LCS control chart will be used. To express a result for a 95% confidence interval, use two times the SD, for a 99% confidence interval, use three times the SD. The confidence interval for suspended solids will be taken from the duplicate control chart, the working (95%) or upper (99%) control limit. The sample result could be reported: result +/- 2 X SD (95% confidence interval)

The laboratory shall, where clients require transmission of test results by telephone, telex, facsimile or other electronic or electromagnetic means, follow Centek's SOP's (LP-60 & PM-40) documented procedures that ensure that the above requirements are met and that confidentiality is preserved.

24. Reagents and Standards

All reagents and standards are to be purchased only by an employee qualified to know proper handling and disposal requirements. All reagents and standards must be dated and initialed after examination/inspected beore they can be accepted into the laboratory by the laboratory director. If the reagent or standard is a compound that the laboratory has not received, then the MSDS for the compound needs to be filed. All reagents and standards are to be stored in a cabinet certified to meet the requirements of the applicable MSDSs. Each standard's Certificate of Analysis (CoA) must be filed in the CoA book in the laboratory.

25. Client Confidentiality

Confidentiality has been defined by "ensuring that information is accessible only to those authorized to have access" and is one of the cornerstones of information security. **Client confidentiality** is the principle that an institution or individual should not reveal information about their clients to a third party without the consent of the client or a clear legal reason. **Client confidentiality** is "privileged" and may not be discussed or divulged to third parties.

Centek Laboratories clients have a strict confidentiality policy. The Laboratory and its employees shall not release any information regarding the activities of Centek's clients or the client's facility(ies). If requested, by the client, the Laboratory and its employees may have to sign a confidentiality agreement. The Laboratory should only contact the client personal listed on the chain of custody

for any discussions with the associated project. Contacting any other unauthorized personal will be considered a breach of cooperation and may result in the termination. In some cases the media (TV, radio, newspapers, social media) may contact Centek Laboratory, we will not divulge to them clients, name, facility name, and the location of the site for which analytical services are being performed either verbally or within written documentation. Should such information appear on any written documentation received or transmitted verbally, the Laboratory will hold such information in trust and not reveal it to any third party.

The Laboratory will hold in trust and not reveal to any third party any and all information including:

- The entire work product and results generated from the Agreement, including project analytical results, recommendations, and conclusions.
- Any and all communications between the client and the Laboratory.

No provision of this confidentiality provision shall prevent Laboratory's release or report of information required by relevant state or federal law or regulation nor shall the Laboratory be required to withhold information from a court or government agency of competent jurisdiction. The Laboratory shall inform the client of any such requests for information as soon as possible and prior to submittal.

26. Opportunities for Improvement

All employees of Centek Laboratories are encouraged to be pro-active to achieve personal and advancement improvements by using, but not limited to:

- Webinars
- Technical training
- Future education through internet or seminars

27. Data Integrity Program

Management acknowledges their support of this program by upholding the spirit and intent of the laboratory's data integrity procedures and effectively implements the specific requirements. The Data Integrity Program consists of four parts:

Data Integrity/Ethics training for all employees who perform laboratory testing either at the initial hiring or within two weeks after assignment to the laboratory. Annual training is also required for all employees. Training may be conducted in-house or externally. A record of training and a signed attestation by the trained employee shall be placed in the employee's training file. All personal will sign and date a form and be filed in their personal folder.
Laboratory Management is required to conduct an annual training in ethics & data integrity for all staff. At a minimum, the training should include the following:
Topics covered shall be documented and provided to all trainees

- Organizational mission and it relationship for honesty and full disclosure in all reporting
- Record keeping
- Employees understand the consequences that any infraction will go through a full investigation and could lead to dismissal from job and civil and criminal prosecution
- Show as many examples of breaches of ethical behavior
- Have discussions regarding data integrity procedures, documentation and data monitoring
- Importance of proper written narration on the part of the analyst to those cases where analytical data is useful
- Ethics Agreement (Code of Ethics)

Following initial data integrity training and on-going annual training for laboratory managers and staff, trainees shall sign a written ethics agreement. Senior managers who provide the training shall also sign the agreement. The agreement states that the signers will not engage in any unethical practices with respect to data integrity nor will they tolerate improper behavior in others if it is observed or suspected. By signing, senior managers acknowledge their duties in upholding the spirit and intent of the data integrity system and in effectively implementing the specific requirements of the plan (See Appendix A).

Monitoring

Monitoring of data production is accomplished by report review. Reports and the data used to support them are randomly selected by the Quality Assurance Officer (QAO) for auditing to verify that all data integrity requirements are met. Each calendar quarter the QAO audits 5 % or 5 data packages, which ever is more, and documents the review. The QAO shall have an in-depth understanding of typical inappropriate analytical behavior and be trained in the data integrity system. Records of these reviews are retained for 5 years.

Confidentiality

Confidentiality is critical and maintained by use of locked filing cabinets and password protected electronic files. All data integrity incidents must be documented, including investigative findings and disciplinary actions. Corrective actions are recorded. If client disclosure is determined to be necessary by senior laboratory management then such disclosures and outcomes are recorded.

All data integrity documents, SOPs, personal records and records of investigations shall be maintained for a period of seven years. Documents are subject to the document control system and records are subject to the records management system as described in the laboratory's quality manual and related SOPs.

28. Risk and Opportunities

Risk assessment involves the **objective analysis of the company's operations** in order to determine potential hazards and liabilities. Once these issues are identified, upper management are tasked with designing, implementing and monitoring processes necessary to protect the company's assets.

How is risk assessed?

1. Identify the hazards. The first step in a risk assessment is to identify any potential risk
2. Determine what, or who, could be harmed.
3. Evaluate the risks and develop control measures.
4. Record the findings. The risk assessment findings should be recorded by management
5. Review and update the risk assessment on a quarter bases

How is Opportunity Assessed?

Opportunity is a **favorable situation for a positive outcome** Ex. Centek employees will discuss at the conference table and look at risks in the lab and opportunities for improvements.

End of Procedure

29. Appendix A and Forms

Appendix A
Code of Ethics

1. No employee is allowed to have any interest, financial or otherwise, direct or indirect, or engage in any business or transaction or professional activity or incur any obligation of any nature, which is in substantial conflict with the proper discharge of his/her duties in the public interest.
2. No employee is allowed to accept other employment that will impair his/her independence of judgment in the exercise of his/her duties.
3. No employee is allowed to disclose confidential information acquired by him/her in the course of his/her official duties nor use such information to further his/her personal interests.
4. No employee is allowed to accept employment or engage in any business or professional activity that will require him/her to disclose confidential information that he/she has gained by reason of his/her official position or authority.
5. No employee is allowed to use or attempt to use his/her official position to secure unwarranted privileges or exemptions for him/herself or others.
6. No employee is allowed to engage in any transaction as representative or agent of the laboratory with any business entity in which he/she has a direct or indirect financial interest that might reasonably tend to conflict with the proper discharge of his/her official duties.
7. No employee is allowed by his/her conduct to give a reasonable basis for the impression that any person can improperly influence him/her.
8. Violations:
   In addition to any penalty contained in any other provision of law, such as fine and imprisonment, any such employee who knowingly and intentionally violates any of the provisions of this Code of Ethics may be fined, suspended, or removed from employment in the manner provided by law.
9. If an employee feels that data integrity and/or ethics needs to be communicated the employee can discuss with their supervisors, technical director, President or DOH without repercussions. All discussions about data integrity and/or ethics will be kept confidential with the employee

By signing below, I certify that I have read and understand the Centek Laboratories, LLC **Code of Ethics**, and possible penalties for violations.

Name	Title	Date

Demonstration of Capability
Certification Statement

Date:_____

Analyst Name:_____

Matrix:_____

Parameter and Method Number:_____

We, the undersigned, CERTIFY that:

1. The analyst identified above, using the cited test method, which is in use at this facility for the analyses of samples under the National Environmental Laboratory Accreditation Program, has met the Demonstration of Capability.
2. The test method was analyzed by the analyst identified on this certification.
3. A copy of the test method and the laboratory-specific SOPs are available for all personnel on-site.
4. The data associated with the Demonstration of Capability are true, accurate, complete, and self-explanatory (1).
5. All raw data (including a copy of this certification form) necessary to reconstruct and validate these analyses have been retained at the facility, and the associated information is well organized and available for review by authorized assessors.

_____	_____	_____
Laboratory Director	Signature	Date
_____	_____	_____
Quality Assurance Officer	Signature	Date

This certification form must be completed each time a Demonstration of Capability is completed.

(1) Definitions

True:	Consistent with supporting data.
Accurate:	Based on good laboratory practices consistent with sound scientific principles/practices.
Complete:	Includes the results of all supporting performance testing.
Self-explanatory:	Data properly labeled and stored so that the results are clear and require no additional explanation.

Technically Acceptable Analyst Documentation

All analysts must show technical competence for each test they conduct. This document, when signed by the analyst, Laboratory Director, and Quality Control Officer, is certification of his/her capability to perform the indicated test according to Centek guidelines and method SOPs. The analyst must show demonstration of capability by independently performing five acceptable analyses of the test method Reference Standard.

Test:_____ Matrix:_____

Method:_____

Analyst:_____

Batch/File Number	Date Performed	True Value	Actual Value	Percent Recovery	Control Limits
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
		Average:	_____	_____	

_____ _____
Analyst Date

_____ _____
Laboratory Director (authorized) Date

_____ _____
QA/QC Officer (authorized) Date

The following people have read and understand the Laboratory Quality Manual

Name	Signature	Date

Quality Systems Manual

Revision XIII: August 2021

Effective Date: August 17, 2021

Document Control Number: 224

Mike Earp
General Manager

signature

Olga Azarian
Quality Assurance Manager

signature

SGS North America Inc.-Dayton
2235 U.S. Route 130
Dayton, New Jersey 08810
732.329.0200

Introduction

The SGS North America Inc. (hereafter referred to as SGS) Quality Assurance System, detailed in this plan, has been designed to meet the quality program requirements of the National Environmental Laboratory Accreditation Program (NELAP), ISO 17025, the Department of Defense Environmental Laboratory Approval Program (DOD ELAP) and other National environmental monitoring programs. The plan establishes the framework for documenting the requirements of the quality processes regularly practiced by the Laboratory. The Quality Assurance (QA) Manager is responsible for changes to the Quality Assurance Program, which is appended to the Quality System Manual (QSM) during the annual program review. The plan is also reviewed annually for compliance purposes by the Vice President (VP) for the Environment, Health & Safety (EHS) division of SGS North America Inc. and by the Laboratory Director and edited if necessary. Changes that are incorporated into the plan are itemized in a summary of changes following the introduction. Plan changes are communicated to the general staff in a meeting conducted by the QA Manager following the plan's approval.

The SGS plan is supported by standard operating procedures (SOPs), which provide specific operational instructions on the execution of each quality element and assure that compliance with the requirements of the plan are achieved. SGS employees are responsible for knowing the requirements of the SOPs and applying them in the daily execution of their duties. These documents are updated as changes occur, and the staff is trained to apply the changes.

At SGS, we believe that satisfying client requirements and providing a product that meets or exceeds the standards of the industry is the key to a good business relationship. However, client satisfaction cannot be guaranteed unless there is a system that assures the product consistently meets its design requirements and is adequately documented to assure that all procedural steps are executed, properly documented and traceable.

This plan has been designed to assure that this goal is consistently achieved and the SGS product withstands the rigors of scrutiny that are routinely applied to analytical data and the processes that support its generation.

Summary of Changes

Section	Page(s)	Description
2.3	9	Updated Organizational Chart
2.2	7	Added QA Director
4.1	17	Added QA Director

Table of Contents

1.0 MISSION AND QUALITY POLICY

1.1 SGS NORTH AMERICA INC. MISSION:

SGS North America Inc. provides analytical services to commercial and government clients in support of environmental monitoring and remedial activities as requested. SGS North America Inc.'s mission is dedicated to providing accurate and reliable data that satisfies client requirements as explained in the following:

"Deliver value to our clients by providing easy access to accurate and timely analytical information which meets or exceeds their expectations."

These services are provided impartially and are not influenced by undue commercial or financial pressures which might impact the staff's technical judgment. SGS North America Inc. does not engage in activities that endanger the trust in our independent judgment and integrity in relation to the testing activities performed.

1.2 QUALITY POLICY AND PROFESSIONALISM STATEMENT:

Quality and Professionalism are integral parts of SGS' Business Principles and are a cornerstone of ensuring high levels of customer satisfaction. By maintaining operational excellence, we ensure the long-term sustainability of our business.

IT IS OUR AIM TO

- Deliver world-class services to meet our customers' needs.
- Be known and recognised for our superior knowledge and reliability, along with our accuracy and consistency.
- Nurture and propagate a culture of quality within SGS with the full support of management and engagement of all employees.
- Develop the understanding that we will never compromise on quality.

IT IS THEREFORE OUR COMMITMENT TO

- Place our customers at the heart of everything we do.
- Actively listen to industry and customer needs and expectations and innovate in our quality statement to meet them.
- Continuously challenge ourselves to improve our quality management system by setting and reviewing our objectives, risks, KPIs, results and customer satisfaction levels.
- Develop and maintain the processes we need to deliver high quality, optimised and coherent services.
- Continuously measure, maintain and increase SGS' knowledge base through a sustainable processes of talent recruitment and training.
- Respect client confidentiality and individual privacy whilst remaining transparent in all other aspects of our work.
- Protect SGS' intellectual property and know-how.
- Embody the SGS brand and its independence in all that we do.

Delivering quality and professionalism is an individual responsibility for all of us, at every level within our organisation.
These commitments apply to all SGS employees and contractors.
Management is responsible for ensuring full compliance with SGS policies.

FRANKIE NG
Chief Executive Officer

11 January 2016

This version cancels and replaces all previous Quality policy statements.

The English version of this document constitutes the binding version.

WHEN YOU NEED TO BE SURE

The following is implied in this policy:

- Commitment to comply with the latest requirements of The NELAC Institute (TNI), ISO 17025, and the Department of Defense Quality System Manual
- Commitment to continually improve the effectiveness of the Quality Management System
- Commitment to good professional practices
- Commitment to the quality of our services
- Commitment that testing will be carried out to stated methods and client requirement
- All personnel must familiarize themselves with the Quality Policy, Quality System Manual and implement all policies and procedures related to their jobs.

Management must ensure that this quality policy is communicated and understood with SGS North America Inc. and reviewed for continued suitability.

2.0 ORGANIZATION

2.1 ***Organizational Entity***. SGS - Dayton is the New Jersey division of SGS North America Inc., which is part of the multi-national SGS S.A., based in Geneva, Switzerland. The facility is located in Dayton, New Jersey where it has conducted business since 1987. Satellite laboratories are maintained in Orlando, Florida; Houston, Texas; Wheat Ridge, Colorado; and Scott, Louisiana.

2.2 ***Management Responsibilities***

Requirement: Each laboratory facility has an established chain of command. The duties and responsibilities of the management staff are linked to the Operations Council and the Chief Executive Officer of SGS S.A. who establishes the agenda for all company activities.

Managing Director NA. Oversees all business operations for the SGS network in North America. Reports to the Chief Operating Officer for SGS North America Inc.

Vice President EHS. Primary responsibility for all business activities. Delegates authority to VP Operation and the quality assurance director to conduct day to day operations and execute quality assurance duties. Reports to the Managing Director of North America.

Vice President Operations. Primary responsibility for all operations. Delegates authority to laboratory directors, general managers to conduct day to day operations and execute quality assurance duties. Reports to the VP EHS of North America.

General Manager/Laboratory Director. Executes day to day responsibility for business and laboratory operations including technical aspects of production activities and associated logistical procedures. Reports directly to the VP Operations.

Technical Managers (Organics/Inorganic Departments). Responsible for day to day operations and activities of the organics and inorganics laboratories including scheduling, production and data quality. Report directly to the Operations Manager.

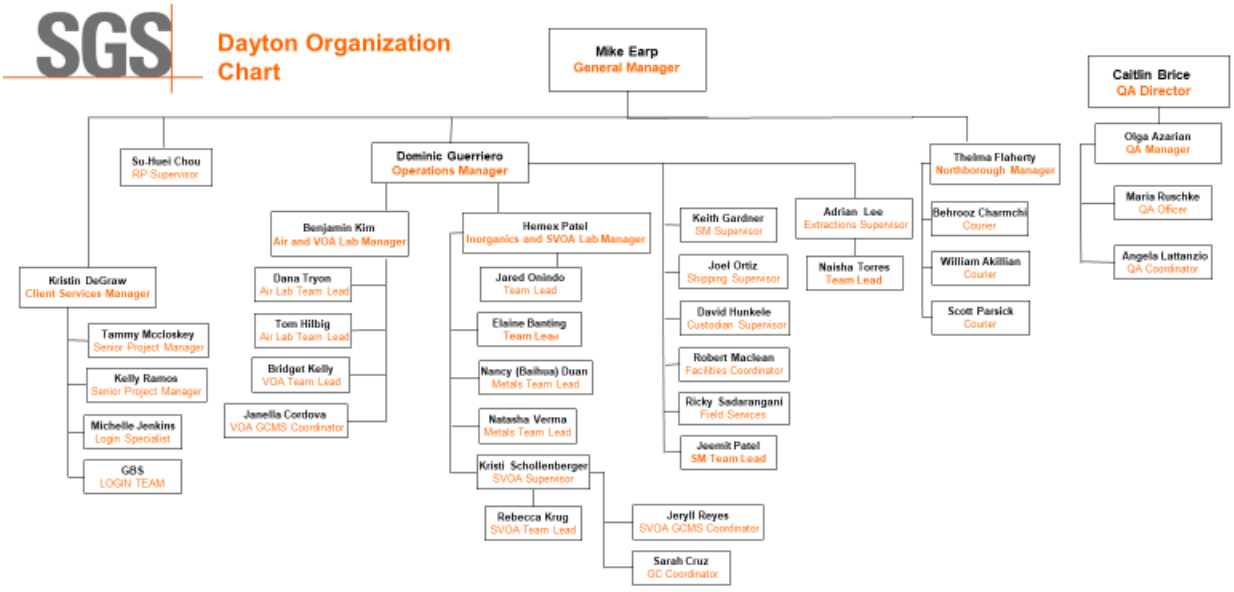
Quality Assurance Manager. Responsible for ensuring that the management system related to Quality is implemented and followed at all times. Reports directly to the QA Director.

Department Supervisors. Execute day to day responsibility for specific laboratory units including technical aspects of production activities and associated logistical procedures. Report directly to the respective Department Manager.

2.3 ***Organization Chart***

The hierarchy of the Company's operational control and oversight is illustrated in the SGS Organization Chart. Appointed deputies are listed in Form QA073. In the event that the technical director or quality assurance manager are absent from their respective position for a period of time exceeding fifteen (15) consecutive calendar days, the designated appointees shall temporarily perform the lab manager, technical director(s), or quality assurance manager job function. If this absence exceeds thirty-five (35) consecutive calendar days, the laboratory shall notify the New Jersey Department of Environmental Protection (NJDEP)-Office of Quality Assurance and the Department of Defense Environmental Laboratory Accreditation Program (DOD ELAP) accrediting body (ANAB) in writing.

Dayton Laboratory Management Team



3.0 QUALITY RESPONSIBILITIES OF THE MANAGEMENT TEAM

3.1 ***Requirement***: Each member of the management team has a defined responsibility for the Quality System. System implementation and operation is designated as an operational management responsibility. System design and implementation is designated as a Quality Assurance Responsibility.

Vice President EHS. Primarily responsible for process improvements to all business aspects of the company.

Vice President Operations. Primarily responsible for process improvements to all operation aspects of the company.

General Manager. Responsible for business and financial oversight of the location.

Technical Directors. Responsible for overseeing the technical aspects of the quality assurance system as they are integrated into method applications and employed to assess analytical control on a daily basis. The Technical Directors review and acknowledge the technical feasibility of proposed quality assurance systems involving technical applications of applied methodology.

Operations Manager. Primarily responsible for process improvements to operations at the Dayton location. Responsible for implementing and operating the Quality System in all laboratory areas. Has the authority to delegate Quality System implementation responsibilities.

Department Managers. Responsible for applying the requirements of the Quality System in their section and assuring subordinate supervisors and staff apply all system requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

Section Supervisors. Responsible for applying the requirements of the Quality System to their operation and assuring the staff applies all system requirements. Initiates, designs, documents, and implements corrective action for quality deficiencies.

Quality Assurance Manager. Responsible for management of the Quality department and oversight of all Quality Assurance and Quality Control aspects at the Dayton location. Evaluates data objectively and performs assessments without outside influences. Empowered with the authority to halt production if quality issues warrant immediate action. Monitors implemented corrective actions for compliance.

Quality Assurance Officers. Responsible for design support, implementation support, training, and monitoring support for the quality system. Conducts audits and product reviews to identify product, process, or operational defects using statistical monitoring tools. Provides support for implemented corrective actions for compliance.

Bench Analysts. Responsible for applying the requirements of the Quality System to the analyses they perform, evaluating QC data and initiating corrective action for quality control deficiencies within their control. Implements global corrective action as directed by superiors.

3.2 ***Data Integrity Policy***. The SGS's Data Integrity Policy reflects a comprehensive, systematic approach for assuring that data produced by the laboratory accurately reflects the outcome of the tests performed on field samples and has been produced in a bias free environment by ethical professionals. The policy includes a commitment to technical ethics, staff training in ethics and data integrity, an individual attestation to data integrity and procedures for evaluating data integrity. Senior management assumes the responsibility for assuring compliance with all technical ethics elements and operation of all data integrity procedures. The staff is responsible for compliance with the ethical code of conduct and for practicing data integrity procedures. There are four required elements within a data integrity system. These are: 1) data integrity training, 2) signed data integrity documentation for all laboratory employees, 3) periodic in-depth data monitoring, and 4) data integrity procedure documentation.

The SGS Data Integrity Policy is as follows:

"SGS is committed to producing data that meets the data integrity requirements of the environmental regulatory community. This commitment is demonstrated through the application of a comprehensive data integrity program that includes ethics and data integrity training, data integrity evaluation procedures, staff participation and management oversight. Adherence to the specifications of the program assures that data provided to our clients is of the highest possible integrity and can be used for decision making processes with high confidence."

Data Integrity Responsibilities

Management. Senior management retains oversight responsibility for the data integrity program and retains ultimate responsibility for execution of the data integrity program elements. Senior management is responsible for providing the resources required to conduct ethics training and operate data integrity evaluation procedures. They also include responsibility for creating an environment of trust among the staff and being the lead advocate for promoting the data integrity policy and the importance of technical ethics. The QA Director is the designated ethics officer for the Laboratory. Additionally, SGS has an Integrity Helpline (1 800 461 9330) which is accessible 24/7 and is managed by Convercent (a third-party specialized supplier) which provides increased security features and improved protection of confidentiality and personal data.

Staff. The staff are responsible for adhering to the company ethics policy as they perform their duties and responsibilities associated with sample analysis and reporting. By executing this responsibility, data produced by SGS retains its high integrity characteristics and withstands the rigors of all data integrity checks.

The staff are also responsible for adhering to all laboratory requirements pertaining to manual data edits, data transcription and data traceability. These include the application of approved manual peak integration and documentation procedures. It also includes establishing traceability for all manual results calculations and data edits.

Ethics Statement. The SGS ethics statement reflects the standards that are expected for businesses that provide environmental services to regulated entities and regulatory agencies on a commercial basis. The Ethics Statement is comprised of key elements that are essential to organizations that perform chemical analysis for a fee. As such, it focuses on elements related to personal, technical and business activities.

SGS provides analytical chemistry services on environmental matters to the regulated community. The data the company produces provides the foundation for determining the risk presented by a chemical pollutant to human health and the environment. The environmental industry is dependent upon the accurate portrayal of environmental chemistry data. This process is reliant upon a high level of scientific and personal ethics.

It is essential to the Company that each employee understands the ethical and quality standards required to work in this industry. Accordingly, SGS has adopted a code of ethics, which each employee is expected to adhere to as follows:

- Perform analysis using acceptable scientific practices and principles.
- Perform tasks in an honest, principled and incorruptible manner inspiring peers & subordinates.
- Maintain professional integrity as an individual.
- Provide services in a confidential, honest, and forthright manner.
- Produce results that are accurate and defensible.
- Report data without any consideration of self-interest.
- Comply with all pertinent laws and regulations associated with assigned tasks and responsibilities.

Data Integrity Procedures. Four key elements comprise the SGS data integrity system. Procedures have been implemented for conducting data integrity training and for documenting that employees conform to the SGS Data Integrity and Ethics policy.

The data integrity program consists of routine data integrity evaluation and documentation procedures to periodically monitor and document data integrity. These procedures are

documented as SOPs. SOPs are approved and reviewed annually following the procedures employed for all SGS SOPs. Documentation associated with data integrity evaluations is maintained on file and is available for review.

Data Integrity Training. SGS employees receive technical ethics training during new employee orientation. Employees are also required to refresh their ethical conduct agreement annually, which verifies their understanding of SGS ethics policy and their ethical responsibilities. A brochure summarizing the details of the SGS Data Integrity Policy is distributed to all employees with the Ethical Conduct Agreement. The refreshed agreement is appended to each individual's training file.

The training focuses on the reasons for technical ethics training, explains the impact of data fraud on human health and the environment, and illustrates the consequences of criminal fraud on businesses and individual careers. SGS ethics policy and code of ethics are reviewed and explained for each new employee.

Training on data integrity procedures are conducted by individual departments for groups involved in data operations. These include procedures for manual chromatographic peak integration, traceability for manual calculations and data transcription.

Data Integrity Training Documentation. Records of all data integrity training are maintained in individual training folders. Attendance at all training sessions is documented and maintained in the training archive.

SGS Data Integrity and Ethical Conduct Agreement. All employees are required to sign a Data Integrity and Ethical Conduct Agreement annually. This document is archived in individual training files, which are retained for duration of employment.

The Data Integrity and Ethical Conduct Agreement are as follows**:**

I. *I understand the high ethical standards required of me with regard to the duties I perform and the data I report in connection with my employment at SGS.*

II. *I have received formal instruction on the code of ethics that has been adapted by SGS during my orientation and agree to comply with these requirements.*

III. *I have received formal instruction on the elements of SGS Data Integrity Policy and have been informed of the following specific procedures:*

   a. *Formal procedures for the confidential reporting of data integrity issues are available, which can be used by any employee,*

   b. *A data integrity investigation is conducted when data issues are identified that may negatively impact data integrity.*

c. *Routine data integrity monitoring is conducted on sample data, which may include an evaluation of the data I produce,*

IV. *I have read the brochure detailing SGS Data Integrity and Ethics Program as required.*

V. *I am aware that data fraud is a punishable crime that may include fines and/or imprisonment upon conviction.*

VI. *I also agree to the following:*

a. *I shall not intentionally report data values, which are not the actual values observed or measured.*

b. *I shall not intentionally modify data values unless the modification can be technically justified through a measurable analytical process.*

c. *I shall not intentionally report dates and times of data analysis that are not the true and actual times the data analysis was conducted.*

d. *I shall not condone any accidental or intentional reporting of inauthentic data by other employees and immediately report its occurrence to my superiors.*

e. *I shall immediately report any accidental reporting of inauthentic data by myself to my superiors.*

Data Integrity Monitoring. Documented procedures are employed for performing data integrity monitoring. These include regular data review procedures by supervisory and management staff (Section 12.7), supervisory review and approval of manual integrations and periodic reviews of GALP audit trails from the LIMS and all computer-controlled analysis.

Data Review. All data produced by the laboratory undergoes at least two levels of review the final review must be performed by a manager, supervisor or designated reviewer. Detected data anomalies that appear to be related to data integrity issues are isolated for further investigation. The investigation is conducted following the procedures described in this section.

Manual Peak Integration Review and Approval. Routine data review procedures for all chromatographic processes includes a review of all manual chromatographic peak integrations. This review is performed by the management staff and consists of a review of the machine integration compared to the manual integration. Manual integrations, which have been performed in accordance with SGS manual peak integration procedures, are approved for further processing and release. Identification of samples and analytes in which manual integration had been necessary may be recorded in a report case narrative specific to a particular client and project requirement.

Manual integrations which are not performed to SGS specifications are set aside for corrective action, which may include analyst retraining or further investigation as necessary.

Data Integrity Review. Data integrity audits are comprehensive data package audits that include a review of raw data, process logbooks, processed data reports and GALP audit trails from individual instruments and LIMS. GALP audit trails, which record all electronic data activities, are available for the majority of computerized methodology and the laboratory information management system (LIMS). These audit trails are periodically reviewed to determine if interventions performed by technical staff constitute an appropriate action. The review is performed on a recently completed job and may include interviews with the staff who performed the analysis. Findings indicative of inappropriate interventions or data integrity issues are investigated to determine the cause and the extent of the anomaly.

Confidential Reporting of Data Integrity Issues. Data integrity concerns may be raised by any individual to their supervisor. Employees with data integrity concerns should always discuss those concerns with their immediate supervisors as a first step unless the employee is concerned with the confidentiality of disclosing data integrity issues or is uncomfortable discussing the issue with their immediate supervisors. The supervisor makes an initial assessment of the situation to determine if the concern is related to a data integrity violation. Those issues that appear to be violations are documented by the supervisor and referred to the QA Manager for investigation.

Documented procedures for the confidential reporting of data integrity issues in the laboratory are part of the data integrity policy. These procedures assure that laboratory staff can privately discuss ethical issues or report items of ethical concern without fears of repercussions with senior staff.

Employees with data integrity concerns that they consider to be confidential are directed to the Human Resources Manager in Dayton, New Jersey. The HR Manager acts as a conduit to arrange a private discussion between the employee and the QA Manager

During the employee - QA discussion, the QA representative evaluates the situation presented by the employee to determine if the issue is a data integrity concern or a legitimate practice. If the practice is legitimate, the QA representative clarifies the process for the employee to assure understanding. If the situation appears to be a data integrity concern, the QA representative initiates a Data Integrity Investigation following the procedures specified in SOP EQA059.

Data Integrity Investigations. Follow-up investigations are conducted for all reported instances of ethical concern related to data integrity. Investigations are performed in a confidential manner by senior management according to a documented procedure. The outcome of the investigation is documented and reported to the company Vice President EHS who has the ultimate responsibility for determining the final course of action in the matter. Investigation documentation includes corrective action records, client notification information and disciplinary action outcomes, which is archived for a period of five years.

The investigations are conducted by the senior staff and supervisory personnel from the affected area. The investigations team includes the Laboratory Director and the QA Manager. Investigations are conducted in a confidential manner until it is completed and resolved.

The investigation includes a review of the primary information in question by the investigations team. The team performs a review of associated data and similar historical data to determine if patterns exist. Interviews are conducted with key staff to determine the reasons for the observed practices.

Following data compilation, the investigations team reviews all information to formulate a consensus conclusion. The investigation results are documented along with the recommended course of action.

Corrective Action, Client Notification & Discipline. Investigations that reveal systematic data integrity issues will be referred for corrective action, resolution and disposition (Section 13). If the investigation indicates that an impact to data has occurred and the defective data has been released to clients, notification procedures will be initiated following the steps in Section 13.2.

In all cases of data integrity violations, some level of disciplinary action will be conducted on the responsible individual. The level of discipline will be consistent with the violation and may range from retraining and/or verbal reprimand to termination. A zero-tolerance policy is in effect for unethical actions.

4.0 JOB DESCRIPTIONS OF KEY STAFF

4.1 ***Requirement***: Descriptions of key positions within the organization are defined to ensure that clients and staff understand duties and the responsibilities of the management staff and the reporting relationships between positions.

Vice President EHS. Responsible for overall process improvement for all business processes. Is also responsible for Quality Assurance, IT Development and Health and Safety. Reports directly to the Managing Director for SGS US operations.

Vice President Operations. Responsible for overall process improvement for all operation processes. Reports directly to the VP EHS.

General Manager. Reports to the Vice President Operations. Establishes laboratory operations strategy. Direct supervision of client services and operations manager.

Operations Manager. Directs the operations of the Dayton facility. Responsible for the process improvement of Dayton operations. Responsible for following Quality System requirements. Reports directly to the General Manager.

Manager, Quality Assurance. Reports to the QA Director. Manages quality assurance and quality control functions. Conducts internal audits and prepares reports for management review. Oversees proficiency testing program. Responsible for quality oversight at the Dayton location.

Manager, Client Services. Reports to the General Manager. Establishes and maintains communications between clients and the laboratory pertaining to client requirements which are related to sample analysis and data deliverables. Initiates client orders and supervises sample login operations.

Manager, Organics. Reports to the Operations Manager. Directs the operations of the organics group, consisting of organics preparation and instrumental analysis. Establishes daily work schedule. Supervises method implementation, application, and data production. Responsible for following Quality System requirements. Maintains laboratory instrumentation in an operable condition.

Manager, Inorganics. Reports to the Operations Manager. Executes daily analysis schedule. Supervises the analysis of samples for wet chemistry parameters using valid, documented methodology. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements.

Supervisor, Metals/General Chemistry. Reports to the Inorganics Manager. Executes daily analysis schedule. Supervises the analysis of samples for metallic elements using valid, documented methodology. Documents all procedures and data production activities. Maintains instrumentation in an operable condition. Reviews data for compliance to quality and methodological requirements.

Supervisor, Organic Preparation. Reports to the Manager, Organics. Executes the daily sample preparation schedule. Performs the extract of multi-media samples for organic constituents using valid, documented methodology. Prepares documentation for extracted samples. Assumes custody until transfer for analysis.

Supervisor, Field Services. Reports to the Manager, Inorganics. Conducts field sampling and analysis of "analyze immediately" parameters in support of ongoing field projects. Responsible for proper collection, preservation, documentation and shipment of field samples. Maintains field sampling and field instrumentation required to perform primary responsibilities.

Manager, Sample Management. Reports to the Operations Manager. Develops, maintains and executes all procedures required for receipt of samples, verification of preservation, and chain of custody documentation. Responsible for maintaining and documenting secure storage, delivery of samples to laboratory units on request and courier services.

Quality Assurance/ Health, Safety & Environment Officer. Reports to the QA Manager. Responsible for employee training on relevant health and safety topics. Documents employee training. Manages laboratory waste management program.

Supervisor, Report Generation. Reports to the Operations Manager. Compiles raw and processed sample data and assembles into client-ready reports. Initiates report scanning for archiving purposes. Maintains raw batch data in accessible storage. Mails completed reports to clients according to specified report turnaround schedule.

Quality Assurance Officers. Report to the Quality Assurance Manager. Perform quality control data review for trend monitoring purposes. Conduct internal audits and prepare reports for management review. Oversee proficiency testing program. Process quality control data for statistical purposes.

4.2 *Employee Screening, Orientation, and Training*.

All potential laboratory employees are screened and interviewed by human resources and technical staff prior to their hire. The pre-screen process includes a review of their qualifications including education, training and work experience to verify that they have adequate skills to perform the tasks of the job.

Newly hired employees receive orientation training beginning the first day of employment by the Company. Orientation training consists of initial health and safety training including

general laboratory safety, personal protection and building evacuation. Orientation also includes quality assurance program training, data integrity training, and an overview of the Company's goals, objectives, mission, and vision.

All technical staff receives training to develop and demonstrate proficiency for the methods they perform. New analysts work under supervision until the supervisory staff is satisfied that a thorough understanding of the method is apparent and method proficiency has been demonstrated, through a precision and accuracy study that has been documented, reviewed and approved by the QA Staff. Data from the study is compared to method acceptance limits. If the data is unacceptable, additional training is required. The analyst may also demonstrate proficiency by producing acceptable data through the analysis of an independently prepared proficiency sample.

Individual proficiency is demonstrated annually for each method performed. Data from initial and continuing proficiency demonstrations are archived in the individual's training folder.

4.3 ***Training Documentation***. The human resources department prepares a training file for every new employee. All information related to qualifications, experience, external training courses, and education are placed into the file. Verification documentation for orientation, health & safety, quality assurance, and ethics training is also included in the file.

Additional training documentation is added to the file as it is developed. This includes documentation of SOP understanding, data for initial and continuing demonstrations of proficiency, performance evaluation study data and notes and attendance lists from group training sessions.

The Quality Assurance Department maintains the employee training database. This database is a comprehensive inventory of training documentation for each individual employee. The database enables supervisors to obtain current status information on training data for individual employees on a job specific basis. It also enables the management staff to identify training documentation in need of completion.

Employee specific database records are created by human resources on the date of hire. Data base fields for job specific requirements such as SOP documentation of understanding and annual demonstration of analytical capability are automatically generated when the supervisor assigns a job responsibility. Employees acknowledge that their SOP responsibilities have been satisfied using a secure electronic process which updates the database record. Reports are produced which summarize the qualifications of individual employees or departments.

5.0 SIGNATORY APPROVALS

Requirement: Procedures have been developed for establishing the traceability of data and documents. The procedure consists of a signature hierarchy, indicating levels of authorization for signature approvals of data and information within the organization. Signature authority is granted for approval of specific actions based on positional hierarchy within the organization and knowledge of the operation that requires signature approval. SOP EQA032 Signature Authority explains the process of SGS Signature Authority and the use of electronic signatures in the laboratory. A log of signatures and initials of all employees is maintained by the QA Staff for cross-referencing purposes.

5.1 *Signature Hierarchy*.

Quality Assurance Manager. Approval of quality assurance policy.

Managing Director/Laboratory Director. Approval of final reports. Approval of SOPs, project specific QAPs, data review and approval in lieu of technical managers. Establishes and implements technical policy.

Manager, Client Services. QAP and sampling and analysis plan approval. Project specific contracts, pricing, and price modification agreements. Approval and acceptance of incoming work, Client Services policy.

Managers, Technical Departments. Methodology and department specific QAPs. Data review and approval, department specific supplies purchase. Technical approval of SOPs.

Manager, Sample Management. Initiation of laboratory sample custody and acceptance of all samples. Approval of department policies and procedures. Department specific supplies purchase.

Supervisor, Field Services. Sampling plan design and approval. Data review for field parameters. State form certification. Department policies and procedures. Department specific supplies purchase.

Supervisors, Technical Departments. Data review approval, purchasing of expendable supplies.

5.2 *Signature Requirements*.

All laboratory activities related to sample custody and generation or release of data must be approved using either initials, signatures or electronic, password protected procedures. The individual, who applies his signature initial or password to an activity or document, is authorized to do so within the limits assigned to them by their

supervisor. All written signatures and initials must be applied in a readable format that can be cross-referenced to the signatures and initials log if necessary.

5.3 ***Signature and Initials Log***. The QA group maintains a signature and initials log. New employee signatures and initials are appended to the log on the first day of employment. Signature of individuals no longer employed by the company are retained but annotated with their date of termination.

5.4 ***Electronic Signature Log.*** Key technical staff will sign a liability document for their signatures designating the use of their electronic signatures on an annual basis. Quality Assurance team keeps a wet copy of these signatures on form DAYT-QAC-0308.

6.0 DOCUMENTATION & DOCUMENT CONTROL

Requirement: Document control policies have been established which specify that any document used as an information source or for recording analytical or quality control information must be managed using defined document control procedures. Accordingly, policies and procedures required for the control, protection, and storage of any information related to the production of analytical data and the operation of the quality system to assure its integrity and traceability have been established and implemented in the laboratory. The system contains sufficient controls for managing, archiving and reconstructing all process steps which contributed to the generation of an analytical test result. Using this system, an audit trail for reported data can be produced, establishing complete traceability for the result.

6.1 ***Administrative Records***. Administrative (non-analytical) records are managed by the quality assurance department. These records consist of electronic documents which are retained in a limited access electronic directory or paper documents, which are released to the technical staff upon specific request.

Form Generation, Modification & Control. The quality assurance group approves and manages all forms used as either stand-alone documents or in logbooks to ensure their traceability. Forms are generated as computer files only and are maintained in a limited access master directory. The QA staff also manages and approves modifications to existing forms. Obsolete editions of modified forms are retained for seven years.

New forms must include the name SGS and appropriate spaces for signatures of approval and dates. Further design specifications are the responsibility of the originating department.

The technical staff is required to complete all forms to the maximum extent possible. If information for a specific item is unavailable, the analyst is required to "Z" the information block. The staff is also required to "Z" the uncompleted portions of a logbook or logbook form if the day's analysis does not fill the entire page of the form.

Logbook Control. All laboratory logbooks are controlled documents that are comprised of approved forms used to document specific processes. New logs are numbered and issued to a specific individual who is assigned responsibility for the log. Old logs are returned to QA for entry into the document archive system where they are retained for seven (7) years. Laboratory staff may hold a maximum of two consecutively dated logbooks of the same type in the laboratory including the most recently issued book to simplify review of recently completed analysis. The Organic prep department maintains multiple active copies of prep logbooks to facilitate production.

Controlled Documents. Key laboratory documents that are distributed internally and externally are numbered for tracking purposes. Individuals receiving documents, who must be informed when changes occur, receive controlled copies of those documents. Controlled status simplifies document updates and retrieval of outdated documents. Control is

maintained through a document numbering procedure and document control logbook which identifies the individual receiving the controlled document and the date of receipt. Key documents are also distributed as uncontrolled documents if the recipient does not require updated copies when changes occur. Key documents in uncontrolled status are numbered and tracked using the same procedures as controlled documents.

Quality Systems Manual (QSM). All QSMs are assigned a number prior to distribution. The number, date of distribution, and identity of the individual receiving the document are recorded in the document control logbook. The numbering system is restarted with each new volume, which corresponds to the annual revision of the QSM. Electronic versions are distributed as PDF files.

Standard Operating Procedures (SOPs). SOPs are electronically maintained by QA Department in a limited access network directory. The PDF copy of each SOP is accessible to the laboratory staff on the QA shared drive.

Electronic versions of outdated SOPs are moved from the active SOP directory to the inactive directory. All operations for issuing new, revising and archiving of SOPs are performed in the training database. Access is limited to QA staff and supervisory personnel who have revision and documentation responsibilities for SOPs.

6.2 ***Technical Records***. All records related to the analysis of samples and the production of an analytical result are archived in secure document storage or on electronic media and contain sufficient detail to produce an audit trail which re-creates the analytical result. These records include information related to the original client request, bottle order, sample login and custody, storage, sample preparation, analysis, data review and data reporting.

Each department involved in this process maintains controlled documents which enable them to maintain records of critical information relevant to their department's process.

6.3 ***Quality Control Support Data & Records***. All information and data related to the quality system is stored in a restricted access directory on the network server. Information on this directory is backed-up daily. Users of the quality assurance information and data have "read-only" access to the files contained in the directory. The QA staff and the laboratory director have "write" capability in this directory.

This directory contains all current and archived quality system manuals, SOPs, control limits, MDL studies, precision and accuracy data, official forms, internal audit reports, proficiency test scores and metrics calibration information.

The following information is retained in the directory:

Quality System Manuals
Standard Operating Procedures
Inactive Standard Operating Procedures
Method Detection Limit Data

ASTM & NIST Methods
Bottleware & Preservative QC Data
Certification Documentation
Change Management Data
External Audit Reports
Internal Audit Reports
Corrective Action Database
Laboratory Forms Directory
Health & Safety Manuals
Metrics Inventory & Calibration Data
Performance Limits
Proficiency Test Scores & Statistics
Project Specific Analytical Requirements
QC Report Reviews
Regulatory Agency Quality Documents
Staff Bios and Job Descriptions
State Specific Methods

6.4 ***Analytical Records***. All data related to the analysis of field samples are retained as either paper or electronic records that can be retrieved to compile a traceable audit trail for any reported result. All information is linked to the client job and sample number, which serves as a reference for all sample related information tracking.

Critical times in the life of the sample from collection through analysis to disposal are documented. This includes date and time of collection, receipt by the laboratory, preparation times and dates, analysis times and dates and data reporting information. Analysis times are calculated in hours and minutes.

Sample preparation information is recorded in a separate controlled logbook. It includes sample identification numbers, types of analysis, preparation and cleanup methods, sample weights and volumes, reagent lot numbers and volumes and any other information pertinent to the preparation procedure.

Information related to the identification of the instrument used for analysis is permanently attached to the electronic record. The record includes an electronic data file that indicates all instrument conditions employed for the analysis, including the type of analysis conducted. The analyst's identification is electronically attached to the record. The instrument tuning and calibration data is electronically linked to the sample or linked though paper logs which were used in the documentation of the analysis. Quality control and performance criteria are permanently linked to the paper archive or electronic file.
Paper records for the identity, receipt, preparation and evaluation of all standards and reagents used in the analysis are documented in prepared records and maintained in controlled documents or files. Lot number information linking these materials to the analysis performed is recorded in the logbooks associated with the samples in which they were used.

Manual calculations or peak integrations that were performed during the data review are retained as paper or scanned documents and included as part of the electronic archive. Signatures for data review are retained on paper or as scanned versions of the paper record for the permanent electronic file.

6.5 ***Confidential Business Information (CBI).*** Operational documents including SOPs, Quality Manuals, personnel information, internal operations statistics, and laboratory audit reports are

considered confidential business information. Strict controls are placed on the release of this information to outside parties.

Release of CBI to outside parties or organizations may be authorized upon execution of a confidentiality agreement between SGS and the receiving organization or individual. CBI information release is authorized for third party auditors and commercial clients in electronic mode as Adobe Acrobat PDF format only.

6.6 ***Software Change Documentation & Control.*** Changes to software are documented as text within the code of the program undergoing change. Documentation includes a description of the change, reason for change and the date the change was placed into effect. Documentation indicating the adequacy of the change is prepared following the evaluation by the user who requested the change.

6.7 ***Report and Data Archiving***. SGS produces digital files of all raw and processed data which is maintained for a minimum period of seven (7) years. The archived files consist of all raw data files and source documents associated with the analysis of field samples and proficiency test samples. Data files and source documents associated with method calibration and project and method quality control are also archived. After seven years, the files may be discarded unless contractual arrangements exist which dictate different requirements. Client or regulatory agency specific data retention practices are employed for several government organizations such as the Department of Defense and the Massachusetts Department of Environmental Protection that require a retention period of ten (10) years. Data archiving may also be extended up to ten (10) years for specific commercial clients in response to contractual requirements.

Complete date and time stamped PDF reports are generated automatically from the laboratory information management system (LIMS) using the source documents archived on the document server. These source documents are maintained on a document server and archived to primary and clone tapes. The primary tapes remain on premises while the clone tapes are taken to a secure offsite location for permanent storage. Both the primary and clone tapes remain in storage for the remainder of the archive period.

6.8 ***Training***. The company maintains a training record for all employees that documents that they have received instruction on administrative and technical tasks that are required for the job they perform. Training records for individuals employed by the company are retained for a period of six months following their termination of employment.

Training File Origination. The QA department initiates training files for each employee. QA Officers retain the responsibility for the maintenance and tracking of all training related documentation in the file. The file is begun on the first day of employment. Information required for the file includes a copy of the individual's most current resume, detailing work experience and a copy of any college diplomas and transcript(s). Information added on the

first day includes documentation of health and safety training, quality assurance training and a signed data integrity training and ethical conduct agreement.

Training documentation, training requirements, analyst proficiency information and other training related support documentation is tracked using a customized database application (Section 4.3). Database extracts provide an itemized listing of specific training requirements by job function. Training status summaries for individual analysts portray dates of completion for job specific training requirements.

6.9 ***Technical Training***. The supervisor of each new employee is responsible for developing a training plan for each new employee. The supervisor evaluates the employees training progress at regular frequencies. Supporting documentation, including demonstration of capability and precision and accuracy studies, which demonstrate an analyst's proficiency for a specific test, are added to the training file as completed. Employees and supervisors verify documentation of understanding (DOU) for all assigned standard operating procedures in the training database. Certificates or diplomas for any off-site training are also added to the file.

7.0 REFERENCE STANDARD TRACEABILITY

Requirement: Documented procedures, which establish traceability between any measured value and a national reference standard, are established by the laboratory as required. All metric measurements are traceable to NIST reference weights or thermometers that are calibrated on a regular schedule. All chemicals used for calibration of a quantitative process are traceable to an NIST reference that is documented by the vendor using a certificate of traceability. The laboratory maintains a documentation system that establishes the traceability links. The procedures for verifying and documenting traceability are documented in standard operating procedures.

7.1 ***Traceability of Metric Measurements - Thermometers***. SGS uses NIST thermometers to calibrate commercially purchased thermometers prior to their use in the laboratory and annually thereafter for liquid in glass thermometers or quarterly for electronic temperature measuring devices. If necessary, thermometers are assigned correction factors that are determined during their calibration using an NIST thermometer as the standard. The correction factor is documented in a thermometer calibration database and on a tag attached to the thermometer. The correction factor is applied to temperature measurements before recording the measurement in the temperature log. Calibration of each thermometer is verified and documented on a regular schedule. The NIST thermometer is checked for accuracy by an ISO 17025 approved vendor every five (5) years following the specifications for NIST thermometer calibration verification detailed in the United States Environmental Protection Agency's "Manual for the Certification of Laboratories Analyzing Drinking Water".

7.2 ***Traceability of Metric Measurements – Calibration Weights***. SGS uses calibrated weights, which are traceable to NIST standard weights to calibrate all balances used in the laboratory. Balances are calibrated to specific tolerances within the intended use range of the balance. Calibration checks are required on each day of use. If the tolerance criteria are not achieved, corrective action specified in the balance calibration SOP is applied before the balance can be used for laboratory measurements. Weights are recalibrated every 5 years by an ISO approved vendor.

7.3 ***Traceability of Chemical Standards***. All chemicals, with the exception of bulk dry chemicals and acids, purchased as reference standards for use in method calibration must establish traceability to NIST referenced material through a traceability certificate. Process links are established that enable a calibration standard solution to be traced to its NIST reference certificate.

Chemical standards used for analysis must meet the purity specifications of the method. These specifications must be stated in the reagents section of the method SOP.

7.4 ***Assignment of Reagent, Bulk Chemical and Standard Expiration Dates.*** Expiration date information for all purchased standards, prepared standard solutions and selected reagents is provided to SGS by the vendor as a condition of purchase. Neat materials, bulk chemicals including solvents, acids and inorganic reagents are not required to be purchased with

expiration dates. An expiration date of five (5) years from the date of receipt shall be established. Prepared solutions are labeled with the expiration date provided by the manufacturer. In-house prepared solutions are assigned expiration dates that are consistent with the method that employs their use unless documented experience indicates that an alternate date can be applied. If alternate expiration dates are employed, their use is documented in the method SOP. Expiration dates for prepared inorganic reagents, which have not exhibited instability, are established at two years from the date of preparation for tracking purposes.

The earliest expiration date has been established as the limiting date for assigning expiration dates to prepared solutions. The assignments of expiration dates that are later than the expiration date of any derivative solution or material are prohibited.

7.5 ***Documentation of Traceability***. Traceability information is documented in individual logbooks designated for specific measurement processes. The quality assurance group maintains calibration documentation for metric references in separate logbooks.

Balance calibration verification is documented in logbooks that are assigned to each balance. The individual conducting the calibration is required to initial and date all calibration activities. Any defects that occur during calibration are also documented along with the corrective action applied and a demonstration of return to control. Annual service reports and certificates are retained on file by the QA staff.

Temperature control is documented in logbooks or an electronic temperature monitoring database assigned to the equipment being monitored. A calibrated thermometer or probe is assigned to each individual item. Uncorrected and corrected measurements are recorded. Logbooks document with the date and initials of the individual conducting the measurement on a daily or as used basis. The temperature database records temperatures automatically every 15 minutes. Corrective action, if required, is also documented including the demonstration of return to control.

Initial traceability of chemical standards is documented via a vendor-supplied certificate (not available for bulk dry chemicals and acids) that includes lot number, expiration date and certified concentration information. Solutions prepared using the vendor supplied chemical standards are documented in logbooks assigned to specific analytical processes. Alternatively, documentation may be entered into the electronic standards and reagent tracking log. The documentation includes links to the vendor's lot number, an internal lot number, and dates of preparation, expiration date, and the preparer's initials.

SGS employs commercially prepared standard solutions whose traceability can be demonstrated through a vendor supplied certificate of analysis that includes an experimental verification of the standard's true concentration. The test value for the verification analysis must agree within 1% of the vendor's true value before it can be employed for calibration purposes. If the test value differs from the nominal value by more than 1%, then the test value

is used as the true value in laboratory calibrations and calculations. Purchased standards which do not have a certificate of analysis cannot be used for calibration or calibration verification purposes and are rejected or returned to the vendor.

Supervisors conduct regular reviews of logbooks, which are verified using a signature and date.

8.0 TEST PROCEDURES, METHOD REFERENCES, AND REGULATORY PROGRAMS

Requirements: The laboratory employs client specified or regulatory agency approved methods for the analysis of environmental samples. A list of active methods is maintained, which specifies the type of analyses performed and cross-references the methods to applicable environmental regulations. Routine procedures used by the laboratory for the execution of a method are documented in standard operating procedures. Method performance and sensitivity are demonstrated annually where required. Defined procedures for the use of method sensitivity limits for data reporting purposes are established by the QA Department and used consistently for all data reporting purposes.

8.1 ***Method Selection & Application***. SGS employs methods for environmental sample analysis that are consistent with the client's application, which are appropriate and applicable to the project objectives. SGS informs the client if the method proposed is inappropriate or outdated and suggests alternative approaches.

SGS employs documented, validated regulatory methods in the absence of a client specification and informs the client of the method selected. These methods are available to the client and other parties as determined by the client. Documented and validated in-house methods may be applied if they are appropriate to the project. The client is informed of the method selection.

8.2 ***Standard Operating Procedures***. Standard operating procedures (SOP) are prepared for routine methods executed by the laboratory, processes related to laboratory operations and sample or data handling. All SOPs are formatted to meet the specifications established by the National Environmental Laboratory Accreditation Conference, which are detailed in Module 4 – Quality Systems of the established Standards. The procedures describe the process steps in sufficient detail to enable an individual, who is unfamiliar with the procedure to execute it successfully.

SOPs are evaluated annually and edited if necessary. SOPs can be edited on a more frequent basis if changes are required for any reason. These may include a change to the methodology, elimination of systematic errors that dictate a need for process changes or modifications to incorporate a new version of the method promulgated by the originating regulatory agency. Procedural modifications are indicted using a revision number. SOPs are available for client review at the SGS facility upon request.

The complete list of the laboratory's SOPs available as of the date of publication of this QSM version are detailed in Appendix II.

8.3 ***Method Validation***. Standard methods from regulatory sources are primarily used for all analysis. Standard methods do not require validation by the laboratory. Non-standard, in-house methods are validated prior to use. Validation is also performed for standard methods

applied outside their intended scope of use. Validation is dependent upon the method application and may include analysis of quality control samples to develop precision and accuracy information for the intended use. A final method validation report is generated, which includes all data in the validation study. A statement of adequacy and/or equivalency is included in the report. A copy of the report is archived in the quality assurance directory of the company server.

Non-standard methods are validated prior to use. This includes the validation of modified standard methods to demonstrate comparability with existing methods. Demonstrations and validations are performed and documented prior to incorporating technological enhancements and nonstandard methods into existing laboratory methods used for general applications. The demonstration includes method specific requirements for assuring that significant performance differences do not occur when the enhancement is incorporated into the method. Validation is dependent upon method application and may include the analysis of quality control samples to develop precision and accuracy information for intended use.

The study procedures and specifications for demonstrating validation include comparable method sensitivity, calibration response, method precision; method accuracy and field sample consistency for several classes of analytical methods are detailed in this document. These procedures and specifications may vary depending upon the method and the modification.

8.4 ***Estimated Uncertainty.*** A statement of the estimated uncertainty of an analytical measurement accompanies the test result when required. Estimated uncertainty is derived from the performance limits established for spiked samples of similar matrices. The degree of uncertainty is derived from the negative or positive bias for spiked samples accompanying a specific parameter. When the uncertainty estimate is applied to a measured value, the possible quantitative range for that specific parameter at that measured concentration is defined. Well recognized regulatory methods that specify values for the major sources of uncertainty and specify the data reporting format do not require a further estimate of uncertainty.

8.5 ***Demonstration of Capability***. Confirmation testing is conducted to demonstrate that the laboratory is capable of performing the method before its application to the analysis of environmental samples. The results of the demonstration tests are compared to the quality control specifications of the method to determine if the performance is acceptable.

Capability demonstrations are conducted initially for every analyst on each method performed and annually on a method specific basis thereafter. Acceptable demonstrations are documented for individual training files and retained by the QA staff. New analytes, which are added to the list of analytes for an accredited method, are evaluated for applicability through a demonstration of capability similar to those performed for accredited analytes.

8.6 ***Method Detection Limit Determination***. Method detection limit (MDL) studies are performed as appropriate for routine methods used in the laboratory. MDL studies are also performed when there is a change to the method that affects how the method is performed or

when an instrumentation change that impacts sensitivity occurs. The procedure used for determining MDLs is described in 40 CFR, Part 136, Appendix B, Revision 2. Studies are performed for each method on water, soil and air matrices for every instrument that is used to perform the method. MDLs are established at the instrument level. Results from low level spikes used in the MDL determination shall meet qualitative identification criteria in the method and shall be above zero; the MDL procedure shall include criteria for and evaluation of false positive rates in routine method blanks. The quality assurance staff manages the annual MDL determination process and is responsible for retaining MDL data on file. Approved MDLs are appended to the LIMS and used for data reporting purposes.

8.7 ***Limit of Detection (LOD).*** For the DoD ELAP, the limit of detection (LOD) for each method and target analyte of concern is established for each instrument that is used to perform the method. The LOD is established by initially spiking a water and/or soil matrix at approximately two to three times the calculated MDL (for a single-analyte standard) or two to four times the calculated MDL (for a multi-analyte standard). The LOD undergoes all sample processing steps and is validated by the qualitative identification of the analytes of interest. The spike concentration establishes the LOD and must be verified quarterly. If the spike concentration in the LOD cannot be verified at the initial level with appropriate analytical quality control, a higher LOD must be defined and verified.

8.8 ***Instrument Detection Limit Determination***. Instrument detection limits (IDLs) are determined for all inductively coupled argon plasma emission spectrophotometers and mass spectrometers. The IDL is determined for the wavelength (emission) of each element and the ion (mass spectrometry) of each element used for sample analysis. The IDL data is used to estimate instrument sensitivity in the absence of the sample matrix. IDL determinations are conducted at the frequency specified in the appropriate SOPs' for ICP and ICP/MS analysis.

8.9 ***Method Reporting Limit.*** The method reporting limit for organic methods is determined by the concentration of the lowest calibration standard in the calibration curve. This value is adjusted based on several sample preparation factors including sample volume, moisture content (soils), digestion, distillation or dilution. The low calibration standard is selected by department managers as the lowest concentration standard that can be used for calibration while continuing to meet the calibration linearity criteria of the method being used. The validity of the method reporting limits are confirmed through the analysis of a spiked quality control sample at the method reporting limit concentration. By definition, detected analytes at concentrations below the low calibration standard cannot be accurately quantitated and are qualified as estimated values.

The reporting limit for inorganics methods is defined as the concentration which is greater than the MDL where method quality control criteria has been achieved. The reporting limit for general chemistry methods employing multiple point calibrations must be greater than or equal to the concentration of the lowest standard of the calibration range.

The reporting limit established for both organic and inorganic analysis is above the calculated method detection limit where applicable.

8.10 ***Limit of Quantitation (LOQ).*** An LOQ is required for each quality system matrix of interest, technology, method, and analyte, except for any component for which spiking solutions are not available or a quantitation limit is not appropriate. The LOQ must be at or above the lowest corresponding calibration standard concentration with the exception of methods using a single point calibration. Precision and bias criteria for the LOQ are established to meet client requirements and are verified quarterly.

8.11 ***Reporting of Quantitative Data.*** Analytical data for all methods is reported without qualification to the reporting limit established for each method. Data, for organic methods may be reported to the established method detection limit depending upon the client's requirements provided that all qualitative identification criteria for the detected parameter have been satisfied. All parameters reported at concentrations between the reporting limit and the method detection limit are qualified as estimated.

Data for inorganic methods are reported to the established method reporting limits. Inorganic data for specific methods may also be reported to the established method detection limit at client request. However, this data is always qualified as estimated.

Measured concentrations of detected analytes that exceed the upper limit of the calibration range are either diluted into the range and reanalyzed or qualified as an estimated value. The only exception to this applies to ICP and ICP/MS analysis, which can be reported to the upper limit of the experimentally determined linear range without qualification.

8.12 ***Precision and Accuracy Studies***. Annual precision and accuracy (P&A) studies, which demonstrate the laboratories ability to generate acceptable data, are performed for all routine methods used in the laboratory. The procedure used for generating organic P&A data is referenced in the majority of the regulatory methodology in use. The procedure requires quadruplicate analysis of a sample spiked with target analytes at a concentration in the working range of the method. This data may be compiled from a series of existing blank spikes or laboratory control samples. Accuracy (percent recovery) of the replicate analysis is averaged and compared to established method performance limits. Values within method limits indicate an acceptable performance demonstration. Precision and accuracy date is also used to annually demonstrate analytical capability for individual analysts. Annual demonstration of capability data is archived in individual training files.

Performance Limits. The Quality Assurance staff is responsible for compilation and maintenance of all precision and accuracy data used for performance limits. Quality control data for all test methods are accumulated and stored in the laboratory information management system (LIMS). Parameter specific QC data are extracted semi-annually for methods 8260, 8270, 8081, 8082 and annually for remaining methods. Each method is statistically processed to develop laboratory specific warning limits and control limits. The new

limits are reviewed and approved by the supervisory staff prior to their use for data assessment. The new limits are used to evaluate QC data for compliance with method requirements for a period of one year. Laboratory generated limits appear on all data reports.

8.13 ***Method Sources & References.*** The Quality Assurance Staff maintains a list of active methods used for the analysis of samples. This list includes valid method references from sources such as USEPA, ASTM or Standard Methods designations and the current version and version date.

Updated versions of approved reference methodology are placed into use as changes occur. The Quality Assurance staff and/or Technical Managers inform operations management of changes in method versions as they occur. The operations management staff selects an implementation date. The operations staff is responsible for completing all method use requirements prior to the implementation date. This includes modification of SOPs, completion of MDL and precision and accuracy studies and staff training. Documentation of these activities is provided to the QA staff who retains this information on file. The updated method is placed into service on the implementation date and the old version is de-activated.

Multiple versions of selected methods may remain in use to satisfy client specific needs. In these situations, the default method version becomes the most recent version. Client specific needs are communicated to the laboratory staff using method specific analytical method codes, which clearly depict the version to be used. The old method version is maintained as an active method until the specified client no longer requires the use of the older version.

SGS will not use methodology that represents significant departures from the reference method unless specifically directed by the client. If clients direct the laboratory to use a method modification that represents a significant departure from the reference method, the request will be documented in the project file.

8.14 ***Analytical Capabilities***. Appendix III provides a detailed listing of the methodology employed for the analysis of test samples.

9.0 SAMPLING, SAMPLE MANAGEMENT, LOGIN, CUSTODY, STORAGE AND DISPOSAL

Requirement: The laboratory must employ a system which ensures that client supplied product or supplied product (the sample) is adequately evaluated, acknowledged, and secured upon delivery to the laboratory. The system also assures that product chain of custody is maintained, and that sample receipt conditions, and preservation status are documented and communicated to the client and internal staff. The login procedure assigns, documents, and maps the specifications for the analysis of each unique sample to assure that the requested analysis is performed on the correct sample and enables the sample to be tracked throughout the laboratory analytical cycle. The system includes procedures for reconciling defects in sample condition or client provided data, which are identified at sample arrival. The system specifies the procedures for proper sample storage, transfer to the laboratory, and disposal after analysis. The system is also documented in standard operating procedures.

9.1 ***Order Receipt and Entry***. New orders are initiated and processed by the client services group (See Chapter 14, Procedures for Executing Client Specifications). The new order procedure includes mechanisms for providing bottles to clients, which meet the size, cleanliness, and preservation specifications for the analysis to be performed.

For new orders, the project manager prepares a bottle request form, which is submitted to sample management. This form provides critical project details to the sample management staff, which are used to prepare and assemble the sample bottles for shipment to the client prior to sampling.

The bottle order is assembled using bottles that meet US EPA specifications for contaminant free sample containers. SGS uses a combination of commercially supplied pre-cleaned bottles and bottles that have been tested for residual contamination and verified to meet USEPA specifications prior to use. Sterile bottles for microbiological samples are purchased from commercial sources.

Bottles, which are not purchased pre-cleaned, are checked to assure that they are free of contamination from targeted analytes before being released for use. Sterile bottles are checked for contamination with each lot. The QA staff retains a copy of the documentation of in-house contamination and sterility checks and maintains the responsibility for approving and releasing bottle lots for use following a review of the check data.

Preservative solutions that are specified for the analysis requested are dispensed into the sample bottle prior to shipment. All preservative solutions are prepared in the laboratory or purchased from commercial suppliers. Each solution is checked to assure that it is free of contamination from the compounds being analyzed before being released for use.

Reagent water for trip and field blanks is poured into appropriately labeled containers. All bottles are packed into ice chests with blank chain of custody forms and the original bottle order form. Completed bottle orders are delivered to clients using SGS couriers or commercial carriers for use in field sample collection.

9.2 ***Sampling***. Documented procedures are employed by the field staff for field sample collection and are accessible during sample collection activities. Field activities are documented which detail relevant field conditions, site data and the results of field measurements. Appropriate custody procedures for collected samples are initiated by the field staff at the time of sample collection. Samples are documented, labeled and preserved according to the specifications of the method and/or regulatory program prior to being shipped to the laboratory.

9.3 ***Sample Receipt and Custody***. Samples are delivered to the laboratory using a variety of mechanisms including SGS couriers, commercial shippers, and client self-delivery. Documented procedures are followed for arriving samples to assure that custody and integrity are maintained, and handling/ preservation requirements are documented and maintained.

Sample custody documentation is initiated when the individual collecting the sample collects field samples. Custody documentation includes all information necessary to provide an unambiguous record of sample collection, sample identification, and sample collection chronology. Initial custody documentation employs either SGS or client generated custody forms.

SGS generates a chain of custody in situations where the individuals who collected the sample did not generate custody documentation in the field.

SGS defines sample custody as follows:

- The sample is in the actual custody or possession of the assigned responsible person,
- The sample is in a secure area.

The SGS facility is defined as a secure facility. Perimeter security has been established, which limits access to authorized individuals only. Visitors enter the facility through the building lobby and must register with the receptionist prior to entering controlled areas. While in the facility, visitors are required to wear a visitor's badge and must be accompanied by their hosts at all times. After hours, building access is controlled using a computerized passkey reader system. This system limits building access to individuals with a pre-assigned authorization status. After hours visitors are not authorized to be in the building. Clients delivering samples after hours must make advanced arrangements through client services and sample management to assure that staff is available to take delivery and maintain custody.

Upon arrival at SGS, the sample custodian reviews the chain of custody for the samples received to verify that the information on the form corresponds with the samples delivered.

This includes verification that all listed samples are present and properly labeled, checks to verify that samples were transported and received at the required temperature, verification that the sample was received in proper containers, verification that sufficient volume is available to conduct the requested analysis, and a check of individual sample containers to verify test specific preservation requirements including the absence of headspace for volatile compound analysis.

Sample conditions and other observations are documented on the chain of custody by the sample custodian prior to completing acceptance of custody and in an online database that creates a permanent record of all sample login activities. The sample custodian accepts sample custody upon verification that the custody document is correct. Discrepancies or non-compliant situations are documented and communicated to the SGS Project Manager, who contacts the client for resolution. The resolution is documented and communicated to sample management for execution.

The sample management staff maintains an electronic sample receipt log. This log details all sample-related information in a searchable database that is updated upon data entry and backed up daily. The log records include critical date information, numbers of samples, numbers of bottles for each parameter, descriptions of bottles for each parameter, preservation conditions, bottle refrigerator location, and bottle conditions. Data entry into the log is secured using individual passwords.

During initial login, each bottle is assigned a unique number and is labeled with a barcode corresponding to that number. A bar-coding and scanning system electronically track sample custody transfers between individuals within the laboratory. Internal custody documentation may be required for compliance with regulatory agency or contractual specifications. A documented, chronological record of each sample transfer identifying each individual having possession of the sample is created in the laboratory information management system, which can be printed and included in data reports to demonstrate continuous custody.

9.4 ***Laboratory Preservation of Improperly Preserved Field Samples.*** SGS will attempt to preserve field samples that were received without proper preservation to the extent that it is feasible and supported by the methods in use. Laboratory preservation of improperly preserved or handled field samples is routinely performed for metals samples. Special handling procedures may also be applied to improperly preserved volatile organics.

Aqueous metals samples that were not nitric acid preserved to pH 2 in the field are laboratory preserved and held for twenty (24) hours to equilibrate prior to analysis. Aqueous metals samples requiring field filtration may be filtered in the laboratory within seventy-two (72) hours of receipt provided that the sample has not been acid preserved.

Unpreserved volatile organics that include Acrolein and /or Acrylonitrile must be analyzed within three (3) days; remaining samples may be analyzed within seven (7) days to minimize degradation of volatile organics if the laboratory is notified in advance of the failure to preserve upon

collection. Laboratory preservation of unpreserved aqueous samples is not possible. A pH check of volatile organic samples prior to analysis will compromise the sample by allowing volatile organics to escape during the check. If the laboratory is not notified of the failure to field preserve an aqueous volatile organic sample, the defect will not be identified until sample analysis has been completed and the data is qualified accordingly.

9.5 ***Sample Tracking Via Status Change.*** An automated, electronic LIMS procedure records sample exchange transactions between departments and changes in analytical status. This system tracks all preparation, analytical, and data reporting procedures to which a sample is subjected while in the possession of the laboratory. Each individual receiving samples must acknowledge the change in custody and operational status in the LIMS. This step is required to maintain an accurate electronic record of sample status, dates of analytical activity, and custody throughout the laboratory.

Sample tracking is initiated at login where all chronological information related to sample collection dates and holding times are entered into the LIMS. This information is entered on an individual sample basis.

9.6 ***Sample Acceptance Policy***. Incoming samples must satisfy SGS's sample acceptance criteria before being logged into the system. Sample acceptance is based on the premise that clients have exercised proper protocols for sample collection. This includes complete documentation, sufficient volume, proper chemical preservation, temperature preservation, sample container sealing and labeling, and appropriate shipping container packing.

The sample management staff will make every attempt to preserve improperly preserved samples upon arrival. However, if preservation is not possible, the samples may be refused unless the client authorizes analysis. No samples will be accepted if holding times have been exceeded or will be exceeded before analysis can take place unless the client authorizes analysis.

Sample acceptance criteria include proper custody and sample labeling documentation. Proper custody documentation includes an entry for all physical samples delivered to the laboratory with an identification code that matches the sample bottle and a date and signature of the individual who collected the sample and delivered them to the laboratory.

SGS reserves the right to refuse any sample which in its sole and absolute discretion and judgment is hazardous, toxic and poses or may pose a health, safety or environmental risk during handling or processing. The company will not accept samples for analysis using methodology that is not performed by the laboratory or for methods that lab does not hold valid accreditations unless arrangements have been made to have the analysis conducted by a qualified subcontractor.

SGS does not accept radioactive samples, however, the policy for sample handling of Naturally Occurring Radioactive Materials (NORM) is described below:

Samples that meet the Federal Department of Transportation and International Air Transportation Association criteria could be accepted and handled following normal procedures (except for disposal) in the lab. This corresponds to samples with United Nations (UN) labels indicating levels of < 500 uR/hour. Samples containing levels at or higher than 500 uR/hour will not be accepted by SGS. Clients must inform SGS of the level of radiation by screening the samples and documenting the level on the Chain of Custody or other form in order for the samples to be accepted.

SGS requires that any shipments containing samples of this type must be clearly labeled with UN labels showing the measured level of radioactivity as < 500 uR/hour.

These samples cannot be disposed of in our normal waste streams. Therefore, on completion of analysis, the samples would be returned to the client or disposed of using an alternate waste handler. In either case, the client would be responsible for the additional shipping or disposal charges, as well as processing charges for segregating the waste stream in the lab.

9.7 ***Assignment of Unique Sample Identification Codes***. Unique identification codes are assigned to each sample bottle to assure traceability and unambiguously identify the tests to be performed in the laboratory.

The sample identification coding process begins with the assignment of a unique alphanumeric job number. A job is defined as a group of samples received on the same day, from a specific client pertaining to a specific project. A job may consist of groups of samples received over a multi-day period. The first two characters of the job number are alpha characters that identify the laboratory facility. The next characters are numeric and sequence by one number with each new job.

Unique sample numbers are assigned to each bottle collected as a discrete entity from a designated sample point. This number begins with the job number and incorporates a second series of numbers beginning at one and continuing chronologically for each point of collection. The test to be performed is clearly identified on the bottle label. Multiple sample bottles collected for analysis of the same parameter are numbered bottle 1, 2, etc.

Alpha suffixes may be added to the sample number to identify special designations such as subcontracted tests, in-house QC checks, or re-logs. Multiple sample bottles for a specific analysis are labeled Bottle 1, Bottle 2, etc.

9.8 ***Subcontracted Analysis***. Subcontract laboratories are employed to perform analysis not performed by SGS. The quality assurance staff evaluates subcontract laboratories to assure their quality processes meet the standards of the environmental laboratory industry prior to engagement. Throughout the subcontract process, SGS follows established procedures to assure that sample custody is maintained, and the data produced by the subcontractor meets established quality criteria.

*Subcontracting Procedure***.** Subcontracting procedures are initiated through several mechanisms, which originate with sample management. Samples for analysis by a subcontractor are logged into the SGS system using regular login procedures. If subcontract parameters are part of the project or sample management has received subcontracting instructions for a specific project, a copy of the chain of custody is given to the appropriate project manager with the subcontracted parameters highlighted. This procedure triggers the subcontract process at the project management level. The project manager contacts an approved subcontractor that carries accreditation in the venue of the project location to place the subcontract order. A subcontract order form (SOF) is simultaneously prepared in electronic format, by the project manager and filed with the original chain of custody. The SOF and the subcontract chain of custody are forwarded to sample management, via email, for processing. A copy is filed with the original CoC.

Sample management signs the subcontract chain of custody and ships the sample(s) to the subcontractor. The subcontract CoC is filed with the original CoC and the request for subcontract. Copies are distributed to the login department, the project manager, sample management and the client.

Clients are verbally notified of the need to subcontract analysis as soon as the need is identified by the client services staff. This may occur during the initial project setup or at the time of login if the project setup had not been initiated through the client services staff. Copies of the subcontract CoC and the original CoC, which are electronically distributed to clients, constitutes documented client notification of the laboratories intent to subcontract analysis.

Subcontractor data packages are reviewed by the QA Staff to assess completeness and quality compliance. If completeness defects are detected, the subcontractor is asked to immediately upgrade the data package. If data quality defects are detected, the QA staff retains the package for further review. The QA staff will pursue a corrective action solution before releasing defective data to the client.

Approved subcontract data is entered into the laboratory information management system (LIMS) if possible and incorporated into the final report. All subcontract data is footnoted to provide the client with a clear indication of its source. Copies of original subcontract data are included in the data report depending on the reporting level specified by the client. Applicable subcontractor accreditation information is provided with the subcontractor data.

*Subcontract Laboratory Evaluation***.** The QA staff evaluates subcontract laboratories prior to engagement. The subcontract laboratory must provide SGS with proof of a valid certification to perform the requested analysis for the venue where they were collected and for a specific program should an approval or accreditation be required. In addition, the QA staff may require a copy of the laboratory's Quality Systems Manual, copies of SOPs used for the subcontracted analysis, a copy of the most recent performance evaluation study for the subcontracted parameter, copies of the internal data integrity policy and copies of the most recent regulatory agency or third-party accreditor audit report. Certification verification must

be submitted to SGS annually. If possible, the QA staff may conduct a site visit to the laboratory to inspect the quality system. SGS assumes the responsibility for the performance of all subcontractors who have successfully demonstrated their qualifications and should obtain an example data deliverable package prior to initiation of subcontract work for compliance review. Qualification of a subcontract laboratory may be bypassed if the primary client directs SGS to employ a specific subcontractor.

9.9 ***Sample Storage***. Following sample transfer to the sample custodian, samples are assigned to various secured, refrigerated storage areas depending upon the test to be performed and the matrix of the samples. The location (refrigerator and shelf) of each sample is recorded on the chain of custody adjacent to the line corresponding to each sample number and also entered into the LIMS. Samples remain in storage until the laboratory technician requests that they be transferred into the laboratory for analysis.

Second shift staff is authorized to retrieve samples from storage and initiate custody transfer. All sample request forms must be completed regardless of who performs the transfer.

Samples for volatile organics analysis are placed in storage in designated refrigerators by the sample custodian and immediately transferred to the organics group control. Sample custody is transferred to the department designee. These samples are segregated according to matrix to limit opportunities for cross contamination to occur.

Organics staff is authorized to retrieve samples from these storage areas for analysis. When analysis is complete, the samples are placed back into storage.

9.10 ***Sample Login***. Following sample custody transfer to the laboratory, the documentation that describes the client's analytical requirements are delivered to the sample login group for coding and entry to the Laboratory Information Management System (LIMS). This process translates all information related to collection time, turnaround time, sample analysis, and deliverables into a code which enables client requirements to be electronically distributed to the various departments within the laboratory for scheduling and execution.

The technical staff is alerted to client or project specific requirements through the use of a unique project code that is electronically attached to the job during login. The unique project code directs the technical staff to controlled specifications documents detailing the unique requirements.

9.11 ***Sample Retrieval for Analysis***. Individual laboratory departments prepare and submit written requests to the sample custodian to retrieve samples for analysis. The sample custodian retrieves all samples except volatile organics and delivers them to the requesting department. Retrieval priorities are established by the requesting department and submitted to the sample custodian when multiple requests are submitted. Internal custody transfers using the bar code scanning system occur whenever the samples change hands or locations.

After sample analysis has been completed, the department requests pick-up and return of the sample to the storage area. The sample custodian retrieves the sample and completes the custody transfer from the department of the transfer back to sample management or sample storage.

9.12 ***Sample Disposal***. SGS retains all samples and sample extracts under proper storage for a minimum of 30 days following completion of the analysis report. Longer storage periods are accommodated on a client specific basis if required. Samples may also be returned to the client for disposal.

SGS disposes of all laboratory wastes following the requirements of the Resource Conservation and Recovery Act (RCRA). The Company has obtained and maintains a waste generator identification number, NJD982533622.

Sample management generates a sample disposal dump sheet from the LIMS tracking system each week, which lists all samples whose holding period has expired. Data from each sample is compared to the hazardous waste criteria established by the New Jersey DEP.

Samples containing constituents at concentrations above the criteria are labeled as hazardous and segregated into five general waste categories for disposal as follows:

- ☐ Waste Oil
- ☐ Soil (solids – positive and negative hazardous characteristics)
- ☐ Mixed Aqueous
- ☐ Sludges (semi-solids)
- ☐ PCB Hazardous Waste (USEPA 40 CFR 761 criteria).

Non-hazardous aqueous samples are diluted and disposed directly into the laboratory sink. All aqueous liquids pass through a neutralization system before entering the municipal system. Solid samples are emptied into consolidation drums and disposed as hazardous waste or non-hazardous wastes depending upon the results of hazardous characteristics determination. Samples classified as PCB hazardous wastes are labeled and packaged according to the requirements in 40 CFR 761.

Empty glass and plastic bottles from aqueous and solid samples are segregated for recycling. Recycled materials are collected by a commercial contractor and transferred to a county transfer facility for separation into various materials categories. These operations are classified as secure facilities employing cameras, security guards and fiber optic security systems. The recyclable material is transported to a recycling facility for further processing. Separated glass is transported to a processing facility where it is acid washed in two, separate wash baths, rinsed in boiling water and ground into ½ inch chunks. The chunks are transported to an end product user for re-manufacturing into a glass product.

Separated plastic is transported to a processing facility where it is acid washed to remove the labels and adhesives and boiled for sterilization. The sample containers and any remaining labels are shredded and ground resulting in complete destruction of remaining labels the ground material is sent by rail car or tractor-trailer to various end users that melt and reform the material into useful products of their industry. The recycling facility employs a Code of Ethics in which all client names are confidential and are not divulged to any individual or corporation without written permission from the client.

Laboratory wastes are collected by waste stream in designated areas throughout the laboratory. Waste streams are consolidated twice each week by the waste custodian and transferred to stream specific drums for disposal through a permitted waste management contractor. Filled, consolidated drums are tested for hazardous characteristics and scheduled for removal from the facility for appropriate disposal based on the laboratory data.

All solvent extracts and digestates are collected for disposal following the thirty-day holding period and drummed according to their specific waste stream category. Chlorinated solvent extracts are drummed as chlorinated wastes (i.e., Methylene Chloride). Non-chlorinated solvent extracts are drummed as non-chlorinated wastes (i.e., acetone, hexane, methanol, and mixed solvents). Digestates are collected for disposal following the thirty-day holding period and drummed as corrosive liquid containing metals.

10.0 LABORATORY INSTRUMENTATION AND MEASUREMENT STANDARDS

Requirement: The laboratory has established procedures, which assure that instrumentation is performing to a pre-determined operational standard prior to the analysis of any samples. In general, these procedures follow the regulatory agency requirements established in promulgated methodology. The instrumentation selected to perform specified analysis are uniquely identified and capable of providing the method specified uncertainty of measurement needed. These procedures are documented and incorporated into the standard operating procedures for the method being executed.

10.1 ***Mass Tuning – Mass Spectrometers***. The mass spectrometer tune and sensitivity is monitored to assure that the instrument is assigning masses and mass abundances correctly and that the instrument has sufficient sensitivity to detect compounds at low concentrations. This is accomplished by analyzing a specific mass tuning compound at a fixed concentration. If the sensitivity is insufficient to detect the tuning compound, corrective action must be performed prior to the analysis of standards or samples. If the mass assignments or mass abundances do not meet criteria, corrective action must be performed prior to the analysis of standards or samples.

10.2 ***Wavelength Verification – Spectrophotometers***. Spectrophotometer detectors are checked on a regular schedule to verify proper response to the wavelength of light needed for the test in use. If the detector response does not meet specifications, corrective action (detector adjustment or replacement) is performed prior to the analysis of standards or samples.

10.3 ***Inter-element Interference Checks (Metals)***. Inductively Coupled Plasma Emission Spectrophotometers (ICP) are subject to a variety of spectral interferences, which can be minimized or eliminated by applying interfering element correction factors and background correction points. Interfering element correction factors are checked on a specified frequency through the analysis of check samples containing high levels of interfering elements. Analysis of single element interferant solutions is also conducted at a specified frequency.

If the check indicates that the method criteria have not been achieved for any element in the check standard, the analysis is halted and data from the affected samples are not reported. Sample analysis is resumed after corrective action has been performed and the correction factors have been re-calculated.

New interfering element correction factors are calculated and applied whenever the checks indicate that the correction factors are no longer meeting criteria. At a minimum, correction factors are replaced once a year.

Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) also is subject to isobaric elemental and polyatomic ion interferences. These interferences are corrected through the use of calculations. The accuracy of corrections is dependent on the sample matrix and instrument conditions and is verified by quality control checks on individual runs.

10.4 ***Calibration and Calibration Verification***. Many tests require calibration using a series of reference standards to establish the concentration range for performing quantitative analysis. Instrument calibration is performed using standards that are traceable to national standards. Method specific procedures for calibration are followed prior to any sample analysis. In general, if a reference method does not specify the number of calibration standards, the minimum number is two (one of which is at the reporting limit or limit of quantitation).

Calibration is performed using a linear regression calculation or calibration factors calculated from the curve. The calibration must meet method specific criteria for linearity or precision. If the criteria are not achieved, corrective action (re-calibration or instrument maintenance) is performed. The instrument must be successfully calibrated before analysis of samples can be conducted.
For calibrations evaluated using correlation coefficient or coefficient of determination, the laboratory must evaluate relative error by either calculating Relative Error (%RE) or Relative Standard Error (%RSE). The %RE and %RSE must meet criteria specified in the method. If no criterion is specified in the method, then the criteria for RE or RSE must be specified in the laboratory SOP.

Initial calibration for metals analysis performed using inductively coupled plasma (ICP) employs the use of a single standard and a calibration blank to establish linearity. Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) can be calibrated using either a two point or a multi-point calibration, as long as all quality control criteria for the analysis can be achieved. The calibration blank contains all reagents that are placed into the calibration standard with the exception of the target elements. Valid calibration blanks must not contain any target elements.

Initial calibrations must be verified using a single concentration calibration standard from a second source (i.e. separate lot or different provider). The continuing validity of existing calibrations must be regularly verified using a single calibration standard. The response to the standard must meet pre-established criteria that indicate the initial calibration curve remains valid. If the criteria are not achieved corrective action (re-calibration) is performed before any additional samples may be analyzed.

If continuing calibration verification results are outside established criteria, data associated with the verification may be fully useable under the following conditions:

- When the acceptance criteria for the continuing calibration verification are exceeded high, i.e., high bias, and there are associated samples that are non-detects, then those non-detects may be reported.

- When the acceptance criteria for the continuing calibration verification are exceeded low, i.e., low bias, those sample results may be reported if they exceed a maximum regulatory limit/decision level.

Calibration verification is also performed whenever it appears that the analytical system is out of calibration or no longer meets the calibration requirements. It is also performed when the time period between calibration verifications has expired.

Sample results are quantitated from the initial instrument calibration unless otherwise required by regulation, method, or program specific criteria.

10.5 ***Linear Range Verification and Calibration (ICP & ICP/MS Metals)***. Linear range verification is performed for all ICP and ICP/MS instrumentation. The regulatory program or analytical method specifies the verification frequency. A series of calibration standards are analyzed over a broad concentration range. The data from these analyses are used to determine the valid analytical range for the instrument. ICP instrument calibration is routinely performed using a single standard at a concentration within the linear range and a blank.

Some methods or analytical programs require a low concentration calibration check to verify that instrument sensitivity is sufficient to detect target elements at the reporting limit. The analytical method or regulatory program defines the criteria used to evaluate the low concentration calibration check. If the low calibration check fails criteria, corrective action is performed and verified through reanalysis of the low concentration calibration check before continuing with the field sample analysis. ICP-MS instrument calibration is normally performed using multiple standards within the linear range and a blank but may be done with a single standard at a concentration within the linear range and a blank.

10.6 ***Retention Time Development and Verification (GC)***. Chromatographic retention time windows are developed for all analysis performed using gas chromatographs with conventional detectors. An initial experimental study is performed, which establishes the width of the retention window for each compound. The retention time width of the window defines the time ranges for elution of specified target analytes on the primary and confirmation columns. Retention time windows are established upon initial calibration, applying the retention time range from the initial study to each target compound. Retention times are regularly confirmed through the analysis of an authentic standard during calibration verification. If the target analytes do not elute within the defined range during calibration verification, the instrument must be recalibrated, and new windows defined. New studies are performed when major changes, such as column replacement are made to the chromatographic system.

10.7 ***Equipment List.*** See Appendix IV for a listing of all equipment used for measurement and/or calibration in laboratory processes.

11.0 INSTRUMENT MAINTENANCE

Requirement. Documented procedures have been established for conducting equipment maintenance. The procedure includes maintenance schedules if required or documentation of daily maintenance activities. All instrument maintenance activities are documented in instrument specific logbooks.

11.1 ***Routine, Daily Maintenance***. Routine, daily maintenance is required on an instrument specific basis and is performed each time the instrument is used. Daily maintenance includes activities to insure a continuation of good analytical performance. This may include performance checks that indicate if non-routine maintenance is needed. If performance checks indicate the need for higher level maintenance, the equipment is taken out of service until maintenance is performed. Analysis cannot be continued until all performance checks meet established criteria and a return to operational control has been demonstrated and documented. The individual assigned to the instrument is responsible for daily maintenance.

11.2 ***Non-routine Maintenance***. Non-routine maintenance is initiated for catastrophic occurrences such as instrument failure. The need for non-routine maintenance is indicated by failures in general operating systems that result in an inability to conduct required performance checks or calibration. Equipment in this category is taken out of service, tagged accordingly and repaired before attempting further analysis. Before initiating repairs, all safety procedures for safe handling of equipment during maintenance, such as lock-out/tag-out are followed. Analysis is not resumed until the instrument meets all operational performance check criteria, is capable of being calibrated and a return to operational control has been demonstrated and documented. Section supervisors are responsible for identifying non-routine maintenance episodes and initiating repair activities to bring the equipment on-line. This may include initiating telephone calls to maintenance contractors if necessary. They are responsible for documenting all details related to the occurrence and repair.

11.3 ***Scheduled Maintenance***. Modern laboratory instrumentation rarely requires regular preventative maintenance. If required, the equipment is placed on a schedule, which dictates when maintenance is needed. Examples include annual balance calibration by an independent provider or ICP preventative maintenance performed by the instrument manufacturer. Section supervisors are responsible for initiating scheduled maintenance on equipment in this category. Scheduled maintenance is documented using routine documentation practices.

11.4 ***Maintenance Documentation***. Routine and non-routine maintenance activities are documented in logbooks assigned to instruments and equipment used for analytical measurements. The logbooks contain preprinted forms, which specify the required maintenance activities. The analyst or supervisor performing or initiating the maintenance activity is required to check the activity upon its completion and initial the form. This includes documenting that the instrument has been returned to operational control following the completion of the activity. Non-routine maintenance (repairs, upgrades) is documented on the back page of the service log.

12.0 QUALITY CONTROL PARAMETERS, PROCEDURES, AND CORRECTIVE ACTION

Requirement: All procedures used for test methods incorporate quality control parameters to monitor elements that are critical to method performance. Each quality parameter includes acceptance criteria that have been established by regulatory agencies for the methods in use. Criteria may also be established through client dictates or through the accumulation and statistical evaluation of internal performance data. Data obtained for these parameters during routine analysis must be evaluated by the analyst and compared to the method criteria in use. If the criteria are not achieved, the procedures must specify corrective action and conformation of control before proceeding with sample analysis. QC parameters, procedures, and corrective action must be documented within the standard operating procedures for each method. In the absence of client specific objectives, the laboratory must define qualitative objectives for completeness and representativeness of data.

12.1 ***Procedure***. Bench analysts are responsible for methodological quality control and sample specific quality control. Each method specifies the control parameters to be employed for the method in use and the specific procedures for incorporating them into the analysis. These control parameters are analyzed and evaluated with every designated sample group (batch).

The data from each parameter provides the analyst with critical decision-making information on method performance. The information is used to determine if corrective action is needed to bring the method or the analysis of a specific sample into compliance. These evaluations are conducted throughout the course of the analysis. Each control parameter is indicative of a critical control feature. Failure of a methodological control parameter is indicative of either instrument or batch failure. Failure of a sample control parameter is indicative of control difficulties with a specific sample or samples.

Sample Batch. All samples analyzed in the laboratory are assigned to a designated sample batch, which contains all required quality control samples and a defined maximum number of field samples that are prepared and/or analyzed over a defined time period. The maximum number of field samples in the preparation batch is 20. SGS has incorporated The NELAC Institute (TNI) Standard batching policy as the sample-batching standard. This policy incorporates the requirement for blanks and spiked blanks as a time-based function as defined by TNI Standard. Accordingly, the specified time period for a sample batch is 24 hours. A matrix spike/matrix spike duplicate, matrix spikes and/or duplicate is required every 20 samples.

Client criteria that defines a batch as a time-based function which includes a matrix spike/matrix spike duplicates as a contractual specification will be honored. The typical batch contains a blank and a laboratory control sample (LCS or spiked blank). Batch documentation includes lot specifications for all reagents and standards used during preparation of the batch.

12.2 ***Methodological Control Parameters and Corrective Action***. Prior to the analysis of field samples, the analyst must determine that the method is functioning properly. Specific control parameters indicate whether critical processes meet specified requirements before continuing with the analysis. Method specific control parameters must meet criteria before sample analysis can be conducted. Each of these parameters is related to processes that are under the control of the laboratory and can be adjusted if out of control.

Method Blank. A method blank is analyzed during the analysis of any field sample. The method blank is defined as a sample. It contains the same standards (internal standards, surrogates, matrix modifiers, etc.) and reagents that are added to the field sample during analysis, with the exception of the sample itself. If the method blank contains target analytes(s) at concentrations that exceed method detection limit concentrations (organics) or reporting limit concentrations (inorganics), the source of contamination is investigated and eliminated before proceeding with sample analysis. Target analyte(s) in method blanks at concentrations no greater than one-half of the reporting limit concentrations (metals) may be requested on a client or project specific basis. Systematic contamination is documented for corrective action and resolved following the established corrective action procedures.

Laboratory Control Samples (LCS or Spiked Blanks). A laboratory control sample (spiked blank or commercially prepared performance evaluation sample) is analyzed along with field samples to demonstrate that method accuracy is within acceptable limits. These spike solutions may be from different sources than the sources of the solutions used for method calibration depending upon the method requirements. All target components are included in the spike mixture. The performance limits are derived from published method specifications or from statistical data generated from the analysis of laboratory method performance samples. Spiked blanks are blank matrices (reagent water or clean sand) spiked with target parameters and analyzed using the same methods used for samples. Accuracy data is compared to laboratory derived limits to determine if the method is in control. Laboratory control samples (LCS) are commercially prepared spiked samples in an inert matrix. Performance criteria for recovery of spiked analytes are pre-established by the commercial entity preparing the sample. The sample is analyzed in the laboratory as an external reference.

Accuracy data is compared to the applicable performance limits. If the spike accuracy exceeds the performance limits, corrective action, as specified in the SOP for the method is performed and verified before continuing with a field sample analysis. In some cases, decisions are made to continue with sample analysis if performance limits are exceeded, provided the unacceptable result has no negative impact on the sample data.

Blanks and spikes are routinely evaluated before samples are analyzed. However, in situations where sample analysis is performed using an auto sampler, they may be evaluated after sample analysis has occurred. If the blanks and spikes do not meet criteria, sample analysis is repeated.

Proficiency Testing. Proficiency test samples (PTs) are single- or double-blind spikes, introduced to the laboratory to assess method performance. PTs may be introduced as double

blinds submitted by commercial clients, single or double blinds from regulatory agencies, or internal blinds submitted by the QA group.

A minimum of two single blind studies must be performed each year for every parameter in aqueous and solid matrices for each field of testing for which the laboratory maintains accreditation. Proficiency samples must be purchased as blinds from an TNI accredited vendor. Data from these studies are provided to the laboratory by the vendor and reported to accrediting agencies. If unsatisfactory performance is noted, corrective action is performed to identify and eliminate any sources of error. A new single blind must be analyzed if required to demonstrate continuing proficiency. The laboratory must evaluate the analytical results for each chemistry field for accreditation to the PTRL (Proficiency Testing Reporting Limit). For the analyses where LOQ is below the PTRL, the laboratory may evaluate the results to their normal LOQ.

PT samples performed for accrediting agencies or clients, which do not meet performance specifications, require a written summary that documents the corrective action investigation, findings, and corrective action implementation. A copy of this summary shall be submitted to the TNI Standard Primary Accrediting Authority, NJDEP Office of Quality Assurance for review.

Single- or double-blind proficiency test samples may be employed for self-evaluation purposes. Data from these analyses are compared to established performance limits. If the data does not meet performance specifications, the system is evaluated for sources of acute or systematic error. If required, corrective action is performed and verified before initiating or continuing sample analysis.

Trend Analysis for Control Parameters. The quality assurance staff is responsible for continuous analytical improvement through quality control data trend analysis. Accuracy data for spiked parameters in the spiked blank are statistically evaluated weekly for trends indicative of systematic problems. Data from LCS parameters and surrogates are pooled on a method, matrix, and instrument basis. This data is evaluated by comparison to existing control and warning limits. Trend analysis is performed automatically as follows:

- Any point outside the control limit
- Any three consecutive points between the warning and control limits
- Any eight consecutive points on the same side of the mean.
- Any six consecutive points increasing or decreasing

The results of the trend analysis are transmitted as .PDF files for supervisory evaluation prior to sample analysis. Trends that indicate the potential loss of statistical control are further evaluated to determine the impact on data quality and to determine if corrective action is necessary. If corrective action is indicated, the supervisor informs the analysts of the corrective actions to be performed. Return to control is demonstrated before analysis resumes.

12.3 ***Sample Control Parameters and Corrective Action***. The analysis of samples can be initiated following a successful demonstration that the method is operating within established controls. Additional controls are incorporated into the analysis of each sample to determine if the method is functioning within established specifications for each individual sample. Sample QC data is evaluated and compared to established performance criteria. If the criteria are not achieved the method or the SOP specifies the corrective action required to continue sample analysis. In many cases, failure to meet QC criteria is a function of sample matrix and cannot be remedied. Each parameter is designed to provide quality feedback on a defined aspect of the sampling and analysis episode.

Duplicates. Duplicate sample analysis is used to measure analytical precision. This can also be equated to laboratory precision for homogenous samples. Precision criteria are method dependent. If precision criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before sample data can be reported.

Laboratory Spikes & Spiked Duplicates. Spikes and spiked duplicates are used to measure analytical precision and accuracy for the sample matrix selected. Precision and accuracy criteria are method dependent. If precision and accuracy criteria are not achieved, corrective action or additional action may be required. Recommended action must be completed before reporting sample data. All target components are included in the spike mixture over a two-year period.

Serial Dilution (Metals). Serial dilutions of metals samples are analyzed to determine if analytical matrix effects may have impacted the reported data. If the value of the serially diluted samples does not agree with the undiluted value within a method-specified range, the sample matrix may be causing interferences, which may lead to either a high or low bias. If the serial dilution criterion is not achieved, it must be flagged to indicate possible bias from matrix effects.

Post Digestion Spikes. Digested samples are spiked and analyzed to determine if matrix interferences are biasing the results when the pre-digestion spike (matrix spike) recovery falls outside the control limits. It may also be used to determine potential interferences per client's specification. The sample is spiked at the concentration specified in the method SOP. No action is necessary if the post digestion spike is outside of the method criteria, unless a preparation problem is suspected with the spike, in which case the post digestion spike should be re-prepared and reanalyzed.

Surrogate Spikes (Organics). Surrogate spikes are organic compounds that are similar in behavior to the target analytes but unlikely to be found in nature. They are added to all quality control and field samples to measure method performance for each individual sample. Surrogate accuracy limits are derived from published method specifications or from the statistical evaluation of laboratory generated surrogate accuracy data. Accuracy data is compared to the applicable performance limits. If the surrogate accuracy exceeds performance limits, corrective action, as specified in the method or SOP is performed before sample data can be reported.

Internal Standards (Organic Methods). Internal standards are retention time and instrument response markers added to every sample to be used as references for quantitation. Their response is compared to reference standards and used to evaluate instrument sensitivity on a sample specific basis. Internal standard retention time is also compared to reference standards to assure that target analytes are capable of being located by their individual relative retention time.

If internal standard response criteria are not achieved, corrective action or additional action may be required. The recommended action must be completed before sample data can be reported.

If the internal standard retention time criteria are not achieved corrective action or additional action may be required. This may include re-calibration and re-analysis. Additional action must be completed before sample data is reported.

Internal Standards (ICP and ICP/MS Metals). Internal standards are used on ICP instruments to compensate for variations in response caused by differences in sample matrices. Multiple internal standards are used for each sample on ICP/MS instruments to compensate for variations in response caused by differences in sample matrices. This adjustment is performed automatically during sample analysis. The internal standard response of replicated sample analysis is monitored to detect potential analytical problems. If analytical problems are suspected, then the field samples may be reanalyzed or reanalyzed upon dilution to minimize the interferences. A different internal standard may be employed for quantitation in situations where the field sample contains the element typically used as the internal standard.

12.4 ***Laboratory Derived Quality Control Criteria.*** Control criteria for in-house methods and client specific modifications that exceed the scope of published methodology are defined and documented prior to the use of the method. The Quality Assurance Department is responsible for identifying additional control criteria needs. Control parameters and criteria based on best technical judgment are established using input provided by the operations staff. These control parameters and criteria are documented and incorporated into the method.

The laboratory-derived criteria are evaluated for technical soundness on spiked samples prior to the use of the method on field samples. The technical evaluation is documented and archived by the Quality Assurance Staff.

When sufficient data from the laboratory developed control parameter is accumulated, the data is statistically processed, and the experimentally derived control limits are incorporated into the method.

12.5 ***Bench Review & Corrective Action***. The bench chemists are responsible for all QC parameters. Before proceeding with sample analysis, they are required to successfully meet all instrumental QC criteria. They have the authority to perform any necessary corrective action

before proceeding with sample analysis. Their authority includes the responsibility for assuring that departures from documented policies and procedures do not occur.

The bench chemists are also responsible for all sample QC parameters. If the sample QC criteria are not achieved, they are authorized and required to perform the method specified corrective action before reporting sample data.
Whenever possible, samples are analyzed straight to minimize detection and reporting limits. If dilutions need to be applied, the minimum dilution is used bring the target compounds in the range of the curve. This dilution may be determined from the original analysis or from screening data. If the target range is large, then multiple dilutions may be required to optimize reporting limits for the maximum number of targets. Up to 3 dilutions may be used for a given sample. In some cases, very high levels of an interfering target may force larger dilutions for other target compounds. In all cases a conservative approach to dilution is applied to minimize the increase of detection and reporting limits.

12.6 ***Data Qualifiers*.** An alpha character coding system is employed for defining use limitations for reported data. These limitations are applied to analytical data by the analyst to clarify the usefulness of the reported data for data user. Common data qualifiers and their definitions are as follows:

Organics.

J: Indicates an estimated value. Applied to calculated concentrations for tentatively identified compounds and qualitatively identified compounds whose concentration is below the reporting limit, but above the MDL.

N: Indicates qualitative evidence of a tentatively identified compound whose identification is based on a mass spectral library search and is applied to all TIC results.

C: Applied to pesticide data that has been qualitatively confirmed by GC/MS.

B: Used for analytes detected in the sample and its associated method blank.

E: Applied to compounds whose concentration exceeds the upper limit of the calibration range.

Metals and Inorganics.

B: Applied if the reported concentration value was less than the reporting limit but greater than the MDL.

U: Applied if the reading is less than the MDL (or IDL if IDL reporting is being used).

E: Estimated concentration caused by the presence of interferences, normally applied when the serial dilution is out.

N: Spike sample recovery not within control limits.

*: Duplicate or matrix spike duplicate analysis not within control limits.

12.7 ***Data Package Review***. SGS employs at least two levels of data review, the final review must be performed by a manager, supervisor or designated reviewer, to assure that reported data has satisfied all quality control criteria and that client specifications and requirements have been met. Each production department has developed specific data review procedures, which must be completed before data is released to the client.

Analytical Review. The analyst conducts the primary review of all data. This review begins with a check of all instrument and method quality control and progresses through sample quality control, concluding with a check to assure that the client's requirements have been executed. Analyst checks focus on a review of qualitative determinations and checks of precision and accuracy data to verify that existing laboratory criteria have been achieved. Checks at this level may include comparisons with project specific criteria if applicable. The analyst has the authority and responsibility to perform corrective action for any out-of-control parameter or nonconformance at this stage of review.

Analysts who have met the qualification criteria for the method in use perform secondary, peer level data reviews. Analyst qualification requirements include a valid demonstration of capability and demonstrated understanding of the method SOP. Section supervisors may perform secondary review in-lieu of a peer review. Managers, Supervisors or designated reviewers evaluate 100% of the data produced by their department. It includes a check of all manual calculations; an accuracy check of manually transcribed data from bench sheets to the LIMS, a check of calibration and continuing calibration, all QC criteria and a comparison of the data package to client specified requirements. Also included are checks to assure the appropriate methodology was applied and that all anomalous information was properly flagged for communication in the case narrative. Supervisors have the authority to reject data and initiate re-analysis, corrective action, or reprocessing.

All laboratory data requiring manual entry into LIMS system is double-checked by the analysts performing initial data entry and the section supervisor. Verification of supervisory review is indicated on the raw data summary by the manager, supervisor, or designated reviewer's initials and date.

Electronic data that is manually edited at the bench by the primary analyst is automatically flagged by the instrument data system indicating an override by the analyst. All manual overrides must be verified and approved by a supervisor who initials and dates all manual changes.

Hard copies (or PDF) of manually integrated chromatographic peaks are printed that clearly depict the manually drawn baseline. The hard copy (or PDF) is reviewed and approved by the section manager, supervisor or designated reviewer (initialed and dated) and included in the

data package of all full tier reports or the archived batch records of commercial report packages.

Edits to electronic data that have already been committed to the LIMS database are controlled through the use of the Master Edit function in LIMS. Permission to access this program is limited to those approved by the upper levels of laboratory management and is controlled by the Information Technology staff. A GALP electronic audit record trail is maintained for all changes that are made and is automatically appended to the record.

The group manager performs a tertiary review on a spot check basis. This review includes an evaluation of QC data against acceptance criteria and a check of the data package contents to assure that all analytical requirements and specifications were executed.

Report Generation Review. The report generation group reviews all data and supporting information delivered by the laboratory for completeness and compliance with client specifications. Missing deliverables are identified and obtained from the laboratory. The group also reviews the completed package to verify that the delivered product complies with all client specifications. Non-analytical defects are corrected before the package is sent to the client.

Project Management/Quality Control Review. Spot-check data package reviews are performed by the project management staff. Project management reviews focus on project specifications. If the project manager identifies defects in the product prior to release, he initiates immediate corrective action to rectify the situation.

The QA staff performs approximately 10% of the completed data packages to verify completeness and compliance with established quality control procedures. Detected deficiencies are brought to the laboratories attention and corrective actions initiated as necessary.

The QA review focuses on all elements of the deliverable including analytical quality control, sample custody documentation case narratives and data qualifiers QA reviews at this step in the production process are geared towards systematic process defects, which require procedural changes to affect a corrective action. However, if defects are identified that have an adverse effect on data, the client is immediately informed following standard notification procedures. QA data review is not used in lieu of a peer level review or a supervisory review.

Data Reporting. Analytical data is released to clients following a secondary review by the manager, supervisor or designated reviewer. Data release at this stage of the process is limited to electronic information, which is released to clients through a secure, encrypted, password protected, Internet connection. Hard copy support data is compiled by the report generation group and assembled into the final report. The report is sent to the client following reviews by the report generation staff.

All data reports include specified information, which is required to identify the report and its contents. This information includes a title, name and address of the laboratory, a unique report number, total number of pages in the report, clients name and address, analytical method identification, arriving sample condition, sample and analysis dates, test results with units of measurement, authorized signature of data release, statement of applicability, report reproduction restrictions and TNI Standard requirements certification. Data reports for the DOD Defense ELAP clients also include the time of preparation and analysis.

12.8 ***Electronic Data Reduction.*** Raw data from sample analysis is entered into the laboratory information management system (LIMS) using automated processes or manual entry. Final data processing is performed by the LIMS using procedures developed by the Company.

All LIMS programs are tested and validated prior to use to assure that they consistently produce correct results. The Information Technology Staff performs software validation testing. The testing procedures are documented in an SOP. Software programs are not approved for use until they have demonstrated that they are capable of performing the required calculations.

12.9 ***Representativeness***. Data representativeness is based on the premise that qualitative and quantitative information developed for field samples is characteristic of the sample that was collected by the client and analyzed in the laboratory. The laboratory objective for representativeness defines data as representative if the criteria for all quality parameters associated with the analysis of the sample are achieved.

12.10 ***Comparability***. Analytical data is defined as comparable when data from a sample set analyzed by the laboratory is representatively equivalent to other sample sets analyzed separately regardless of the analytical logistics. The laboratory will achieve 100% comparability for all sample data which meets the criteria for the quality parameters associated with its analysis using the method requested by the client.

13.0 CORRECTIVE ACTION SYSTEM

Requirement. The laboratory employs policies and procedures for correcting defective processes, systematic errors, and quality defects enabling the staff to systematically improve product quality. The system includes procedures for communicating items requiring corrective action to responsible individuals, corrective action tracking procedures, corrective action documentation, monitoring of effectiveness, and reports to management. The system is fully documented in a standard operating procedure. Individual corrective actions and responses are documented in a dedicated database.

13.1 ***Procedure***. Corrective action is the step that follows the identification of a process defect. The type of defect determines the level of documentation, communication, and training necessary to prevent re-occurrence of the defect or non-conformance. The formal system is maintained by the quality assurance department. Operations management is responsible for working within the system to resolve identified deficiencies.

Routine Corrective Action. Routine corrective action is defined as the procedures used to return out of control analytical systems back to control. This level of corrective action applies to all analytical quality control parameters or analytical system specifications.

Bench analysts have full responsibility and authority for performing routine corrective action. The resolution of defects at this level does not require a procedural change or staff re-training. The analyst is free to continue work once corrective action is complete and the analytical system has been returned to control. Documentation of routine corrective actions is limited to logbook comments for the analysis being performed.

Process Changes. Corrective actions in this category require procedural modifications. They may be the result of systematic defects identified during audits, the investigation of client inquiries, failed proficiency tests, product defects identified during data review, or method updates. Resolution of defects of this magnitude requires formal identification of the defect, development and documentation of a corrective action plan, and staff training to communicate the procedural change.

Technical Corrective Action. Technical corrective action encompasses routine corrective action performed by bench analysts for out of control systems and corrective actions performed for data produced using out of control systems. Technical corrective action for routine situations is conducted using the procedures detailed above.

Non-routine corrective actions apply to situations where the bench analysts failed to perform routine corrective action before continuing analysis. Supervisors and Department Managers perform corrective action in these situations. Documentation of all non-routine corrective actions is performed using the corrective action system.

Sample re-analysis is conducted if sufficient sample and holding time remain to repeat the analysis using an in-control system. If insufficient sample or holding time remains, the data is processed, and qualifiers applied that describe the out of control situation. The occurrence is further documented in the case narrative and in the corrective action response. The corrective action must include provisions for retraining the analysts who failed to perform routine corrective action.

13.2 ***Documentation & Communication***. Routine corrective actions are documented as part of the analytical record. Notations are made in the comments section of the analytical chronicle or data sheet detailing the nonconformance and corrective action. Continuation of the analysis indicates that return to control was successful.

Corrective actions for process changes are documented, tracked and monitored for effectiveness. Supervisors or senior staff members may initiate corrective actions by generating a corrective action using the corrective action database application.

The corrective action database is an Access application. The initiator generates the corrective action investigation form, which is documented, tracked, distributed to responsible parties and archived through the application. The application assigns a tracking number, initiation data and due date to each action and copies the corrective action form to the database. E-mail message containing the form is automatically distributed to the responsible parties for resolution.

The responsible party identifies the root cause of the defect, initiates the immediate fix and develops and implements the procedural change. Existing documentation such as SOPs are edited to reflect the change. The affected staff is informed of the procedural change through a formal training session. The training is documented, and copies are placed into individual training files. The corrective action form is completed by the responsible party and returned to the QA staff via e-mail using the database application.

Initial and completed corrective action forms are maintained in the corrective action database. This entire database is backed up and archived daily. The corrective action tracking form is maintained as an active report in the database.

Monitoring. The QA Staff monitors the implemented corrective action until it is evident that the action has been effective, and the defect has been eliminated. The corrective action database is updated by QA to reflect closure of the corrective action. The QA staff assigns an error code to the corrective action for classification of the type of errors being committed. Additional monitoring of the corrective action is conducted during routine laboratory audits.

Additional monitoring of the corrective action is conducted by adding the corrective action to a verification list by the QA staff at closure. Verification is performed by the QA Staff to assure that the corrective action has remained in effect is scheduled for six (6) months from the initial closure date.

If QA determines that the corrective action response has not effectively remedied the deficiency, the process continues with a re-initiation of the corrective action. Corrective action continues until the defect is eliminated. If another procedural change is required, it is treated as a new corrective action, which is documented and monitored using established procedures.

Client Notification. Defective processes, systematic errors and/or quality defects may be detected during routine audits or data inquiries and may have negative impacts on data quality. In some cases, data affected may have been released to clients. If defective data has been released for use, SGS will identify and notify the affected clients of the defect and impact in accordance with Corrective Action SOP EQA011. For any Department of Defense (DoD) projects where instances of inappropriate and prohibited practices (as per the DoD QSM section 5.2.7) may have occurred, affected clients and the accrediting body (i.e., ANAB) must be notified within 15 business days of discovery and a corrective action plan must be provided within 30 business days of discovery.

14.0 PROCEDURES FOR EXECUTING CLIENT SPECIFICATIONS

Requirement. Systems have been established for evaluating and processing client specifications for routine and non-routine analytical services. The systems enable the client services staff to identify, evaluate, and document the requested specifications to determine if adequate resources are available to perform the analysis. The system includes procedures for communicating the specifications to the laboratory staff for execution and procedures for verifying the specifications have been executed.

14.1 ***Client Specific Requirements***. The project manager is the primary contact for clients requesting laboratory services. Client specifications are communicated using several mechanisms. The primary sources of information are the client's quality assurance project plan (QAPP) and the analytical services contract both of which detail the analytical, quality control and data reporting specifications for the project. In the absence of a QAPP, projects specifications can also be communicated using contracts, letters of authorization, or letters of agreement, which may be limited to a brief discussion of the analytical requirements and the terms and conditions for the work. These documents may also include pricing information, liabilities and scope of work, in addition to the analytical requirements. QAPPs include detailed analytical requirements and data quality objectives, which supersede those found in the referenced methods. This information is essential to successful project completion.

The client services staff provides additional assistance to clients who are unsure of the specifications they need to execute the sampling and analysis requirements of their project. They provide additional support to clients who require assistance in results interpretation as needed, provided they possess the expertise required to render an opinion.

The project manager is responsible for obtaining project documents, which specify the analytical requirements. Following project management and lab manager review, QAPPs are distributed to the QA staff for review and completion. The original QAPP is filed in a secure location.

For certain states or programs an additional form or checklist is required. In these instances, QA must be notified if any new form is requested to confirm the accuracy of the new document.

14.2 ***Requirements for Non-Standard Analytical Specifications***. Client requirements that specify departures from documented policies, procedures, or standard specifications must be submitted to SGS in writing. These requirements are reviewed and approved by the technical staff before the project is accepted. Once accepted, the non-standard requirements become analytical specifications, which follow the routine procedure for communicating client specifications. Departures from documented policies, procedures, or standard specifications that do not follow this procedure are not permitted.

14.3 ***Evaluation of Resources.*** A resource evaluation is completed prior to accepting projects submitted by clients. The evaluation is initiated by the client services staff who prepares a brief synopsis that includes the logistical requirements of the project. Logistical specifications for new projects are summarized in writing for evaluation by the affected departments. The specifications are evaluated by the department manager from a scheduling and hardware resources perspective. The project is not accepted unless the department managers have the necessary resources to execute the project according to client specifications.

14.4 ***Documentation***. New projects are created directly into the LIMS (Laboratory Information Management System) at the time a bottle order it is requested or after sample arrival during the login process. For project requiring NJ DKQP (Data of Known Quality Protocol) reporting, a project set up form is completed prior to the start of the project (DAYT-CSS-030-FORM DKQP Project set up).This form can also be used in initial project set-up for complex projects, and it details all of the information needed to correctly enter the specifications for each project into LIMS. The form includes data reporting requirements, billing information, data turnaround times, QA level, state of origin, and comments for detailing project specific requirements. The project manager is responsible for obtaining this information from the client and completing the form prior to sample arrival and login.

Sample receipt triggers project creation and the login process. The information on the set-up form is entered into the LIMS immediately prior to logging in the first sample. The set-up form may be accompanied by a quotation, which details the analytical product codes and sample matrices. These details are also entered into the LIMS during login.

Special information is distributed to the laboratory supervisors and login department in electronic or hardcopy format upon project setup. All, project specific information is retained by the project manager in a secure file. The project manager maintains a personal telephone log, which details conversations with the client regarding the project.

QA Department includes special information provided by the project managers into the Project Specific Bench Notes that detail client specific analytical requirements for each test. Bench analysts use these Bench Notes to obtain information regarding client specific analytical requirements before analyzing samples. A program code is established for each client that links the client specifications to a client project. This code is attached to a project by the project manager at login and listed on the work list for each work group conducting analysis for clients with standing requirements.

14.5 ***Communication***. A pre-project meeting is held between client services and the operations managers to discuss the specifications described in the QAPP, contract and/or related documents. Project logistics are discussed and finalized, and procedures are developed to assure proper execution of the client's analytical specifications and requirements. Questions, raised in the review meeting, are discussed with the client for resolution. Exceptions to any requirements, if accepted by the client, are documented and incorporated into the QAPP or project documentation records.

Non-standard specifications for individual clients are documented in the LIMS at the client account level or program level. Simple specifications are documented as comments for each project. Once entered into the LIMS, these specifications become memorialized for all projects related to the client account. Complex specifications are assigned program codes that link the specification to detailed analytical specifications.

Upon sample arrival, these specifications are accessed through a terminal or printed as a hard copy and stored in a binder for individuals who require access to the specification. Specifications that are not entered into the LIMS are prohibited unless documented in an interdepartmental memo, which clearly identifies the project, client and effective duration of the specification.

14.6 ***Operational Execution***. A work schedule is prepared for each analytical department on a daily basis. Analytical specifications or program codes from recently arrived samples have now been entered into the LIMS database. The database is sorted by analytical due date and holding time, into product specific groups. Samples are scheduled for analysis by due date and holding time. The completed schedule, which is now defined as a work list, is printed. The list contains the client requested product codes, program codes and specifications required for the selected sample(s). Special requirements are communicated to the analyst using the Project Specific Bench Notes. The bench analyst assumes full responsibility for performing the analysis according to the specifications printed on the work sheet and stated on the Bench Notes.

14.7 ***Verification***. Prior to the release of data to the client, the report generation staff review the report and compare the completed product to the client specifications documentation to assure that all requirements have been met. Project managers may perform a spot check of projects with unique requirements to assure that the work was executed according to specifications.

15.0 CLIENT COMPLAINT RESOLUTION PROCEDURE

Requirement. The laboratory follows a formal system for managing and reconciling client complaints. The system includes procedures for documenting the complaint and communicating it to the appropriate department for resolution. The system also includes a quality assurance evaluation to determine if the complaint is related to systematic defects requiring corrective action and process changes.

15.1 ***Procedure***. Client complaints are communicated to client services representatives, quality assurance staff, or senior management staff for resolution. The individual receiving the complaint retains the responsibility for documentation and communicating the nature of the complaint to the responsible department(s) for resolution. The responsible party addresses the complaint. The resolution is communicated to the QA department and the originator for communication to the client. QA reviews the complaint and resolution to determine if systematic defects exist. If systematic defects are present, QA initiates a corrective action for the responsible party who develops and implements a response that eliminates the defect. If systematic defects are not present and the resolution is satisfactory, the QA Staff will close the complaint/inquiry with a no further action is necessary tag.

15.2 ***Documentation***. Client's complaints are documented by the individual receiving the complaint using the Data Inquiry and Corrective Action Process. This process generates an E-Mail message that contains detailed information essential to the complaint resolution. A record of the telephone conversation is maintained by client services. The message is distributed to the QA staff and the party bearing responsibility for resolution by E-Mail. The complaint resolution is documented on the message by the responsible party and returned to the originator. A copy is sent to QA for review and database archiving.
Positive feedback from clients is now documented in the program. In the past, these types of communications with clients were discussed at the Client Services Meeting but were not tracked by SGS. Documenting this information can be used to improve service to all clients.

15.3 ***Corrective Action***. Responses to data queries are required from the responsible party. At a minimum, the response addresses the query and provides an explanation to the complaint. Formal corrective action may focus on the single issue expressed in the complaint. Corrective action may include reprocessing of data, editing of the initial report, and re-issue to the client. If the QA review indicates a systematic error, process modification is required. The defective process at the root of the complaint is changed. SOPs are either created or modified to reflect the change. The party responsible for the process implements process changes.

15.4 ***QA Monitoring***. Process changes, implemented to resolve systematic defects, are monitored for effectiveness by QA. If monitoring indicates that the process change has not resolved the defect, QA works with the department management to develop and implement an effective process. If monitoring indicates that the defect has been resolved, monitoring is slowly discontinued, and the corrective action is closed. Continued monitoring is incorporated as an element of the annual system audit.

16.0 CONTROL OF NONCONFORMING PRODUCT

Requirement: Policies and procedures have been developed and implemented that describe the procedures employed by the laboratory when any aspect of sample analysis or data reporting do not conform to established procedures or client specifications. These procedures include steps to ensure that process defects are corrected, and affected work is evaluated to assess its impact to the client.

Procedure. Nonconforming product is identified through routine internal review and audit practices or through client inquiry. The individuals who identify the nonconformance or receiving a nonconformance inquiry immediately inform the Laboratory Director and the Quality Assurance Manager. The Laboratory Director initiates an evaluation of the nonconformance through the Quality Assurance Department and takes full responsibility for managing the process and identifying the course of action to take, initiating corrective action and mitigating the impact of the nonconformance to the client. Reference SOP EQA 065 Control of Non-Conforming Product and EQA 038 Complaints & Data Inquiry for specific procedures on handling non-conformances and Data Inquires.

16.1 ***Corrective Action.*** The outcome of the evaluation dictates the course of action. This includes client notification when the quality of data reported has been impacted and may also include corrective action if applicable. Immediate corrective action is performed using the procedures specified in SGS SOP EQA011. However, additional action may be required including cessation of analysis and withholding and or recalling data reports. If the evaluation indicates that nonconforming data may have been issued to clients, the client is immediately notified, and data may be recalled following the procedures specified in SOP EQA011. If work has been stopped because of a nonconformance, the General Manager/Laboratory Director is the only individual authorized to direct a resumption of analysis.

Non-conformances caused by systematic process defects require retraining of the personnel involved as an element of the corrective action solution.

17.0 CONFIDENTIALITY PROTECTION PROCEDURES

Requirements: Policies and procedures have been developed to protect client data from release to unauthorized parties or accidental release of database information through accidental electronic transmission or illegal intrusion. These policies have been communicated to clients and staff. Electronic systems are regularly evaluated for effectiveness.

17.1 ***Client Anonymity***. Information related to the Company's clients is granted to employees on a "need to know" basis. An individual's position within the organization defines his "need to know". Individuals with "need to know" status are given password access to systems that contain client identity information and access to documents and document storage areas containing client reports and information. Access to client information by individuals outside of the Company is limited to the client and individuals authorized by the client.

Any other third-party requests for documents will not be released without written permission from the client. Reports and report copies can be distributed to Regulatory Agencies.

In the case where SGS receives a subpoena or other legal request for data or a report, SGS Legal must be notified immediately and the following steps taken:

-A copy of the Subpoena or legal request is sent to SGS Legal
-SGS Legal is involved in the client notification process, the content of the notification, and how the client is notified
-SGS Legal is involved in the response to the regulatory agency

17.2 ***Documents***. Access to client documents is restricted to employees in need to know positions. Copies of all client reports are stored in secure electronic archives with restricted access. Reports and report copies are distributed to individuals who have been authorized by the client to receive them. Data reports or data are not released to third parties without verbally expressed or written permission from the client.

17.3 ***Electronic Data***.

Database Intrusion. Direct database entry is authorized for employees of SGS only on a need to know basis. Entry to the database is restricted through a user specific multiple password entry system. Direct access to the database outside the facility is possible through secured channels set up by SGS. A unique password is required for access to the local area network. A second unique password is required to gain access to the database. The staff receives read or write level authorization on a hierarchical privilege basis.

Internet Access. Access to client information is through an HTTP Web application only. It does not contain a mechanism that allows direct access to the database. Clients can gain access to their data only using a series of SGS assigned client and user specific passwords. The viewable data, which is encrypted during transmission, consists of an extraction of database information only.

Client Accessibility. Accessibility to client data delivered via electronic means follows strict protocols to insure confidentiality. Clients accessing electronic data are assigned a company account. The account profile, which is established by the MIS staff, grants explicit access to specific information pertaining to the client's project activity. Passwords are assigned on an individual basis within a client account. These accounts can be activated or deactivated by the MIS staff only.

17.4 ***Information Requests***. Client specific data or information is not released to third parties without verbally expressed or written permission from the client. Written permission is required from third parties, who contact the Company directly for the release of information. Verbal requests will be honored only if they are received directly from the client. These requests must be documented in a record of communication maintained by the authorized recipient.

17.5 ***Transfer of Records***. Archived data, which has previously been reported and transmitted to clients, is the exclusive property of SGS. In the event of a cessation of business activities due to business failure or sale, The Company's legal staff will be directed to arrange for the final disposition of archived data.

The final disposition of archived data will be accomplished using the approach detailed in the following sequence:

1. All data will be transferred to the new owners for the duration of the required archive period as a condition of sale.

2. If the new owners will not accept the data or the business has failed, letters will be sent to clients listed on the most recent active account roster offering them the option to obtain specific reports (identified by SGS Job Number) at their own expense.

3. A letter will be sent to the TNI Standard accrediting authority with organizational jurisdiction over the company offering them the option to obtain all unclaimed reports at their own expense.

4. All remaining archived data will be recycled using the most expedient means possible.

18.0 QUALITY AUDITS AND SYSTEM REVIEWS

Requirement: The quality assurance group conducts regularly scheduled audits of the laboratory to assess compliance with quality system requirements, technical requirements of applied methodology, and adherence to documentation procedures. The information gathered during these audits is used to provide feedback to senior management and perform corrective action where needed for quality improvement purposes.

18.1 ***Quality System Reviews***. Quality system reviews are performed annually by the Quality Assurance Department. In this review, the laboratory is evaluated for compliance with the laboratory Quality Systems Manual (QSM) and the quality system standards of the National Environmental Laboratory Accreditation Conference. Findings, which indicate non-compliance or deviation from the QSM, are flagged for corrective action. Corrective actions require either a return to compliance or a plan change to reflect an improved quality process. The Quality Assurance Manager is responsible for making and documenting changes to the QSM.

18.2 ***Quality System Audits.*** Quality system audits are conducted to evaluate the effectiveness and laboratory compliance with individual quality system elements. These audits are conducted on an established schedule. Audit findings are documented and communicated to the management staff and entered into the corrective action system for resolution. If necessary, retraining is conducted to assure complete understanding of the system requirements.

18.3 ***Test Method Assessments.*** Test Method Assessments are performed throughout the year following an established schedule. Selected analytical procedures are evaluated for compliance with standard operating procedures (SOPs) and method requirements. If non-conformances exist, the published method serves as the standard for compliance. SOPs are edited for compliance if the document does not reflect method requirements. Analysts are trained to the new requirements and the process is monitored by quality assurance. Analysts are retrained in method procedures if an evaluation of bench practices indicates non-compliance with SOP requirements.

18.4 ***Documentation Audits***. Documentation audits are conducted during routine internal audits. The audit includes a check of measurement processes that require manual documentation. It also includes checks of data archiving systems. Non-conformances are corrected on the spot. Procedural modifications are implemented if the evaluation indicates a systematic defect.

18.5 ***Corrective Action Monitoring***. Defects or non-conformances that are identified during client or internal audits are documented in the corrective action systems (Section 13) and corrected through process modifications and/or retraining. Once a corrective action has been designed and implemented, it is monitored for compliance on a regular basis by the QA staff. Spot corrections are performed if the staff is not following the new procedure. Monitoring of the corrective action continues until satisfactory implementation has been verified.

18.6 ***Preventive Action.*** Laboratory systems or processes, which may be faulty and pose the potential for non-conformances, errors, confusing reports or difficulties establishing traceability may be identified during internal audits. These items are highlighted for systematic change using the corrective action system and managed to resolution using the procedures for corrective action identified in EQA041.

18.7 ***Management Reports.*** Formal reports of all audit and proficiency testing activity are prepared for the management staff and presented as they occur. Additional reports may be presented orally at regularly scheduled staff meetings

Management reports may also address the following topics:

- Status and results of internal and external audits,
- Status and results of internal and external proficiency testing,
- Identification of quality control problems in the laboratory,
- Discussion of corrective action program issues,
- Status of external certifications and approvals,
- Status of staff training and qualifications,
- Discussion of new quality system initiatives,
- Customer feedback and complaints,
- Results of risk identification,
- Suitability of policies and procedures,
- Changes in volume and type of the work,
- Recommendations for further action on listed items are included in the report.

19.0 HEALTH AND SAFETY

Requirement.

The company health and safety program meet the requirements established by the Occupational Safety and Health Administration (OSHA) including applicable regional and local regulations and laws. All employees receive training on the program and are required to comply with its policies and procedures at every level within our organization.

19.1 Policy.

SGS provides safe and healthy working conditions to all our employees (permanent and temporary), visitors, contractors and other stakeholders. We ensure that all our services and operations are performed and managed in such a way as to protect the environment.

The company will continuously assess and improve safety management systems, programs and tools towards our "Zero incident" target.

The company provides all necessary safety equipment, resources and training gives the Stop-Work-Authority to all employees and contractors in case of any risk to health, safety or environment.

19.2 Responsibilities.

Management is responsible for ensuring full compliance with company safety policies and procedures and investigating any incidents including root cause analysis and corrective action.

The Vice President EHS and General Manager/Lab Director are ultimately responsible for management decisions and actions pertaining to the health and safety program.

The Health & Safety program is reviewed annually by the laboratory General Manager and Department Managers. The program establishes laboratory training and performs inspections and audits to ensure that program elements are being implemented and compliance is being met.

Department Managers and Supervisors are responsible for daily operations, employee oversight, and ensuring the requirements of the health and safety program are practiced daily.

Employees are responsible for following all safety rules and the proper use of protective devices provided by the company. The employee is expected to comply with the requirements of the health and safety program at all times.

19.3 Program Elements.

Safety Training and Communication.

All new employees to the company are provided health and safety training on their first day. Annual safety training is conducted for all employees. Additional training is provided when new substances, equipment, or procedures are introduced and when management is made aware of a situation that requires re-training.

Training is documented, and appropriate records kept.

Safety Committee.

The safety committee meets on a regular basis and establishes an additional safety "presence" throughout the facility. The safety committee promotes knowledge of health and safety at all levels, identifies and notifies of any unsafe work practices and conditions, and participates in development of safety initiatives.

Membership in the safety committee is open to any employee and will be comprised of both management and employee representatives.

Hazard Communication.

The hazard communication program enables employees to readily identify any laboratory hazards and protect themselves from those hazards. The program complies with the OSHA Hazard Communication Standard, Title 29 Code of Federal Regulations 1910.1200 and includes the following:

- Safety Data Sheets (SDS) available to all employees
- Chemical inventory
- Globally harmonized system of classification and labeling of chemicals

Identification of Workplace Hazards.

The hazard identification procedures assure that hazards are identified and corrected before an incident occurs. Hazard identifications are reported to management by all employees and learnings are shared throughout the company.

Employee Exposure Assessment.

Employee exposure assessment is performed to identify and evaluate potential exposure hazards in the workplace. The exposure assessment data is used to document safe practices

and to determine if any changes or modifications may be required to improve the work environment.

Bloodborne Pathogens.

Awareness training on the OSHA Bloodborne Pathogen Standard, 29CFR1910.1030 is conducted to inform employees about standard precautions when someone is injured at work.

Chemical Hygiene Plan.

The Chemical Hygiene Plan meets the requirements established by the OSHA Occupational Exposure to Hazardous Chemicals in the Laboratory Standard, 29 CFR 1910.1450. The plan references best laboratory practices, engineering controls and personal protective equipment that are necessary when working in an environmental laboratory.

Chemical Spill Response.

The chemical spill response plan ensures immediate notification and corrective action in the event of a chemical spill.

Employees that are required to respond to an emergency spill are trained per the OSHA Hazardous Waste Operations and Emergency Response Standard, 29 CFR 1910.120.

Emergency Action & Evacuation.

All employees are trained on what to do in the event of an emergency that includes fire, explosion, gas leak, hazardous material spill, natural disaster and terrorist action. The plan identifies emergency coordinators, building evacuation meeting areas, and contact information for local and national emergency responders.

Lockout/Tagout.

Lockout/tagout procedures are established to ensure that mechanical and electrical equipment is made inoperable and safe before experienced individuals perform inspection, maintenance and repair.

Personal Protective Equipment.

Personal protective equipment (PPE) is provided to employees that includes safety eyewear, laboratory coat and protective gloves. Other PPE may be provided such as safety shoes, hearing protection and respirators depending on specific job tasks.

Respiratory Protection.

The respiratory protection program assures proper training, medical evaluation and respirator selection and fit testing on an annual basis for employees that are required to wear this type of personal protective equipment.

Visitor and Contractor Safety.

A safety presentation is given to all visitors. Visitors must sign in, wear a visitor badge, follow the instructions of their escort, and sign out before leaving the premises.

Appendix I

Glossary of Terms

GLOSSARY OF TERMS

Acceptance Criteria: specified limits placed on characteristics of an item, process, or service defined in requirement documents.

Accuracy: the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.

Analyst: the designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.

Analyte: A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed.

Audit: a systematic evaluation to determine the conformance to quantitative *and qualitative* specifications of some operational function or activity.

Batch: environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A preparation batch is composed of one to 20 environmental samples of the same TNI Standard defined matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An analytical batch is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group.

Blank (BLK): a sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results.

Blind Sample: a sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.

Calibration: to determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter, instrument, or other device. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements.

Calibration Curve: the graphical relationship between the known values, such as concentrations of a series of calibration standards and their instrument response.

Calibration Method: a defined technical procedure for performing a calibration.

Calibration Range: the range of concentrations between the lowest and highest calibration standards of a multi-level calibration curve. For metals analysis with a single-point calibration, the low-level calibration check standard and the high standard establish the linear calibration range, which lies within the linear dynamic range.

Calibration Standard: a substance or reference material used to calibrate an instrument.

Certified Reference Material (CRM): a reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation, which is issued by a certifying body.

Chain of Custody (COC): an unbroken trail of accountability that ensures the physical security of samples and includes the signatures of all who handle the samples.

Confirmation: verification of the identity of a component through the use of an approach with a different scientific principle from the original method. These may include, but are not limited to second column confirmation, alternate wavelength, derivatization, mass spectral, interpretation, alternative detectors or, additional cleanup procedures.

Continuing Calibration Verification (CCV): the verification of the initial calibration that is required during the course of analysis at periodic intervals. Continuing calibration verification applies to both external standard and internal standard calibration techniques, as well as to linear and non-linear calibration models.

Corrective Action (CA): the action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence.

Data Reduction: the process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useable form.

Demonstration of Capability (DOC): a procedure to establish the ability of the analyst to generate acceptable accuracy.

Documentation of Understanding (DOU): certifies that the analyst or technician has read and understood the procedures detailed in the Standard Operating Procedure (SOP) and will follow the SOP as written.

Document Control: the act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and

controlled to ensure use of the correct version at the location where the prescribed activity is performed.

Duplicate Analyses (DUP): the analyses or measurements of the variable of interest performed identically on two sub-samples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory.

Field of Testing: TNI Standard's approach to accrediting laboratories by program, method and analyte. Laboratories requesting accreditation for a program-method-analyte combination or for an up-dated/improved method are required submit to only that portion of the accreditation process not previously addressed

Laboratory Control Sample-LCS (such as laboratory fortified blank, spiked blank, or QC check sample): a sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes from a source independent of the calibration standards or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.

Limit of Detection (LOD): an estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific. DoD clarification is the smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%). At the LOD, the false negative rate (Type II error) is 1%.

Limit of Quantitation (LOQ): the minimum levels, concentrations, or quantities of a target analyte that can be reported with a specified degree of confidence. DoD clarification is the lowest concentration that produces a quantitative result within specified limits of precision and bias. The LOQ shall be at or above the concentration of the lowest initial calibration standard.

Matrix: the component or substrate that contains the analyte of interest. For purposes of batch and QC requirement determinations, the following matrix distinctions shall be used:

Aqueous: any aqueous sample excluded from the definition of Drinking Water matrix or Saline/Estuarine source. Includes surface water, groundwater, effluents, and TCLP or other extracts.

Drinking Water: any aqueous sample that has been designated a potable or potential potable water source. Saline/Estuarine: any aqueous sample from an ocean or estuary, or other salt-water source such as the Great Salt Lake. Non-aqueous Liquid: any organic liquid with <15% settleable solids.

Solids: includes soils, sediments, sludges and other matrices with >15% settleable solids.

Chemical Waste: a product or by-product of an industrial process that results in a matrix not previously defined.

Air: whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter, or another device.

Biota: animal or plant tissue, consisting of entire organisms, homogenates, and/or organ or structure specific subsamples.

Matrix Spike-MS (spiked sample or fortified sample): a sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency.

Matrix Spike Duplicate -MSD (spiked sample or fortified sample duplicate): a second replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.

Method Blank (MB): a sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest, which is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences are present at concentrations that impact the analytical results for sample analyses.

Method Detection Limit (MDL): the minimum measured concentration of a substance (an analyte) that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.

National Environmental Laboratory Accreditation Program (NELAP): the overall National Environmental Laboratory Accreditation Program.

NELAP Standards: the plan of procedures for consistently evaluating and documenting the ability of laboratories performing environmental measurements to meet nationally defined standards established by the National Environmental Laboratory Accreditation Conference.

Performance Audit: the routine comparison of independently obtained *qualitative and quantitative* measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory.

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

Preservation: refrigeration and/or reagents added at the time of sample collection (or later) to maintain the chemical and/or biological integrity of the sample.

Proficiency Testing: a means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source.

Proficiency Test Sample (PT): a sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria.

Proficiency Testing reporting Limit (PTRL): A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.

Reference Method: A reference method is a published method issued by an organization generally recognized as a competent to do so. When a laboratory is required to analyze an analyte by a specified method due to a regulatory requirement, the analyte/method combination is recognized as a reference method. If there is not a regulatory requirement for the analyte/method combination, the analyte/method combination is recognized as a reference method if it can be analyzed by another reference method of the same matrix and technology.

Quality Assurance (QA): an integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence.

Quality Control (QC): the overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users.

Quality Manual: a document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.

Quality System: a structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products

(items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC.

Reporting Limits (RL): the maximum or minimum levels, concentrations, or quantities of a target variable (e.g., target analyte) that can be quantified with the confidence level required by the data user.

Reagent Blank (method reagent blank or method blank): a sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps.

Reference Material: a material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Reference Method: a method of known and documented accuracy and precision issued by an organization recognized as competent to do so.

Reference Standard: a standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

Replicate Analyses: the measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval.

Sample Duplicate (SD): two samples taken from and representative of the same population and carried through all steps of the sampling and analytical procedures in an identical manner. Duplicate samples are used to assess variance of the total method including sampling and analysis.

Spike: a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery efficiency or for other quality control purposes.

Standard: the document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of TNI Standard and meets the approval requirements of TNI Standard procedures and policies.

Traceability: the property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons.

Validation: the process of substantiating specified performance criteria.

Work Cell: A defined group of analysts that together perform the method analysis. Members of the group and their specific functions within the work cell must be fully documented. A "work cell" is considered to be all those individuals who see a sample through the complete process of preparation, extraction, or analysis. The entire process is completed by a group of capable individuals; each member of the work cell demonstrates capability for each individual step in the method sequence.

Appendix II

Standard Operating Procedures Directory

SGS – Dayton

Version-1 6-18-2019

Department	Standard Operating Procedure (SOP) Title	SOP Number
AIR	TO-3	DAYT-AIR-0216
AIR	RSK	DAYT-AIR-0225
AIR	TO-15	DAYT-AIR-0253
AIR	Summa Prep	EAT002
AIR	Flow Controller	EAT006
AIR	TO15-Minnesota	EAT007
AIR	MAAPH	EAT009
Facilities	Lab Coats and Lockers	EFM002
Facilities	Maintenance Procedures	EFM001
FIELD	Oxidation-Redox Potential	EFP029
FIELD	Turbidity1	EFP030
FIELD	DO Winker-Probe	EFP031
FIELD	pH	EFP032
FIELD	SCON RSTVTY	EFP033
FIELD	Low Flow Monitoring Well Sampling	EFP034
FIELD	Calibration of Horiba U-52	EFP035
FIELD	PSE&G SAMPLING SOIL DRUMS NEW JERSEY	DAYT-FSC-0171
FIELD	PSE&G SAMPLING LIQUID DRUMS NEW JERSEY	DAYT-FSC-0172
FIELD	PSE&G SAMPLING LIQUID FRAC TANKS NEW JERSEY	DAYT-FSC-0173
FIELD	PSE&G SAMPLING SOIL FROM ROLL-OFF BOX NEW JERSEY	DAYT-FSC-0174
FIELD	PSE&G SAMPLING CONCRETE NEW JERSEY	DAYT-FSC-0175
FIELD	PSE&G SAMPLING SOIL PILE NEW JERSEY	DAYT-FSC-0176
FIELD	PFAS LOW-FLOW MONITORING WELL SAMPLING NEW JERSEY	DAYT-FSC-0209
FIELD	Aqueous Grab	EFP001
FIELD	Auto WW	EFP002
GENCHEM	FattyAcids	DAYT-WET-0106
GENCHEM	Chlorides	DAYT-WET-0156
GENCHEM	Total Chlorine Bomb 2	DAYT-WET-0157
GENCHEM	TOX AQ	DAYT-WET-0158
GENCHEM	TOX SO	DAYT-WET-0159
GENCHEM	ACIDITY	DAYT-WET-0179
GENCHEM	AMN LACHAT	DAYT-WET-0187
GENCHEM	DISSOLVED SILICA	DAYT-WET-0198
GENCHEM	PN AQ DISTILLATION	DAYT-WET-0201
GENCHEM	PN AQ LACHAT	DAYT-WET-0202
GENCHEM	PN SO LACHAT	DAYT-WET-0203
GENCHEM	PN SO DISTILLATION	DAYT-WET-0204
GENCHEM	TURBIDITY	DAYT-WET-0207

SGS – Dayton

Department	Standard Operating Procedure (SOP) Title	SOP Number
GENCHEM	TCLP-Wheelabrator	DAYT-WET-0213
GENCHEM	TCLP ZHE	DAYT-WET-0214
GENCHEM	TOC SW846 SO	DAYT-WET-0221
GENCHEM	EPA 218.7	DAYT-WET-0222
GENCHEM	PERCHLORATE	DAYT-WET-0226
GENCHEM	BOD	DAYT-WET-0227
GENCHEM	TCLPE METEXT	DAYT-WET-0235
GENCHEM	COMPOSITE	DAYT-WET-0246
GENCHEM	CR6 Soils 3060A + 7199	DAYT-WET-0252
GENCHEM	AMN DIST	DAYT-WET-0257
GENCHEM	TOCLK	DAYT-WET-0259
GENCHEM	HOMOGENIZATION	DAYT-WET-0275
GENCHEM	CRUSH	DAYT-WET-0276
GENCHEM	pH SM4500H+ B-11	DAYT-WET-0277
GENCHEM	pH & corr soil 9045D	DAYT-WET-0278
GENCHEM	pH & corr aqueous 9040C	DAYT-WET-0279
GENCHEM	TRC SM4500Cl	DAYT-WET-0291
GENCHEM	TOCAQ	DAYT-WET-0292
GENCHEM	COD	DAYT-WET-0293
GENCHEM	CNAC	DAYT-WET-0295
GENCHEM	IODIDE	DAYT-WET-0296
GENCHEM	AMNGD	DAYT-WET-0298
GENCHEM	NO2 4500NO2B-11	DAYT-WET-0299
GENCHEM	Total Solids - % Solids and Soil Samples	EGN007
GENCHEM	mbas	EGN008
GENCHEM	CTAS	EGN009
GENCHEM	Total Solids - AQ Samples	EGN010
GENCHEM	TDS	EGN020
GENCHEM	SETTLEABLE SOL	EGN021
GENCHEM	NO2NO3 Lachat 353.2	EGN026
GENCHEM	TVS	EGN030
GENCHEM	ALK SM2320 B-11	EGN037
GENCHEM	BICARBONATE CARBONATE CO2	EGN045
GENCHEM	VISC	EGN067
GENCHEM	TSSSM2540 D-11	EGN087
GENCHEM	COD SM5220 C-11	EGN099
GENCHEM	Hrd by Titration, SM2340C-11	EGN101
GENCHEM	Orthophosphate DW	EGN102
GENCHEM	Sulfide	EGN118
GENCHEM	SO3	EGN119
GENCHEM	COLOR	EGN120
GENCHEM	SCON RSTVTY SM2510	EGN124

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Department	Standard Operating Procedure (SOP) Title	SOP Number
GENCHEM	CHLTITR	EGN131
GENCHEM	Turbidity for DW Metals	EGN132
GENCHEM	ODOR	EGN133
GENCHEM	DO Wink SM4500O C-11	EGN135
GENCHEM	DO4500O G-11	EGN136
GENCHEM	SREAC.CREAC	EGN137
GENCHEM	IGN	EGN140
GENCHEM	TCLP SVOC-Metals Extraction	EGN141
GENCHEM	Paint Filter Liq Test	EGN143
GENCHEM	Temperature SM2550 B-10	EGN146
GENCHEM	Salinity	EGN158
GENCHEM	BTU ATM D240-92	EGN202
GENCHEM	%SULFURD129-95	EGN203
GENCHEM	BDENSD2937-94	EGN204
GENCHEM	ASH	EGN205
GENCHEM	TOCNT	EGN206
GENCHEM	CN-lachat-9012B	EGN207
GENCHEM	TOCHL D808-91M	EGN209
GENCHEM	TKN Lach 351 2	EGN210
GENCHEM	SpecGrav D1298-85	EGN211
GENCHEM	XCRA 3060A 7196A	EGN214
GENCHEM	PN lachat	EGN217
GENCHEM	Petro BaseSed D473-81	EGN222
GENCHEM	WATCON Petro D95-83	EGN223
GENCHEM	Reactive Sulfides	EGN228
GENCHEM	XCr H2O- 7196A	EGN230
GENCHEM	HexCr AQSM3500Cr B-2011 i	EGN231
GENCHEM	SPLP, Non-Volatile	EGN239
GENCHEM	SPLP, Volatile	EGN240
GENCHEM	CEC	EGN242
GENCHEM	FE2 SM3500FE B-11	EGN243
GENCHEM	SG	EGN247
GENCHEM	O+G-PHC 1664	EGN249
GENCHEM	O&G Hex 9071B	EGN250
GENCHEM	TCLP LEACH	EGN252
GENCHEM	ORP-EH-ASTM D1498-76	EGN253
GENCHEM	Total Phosphorous 365.3	EGN256
GENCHEM	Dissolved Silica	EGN257
GENCHEM	GRAINS & SIEVE	EGN258
GENCHEM	Hardness By Calc	EGN259
GENCHEM	Spec cal check	EGN260
GENCHEM	Massachusetts Sieve Test	EGN262

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Department	Standard Operating Procedure (SOP) Title	SOP Number
GENCHEM	VSS EPA160.4 SM2540D,E-11	EGN264
GENCHEM	TVS	EGN264
GENCHEM	UNBCOM 160.1+160.4	EGN266
GENCHEM	ELUTSTD	EGN268
GENCHEM	HYDPO4	EGN271
GENCHEM	%LIPIDS	EGN273
GENCHEM	CN MicroDist 335.4 + 9012B	EGN275
GENCHEM	CN icro Distil 9012	EGN276
GENCHEM	DistillationTubeCal	EGN277
GENCHEM	Phenol micro Dist H2O	EGN279
GENCHEM	Phenol micro Dist soil	EGN280
GENCHEM	CNWAD MicroDist SM4500CN I-11	EGN286
GENCHEM	FE2 ASTM D3872	EGN288
GENCHEM	ICAR	EGN289
GENCHEM	BIOTA	EGN290
GENCHEM	XCR SW846 7199	EGN291
GENCHEM	Hand blender homgenization	EGN293
GENCHEM	H2S	EGN294
GENCHEM	SW1320-MEP	EGN295
GENCHEM	MODELUTE	EGN296
GENCHEM	Acid sol sulfides	EGN298
GENCHEM	Pore Water Prep	EGN299
GENCHEM	ASTM SOL	EGN301
GENCHEM	UAMN Calculation	EGN302
GENCHEM	Dens - ASTM Def	EGN303
GENCHEM	1664 SPE	EGN304
GENCHEM	XCRA Wipes 3060A	EGN305
GENCHEM	phMMehl	EGN306
GENCHEM	Sulfide screen SULFS sm4500S2- A-11	EGN307
GENCHEM	BCAR	EGN308
GENCHEM	PHYSD	EGN309
GENCHEM	OPO4 365 3 Aq + So	EGN310
GENCHEM	OXIDIZER SCREEN	EGN311
GENCHEM	ISM	EGN314
GENCHEM	QPS crushing composite resin	EGN316
GENCHEM	Spike Witness	EGN319
GENCHEM	PN lachat 9066	EGN320
GENCHEM	STLC-CA	EGN321
GENCHEM	CN.CNAC-SEAL	EGN322
GENCHEM	IC2000EPA 300 9056A	EGN323
GENCHEM	NO2 by Seal SM4500NO2 B2011	EGN325

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Department	Standard Operating Procedure (SOP) Title	SOP Number
HS	Compressed Gas Cylinder Safety	EHS003
HS	Sample and Waste Disposal	EHS004
HS	Handling Inorganic Wastes	EHS005
HS	Foreign Soil	EHS006
HS	Management of Industrial Product Samples	EHS007
HS	Laboratory Visitor Safety Procedures	EHS009
HS	Exposure Monitoring of Organic Prep Laboratory	EHS010
HS	Contamination Avoidance	EHS001
HS	Measuring Face Velocities in Fume Hoods	EHS002
MET	HG SOILS	DAYT-MET-0255
MET	HG AQ 245.1+7470A	EMA215
MET	ICP-MS 200.8	EMA216
MET	ICP 200.7	EMA223
MET	LLHG by 1631	EMA224
MET	LLHG by 245.7_1	EMA225
MET	ICP-SS 6010D	EMA601
MET	ICP-MS 6020B	EMA602
METPREP	ICP Dig 3050B	EMP073
METPREP	SW-3005A	EMP081
METPREP	ICPDig Tot Rec 200.7 & 200.8	EMP200
METPREP	Spiking Procedure	EMP202
METPREP	tppm10 air filters, 40CFR, pt 50G	EMP207
METPREP	Metals Dig SM20 3030C	EMP208
METPREP	metals filtration	EMP209
METPREP	DW Dig 200.7 - 200.8	EMP048
METPREP	ICP Dig 3010A	EMP070
MICRO	TCFC Colilert SM9223B	EMB002
MICRO	TCF by SM9222 B-06 + conf	EMB003
MICRO	General Petroleum Degraders	EMB009
MICRO	Calibration	EMB010
MICRO	Fecal Coliform - MF SM9222	EMB127
MICRO	Water Suitability	EMB128
MICRO	Microbiological Quality Control	DAYT-MIC-0231
MICRO	TPC	DAYT-MIC-0271
MIS	EDD Procedure	CMI003
MIS	System Maintenance	CMI006
MIS	Data Security Integrity	CMI001
MIS	Software Development	CMI002

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Department	Standard Operating Procedure (SOP) Title	SOP Number
ORG_GC_SEMI	8081B	DAYT-ORG-0179
ORG_GC_SEMI	8015D GRO	DAYT-ORG-0181
ORG_GC_SEMI	8015D ALCOHOLS	DAYT-ORG-0182
ORG_GC_SEMI	8015D DRO	DAYT-ORG-0185
ORG_GC_SEMI	504	DAYT-ORG-0195
ORG_GC_SEMI	CT-ETPH	DAYT-ORG-0245
ORG_GC_SEMI	MAEPH	DAYT-ORG-0263
ORG_GC_SEMI	EPA 608.3 Pest-PCBs	EGC608
ORG_GC_SEMI	8011	EGC8011
ORG_GC_SEMI	PCB	EGC8082A
ORG_GC_SEMI	Herbicides-8151	EGC8151
ORG_GC_SEMI	Herbicides-8151	EGC8151L-2
ORG_GC_SEMI	Eglycol	EGC-EGLYCOL
ORG_GC_SEMI	MAVPH	EGCMAVPH
ORG_GC_SEMI	EPH	EGCNJEPH
ORG_GC_SEMI	GC Fingerprint	EGCOILID
ORG_MS	MAVPH	DAYT-EMS-0165
ORG_MS	8260C-DAI	DAYT-ORG-0208
ORG_MS	V8260C	DAYT-ORG-0243
ORG_MS	624.1	DAYT-ORG-0244
ORG_MS	EPA 522	DAYT-ORG-0281
ORG_MS	EPA 524.2 rev 4.1	EMS524
ORG_MS	EPA 625.1	EMS625.1
ORG_MS	GCMS Semivolatiles	EMS8270D
ORG_PREP	Semi-Volatile Ext AQ	DAYT-EXT-0155
ORG_PREP	EPH Extraction	DAYT-EXT-0268
ORG_PREP	LVI	DAYT-ORG-0180
ORG_PREP	Sonic-SW3550C	EOP003
ORG_PREP	SW3610-Alumina	EOP005
ORG_PREP	SW3520C Cont. Liq-Liq	EOP007
ORG_PREP	Sulfur	EOP011
ORG_PREP	Solvent & Standards Testing	EOP013
ORG_PREP	MDL Check Spike	EOP014
ORG_PREP	PCBs In Oil	EOP017
ORG_PREP	Sulfur_SW3660B	EOP018
ORG_PREP	Soxhlet SW3540C	EOP020
ORG_PREP	Pest In Oil	EOP021
ORG_PREP	BNA In Oil	EOP022
ORG_PREP	WI SEPFUN	EOP023

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Department	Standard Operating Procedure (SOP) Title	SOP Number
ORG_PREP	WI Sonc	EOP024
ORG_PREP	Calibration of Extract Vials	EOP026
ORG_PREP	Spike Witness	EOP027
ORG_PREP	BCEE	EOP028
ORG_PREP	Preparation of Drying Agents, Ottawa Sand, and Salt	EOP029
ORG_PREP	DRO In Oil	EOP030
ORG_PREP	Herbicide In Oil	EOP031
ORG_PREP	EPH In Oil	EOP032
ORG_PREP	Extractions Scheduling	EOP033
ORG_PREP	liquid-liquid TCLP	EOP034
ORG_PREP	liquid-liquid SPLP	EOP035
ORG_PREP	PFAS AQ	EOP037
ORG_PREP	Microwave Extraction	EOP354
ORG_PREP	Alumina-Petroleum	EOP361
ORG_PREP	Florisil	EOP362
ORG_PREP	Silica Gel	EOP363
ORG_PREP	Acid-Base	EOP365
ORG_PREP	Sulfuric-Permang	EOP366
ORG_PREP	Purge and trap extraction for aqueous samples	EOP503
ORG_PREP	Solid Samples for Volatile Organics Encore	EOP503
ORG_PREP	Herbicides 8151 Extraction	EOP815
ORG_PREP	GPC - SW3540A	EOPGPC
PM	NJDEP DW Notification	EPM003
PM	Login Data Entry	EPM004
PM	Subcontracting high volume	EPM005
PM	PA DW Notification	EPM008
PM	MASS DW Notification	EPM009
PM	PROJECT MANAGEMENT	DAYT-CSS-0190
PM	Client Specific Method Mod	EPM002
QA	SOP SOP	EQA001
QA	Calibration of Thermometers	EQA003
QA	Autopipet Cal	EQA004
QA	Temperature Monitoring	EQA005
QA	Sample Preservatives	EQA008
QA	EmployeeTraining & DOC	EQA009
QA	Sample Batching	EQA010
QA	Corrective Action	EQA011
QA	Inorg Glassware Prep	EQA012
QA	Org Glass Prep	EQA013
QA	Standards Traceability	EQA014

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Department	Standard Operating Procedure (SOP) Title	SOP Number
QA	PT Handling	EQA017
QA	Internal CoC	EQA018
QA	Create Account	EQA019
QA	Create Project	EQA020
QA	Create Product Code	EQA021
QA	Purchasing SOP	EQA023
QA	Document Control	EQA025
QA	Air Monitoring of Extraction Lab	EQA026
QA	Quality System Rev	EQA028
QA	Contract Review	EQA029
QA	Subcontracting	EQA031
QA	Signature Authority	EQA032
QA	Review of Inorganic Data	EQA034
QA	Organics Data Rev	EQA035
QA	Documentation of equipment maintenance	EQA036
QA	Complaints and Data Inquiry	EQA038
QA	Ethics	EQA039
QA	Internal Audit&Preventative Action	EQA041
QA	Sample aliquots procedure	EQA042
QA	In house control limits and trending	EQA043
QA	Manual Peak Integration	EQA044
QA	DI Water QC Procedure	EQA046
QA	Management of Change	EQA047
QA	Syringe & Cylinder Cal	EQA049
QA	Autosampler Vial Labeling	EQA050
QA	pH VOA-Aq	EQA051
QA	QC Review of Data Packages	EQA054
QA	Method Comparabilityand Validation	EQA055
QA	Refrigerator blank	EQA056
QA	Data Integrity Procedure	EQA057
QA	Data Integrity Monitoring Procedure	EQA058
QA	Data_Integrity_Inv	EQA059
QA	Data_Integrity_Rep	EQA061
QA	Vol.DispenserCritical-volume	EQA062
QA	Vol.DispenserNon-critical Volume	EQA063
QA	VOA Glass Prep	EQA064
QA	Non-conforming Product	EQA065
QA	Key Personnel Change	EQA066
QA	Inorganics notebook Rev	EQA067
QA	SVOE Disposal	EQA068
QA	Compressed Gas Management	EQA069
QA	Non-conformance Tracking	EQA070

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Department	Standard Operating Procedure (SOP) Title	SOP Number
QA	New MDL, also LOD-LOQ	EQA075
QA	VOA initial working instruction	EQA076
QA	VOA data processing working instruction	EQA077
QA	VOA LIMS working instruction	EQA078
QA	SVOA initial calibration working instruction	EQA079
QA	SVOA data processing working instruction	EQA080
QA	SVOA LIMS working instruction	EQA081
QA	BOTTLE QC	DAYT-QAC-0186
QA	Confidentiality	DAYT-QAC-0205
QA	BALANCE CALIBRATION	DAYT-QAC-0234
RP	Data Pack Gen	ERG002
SM	Modified Trip Blank Collection Time	DAYT-SMT-0241
SM	CLEANING-PACKAGING-SHIPPING	DAYT-SMT-0242
SM	COC AND LOGIN	DAYT-SMT-0247
SM	Sample Storage	ESM001
SM	Cooler Temperature	ESM004
SM	Cleaning Packaging and Shipping	ESM008
SM	Courier SOP	ESM011
SM	AirSmp Equip	ESM012

Appendix III

Analytical Capabilities

Annual Certified Parameter List

Version 01 - 6-13-19

SGS NORTH AMERICA INC. - DAYTON (Lab ID Number: 12129)

2235 RT 130
DAYTON NJ 08810

Lab Contact Name	OLGA AZARIAN
E-mail Address	OLGA.AZARIAN@SGS.COM
Contact Phone Number	732-329-0200
Fax Number	732-329-3499

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Acetaldehyde	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03500
Acetone	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03510
Acetonitrile	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03520
Acetophenone	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03530
Acrolein	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03540
Acrylamide	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03550
Acrylic acid	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03560
Acrylonitrile	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03570
Allyl chloride	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03580
Benzene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03600
Benzyl chloride	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03610
Bis (2-chloroethyl) ether	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03620
Bis (chloromethyl) ether	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03630
Bromodichlorometha ne	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03640
Bromoform	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03650

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Bromomethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03660
Butadiene (1,3-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03670
Butadiene (2- chloro-1,3-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03680
Butylbenzene (n-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03690
Carbon disulfide	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03700
Carbon oxysulfide (Carbonyl sulfide)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03710
Carbon tetrachloride	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03720
Catechol	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03730
Chloroacetic acid	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03740
Chlorobenzene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03750
Chloroethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03760
Chloroform	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03770
Chloromethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03780
Chloromethyl methyl ether	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03790
Chlorotoluene (2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03800
Cresols/Cresylic acid	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03810
Cyclohexane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03820
Diazomethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03830
Dibromo-3-chloropropane (1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03840
Dibromochloromethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03850
Dibromoethane (1,2-) (EDB)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03860
Dichlorobenzene (1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03870
Dichlorobenzene (1,3-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03880
Dichlorobenzene (1,4-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03890

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dichlorodifluoromethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03900
Dichloroethane (1,1-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03910
Dichloroethane (1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03920
Dichloroethene (1,1-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03930
Dichloroethene (cis-1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03940
Dichloroethene (trans-1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03950
Dichlorofluoromethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03960
Dichloropropane (1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03970
Dichloropropene (cis-1,3-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03980
Dichloropropene (trans-1,3-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.03990
Dichlorotetrafluoroethane (1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04000
Diethyl sulfate	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04010
Dimethyl formamide (N, N-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04020
Dimethyl sulfate	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04040
Dimethylcarbamoyl chloride	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04060
Dioxane (1,4-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04070
Epichlorohydrin	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04080
Epoxybutane (1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04090
Ethanol	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04100
Ethyl acetate	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04110
Ethyl acrylate	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04120
Ethylbenzene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04140
Ethyltoluene (4-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04170
Heptane (n-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04200

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Hexachlorobutadiene (1,3-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04210
Hexachloroethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04220
Hexane (n-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04230
Hexanone (2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04240
Isophorone	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04250
Isopropanol	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04260
Isopropylbenzene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04270
Methyl ethyl ketone (MEK)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04290
Methyl iodide	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04300
Methyl isobutyl ketone (MIBK)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04310
Methyl isocyanate	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04320
Methyl methacrylate	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04330
Methyl tert-butyl ether	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04340
Methylene chloride (Dichloromethane)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04350
Methylphenol (2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04370
Naphthalene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04380
Nitrobenzene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04390
Nitropropane (2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04400
N-Nitrosodimethylamine	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04410
N-Nitrosomorpholine	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04420
N-Nitroso-N-methylurea	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04430
Phenol	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04440
Phosgene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04450
Propane sultone (1,3-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04460
Propiolactone (beta-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04470
Propionaldehyde	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04480
Propylbenzene (n-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04490

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Propylene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04510
Propylene oxide	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04520
Sec-butylbenzene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04540
Styrene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04550
Styrene oxide	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04560
Tert-butyl alcohol	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04570
Tetrachloroethane (1,1,2,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04590
Tetrachloroethene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04600
Tetrahydrofuran	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04610
Toluene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04620
Trichloro (1,1,2-) trifluoroethane (1,2,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04630
Trichlorobenzene (1,2,4-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04640
Trichloroethane (1,1,1-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04650
Trichloroethane (1,1,2-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04660
Trichloroethene	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04670
Trichlorofluorometha ne	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04680
Trifluorochloroethene (HCFC-1113)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04696
Trifluoro (1,1,2-) dichloroethane (1,2-) (HCFC-123a)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04698
Trifluoromethane	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04700
Trimethylbenzene (1,2,4-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04710
Trimethylbenzene (1,3,5-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04720
Trimethylpentane (2,2,4-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04730

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Vinyl acetate	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04740
Vinyl bromide	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04750
Vinyl chloride	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04760
Xylene (m-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04770
Xylene (o-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04780
Xylene (p-)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04790
Xylenes (total)	AE	Certified	EPA TO-15	GC/MS, Canisters	AE04.04800
Benzene	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06220
Ethylbenzene	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06260
Isopropylbenzene	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06270
Methane	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06280
Methyl tert-butyl ether	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06290
Tert-butyl alcohol	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06300
Toluene	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06320
Xylenes (total)	AE	Certified	EPA TO-3	GC, FID and/or ECD, Cryogenic Preconcentration	AE04.06350
Heterotrophic bacteria	DW	Certified	SM 9215 B	Pour Plate	DW01.00070
Total coliform / E. coli	DW	Certified	SM 9223 B	ONPG-MUG (Autoanalysis Colilert System) (P-A)	DW01.00100
Alkalinity	DW	Certified	SM 2320 B	Electrometric Titration	DW03.00010

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Ammonia	DW	Certified	SM 4500 NH3 H	Automated Phenate	DW03.00070
Chloride	DW	Certified	EPA 300.0	Ion Chromatography	DW03.00420
Color	DW	Certified	SM 2120 B	Platinum-Cobalt	DW03.00550
Conductivity	DW	Certified	SM 2510 B	Conductance	DW03.00590
Cyanide	DW	Certified	EPA 335.4	Spectrophotometric, Distill, Semi Automated	DW03.00720
Dissolved organic carbon (DOC)	DW	Applied	SM 5310 B	High Temp. Combustion, Filtration	DW03.00760
Fluoride	DW	Applied	EPA 300.0	Ion Chromatography	DW03.00860
Foaming agents	DW	Certified	SM 5540 C	Methylene Blue	DW03.00910
Nitrate	DW	Certified	EPA 353.2	Automated Cadmium Reduction	DW03.00940
Nitrite	DW	Certified	SM 4500-NO2 B	Spectrophotometric	DW03.01300
Odor	DW	Certified	SM 2150 B	Consistent Series	DW03.01320
Orthophosphate	DW	Certified	SM 4500-P E	Colorimetric	DW03.01360
Perchlorate	DW	Certified	EPA 314.0	Ion Chromatography	DW03.01480
Residue - nonfilterable (TSS)	DW	Certified	SM 2540 D	Gravimetric, 103-105 Deg C, Post Washing - mining	DW03.01520
Sulfate	DW	Certified	EPA 300.0	Ion Chromatography	DW03.01600
Total dissolved solids (TDS)	DW	Certified	SM 2540 C	Gravimetric At 180	DW03.01660
Total hardness	DW	Certified	SM 2340 C	Titrimetric, EDTA	DW03.01690
Total organic carbon (TOC)	DW	Certified	SM 5310 B	High Temp. Combustion	DW03.01710
Turbidity	DW	Applied	EPA 180.1	Nephelometric	DW03.01790
Chlorine - total, free or combined	DW	Certified	SM 4500-Cl F	DPD, Ferrous Titrimetric	DW04.00020
pH	DW	Certified	SM 4500-H B	Electrometric	DW04.00150
Temperature	DW	Certified	SM 2550 B	Thermometric	DW04.00170
Chromium (VI)	DW	Certified	EPA 218.7	Ion Chromatography	DW06.00242
Mercury	DW	Certified	EPA 245.1	Manual Cold Vapor	DW06.00480
Silica	DW	Applied	SM 4500-Si D	Molybdosilicate	DW06.00600
Aluminum	DW	Certified	EPA 200.7	ICP	DW07.00001

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Aluminum	DW	Certified	EPA 200.8	ICP/MS	DW07.00020
Antimony	DW	Certified	EPA 200.8	ICP/MS	DW07.00050
Arsenic	DW	Certified	EPA 200.8	ICP/MS	DW07.00070
Barium	DW	Certified	EPA 200.7	ICP	DW07.00080
Barium	DW	Certified	EPA 200.8	ICP/MS	DW07.00110
Beryllium	DW	Certified	EPA 200.7	ICP	DW07.00120
Beryllium	DW	Certified	EPA 200.8	ICP/MS	DW07.00150
Boron	DW	Certified	EPA 200.7	ICP	DW07.00160
Cadmium	DW	Certified	EPA 200.7	ICP	DW07.00170
Cadmium	DW	Certified	EPA 200.8	ICP/MS	DW07.00190
Calcium-hardness	DW	Certified	SM 2340 B	Ca as Carbonate, AA	DW07.00230
Chromium	DW	Certified	EPA 200.7	ICP	DW07.00240
Chromium	DW	Certified	EPA 200.8	ICP/MS	DW07.00270
Cobalt	DW	Certified	EPA 200.7	ICP	DW07.00280
Cobalt	DW	Certified	EPA 200.8	ICP/MS	DW07.00290
Copper	DW	Certified	EPA 200.7	ICP	DW07.00300
Copper	DW	Certified	EPA 200.8	ICP/MS	DW07.00330
Iron	DW	Certified	EPA 200.7	ICP	DW07.00340
Lead	DW	Certified	EPA 200.8	ICP/MS	DW07.00380
Magnesium	DW	Certified	EPA 200.7	ICP	DW07.00400
Manganese	DW	Certified	EPA 200.7	ICP	DW07.00430
Manganese	DW	Certified	EPA 200.8	ICP/MS	DW07.00460
Molybdenum	DW	Certified	EPA 200.7	ICP	DW07.00480
Molybdenum	DW	Certified	EPA 200.8	ICP/MS	DW07.00490
Nickel	DW	Certified	EPA 200.7	ICP	DW07.00500
Nickel	DW	Certified	EPA 200.8	ICP/MS	DW07.00530
Potassium	DW	Certified	EPA 200.7	ICP	DW07.00540
Selenium	DW	Certified	EPA 200.8	ICP/MS	DW07.00560
Silica	DW	Certified	EPA 200.7	ICP	DW07.00570
Silver	DW	Certified	EPA 200.7	ICP	DW07.00600
Silver	DW	Certified	EPA 200.8	ICP/MS	DW07.00630
Sodium	DW	Certified	EPA 200.7	ICP	DW07.00640

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Strontium	DW	Certified	EPA 200.7	ICP	DW07.00660
Thallium	DW	Certified	EPA 200.8	ICP/MS	DW07.00670
Tin	DW	Certified	EPA 200.7	ICP	DW07.00680
Titanium	DW	Certified	EPA 200.7	ICP	DW07.00690
Total hardness	DW	Certified	SM 2340 B	Hardness By Calculation, ICP	DW07.00700
Vanadium	DW	Certified	EPA 200.7	ICP	DW07.00750
Vanadium	DW	Certified	EPA 200.8	ICP/MS	DW07.00760
Zinc	DW	Certified	EPA 200.7	ICP	DW07.00770
Zinc	DW	Certified	EPA 200.8	ICP/MS	DW07.00800
Dibromo-3-chloropropane (1,2-)	DW	Certified	EPA 504.1	Solvent Extract, GC	DW08.00710
Dibromoethane (1,2-) (EDB)	DW	Certified	EPA 504.1	Solvent Extract, GC	DW08.00720
Trichloropropane (1,2,3-)	DW	Certified	EPA 504.1	Solvent Extract, GC	DW08.00730
Dioxane (1,4-)	DW	Applied	EPA 522	SPE, GC/MS/SIM	DW09.02260
Acetone	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02270
Acrylonitrile	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02280
Allyl chloride	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02290
Benzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02300
Bromobenzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02310
Bromochloromethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02320
Bromodichloromethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02330
Bromoform	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02340
Bromomethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02350
Butanone (2-) (Methyl ethyl	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02360
Butylbenzene (n-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02370
Carbon disulfide	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02380
Carbon tetrachloride	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02390
Chloroacetonitrile	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02400
Chlorobenzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02410

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Chlorobutane (1-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02420
Chloroethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02430
Chloroform	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02440
Chloromethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02450
Chlorotoluene (2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02460
Chlorotoluene (4-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02470
Dibromo-3-chloropropane (1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02480
Dibromochloromethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02490
Dibromoethane (1,2-) (EDB)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02500
Dibromomethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02510
Dichloro-2-butene (trans-1,4-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02520
Dichlorobenzene (1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02530
Dichlorobenzene (1,3-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02540
Dichlorobenzene (1,4-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02550
Dichlorodifluoromethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02560
Dichloroethane (1,1-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02570
Dichloroethane (1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02580
Dichloroethene (1,1-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02590
Dichloroethene (cis-1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02600
Dichloroethene (trans-1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02610
Dichloropropane (1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02620
Dichloropropane (1,3-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02630

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dichloropropane (2,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02640
Dichloropropanone (1,1-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02650
Dichloropropene (1,1-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02660
Dichloropropene (cis-1,3-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02670
Dichloropropene (trans-1,3-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02680
Diethyl ether (Ethyl ether)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02690
Ethyl methacrylate	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02700
Ethylbenzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02710
Hexachlorobutadiene (1,3-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02720
Hexachloroethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02730
Hexane (n-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02740
Hexanone (2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02750
Isopropylbenzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02760
Isopropyltoluene (4-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02770
Methacrylonitrile	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02780
Methyl acrylate	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02790
Methyl iodide	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02800
Methyl methacrylate	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02810
Methyl tert-butyl ether	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02820
Methylene chloride (Dichloromethane)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02830
Naphthalene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02840
Nitrobenzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02850
Nitropropane (2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02860
Pentachloroethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02870
Pentanone (4- methyl-2-) (MIBK)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02880

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Propionitrile	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02890
Propylbenzene (n-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02900
Sec-butylbenzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02910
Styrene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02920
Tert-butyl alcohol	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02930
Tert-butylbenzene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02940
Tetrachloroethane (1,1,1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02950
Tetrachloroethane (1,1,2,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02960
Tetrachloroethene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02970
Tetrahydrofuran	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02980
Toluene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.02990
Trichlorobenzene (1,2,3-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03000
Trichlorobenzene (1,2,4-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03010
Trichloroethane (1,1,1-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03030
Trichloroethane (1,1,2-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03040
Trichloroethene	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03050
Trichlorofluoromethane	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03060
Trichloropropane (1,2,3-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03070
Trimethylbenzene (1,2,4-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03080
Trimethylbenzene (1,3,5-)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03090
Vinyl chloride	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03100
Xylenes (total)	DW	Certified	EPA 524.2	GC/MS, P & T	DW09.03130
Fecal coliform	NPW	Certified	SM 9222 D-97	Membrane Filter (MF), Single Step	NPW01.00300

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Heterotrophic plate count	NPW	Certified	SM 9215 B	Pour Plate	NPW01.00390
Total coliform	NPW	Certified	SM 9222 B-97	MF Single Step or Two Step	NPW01.00530
Acidity as CaCO3	NPW	Certified	SM 2310 B-11	Electrometric or Phenolphthalei	NPW03.00020
Alkalinity as CaCO3	NPW	Certified	SM 2320 B-11	Electrometric or Color Titration	NPW03.00060
Ammonia	NPW	Certified	SM 4500-NH3 B plus H-11	Distillation or Gas Diffusion, Semi-automated Phenate	NPW03.00270
Biochemical oxygen demand	NPW	Certified	SM 5210 B-11	Dissolved Oxygen Depletion - Membrane Electrode	NPW03.00350
Bromide	NPW	Certified	EPA 300.0	Ion Chromatography	NPW03.00540
Bromide	NPW	Certified	SW-846 9056A	Ion Chromatography	NPW03.00580
Carbonaceous BOD (CBOD)	NPW	Certified	SM 5210 B-11	Diss. Oxygen Depl., Nitrif. Inhib. - Membrane Electrode	NPW03.00660
Chemical oxygen demand	NPW	Certified	SM 5220 C-11	Titrimetric	NPW03.00750
Chloride	NPW	Certified	SM 4500-Cl C-11	Titrimetric, Mercuric Nitrate	NPW03.00970
Chloride	NPW	Certified	EPA 300.0	Ion Chromatography	NPW03.01100
Chloride	NPW	Certified	SW-846 9056A	Ion Chromatography	NPW03.01160
Color	NPW	Certified	SM 2120 B-11	Colorimetric (Platinum-Cobalt)	NPW03.01370
Cyanide	NPW	Certified	EPA 335.4	Distillation, Spectrophotometric (Auto)	NPW03.01530
Cyanide	NPW	Certified	SW-846 9012B	Colorimetric, Automated	NPW03.01550
Cyanide - amenable to Cl2	NPW	Certified	SM 4500-CN B-11 and G-11	Manual Distillation, Titrimetr/Spectro	NPW03.01660
Cyanide - amenable to Cl2	NPW	Certified	SM 4500-CN C-11 and G-11	Manual Distillation, Titrimetr/Spectro	NPW03.01670

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dissolved organic carbon (DOC)	NPW	Certified	SM 5310 B	Filtration and Combustion	NPW03.01750
Fluoride	NPW	Certified	EPA 300.0	Ion Chromatography	NPW03.01930
Fluoride	NPW	Certified	SW-846 9056A	Ion Chromatography	NPW03.01980
Hardness - total as CaCO3	NPW	Certified	SM 2340 C-11	Titrimetric, EDTA	NPW03.02110
Kjeldahl nitrogen - total	NPW	Certified	EPA 351.2	Digestion, Semiauto. Digestor, Colorimetric	NPW03.02470
Nitrate - nitrite	NPW	Certified	EPA 353.2	Cadmium Reduction, Automated	NPW03.02790
Nitrite	NPW	Certified	SM 4500-NO2 B-11	Spectrophotometric, Manual	NPW03.02960
Oil & grease - hem-LL	NPW	Certified	EPA 1664A	Gravimetric, Hexane Extractable Material-LL	NPW03.03200
Oil & grease - sgt-non polar	NPW	Certified	EPA 1664A	Gravimetric, Silica Gel Treated-Hem-LL	NPW03.03340
Organic nitrogen	NPW	Certified	User Defined EPA 351.2-SM 4500 NH3 B	Total Kjeldahl-N Minus Ammonia-N	NPW03.03400
Orthophosphate	NPW	Certified	EPA 365.3	Ascorbic Acid, Manual Two Reagent	NPW03.03510
Perchlorate	NPW	Certified	EPA 314.0	Ion Chromatography	NPW03.03710
Phenols	NPW	Certified	EPA 420.4	Manual Distillation, Colorimetric Auto	NPW03.03810
Phosphorus (total)	NPW	Certified	EPA 365.3	Persulfate Digestion + Manual	NPW03.03860
Residue - filterable (TDS)	NPW	Certified	SM 2540 C-11	Gravimetric, 180 Degrees C	NPW03.04010
Residue - nonfilterable (TSS)	NPW	Certified	SM 2540 D-11	Gravimetric, 103-105 Degrees C, Post Washing	NPW03.04050
Residue - settleable	NPW	Certified	SM 2540 F-11	Volumetric (Imhoff Cone) or Gravimetric	NPW03.04080
Residue - total	NPW	Certified	SM 2540 B-11	Gravimetric, 103-105 Degrees C	NPW03.04100

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Residue - volatile	NPW	Certified	EPA 160.4	Gravimetric, 550 Degrees C	NPW03.04130
Salinity	NPW	Certified	SM 2520 B	Electrical Conductivity	NPW03.04170
Specific conductance	NPW	Certified	SM 2510 B-11	Wheatstone Bridge	NPW03.04250
Specific conductance	NPW	Certified	SW-846 9050A	Wheatstone Bridge	NPW03.04270
Sulfate	NPW	Certified	EPA 300.0	Ion Chromatography	NPW03.04490
Sulfate	NPW	Certified	SW-846 9056A	Ion Chromatography	NPW03.04550
Sulfides	NPW	Certified	SM 4500-S2 B, C plus F-11	Titrimetric, Iodine	NPW03.04650
Sulfides, acid sol. & insol.	NPW	Certified	SW-846 9034	Titration	NPW03.04700
Surfactants	NPW	Certified	SM 5540 C-11	Colorimetric (Methylene Blue)	NPW03.04720
Total organic carbon (TOC)	NPW	Certified	SM 5310 B-11	Combustion	NPW03.04790
Total organic carbon (TOC)	NPW	Certified	SW-846 9060A	Infrared Spectrometry or FID	NPW03.04880
Total organic halides (TOX)	NPW	Certified	SW-846 9020B	Combustion, Titration	NPW03.04930
Total, fixed, and volatile solids (SQAR)	NPW	Certified	SM 2540 G SM 18th Ed.	Gravimetric, 500 Degrees C	NPW03.04960
Turbidity	NPW	Certified	EPA 180.1	Nephelometric	NPW03.05010
Chlorine	NPW	Certified	SM 4500-Cl F-11	DPD-FAS	NPW04.00050
Oxygen (dissolved)	NPW	Certified	SM 4500-O G-11	Membrane Electrode	NPW04.00230
Oxygen (dissolved)	NPW	Certified	SM 4500-O C-11	Winkler, Azide Modification	NPW04.00310
pH	NPW	Certified	SM 4500-H B-11	Electrometric	NPW04.00380
pH (corrosivity)	NPW	Certified	SW-846 9040C	Aqueous, Electrometric	NPW04.00420
Sulfite - SO3	NPW	Certified	SM 4500-SO3 B-11	Titrimetric, Iodine-Iodate	NPW04.00470
Temperature	NPW	Certified	SM 2550 B-00	Thermometric	NPW04.00490
Metals	NPW	Certified	SW-846 1311	TCLP, Toxicity Procedure, Shaker	NPW06.00020

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Metals	NPW	Certified	SW-846 1312	Synthetic PPT Leachate Procedure	NPW06.00030
Metals, Total Rec and Dissolved	NPW	Certified	SW-846 3005A	Acid Digestion/Surface and Groundwater	NPW06.00050
Metals, Total	NPW	Certified	SW-846 3010A	Acid Digestion/ Aqueous Samples	NPW06.00060
Chromium (VI)	NPW	Certified	SW-846 7196A	Colorimetric	NPW07.01000
Chromium (VI)	NPW	Certified	SM 3500-Cr B-11	0.45u Filter, Colorimetric DPC	NPW07.01020
Chromium (VI)	NPW	Certified	SW-846 7199	Ion Chromatography	NPW07.01050
Iron, Ferrous	NPW	Certified	SM 3500-Fe B-11	Digestion, Colorimetric (Phenanthroline)	NPW07.01690
Mercury	NPW	Certified	EPA 245.7	Cold Vapor Atomic Fluorescence Spectrometry	NPW07.02130
Mercury	NPW	Certified	EPA 245.1	Manual Cold Vapor	NPW07.02160
Mercury - liquid waste	NPW	Certified	SW-846 7470A	AA, Manual Cold Vapor	NPW07.02190
Mercury	NPW	Certified	EPA 1631E	Purge & Trap Atomic Fluorescence	NPW07.02200
Silica - dissolved	NPW	Certified	SM 4500-SiO2 C-11	0.45u Filtration + Colorimetric (Manual)	NPW07.02860
Aluminum	NPW	Certified	SW-846 6010D	ICP	NPW08.00012
Aluminum	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.00050
Aluminum	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.00082
Aluminum	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.00130
Antimony	NPW	Certified	SW-846 6010D	ICP	NPW08.00182
Antimony	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.00220
Antimony	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.00252
Antimony	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.00300
Arsenic	NPW	Certified	SW-846 6010D	ICP	NPW08.00342
Arsenic	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.00370
Arsenic	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.00402
Arsenic	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.00450

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Barium	NPW	Certified	SW-846 6010D	ICP	NPW08.00482
Barium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.00510
Barium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.00542
Barium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.00590
Beryllium	NPW	Certified	SW-846 6010D	ICP	NPW08.00642
Beryllium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.00680
Beryllium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.00712
Beryllium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.00760
Boron	NPW	Certified	SW-846 6010D	ICP	NPW08.00822
Boron	NPW	Certified	EPA 200.7	ICP	NPW08.00860
Boron	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.00892
Boron	NPW	Certified	EPA 200.8	ICP/MS	NPW08.00940
Cadmium	NPW	Certified	SW-846 6010D	ICP	NPW08.00982
Cadmium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.01030
Cadmium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.01062
Cadmium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.01110
Calcium	NPW	Certified	SW-846 6010D	ICP	NPW08.01172
Calcium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.01200
Calcium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.01232
Calcium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.01270
Chromium	NPW	Certified	SW-846 6010D	ICP	NPW08.01312
Chromium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.01350
Chromium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.01382
Chromium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.01430
Cobalt	NPW	Certified	SW-846 6010D	ICP	NPW08.01502
Cobalt	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.01530
Cobalt	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.01562
Cobalt	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.01610
Copper	NPW	Certified	SW-846 6010D	ICP	NPW08.01652
Copper	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.01690
Copper	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.01722
Copper	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.01770

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Hardness - total as CaCO3	NPW	Certified	EPA 200.7	Ca + Mg Carbonates, ICP	NPW08.01890
Iron	NPW	Certified	SW-846 6010D	ICP	NPW08.02002
Iron	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.02040
Iron	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.02072
Iron	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.02110
Lead	NPW	Certified	SW-846 6010D	ICP	NPW08.02172
Lead	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.02210
Lead	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.02242
Lead	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.02290
Lithium	NPW	Certified	SW-846 6010D	ICP	NPW08.02362
Magnesium	NPW	Certified	SW-846 6010D	ICP	NPW08.02382
Magnesium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.02420
Magnesium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.02452
Magnesium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.02490
Manganese	NPW	Certified	SW-846 6010D	ICP	NPW08.02542
Manganese	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.02580
Manganese	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.02612
Manganese	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.02660
Molybdenum	NPW	Certified	SW-846 6010D	ICP	NPW08.02722
Molybdenum	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.02750
Molybdenum	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.02782
Molybdenum	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.02830
Nickel	NPW	Certified	SW-846 6010D	ICP	NPW08.02872
Nickel	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.02910
Nickel	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.02942
Nickel	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.02990
Potassium	NPW	Certified	SW-846 6010D	ICP	NPW08.03142
Potassium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.03150
Potassium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.03200
Potassium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.03232
Selenium	NPW	Certified	SW-846 6010D	ICP	NPW08.03282

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Selenium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.03310
Selenium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.03342
Selenium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.03390
Silica - dissolved	NPW	Certified	EPA 200.7	0.45u Filtration + ICP	NPW08.03440
Silver	NPW	Certified	SW-846 6010D	ICP	NPW08.03532
Silver	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.03570
Silver	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.03602
Silver	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.03650
Sodium	NPW	Certified	SW-846 6010D	ICP	NPW08.03712
Sodium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.03740
Sodium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.03772
Sodium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.03810
Strontium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.03840
Strontium	NPW	Certified	SW-846 6010D	ICP	NPW08.03862
Strontium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.03882
Thallium	NPW	Certified	SW-846 6010D	ICP	NPW08.03932
Thallium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.03950
Thallium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.03982
Thallium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.04030
Tin	NPW	Certified	SW-846 6010D	ICP	NPW08.04112
Tin	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.04130
Tin	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.04152
Tin	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.04190
Titanium	NPW	Certified	SW-846 6010D	ICP	NPW08.04212
Titanium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.04220
Titanium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.04242
Titanium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.04280
Vanadium	NPW	Certified	SW-846 6010D	ICP	NPW08.04392
Vanadium	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.04430
Vanadium	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.04462
Vanadium	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.04510
Zinc	NPW	Certified	SW-846 6010D	ICP	NPW08.04572

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Zinc	NPW	Certified	EPA 200.7	Digestion, ICP	NPW08.04610
Zinc	NPW	Certified	SW-846 6020B	ICP/MS	NPW08.04642
Zinc	NPW	Certified	EPA 200.8	Digestion, ICP/MS	NPW08.04690
Zirconium	NPW	Certified	SW-846 6010D	ICP	NPW08.04744
Organics	NPW	Certified	SW-846 1312	Synthetic PPT Leachate Procedure	NPW09.00040
Semivolatile organics	NPW	Certified	SW-846 1311	TCLP, Toxicity Procedure, Shaker	NPW09.00080
Semivolatile organics	NPW	Certified	SW-846 3510C	Separatory Funnel Extraction	NPW09.00090
Semivolatile organics	NPW	Certified	SW-846 3520C	Continuous Liquid-Liquid Extraction	NPW09.00110
Volatile organics	NPW	Certified	SW-846 1311	TCLP, Toxicity Procedure, ZHE	NPW09.00290
Volatile organics	NPW	Certified	SW-846 5030C	Purge & Trap Aqueous	NPW09.00340
Aldrin	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03360
Alpha BHC	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03370
Beta BHC	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03380
Chlordane	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03390
Chlordane (alpha) (cis-)	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03400
Chlordane (gamma) (trans-)	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03410
DDD (4,4'-)	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03430
DDE (4,4'-)	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03440
DDT (4,4'-)	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03450
Delta BHC	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03460
Dieldrin	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03470
Endosulfan I	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03480
Endosulfan II	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03490
Endosulfan sulfate	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03500
Endrin	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03510
Endrin aldehyde	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03520
Endrin ketone	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03530

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Heptachlor	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03550
Heptachlor epoxide	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03560
Lindane (gamma BHC)	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03570
Methoxychlor	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03576
PCB 1016	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03590
PCB 1221	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03600
PCB 1232	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03610
PCB 1242	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03620
PCB 1248	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03630
PCB 1254	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03640
PCB 1260	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03650
Toxaphene	NPW	Certified	EPA 608.3	Extract/GC (ECD)	NPW10.03660
Butane	NPW	Certified	Other J. Chrom. Sci. RSK-175	GC, Headspace, FID	NPW10.06000
Ethane	NPW	Certified	Other J. Chrom. Sci. RSK-175	GC, Headspace, FID	NPW10.06010
Ethene	NPW	Certified	Other J. Chrom. Sci. RSK-175	GC, Headspace, FID	NPW10.06020
Methane	NPW	Certified	Other J. Chrom. Sci. RSK-175	GC, Headspace, FID	NPW10.06040
Propane	NPW	Certified	Other J. Chrom. Sci. RSK-175	GC, Headspace, FID	NPW10.06050
Extractable Petroleum Hydrocarbons	NPW	Certified	Other NJDEP EPH 10/08, Rev. 3	Extraction, GC, FID	NPW10.06060
Dibromo-3-chloropropane (1,2-)	NPW	Certified	SW-846 8011	Extract/GC (ECD)	NPW10.07680
Dibromoethane (1,2-) (EDB)	NPW	Certified	SW-846 8011	Extract/GC (ECD)	NPW10.07690
Trichloropropane (1,2,3-)	NPW	Certified	SW-846 8011	Extract/GC (ECD)	NPW10.07700
Butanol (1-)	NPW	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	NPW10.08330
Diesel range organic	NPW	Certified	SW-846 8015D	Extraction, GC, FID	NPW10.08360

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Ethyl alcohol	NPW	Certified	SW-846 8015D	GC, Direct Injection, FID	NPW10.08400
Ethylene glycol	NPW	Applied	SW-846 8015D	GC, Direct Injection, FID	NPW10.08410
Gasoline range organic	NPW	Certified	SW-846 8015D	GC P&T, FID	NPW10.08440
Iso-butyl alcohol	NPW	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	NPW10.08460
Isopropyl alcohol	NPW	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	NPW10.08470
Methyl alcohol (Methanol)	NPW	Certified	SW-846 8015D	GC, Direct Injection, FID	NPW10.08480
Propyl Alcohol (n-)	NPW	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	NPW10.08550
Propylene glycol	NPW	Applied	SW-846 8015D	GC, Direct Injection, FID	NPW10.08560
Tert-butyl alcohol	NPW	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	NPW10.08600
Alachlor	NPW	Applied	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.09870
Aldrin	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.09880
Alpha BHC	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.09890
Beta BHC	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.09910
Chlordane (alpha) (cis-)	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.09920
Chlordane (gamma) (trans-)	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.09930
Chlordane (technical)	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.09940
DDD (4,4'-)	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10010
DDE (4,4'-)	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10020

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
DDT (4,4'-)	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10030
Delta BHC	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10040
Dieldrin	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10050
Endosulfan I	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10060
Endosulfan II	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10070
Endosulfan sulfate	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10080
Endrin	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10090
Endrin aldehyde	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10100
Endrin ketone	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10110
Heptachlor	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10130
Heptachlor epoxide	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10140
Hexachlorobenzene	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10150
Lindane (gamma BHC)	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10170
Methoxychlor	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10180
Mirex	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10210
Toxaphene	NPW	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	NPW10.10250
PCB 1016	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10780
PCB 1221	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10790

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
PCB 1232	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10800
PCB 1242	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10810
PCB 1248	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10820
PCB 1254	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10830
PCB 1260	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10840
PCB 1262	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10850
PCB 1268	NPW	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	NPW10.10860
D (2,4-)	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12230
Dalapon	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12240
DB (2,4-)	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12250
Dicamba	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12270
Dichlorprop	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12290
Dinoseb	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12300
MCPA	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12320
MCPP	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12330
Pentachlorophenol	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12350
Picloram	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12360
T (2,4,5-)	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12370

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
TP (2,4,5-) (Silvex)	NPW	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	NPW10.12380
Dioxane (1,4-)	NPW	Applied	EPA 522	SPE, GC/MS/SIM	NPW11.06660
Acetone	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07870
Acetonitrile	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07880
Acrolein	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07890
Acrylonitrile	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07900
Allyl chloride	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07910
Amyl acetate (n-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07920
Amyl alcohol (n-)	NPW	Applied	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07930
Benzene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07940
Bromobenzene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07950
Bromochloromethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07960
Bromodichlorometha ne	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07970
Bromoform	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.07990
Bromomethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08000
Butanol (1-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08020
Butanone (2-) (Methyl ethyl	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08030
Butyl acetate (n-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08040

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Butylbenzene (n-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08070
Carbon disulfide	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08080
Carbon tetrachloride	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08090
Chlorobenzene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08100
Chloroethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08110
Chloroethyl vinyl ether (2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08120
Chloroform	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08130
Chloromethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08140
Chlorotoluene (2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08150
Chlorotoluene (4-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08160
Cyclohexane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08180
Cyclohexanone	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08190
Dibromo-3-chloropropane (1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08200
Dibromochloromethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08210
Dibromoethane (1,2-) (EDB)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08220
Dibromomethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08230
Dichloro-2-butene (trans-1,4-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08250
Dichlorobenzene (1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08260

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dichlorobenzene (1,3-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08270
Dichlorobenzene (1,4-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08280
Dichlorodifluoromethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08282
Dichloroethane (1,1-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08290
Dichloroethane (1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08300
Dichloroethene (1,1-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08310
Dichloroethene (cis-1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08320
Dichloroethene (trans-1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08330
Dichloropropane (1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08340
Dichloropropane (1,3-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08350
Dichloropropane (2,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08360
Dichloropropene (1,1-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08370
Dichloropropene (cis-1,3-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08380
Dichloropropene (trans-1,3-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08390
Diethyl ether (Ethyl ether)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08400
Diisopropyl Ether (DIPE)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08410
Dioxane (1,4-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08420
Ethyl acetate	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08440

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Ethyl methacrylate	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08450
Ethylbenzene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08460
Ethyl-tert-butyl Ether (ETBE)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08470
Heptane (n-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08480
Hexachlorobutadiene (1,3-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08490
Hexane (n-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08500
Hexanone (2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08510
Isobutyraldehyde	NPW	Applied	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08530
Isopropanol	NPW	Applied	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08540
Isopropyl acetate	NPW	Applied	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08550
Isopropyl ether	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08560
Isopropylbenzene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08570
Isopropyltoluene (4-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08580
Methyl acetate	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08600
Methyl formate	NPW	Applied	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08610
Methyl iodide	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08620
Methyl isobutyl ketone (MIBK)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08630
Methyl methacrylate	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08640

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Methyl tert-butyl ether	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08650
Methylcyclohexane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08660
Methylene chloride (Dichloromethane)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08670
Naphthalene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08672
Nitropropane (2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08680
Propylbenzene (n-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08720
Sec-butylbenzene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08730
Styrene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08740
tert-Amylmethyl ether (TAME)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08750
Tert-butyl alcohol	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08770
Tert-butylbenzene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08780
Tetrachloroethane (1,1,1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08790
Tetrachloroethane (1,1,2,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08800
Tetrachloroethene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08810
Tetrahydrofuran	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08820
Toluene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08830
Trichloro (1,1,2-) trifluoroethane (1,2,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08840
Trichlorobenzene (1,2,3-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08850

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Trichlorobenzene (1,2,4-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08852
Trichloroethane (1,1,1-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08860
Trichloroethane (1,1,2-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08870
Trichloroethene	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08880
Trichlorofluoromethane	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08890
Trichloropropane (1,2,3-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08900
Trimethylbenzene (1,2,4-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08920
Trimethylbenzene (1,3,5-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08930
Vinyl acetate	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08940
Vinyl chloride	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08950
Xylene (m- + p-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08960
Xylene (o-)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.08980
Xylenes (total)	NPW	Certified	EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.09000
Acenaphthene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09010
Acenaphthylene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09020
Acetophenone	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09030
Acetylaminofluorene (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09040
Alpha - terpineol	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09050
Aminobiphenyl (4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09060
Aniline	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09070
Anthracene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09080

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Aramite	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09090
Benzidine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09110
Benzo(a)anthracene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09120
Benzo(a)pyrene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09130
Benzo(b)fluoranthene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09140
Benzo(ghi)perylene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09150
Benzo(k)fluoranthene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09170
Benzoic acid	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09180
Benzyl alcohol	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09190
Bis (2-chloroethoxy) methane	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09210
Bis (2-chloroethyl) ether	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09220
Bis(2-chloroisopropyl) ether|2,2'-oxybis(1-chloropropane)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09230
Bis (2-ethylhexyl) phthalate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09240
Bromophenyl-phenyl ether (4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09250
Butylbenzylphthalate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09260
Carbazole	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09270
Chloroaniline (4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09280
Chlorobenzilate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09290
Chloronaphthalene (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09310
Chlorophenol (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09320
Chlorophenyl-phenyl ether (4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09330
Chrysene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09340
Decane (n-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09350
Dibenz(a,h)acridine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09380
Dibenzo(a,h) anthracene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09410

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dibenzofuran	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09440
Dichloroaniline (2,3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09450
Dichlorobenzidine (3,3'-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09460
Dichlorophenol (2,4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09470
Dichlorophenol (2,6-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09480
Diethyl phthalate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09490
Dimethoate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09500
Dimethyl benzidine (3,3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09510
Dimethyl phthalate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09520
Dimethylaminoazobenzene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09530
Dimethylbenz(a) anthracene (7,12-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09540
Dimethylphenol (2,4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09550
Di-n-butyl phthalate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09560
Dinitrobenzene (1,3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09570
Dinitrophenol (2,4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09580
Dinitrophenol (2-methyl-4,6-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09590
Dinitrotoluene (2,4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09600
Dinitrotoluene (2,6-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09610
Di-n-octyl phthalate	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09620
Dinoseb	NPW	Applied	EPA 625.1	Extract, GC/MS	NPW11.09624
Diphenylhydrazine / Azobenzene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09640
Disulfoton	NPW	Applied	EPA 625.1	Extract, GC/MS	NPW11.09644
Famphur	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09680
Fluoranthene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09690
Fluorene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09700
Hexachlorobenzene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09710
Hexachlorobutadiene (1,3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09720

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Hexachlorocyclopen t adiene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09730
Hexachloroethane	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09740
Hexachloropropene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09760
Indeno(1,2,3-cd) pyrene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09780
Isodrin	NPW	Applied	EPA 625.1	Extract, GC/MS	NPW11.09784
Isophorone	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09790
Methylnaphthalene (1-)	NPW	Applied	EPA 625.1	Extract, GC/MS	NPW11.09799
Kepone	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09820
Methanesulfonate (Ethyl-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09830
Methanesulfonate (Methyl-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09840
Methapyrilene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09850
Methyl phenol (4-chloro-3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09860
Methylcholanthrene (3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09870
Methylnaphthalene (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09880
Methylphenanthrene (1-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09890
Methylphenol (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09900
Methylphenol (3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09910
Methylphenol (4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09920
Naphthalene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09930
Napthoquinone (1,4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09940
Napththylamine (1-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09950
Napththylamine (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09960
Nitroaniline (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09970
Nitroaniline (3-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09980
Nitroaniline (4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.09990

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Nitrobenzene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10000
Nitrophenol (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10010
Nitrophenol (4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10020
N-Nitrosodiethylamine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10030
N-Nitrosodimethylamine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10040
N-Nitroso-di-n-butylamine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10050
N-Nitroso-di-n-propylamine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10060
N-Nitrosodiphenylamine / Diphenylamine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10070
N-Nitrosomethylethylamine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10080
N-Nitrosomorpholine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10090
N-Nitrosopiperidine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10100
N-Nitrosopyrrolidine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10110
Octadecane (n-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10120
Parathion ethyl (Parathion)	NPW	Applied	EPA 625.1	Extract, GC/MS	NPW11.10194
Parathion methyl	NPW	Applied	EPA 625.1	Extract, GC/MS	NPW11.10196
Pentachlorobenzene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10200
Pentachlorophenol	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10230
Phenacetin	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10240
Phenanthrene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10250
Phenol	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10260
Phenylethylamine (alpha, alpha-Dimethyl)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10280
Phosphorothioate (O,O,O-triethyl)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10290

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Phosphorothioate (diethyl-O-2-pyrazinyl) [Thionazin]	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10300
Picoline (2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10310
Pyrene	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10320
Pyridine	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10330
Quinoline -1-Oxide (4-Nitro)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10340
Safrole	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10350
Tetrachlorobenzene (1,2,4,5-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10390
Tetrachlorophenol (2,3,4,6-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10400
Toluidine (2-) (2-Methylaniline)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10420
Toluidine (5-nitro-2-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10430
Trichlorobenzene (1,2,4-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10440
Trichlorophenol (2,4,5-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10460
Trichlorophenol (2,4,6-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10470
Trinitrobenzene (1,3,5-)	NPW	Certified	EPA 625.1	Extract, GC/MS	NPW11.10480
TCDD (2,3,7,8-)	NPW	Certified	EPA 625.1 (screen only)	GC/MS	NPW11.10680
Trimethylpentane (2,2,4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14320
Acetone	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14330
Acetonitrile	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14340
Acrolein	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14350

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Acrylonitrile	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14360
Allyl chloride	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14370
Amyl alcohol (t-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14380
Benzene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14390
Benzyl chloride	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14400
Bromobenzene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14410
Bromochloromethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14420
Bromodichlorometha ne	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14430
Bromoform	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14450
Bromomethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14460
Butadiene (2- chloro-1,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14470
Butanol (1-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14480
Butanol (3,3-Dimethyl-1-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14490
Butanone (2-) (Methyl ethyl	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14500
Butyl formate (t-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14510
Butylbenzene (n-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14540
Carbon disulfide	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14550
Carbon tetrachloride	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14560

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Chlorobenzene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14570
Chloroethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14580
Chloroethyl vinyl ether (2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14590
Chloroform	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14600
Chloromethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14610
Chlorotoluene (2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14620
Chlorotoluene (4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14630
Cyclohexane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14650
Cyclohexanone	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14660
Dibromo-3-chloropropane (1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14670
Dibromochloromethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14680
Dibromoethane (1,2-) (EDB)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14690
Dibromomethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14700
Dichloro-2-butene (trans-1,4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14720
Dichlorobenzene (1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14730
Dichlorobenzene (1,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14740
Dichlorobenzene (1,4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14750
Dichlorodifluoromethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14760

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dichloroethane (1,1-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14770
Dichloroethane (1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14780
Dichloroethene (1,1-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14790
Dichloroethene (cis-1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14800
Dichloroethene (trans-1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14810
Dichloropropane (1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14820
Dichloropropane (1,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14830
Dichloropropane (2,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14840
Dichloropropene (1,1-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14850
Dichloropropene (cis-1,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14860
Dichloropropene (trans-1,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14870
Diethyl ether (Ethyl ether)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14880
Diisopropyl Ether (DIPE)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14890
Dioxane (1,4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14900
Ethanol	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14910
Ethyl acetate	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14920
Ethyl methacrylate	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14930
Ethylbenzene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14940

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Ethyl-tert-butyl Ether (ETBE)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14950
Heptane (n-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14960
Hexachlorobutadiene (1,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14970
Hexachloroethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14980
Hexane (n-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.14990
Hexanone (2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15000
Iso-butyl alcohol	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15010
Isopropyl acetate	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15030
Isopropylbenzene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15040
Isopropyltoluene (4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15050
Methacrylonitrile	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15060
Methyl acetate	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15070
Methyl acrylate	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15080
Methyl iodide	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15090
Methyl methacrylate	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15100
Methyl tert-butyl ether	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15110
Methylcyclohexane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15120
Methylene chloride (Dichloromethane)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15130

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Naphthalene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15160
Nitropropane (2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15180
Pentachloroethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15210
Pentanone (4- methyl-2-) (MIBK)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15230
Propionitrile	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15240
Propylbenzene (n-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15250
Sec-butylbenzene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15260
Styrene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15270
tert-Amylmethyl ether (TAME)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15280
Tert-butyl alcohol	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15300
Tert-butylbenzene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15310
Tetrachloroethane (1,1,1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15320
Tetrachloroethane (1,1,2,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15330
Tetrachloroethene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15340
Tetrahydrofuran	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15350
Toluene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15360
Trichloro (1,1,2-) trifluoroethane (1,2,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15380
Trichlorobenzene (1,2,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15390

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Trichlorobenzene (1,2,4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15400
Trichloroethane (1,1,1-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15410
Trichloroethane (1,1,2-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15420
Trichloroethene	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15430
Trichlorofluoromethane	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15440
Trichloropropane (1,2,3-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15450
Trimethylbenzene (1,2,4-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15470
Trimethylbenzene (1,3,5-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15480
Vinyl acetate	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15490
Vinyl chloride	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15500
Xylene (m-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15510
Xylene (o-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15520
Xylene (p-)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15530
Xylenes (total)	NPW	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.15540
Dioxane (1,4-)	NPW	Certified	SW-846 8260C	GC/MS/SIM, P & T or Direct Injection, Capillary	NPW11.15545
Acenaphthene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17750
Acenaphthylene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17760
Acetophenone	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17770

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Acetylaminofluorene (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17780
Alpha - terpineol	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17800
Aminobiphenyl (4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17820
Aniline	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17840
Anthracene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17850
Aramite	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17860
Atrazine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17870
Benzaldehyde	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17890
Benzenethiol	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17900
Benzidine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17910
Benzo(a)anthracene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17920
Benzo(a)pyrene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17930
Benzo(b)fluoranthene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17940
Benzo(ghi)perylene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17950
Benzo(k)fluoranthene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17970
Benzoic acid	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.17980
Benzyl alcohol	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18000
Biphenyl (1,1'-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18030

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Bis (2-chloroethoxy) methane	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18040
Bis (2-chloroethyl) ether	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18050
Bis(2-chloroisopropyl) ether|2,2'-oxybis(1-chloropropane)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18060
Bis (2-ethylhexyl) phthalate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18070
Bromophenyl-phenyl ether (4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18080
Butylbenzylphthalate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18090
Caprolactam	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18100
Carbazole	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18110
Chloroaniline (4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18150
Chlorobenzilate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18160
Chloronaphthalene (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18180
Chlorophenol (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18190
Chlorophenyl-phenyl ether (4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18200
Chrysene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18210
Decane (n-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18250
Diallate (cis)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18270
Diallate (trans)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18280
Dibenz(a,h)acridine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18290

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dibenzo(a,h) anthracene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18320
Dibenzofuran	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18360
Dichlorobenzene (1,2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18370
Dichlorobenzene (1,3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18380
Dichlorobenzene (1,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18390
Dichlorobenzidine (3,3'-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18400
Dichlorophenol (2,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18410
Dichlorophenol (2,6-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18420
Diethyl phthalate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18440
Dimethoate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18450
Dimethyl benzidine (3,3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18460
Dimethyl phthalate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18470
Dimethylaminoazobe nzene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18480
Dimethylbenz(a) anthracene (7,12-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18530
Dimethylphenol (2,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18540
Di-n-butyl phthalate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18550
Dinitrobenzene (1,3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18560
Dinitrophenol (2,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18580

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dinitrophenol (2-methyl-4,6-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18590
Dinitrotoluene (2,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18600
Dinitrotoluene (2,6-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18610
Di-n-octyl phthalate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18620
Dinoseb	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18630
Dioxane (1,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18634
Diphenylhydrazine / Azobenzene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18650
Disulfoton	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18660
Famphur	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18740
Fluoranthene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18750
Fluorene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18760
Hexachlorobenzene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18790
Hexachlorobutadiene (1,3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18800
Hexachlorocyclopen t adiene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18810
Hexachloroethane	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18820
Hexachlorophene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18830
Hexachloropropene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18840
Hydroquinone	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18850

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Indene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18860
Indeno(1,2,3-cd) pyrene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18870
Isodrin	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18880
Isophorone	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18890
Isosafrole (cis-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18900
Isosafrole (trans-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18910
Kepone	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18920
Methanesulfonate (Ethyl-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18940
Methanesulfonate (Methyl-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18950
Methapyrilene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18960
Methyl phenol (4-chloro-3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18980
Methylcholanthrene (3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.18990
Methylnaphthalene (1-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19000
Methylnaphthalene (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19010
Methylphenol (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19020
Methylphenol (3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19030
Methylphenol (4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19040
Naphthalene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19050

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Napthoquinone (1,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19060
Napththylamine (1-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19070
Napththylamine (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19080
Nitroaniline (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19090
Nitroaniline (3-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19100
Nitroaniline (4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19110
Nitrobenzene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19120
Nitrophenol (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19140
Nitrophenol (4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19150
N-Nitrosodiethylamine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19160
N-Nitrosodimethylamine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19170
N-Nitroso-di-n-butylamine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19180
N-Nitroso-di-n-propylamine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19190
N-Nitrosodiphenylamine / Diphenylamine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19200
N-Nitrosomethylethylamine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19210
N-Nitrosomorpholine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19220
N-Nitrosopiperidine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19230

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
N-Nitrosopyrrolidine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19240
Octadecane (n-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19250
Parathion	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19260
Parathion methyl	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19270
Pentachlorobenzene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19350
Pentachloroethane	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19360
Pentachloronitrobenzene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19370
Pentachlorophenol	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19380
Phenacetin	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19390
Phenanthrene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19400
Phenol	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19410
Phenylenediamine (1,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19420
Phenylethylamine (alpha, alpha-Dimethyl)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19430
Phorate	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19440
Phosphorothioate (O,O,O-triethyl)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19450
Phosphorothioate (diethyl-O-2-pyrazinyl) [Thionazin]	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19460
Picoline (2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19470

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Pronamide	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19480
Pyrene	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19490
Pyridine	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19500
Quinoline	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19510
Quinoline -1-Oxide (4-Nitro)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19520
Safrole	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19530
Tetrachlorobenzene (1,2,4,5-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19580
Tetrachlorophenol (2,3,4,6-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19590
Toluidine (2-) (2-Methylaniline)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19600
Toluidine (5-nitro-2-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19620
Trichlorobenzene (1,2,4-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19640
Trichlorophenol (2,4,5-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19650
Trichlorophenol (2,4,6-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19660
Trinitrobenzene (1,3,5-)	NPW	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	NPW11.19680
Acenaphthene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19690
Acenaphthylene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19700
Anthracene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19710
Benzo(a)anthracene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19720

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Benzo(a)pyrene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19730
Benzo(b)fluoranthene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19740
Benzo(ghi)perylene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19750
Benzo(k)fluoranthene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19760
Chrysene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19770
Dibenzo(a,h) anthracene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19780
Dinitrophenol (2-methyl-4,6-)	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19790
Dioxane (1,4-)	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19794
Fluoranthene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19800
Fluorene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19810
Hexachlorobenzene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19820
Hexachlorobutadiene (1,3-)	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19830
Indeno(1,2,3-cd) pyrene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19840
Methylnaphthalene (2-)	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19860
Naphthalene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19870
Pentachlorophenol	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19890
Phenanthrene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19900
Pyrene	NPW	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	NPW11.19910

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dioxane (1,4-)	NPW	Applied	User Defined SW 846-8270D	GC/MS, Extract, SIM / Isotope Dilution	NPW11.21250
1,1,1-Trifluoroethane	NPW	Certified	User Defined SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.21260
1-Chloro-1,1-difluoroethane	NPW	Certified	User Defined SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW11.21270
1,1,1-Trifluoroethane	NPW	Certified	User Defined EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.21280
1,1-Dichloro-1-fluoroethane	NPW	Certified	User Defined EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.21290
1-Chloro-1,1-difluoroethane	NPW	Certified	User Defined EPA 624.1	GC/MS, P & T, Capillary Column	NPW11.21300
Ethylene glycol	NPW	Certified	User Defined SW-846 8260C	GC/MS/SIM, Direct Aqueous Injection	NPW11.22120
Propylene glycol	NPW	Certified	User Defined SW-846 8260C	GC/MS/SIM, Direct Aqueous Injection	NPW11.22130
Acetone [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24001
Benzene [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24010
Chlorobenzene [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24020
Chloroform [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24030
Dichlorobenzene (1,2-) [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24040
Dichloroethane (1,2-) [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24050
Methylene chloride [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24060

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Pentanone (4-methyl-2-) (MIBK) [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24070
Tetrahydrofuran [40CFR136, Table 1F]	NPW	Certified	EPA 524.2	GC/MS, P & T	NPW11.24080
Toluene [40CFR136, Table 1F]	NPW	Applied	EPA 524.2	GC/MS, P & T	NPW11.24090
1,1-Dichloro-1-fluoroethane	NPW	Certified	User Defined SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	NPW16.00001
Cation-exchange capacity	SCM	Certified	SW-846 9081	Soils, Sodium Acetate	SCM02.00020
Chlorine - total, solid waste	SCM	Certified	SW-846 5050	Combustion, Bomb Oxidation	SCM02.00060
Free liquid	SCM	Certified	SW-846 9095B	Flow-Through Paint Filter, Observation	SCM02.00140
Heat of combustion (BTU)	SCM	Certified	ASTM D240	Bomb Calorimeter	SCM02.00160
Ignitability	SCM	Certified	SW-846 1010A	Pensky Martens	SCM02.00180
pH - soil and waste	SCM	Certified	SW-846 9045D	Mix with Water or Calcium Chlorides	SCM02.00270
Bromide	SCM	Certified	SW-846 9056A	Ion Chromatography	SCM03.00130
Chloride	SCM	Certified	SW-846 9056A	Ion Chromatography	SCM03.00220
Cyanide	SCM	Certified	SW-846 9012B	Colorimetric, Automated	SCM03.00310
Cyanide - amenable to Cl2	SCM	Certified	SW-846 9012B	Distillation, Colorimetric (Automated)	SCM03.00382
Extractable organic halides (EOX)	SCM	Certified	SW-846 9023	Extraction	SCM03.00420
Fluoride	SCM	Certified	SW-846 9056A	Ion Chromatography	SCM03.00470
Kjeldahl nitrogen - total	SCM	Certified	EPA 351.2	Digestion, Semi-automated	SCM03.00640
Nitrate - nitrite	SCM	Certified	EPA 353.2	Cadmium Reduction, Automated	SCM03.00720

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Nitrite	SCM	Certified	SM 4500-NO2 B-11	Spectrophotometric, Manual	SCM03.00790
Oil & grease - sludge-hem	SCM	Certified	SW-846 9071B	Extraction & Gravimetric	SCM03.00800
Sulfate	SCM	Certified	SW-846 9056A	Ion Chromatography	SCM03.01020
Sulfides, acid sol. & insol.	SCM	Certified	SW-846 9034	Titration	SCM03.01080
Total organic carbon (TOC)	SCM	Certified	OTHER SW-846 9060A Modified	Infrared Spectrometry or FID	SCM03.01120
Total organic carbon (TOC)	SCM	Certified	Other Lloyd Kahn	Pyrolytic	SCM03.01130
Metals	SCM	Certified	SW-846 3050B	Acid Digestion, Soil Sediment &	SCM05.00010
Metals	SCM	Certified	SW-846 3060A	Chromium VI Digestion	SCM05.00020
Metals	SCM	Certified	SW-846 1312	Synthetic PPT Leachate Procedure	SCM05.00130
Metals	SCM	Certified	SW-846 1311	TCLP, Toxicity Procedure, Shaker	SCM05.00140
Chromium (VI)	SCM	Certified	SW-846 7196A	Colorimetric	SCM06.00320
Chromium (VI)	SCM	Certified	SW-846 7199	Ion Chromatography	SCM06.00350
Mercury - solid waste	SCM	Certified	SW-846 7471B	AA, Manual Cold Vapor	SCM06.00660
Aluminum	SCM	Certified	SW-846 6010D	ICP	SCM07.00022
Aluminum	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00042
Antimony	SCM	Certified	SW-846 6010D	ICP	SCM07.00062
Antimony	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00092
Arsenic	SCM	Certified	SW-846 6010D	ICP	SCM07.00122
Arsenic	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00152
Barium	SCM	Certified	SW-846 6010D	ICP	SCM07.00172
Barium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00202
Beryllium	SCM	Certified	SW-846 6010D	ICP	SCM07.00232
Beryllium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00262
Boron	SCM	Certified	SW-846 6010D	ICP	SCM07.00282
Boron	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00302
Cadmium	SCM	Certified	SW-846 6010D	ICP	SCM07.00332

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Cadmium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00362
Calcium	SCM	Certified	SW-846 6010D	ICP	SCM07.00392
Calcium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00412
Chromium	SCM	Certified	SW-846 6010D	ICP	SCM07.00432
Chromium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00462
Cobalt	SCM	Certified	SW-846 6010D	ICP	SCM07.00502
Cobalt	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00532
Copper	SCM	Certified	SW-846 6010D	ICP	SCM07.00552
Copper	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00582
Iron	SCM	Certified	SW-846 6010D	ICP	SCM07.00612
Iron	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00632
Lead	SCM	Certified	SW-846 6010D	ICP	SCM07.00662
Lead	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00692
Lithium	SCM	Certified	SW-846 6010D	ICP	SCM07.00722
Magnesium	SCM	Certified	SW-846 6010D	ICP	SCM07.00742
Magnesium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00762
Manganese	SCM	Certified	SW-846 6010D	ICP	SCM07.00792
Manganese	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00822
Molybdenum	SCM	Certified	SW-846 6010D	ICP	SCM07.00852
Molybdenum	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00882
Nickel	SCM	Certified	SW-846 6010D	ICP	SCM07.00912
Nickel	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.00942
Potassium	SCM	Certified	SW-846 6010D	ICP	SCM07.00992
Potassium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01012
Selenium	SCM	Certified	SW-846 6010D	ICP	SCM07.01042
Selenium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01072
Silver	SCM	Certified	SW-846 6010D	ICP	SCM07.01122
Silver	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01152
Sodium	SCM	Certified	SW-846 6010D	ICP	SCM07.01182
Sodium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01202
Strontium	SCM	Certified	SW-846 6010D	ICP	SCM07.01222
Strontium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01242

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Thallium	SCM	Certified	SW-846 6010D	ICP	SCM07.01292
Thallium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01322
Tin	SCM	Certified	SW-846 6010D	ICP	SCM07.01382
Tin	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01402
Titanium	SCM	Certified	SW-846 6010D	ICP	SCM07.01422
Titanium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01442
Vanadium	SCM	Certified	SW-846 6010D	ICP	SCM07.01532
Vanadium	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01562
Zinc	SCM	Certified	SW-846 6010D	ICP	SCM07.01592
Zinc	SCM	Certified	SW-846 6020B	ICP/MS	SCM07.01622
Zirconium	SCM	Certified	SW-846 6010D	ICP	SCM07.01644
Organics	SCM	Certified	SW-846 1312	Synthetic PPT Leachate Procedure	SCM08.00080
Organics	SCM	Certified	SW-846 3580A	Waste Dilution	SCM08.00090
Semivolatile organics	SCM	Certified	SW-846 3650B	Cleanup-Acid/Base Partition	SCM08.00140
Semivolatile organics	SCM	Certified	SW-846 3610B	Cleanup-Alumina	SCM08.00150
Semivolatile organics	SCM	Certified	SW-846 3620C	Cleanup-Florisil	SCM08.00170
Semivolatile organics	SCM	Certified	SW-846 3640A	Cleanup-Gel Permeation	SCM08.00180
Semivolatile organics	SCM	Certified	SW-846 3630C	Cleanup-Silica Gel	SCM08.00190
Semivolatile organics	SCM	Certified	SW-846 3660B	Cleanup-Sulfur Removal	SCM08.00200
Semivolatile organics	SCM	Certified	SW-846 3665A	Cleanup-Sulfuric Acid/ KMnO4	SCM08.00220
Semivolatile organics	SCM	Certified	SW-846 3546	Microwave Extraction	SCM08.00240
Semivolatile organics	SCM	Certified	SW-846 3611B	Petroleum Waste, Cleanup Alumina	SCM08.00250
Semivolatile organics	SCM	Certified	SW-846 3540C	Soxhlet Extraction	SCM08.00280
Semivolatile organics	SCM	Certified	SW-846 1311	TCLP, Toxicity Procedure, Shaker	SCM08.00320
Semivolatile organics	SCM	Certified	SW-846 3550C	Ultrasonic Extraction	SCM08.00350
Volatile organics	SCM	Certified	SW-846 1311	TCLP, Toxicity Procedure, ZHE	SCM08.00390

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Volatile organics - high conc.	SCM	Certified	SW-846 5035A	Methanol Extract, Closed System P & T	SCM08.00440
Volatile organics - low conc.	SCM	Certified	SW-846 5035A	Closed System Purge & Trap	SCM08.00460
Extractable Petroleum Hydrocarbons	SCM	Certified	Other NJDEP EPH 10/08, Rev. 3	Extraction, GC, FID	SCM09.00050
Butanol (1-)	SCM	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	SCM09.00740
Diesel range organic	SCM	Certified	SW-846 8015D	Extraction, GC, FID	SCM09.00770
Ethyl alcohol	SCM	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	SCM09.00810
Ethylene glycol	SCM	Applied	SW-846 8015D	GC, Direct Injection, FID	SCM09.00820
Gasoline range organic	SCM	Certified	SW-846 8015D	GC P&T, FID	SCM09.00850
Iso-butyl alcohol	SCM	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	SCM09.00870
Isopropyl alcohol	SCM	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	SCM09.00880
Methyl alcohol (Methanol)	SCM	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	SCM09.00890
Propyl Alcohol (n-)	SCM	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	SCM09.00960
Propylene glycol	SCM	Applied	SW-846 8015D	GC, Direct Injection, FID	SCM09.00970
Tert-butyl alcohol	SCM	Certified	SW-846 8015D	GC, Direct Injection or P & T, FID	SCM09.01010
Alachlor	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02280
Aldrin	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02290
Alpha BHC	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02300
Beta BHC	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02320

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Chlordane (alpha) (cis-)	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02330
Chlordane (gamma) (trans-)	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02340
Chlordane (technical)	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02350
DDD (4,4'-)	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02420
DDE (4,4'-)	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02430
DDT (4,4'-)	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02440
Delta BHC	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02450
Dieldrin	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02460
Endosulfan I	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02470
Endosulfan II	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02480
Endosulfan sulfate	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02490
Endrin	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02500
Endrin aldehyde	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02510
Endrin ketone	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02520
Heptachlor	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02540
Heptachlor epoxide	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02550
Hexachlorobenzene	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02560
Lindane (gamma BHC)	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02580

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Methoxychlor	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02590
Mirex	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02620
Toxaphene	SCM	Certified	SW-846 8081B	GC, Extraction, ECD or HECD, Capillary	SCM09.02660
PCB 1016	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03190
PCB 1221	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03200
PCB 1232	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03210
PCB 1242	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03220
PCB 1248	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03230
PCB 1254	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03240
PCB 1260	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03250
PCB 1262	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03260
PCB 1268	SCM	Certified	SW-846 8082A	GC, Extraction, ECD or HECD, Capillary	SCM09.03270
D (2,4-)	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04640
Dalapon	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04650
DB (2,4-)	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04660
Dicamba	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04680
Dichlorprop	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04700
Dinoseb	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04710

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
MCPA	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04730
MCPP	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04740
Pentachlorophenol	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04760
Picloram	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04770
T (2,4,5-)	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04780
TP (2,4,5-) (Silvex)	SCM	Certified	SW-846 8151A	GC, Extraction, ECD, Capillary	SCM09.04790
Acetone	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05810
Acetonitrile	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05820
Acrolein	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05830
Acrylonitrile	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05840
Allyl chloride	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05850
Benzene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05870
Benzyl chloride	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05880
Bromobenzene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05890
Bromochloromethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05900
Bromodichlorometha ne	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05910
Bromoform	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05930
Bromomethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05940

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Butadiene (2- chloro-1,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05950
Butanol (1-)	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.05960
Butanol (3,3-Dimethyl-1-)	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.05970
Butanone (2-) (Methyl ethyl	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.05980
Butyl formate (t-)	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.05990
Butylbenzene (n-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06020
Carbon disulfide	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06030
Carbon tetrachloride	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06040
Chlorobenzene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06050
Chloroethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06060
Chloroethyl vinyl ether (2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06070
Chloroform	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06080
Chloromethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06090
Chlorotoluene (2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06100
Chlorotoluene (4-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06110
Cyclohexane	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.06130
Cyclohexanone	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06140
Dibromo-3-chloropropane (1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06150

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dibromochloromethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06160
Dibromoethane (1,2-) (EDB)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06170
Dibromomethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06180
Dichloro-2-butene (trans-1,4-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06200
Dichlorobenzene (1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06210
Dichlorobenzene (1,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06220
Dichlorobenzene (1,4-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06230
Dichlorodifluoromethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06240
Dichloroethane (1,1-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06250
Dichloroethane (1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06260
Dichloroethene (1,1-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06270
Dichloroethene (cis-1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06280
Dichloroethene (trans-1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06290
Dichloropropane (1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06300
Dichloropropane (1,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06310
Dichloropropane (2,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06320
Dichloropropene (1,1-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06330
Dichloropropene (cis-1,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06340

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dichloropropene (trans-1,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06350
Diethyl ether (Ethyl ether)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06360
Diisopropyl Ether (DIPE)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06370
Dioxane (1,4-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06380
Ethanol	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06390
Ethyl acetate	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06400
Ethyl methacrylate	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06410
Ethylbenzene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06420
Ethyl-tert-butyl Ether (ETBE)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06430
Heptane (n-)	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.06440
Hexachlorobutadiene (1,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06450
Hexachloroethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06460
Hexane (n-)	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.06470
Hexanone (2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06480
Iso-butyl alcohol	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06490
Isopropyl acetate	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06510
Isopropylbenzene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06520
Isopropyltoluene (4-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06530

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Methacrylonitrile	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06540
Methyl acetate	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.06550
Methyl acrylate	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06560
Methyl iodide	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06570
Methyl methacrylate	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06580
Methyl tert-butyl ether	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06590
Methylcyclohexane	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.06600
Methylene chloride (Dichloromethane)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06610
Naphthalene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06640
Nitropropane (2-)	SCM	Certified	SW-846 8260C	GC/MS, P&T, or Direct Injection, Capillary	SCM10.06660
Pentachloroethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06690
Pentanone (4- methyl-2-) (MIBK)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06710
Propionitrile	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06720
Propylbenzene (n-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06730
Sec-butylbenzene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06740
Styrene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06750
tert-Amylmethyl ether (TAME)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06760
Tert-butyl alcohol	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06780

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Tert-butylbenzene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06790
Tetrachloroethane (1,1,1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06800
Tetrachloroethane (1,1,2,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06810
Tetrachloroethene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06820
Tetrahydrofuran	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06830
Toluene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06840
Trichloro (1,1,2-) trifluoroethane (1,2,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06860
Trichlorobenzene (1,2,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06870
Trichlorobenzene (1,2,4-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06880
Trichloroethane (1,1,1-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06890
Trichloroethane (1,1,2-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06900
Trichloroethene	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06910
Trichlorofluoromethane	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06920
Trichloropropane (1,2,3-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06930
Trimethylbenzene (1,2,4-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06950
Trimethylbenzene (1,3,5-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06960
Trimethylpentane (2,2,4-)	SCM	Certified	SW-846 8260C	GC/MS, Extract or Dir Inj, Capillary	SCM10.06970
Vinyl acetate	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06980

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Vinyl chloride	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.06990
Xylene (m-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.07000
Xylene (o-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.07010
Xylene (p-)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.07020
Xylenes (total)	SCM	Certified	SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.07030
Dioxane (1,4-)	SCM	Certified	SW-846 8260C	GC/MS/SIM, P & T or Direct Injection, Capillary	SCM10.07035
Acenaphthene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09230
Acenaphthylene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09240
Acetophenone	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09250
Acetylaminofluorene (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09260
Alpha - terpineol	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09280
Aminobiphenyl (4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09300
Aniline	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09320
Anthracene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09330
Aramite	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09340
Atrazine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09350
Benzaldehyde	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09370
Benzenethiol	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09380

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Benzidine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09390
Benzo(a)anthracene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09400
Benzo(a)pyrene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09410
Benzo(b)fluoranthene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09420
Benzo(ghi)perylene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09430
Benzo(k)fluoranthene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09450
Benzoic acid	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09460
Benzyl alcohol	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09480
Biphenyl (1,1'-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09510
Bis (2-chloroethoxy) methane	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09520
Bis (2-chloroethyl) ether	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09530
Bis(2-chloroisopropyl) ether|2,2'-oxybis(1-chloropropane)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09540
Bis (2-ethylhexyl) phthalate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09550
Bromophenyl-phenyl ether (4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09560
Butylbenzylphthalate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09570
Caprolactam	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09580
Carbazole	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09590
Chloroaniline (4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09630

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Chlorobenzilate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09640
Chloronaphthalene (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09660
Chlorophenol (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09670
Chlorophenyl-phenyl ether (4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09680
Chrysene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09690
Decane (n-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09730
Diallate (cis)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09750
Diallate (trans)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09760
Dibenz(a,h)acridine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09770
Dibenzo(a,h) anthracene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09800
Dibenzofuran	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09840
Dichlorobenzene (1,2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09850
Dichlorobenzene (1,3-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09860
Dichlorobenzene (1,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09870
Dichlorobenzidine (3,3'-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09880
Dichlorophenol (2,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09890
Dichlorophenol (2,6-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09900
Diethyl phthalate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09920

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Dimethoate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09930
Dimethyl phthalate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09950
Dimethylaminoazobenzene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.09960
Dimethylbenz(a) anthracene (7,12-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10010
Dimethylphenol (2,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10020
Di-n-butyl phthalate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10030
Dinitrobenzene (1,3-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10040
Dinitrophenol (2,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10060
Dinitrophenol (2-methyl-4,6-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10070
Dinitrotoluene (2,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10080
Dinitrotoluene (2,6-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10090
Di-n-octyl phthalate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10100
Dinoseb	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10110
Dioxane (1,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10114
Diphenylhydrazine / Azobenzene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10130
Disulfoton	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10140
Famphur	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10220
Fluoranthene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10230

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Fluorene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10240
Hexachlorobenzene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10270
Hexachlorobutadiene (1,3-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10280
Hexachlorocyclopen t adiene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10290
Hexachloroethane	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10300
Hexachloropropene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10320
Hydroquinone	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10330
Indene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10340
Indeno(1,2,3-cd) pyrene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10350
Isodrin	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10360
Isophorone	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10370
Isosafrole (cis-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10380
Isosafrole (trans-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10390
Kepone	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10400
Methanesulfonate (Ethyl-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10420
Methanesulfonate (Methyl-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10430
Methapyrilene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10440
Methyl phenol (4-chloro-3-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10460

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Methylcholanthrene (3-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10470
Methylnaphthalene (1-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10480
Methylnaphthalene (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10490
Methylphenol (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10500
Methylphenol (3-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10510
Methylphenol (4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10520
Naphthalene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10530
Napthoquinone (1,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10540
Napththylamine (1-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10550
Napththylamine (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10560
Nitroaniline (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10570
Nitroaniline (3-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10580
Nitroaniline (4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10590
Nitrobenzene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10600
Nitrophenol (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10620
Nitrophenol (4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10630
N-Nitrosodiethylamine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10640
N-Nitrosodimethylamine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10650

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
N-Nitroso-di-n-butylamine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10660
N-Nitroso-di-n-propylamine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10670
N-Nitrosodiphenylamine / Diphenylamine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10680
N-Nitrosomethylethylamine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10690
N-Nitrosomorpholine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10700
N-Nitrosopiperidine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10710
N-Nitrosopyrrolidine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10720
Octadecane (n-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10730
Parathion	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10740
Parathion methyl	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10750
Pentachlorobenzene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10830
Pentachloroethane	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10840
Pentachloronitrobenzene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10850
Pentachlorophenol	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10860
Phenacetin	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10870
Phenanthrene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10880
Phenol	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10890

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Phenylenediamine (1,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10900
Phenylethylamine (alpha, alpha-Dimethyl)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10910
Phorate	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10920
Phosphorothioate (O,O,O-triethyl)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10930
Phosphorothioate (diethyl-O-2-pyrazinyl) [Thionazin]	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10940
Picoline (2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10950
Pronamide	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10960
Pyrene	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10970
Pyridine	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10980
Quinoline	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.10990
Quinoline -1-Oxide (4-Nitro)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11000
Safrole	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11010
Tetrachlorobenzene (1,2,4,5-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11060
Tetrachlorophenol (2,3,4,6-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11070
Toluidine (2-) (2-Methylaniline)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11080
Toluidine (5-nitro-2-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11100
Trichlorobenzene (1,2,4-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11120

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Trichlorophenol (2,4,5-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11130
Trichlorophenol (2,4,6-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11140
Trinitrobenzene (1,3,5-)	SCM	Certified	SW-846 8270D	GC/MS, Extract or Dir Inj, Capillary	SCM10.11160
Acenaphthene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11170
Acenaphthylene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11180
Anthracene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11190
Benzo(a)anthracene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11200
Benzo(a)pyrene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11210
Benzo(b)fluoranthene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11220
Benzo(ghi)perylene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11230
Benzo(k)fluoranthene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11240
Chrysene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11250
Dibenzo(a,h) anthracene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11260
Dinitrophenol (2-methyl-4,6-)	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11270
Dioxane (1,4-)	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11274
Fluoranthene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11280
Fluorene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11290
Hexachlorobenzene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11300

Parameter	Matrix Code	Status	Approved Method	Technique	Parameter Code
Hexachlorobutadiene (1,3-)	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11310
Indeno(1,2,3-cd) pyrene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11320
Methylnaphthalene (2-)	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11340
Naphthalene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11350
Pentachlorophenol	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11370
Phenanthrene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11380
Pyrene	SCM	Certified	SW-846 8270D	GC/MS/SIM, Extract or Dir Inj, Capillary	SCM10.11390
1,1,1-Trifluoroethane	SCM	Certified	User Defined SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.12810
1-Chloro-1,1-difluoroethane	SCM	Certified	User Defined SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.12820
1,1-Dichloro-1-fluoroethane	SCM	Certified	User Defined SW-846 8260C	GC/MS, P & T or Direct Injection, Capillary	SCM10.12824
Ethylene glycol	SCM	Certified	User Defined SW-846 8260C	GC/MS/SIM, Direct Aqueous Injection	SCM10.12860
Propylene glycol	SCM	Certified	User Defined SW-846 8260C	GC/MS/SIM, Direct Aqueous Injection	SCM10.12870
Diesel range organic	SCM	Certified	User Defined TCEQ 1005	Extraction, GC, FID	SCM14.00920
Perchlorate	SCM	Certified	User Defined EPA 314	Ion Chromatography	SCM14.01940

Method Capabilities—Non-NELAP Methods

Analytes	Method Number	Program	Chemistry Field
Phenols	EPA 420.4	Drinking Water	Inorganic Analysis
Carbon Dioxide	SM 4500-CO_2 C or D	Wastewater	Inorganic Analysis
Iodide	SM 4500-I B	Wastewater	Inorganic Analysis
Nonionic Surfactants as CTAS	SM 5540 D	Wastewater	Inorganic Analysis
Particulate Matter	EPA 160.2M	Wastewater	Inorganic Analysis
Phosphorus, Hydrolyzable	EPA 365.3	Wastewater	Inorganic Analysis
Redox Potential vs H^+	ASTM D1498-76	Wastewater	Inorganic Analysis
Specific Gravity	ASTM D1298-85	Wastewater	Inorganic Analysis

Method Capabilities—Non-NELAP Methods

Analytes	Method Number	Program	Chemistry Field
Total Organic Content	ASTM D2974-87	Wastewater	Inorganic Analysis
Unburned Combustibles	EPA 160.1+160.4	Wastewater	Inorganic Analysis
Viscosity	ASTM D445/6	Wastewater	Inorganic Analysis
Volatile Suspended Solids	EPA 160.2+160.4	Wastewater	Inorganic Analysis
Weak Acid Dissociable Cyanide Prep	SM 4500-CN I	Wastewater	Inorganic Analysis
Ammonia	EPA 350.1M	Solid/Haz. Waste	Inorganic Analysis
Ammonia	EPA 350.2M	Solid/Haz. Waste	Inorganic Analysis
Base Sediment	ASTM D473-81	Solid/Haz. Waste	Inorganic Analysis
Bulk Density (Dry Basis)	ASTM D2937-94M	Solid/Haz. Waste	Inorganic Analysis
Chemical Oxygen Demand	HACH 8000M	Solid/Haz. Waste	Inorganic Analysis
Chloride	EPA 325.3M	Solid/Haz. Waste	Inorganic Analysis
Grain Size & Sieve Testing	ASTM D422-63	Solid/Haz. Waste	Inorganic Analysis
Heat Content, BTU	ASTM D3286-85	Solid/Haz. Waste	Inorganic Analysis
Ignitability (Flashpoint)	ASTM D93-90/SW846 Ch 7	Solid/Haz. Waste	Inorganic Analysis
Multiple Extractions	SW846 1320	Solid/Haz. Waste	Inorganic Analysis
Neutral Leaching Procedure	ASTM D3987-85	Solid/Haz. Waste	Inorganic Analysis
Nitrate/Nitrite	EPA 353.2M	Solid/Haz. Waste	Inorganic Analysis
Organic Matter (Ignition Loss)	AASHTO T267-86M	Solid/Haz. Waste	Inorganic Analysis
Orthophosphate	EPA 365.2M	Solid/Haz. Waste	Inorganic Analysis
Percent Ash (Dry Basis)	ASTM D482-91	Solid/Haz. Waste	Inorganic Analysis
Percent Solids	ASTM D4643-00	Solid/Haz. Waste	Inorganic Analysis
Percent Sulfur	ASTM D129-61	Solid/Haz. Waste	Inorganic Analysis
Phosphorus, Total	EPA 365.3M	Solid/Haz. Waste	Inorganic Analysis
Phosphorus, Hydrolyzable	EPA 365.3M	Solid/Haz. Waste	Inorganic Analysis
Pour Point	ASTM D97-87	Solid/Haz. Waste	Inorganic Analysis
Reactive Cyanide	SW846 7.3.3.2	Solid/Haz. Waste	Inorganic Analysis
Reactive Sulfide	SW846 7.3.4.2	Solid/Haz. Waste	Inorganic Analysis
Redox Potential vs H^+	ASTM D1498-76M	Solid/Haz. Waste	Inorganic Analysis
Specific Gravity of Solids	ASTM D1429-86M	Solid/Haz. Waste	Inorganic Analysis
Sulfide (S)	EPA 376.1 M	Solid/Haz. Waste	Inorganic Analysis
Sulfite (SO_3)	EPA 377.1M	Solid/Haz. Waste	Inorganic Analysis
Total Chlorine	ASTM D808-91	Solid/Haz. Waste	Inorganic Analysis
Total Kjeldahl Nitrogen	EPA 351.2M	Solid/Haz. Waste	Inorganic Analysis
Total Organic Carbon	CORP ENG 81	Solid/Haz. Waste	Inorganic Analysis

Method Capabilities—Non-NELAP Methods

Analytes	Method Number	Program	Chemistry Field
Total Organic Carbon	LLOYD KAHN 1988	Solid/Haz. Waste	Inorganic Analysis
Total Organic Chlorine	ASTM D808-91M	Solid/Haz. Waste	Inorganic Analysis
Total Plate Count	SM 9215BM	Solid/Haz. Waste	Inorganic Analysis
Total Volatile Solids	EPA 160.4M	Solid/Haz. Waste	Inorganic Analysis
Water Content	ASTM D95-83	Solid/Haz. Waste	Inorganic Analysis

Appendix IV

Laboratory Equipment

Equipment (Air Lab)	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
GC-AA	GC Agilent 7890A/FID	CN10361127	HP Chemstation	HP Enviroquant	Air Laboratory	N/A
GC-J			HP Chemstation	HP Enviroquant	Air Laboratory	N/A
GCMS- 5W	Agilent Technologies 5975C / 7890A / Entech7200pre-concentrator pre-concentrator	US13207902/CN13141001/1123	HP Chemstation	HP Chemstation	Air Laboratory	2013
GCMS-2W	Agilent Technologies 5975C / 7890A Entech 7016CA	CN10361158 / US10323601 / CN10361158	HP Chemstation	HP Enviroquant	Air Laboratory	2012
GCMS-3W	Agilent Technologies 5973 / 6890N Entech 7016A	CN10425086 / US41746669 / 1351	HP Chemstation	HP Enviroquant	Air Laboratory	2007
GCMS-Q	Hewlett-Packard 5890ll / 5971 MSD / Entech Air Samp 7000	3033A31092 / 3188A02934	HP Chemstation	HP Enviroquant	Air Laboratory	1993
GCMS-W	Agilent Technologies 5973 / 6890N AS Entech 7016CA	US44621451 / CN10517032 / 1119	HP Chemstation	HP Enviroquant	Air Laboratory	2005
GC-QT	Agilent 6890 / PID / FID / Entech 7032AB-L	US10148124/1176	HP Chemstation	HP Enviroquant	Air Laboratory	2010
GC-WW	Hewlett-Packard6890 / PID	US00010037	HP Chemstation	HP Enviroquant	Air Laboratory	2010
GCMS – 6W			HP Chemstation	HP Enviroquant	Air Laboratory	
OVEN – 10A	Entech 3100A Canister cleaner	0404-4596	None	None	Air Laboratory	N/A
OVEN – 10C	Entech 3100A Canister cleaner	0404-4597	None	None	Air Laboratory	N/A
OVEN – 10E	Entech 3100A Canister cleaner	N/A	None	None	Air Laboratory	N/A
OVEN -10F	Entech 3100A Canister cleaner	N/A	None	None	Air Laboratory	N/A
Test Gauge	Ashcroft (TG-1)	None	None	None	Air Laboratory	N/A
Test Gauge	Ashcroft (TG-2)	None	None	None	Air Laboratory	N/A
Test Gauge	Ashcroft (TG-3)	None	None	None	Air Laboratory	N/A
Test Gauge	Ashcroft (TG-4)	None	None	None	Air Laboratory	N/A
Flow Meters	Flow Professor	FP1, FP2, FP3, FP4	None	None	Air Laboratory	N/A

Equipment (Air Lab, cont'd)	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
Cleaning System	Entech		None	None		
Tube Conditioner	Markes International TC-20	R-10659	None	None		
Wrist Action Shaker	Burrell Model 75		None	None		
Cleaning System-1	Entech 3100A	1064	None	None		

Equipment (General Chemistry Lab)	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
DO Meter	YSI-51B	92A035818	None	None	Field Serv.	1998
DO Meter	YSI-55/12ft	00C0598BG	None	None	Field Serv.	2000
PH Meter-10	YSI	JC02538	None	None	Field Serv.	2007
PH Meter-11	YSI	JC02540	None	None	Field Serv.	2010
PH Meter-9	Orion 250A	O18019	None	None	Field Serv.	2007
SCON Meter	YSI-30	J0183	None	None	Field Serv.	2004
Balance- Top Load	Ohaus Adventure AV212 (B-36)	8029131104	None	None	IC Lab	2008
Balance-Analytical	Ohaus Adventurer (B-24)	1225032523P	None	None	Inorganics	2004
Balance-Analytical (B-5)	Mettler AE 160 (B-5)	C11620	None	None	Inorganics	1999
Balance- Top Load (B-43)	Ohaus Adv. Pro (B43)	8032501223	None	None	Inorganics	2012
Balance- Top Load (B-14)	Denver Inst. Co. XL500 (B-14)	B045530	None	None	Inorganics	Pre-2000
Balance- Top Load (B-52)	Ohaus Adv. Pro (B52)	B334691952	None	None	Inorganics	2013
Balance- Top Load (B-16)	Ohaus Explorer (B-16)	E1581119212171	None	None	Inorganics	2001
Balance- Top Load (B-21)	Ohaus Adventurer (B-21)	E1021218270448	None	None	Inorganics	2001
Balance- Top Load (B-27)	Ohaus Adventurer AV412 (B-27)	8026251106	None	None	Inorganics	2005
Balance- Top Load (B-32)	Sartorius TE31025 (B-32)	21950273	None	None	Inorganics	2007
Balance- Top Load (B-39)	Denver P-214 (B-39)	25450279	None	None	Inorganics	2010
Balance- Top Load (B-53)	A+D HR-250A (B-53)	687601248	None	None	Inorganics	2012
Balance- Top Load (B-37)	Ohaus Adv. Pro (B-37)	8029161122	None	None	Inorganics	2013

Equipment (General Chem Lab, cont'd)	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
Balance- Top Load(B-51)	(B-51)		None	None		
Calorimeter	PARR 1261EA	1499	None	None	Inorganics	1996
COD Block	HACH DRB200	11020C0029	None	None	Inorganics	2010
Distillation Block 1	Lachat Micro Distillation system	A2000738	None	None	Inorganics	2010
Distillation Block 2	Lachat Micro Distillation system	A2000726	None	None	Inorganics	2010
Distillation Block 3	Lachat Micro Distillation system	A2000807	None	None	Inorganics	2010
DO Meter	YSI 5000	07B1560	None	None	Inorganics	2008
FIA Analyzer	Lachat Quikchem 8000	13200001620	None	None	Inorganics	
Flashpoint	Koehler – K16200	R07002295	None	None	Inorganics	2010
Flashpoint	Koehler – K16200	R07002563B	None	None	Inorganics	2010
IC-2	Dionex ICS2000	2090737	Dionex Chrom. Client	Dionex Chrom. Client	Inorganics	2004
IC-3	Dionex ICS2000	2110028	Dionex Chrom. Client	Dionex Chrom. Client	Inorganics	2004
IC-4	Dionex ICS2000	4060060	Dionex Chrom. Client	Dionex Chrom. Client	Inorganics	2004
IC-6	Dionex ICS3000	Column 6040160	Dionex Chrom. Client	Dionex Chrom. Client	Inorganics	2006
IC-7	Dionex IC5000+	Pump-13120208, IC-7 7199, IC-A (2187), Column 13117597	Dionex Chrom. Client	Dionex Chrom. Client	Inorganics	2013
IC-8	Dionex IC5000, 5000-1	Column 10120556				

Equipment (General Chem Lab, cont'd))	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
IC-9	IC5000, 5000-3	Column 11090696				
IC-B	IC- 2100 Fatty Acids	11090126				
Seal Analyzer	Discreet Analyzer (AQ-2)	190185				
IR Spec.	Buck Scientific HC-404	687	None	None	Inorganics	1997
Oven (Inc-21)	Fisher	N/A	None	None	Inorganics	2014
Oven (Inc-7)	Precision	699030922	None	None	Inorganics	2014
Oven Inc 19	Total Dissolved Solids(180°C)	20-2100149111	None	None	Inorganics	2014
PH Meter-46	Thermo Orion 4 Star	B10299	None	None	Inorganics	2008
PH Meter-47	Thermo Orion 4 Star	B04869	None	None	Inorganics	2008
PH Meter-50	Orion Star Series	B27564	None	None	Inorganics	2010
pH Meter-53	VWR Symphony B10P	1223350009	None	None	Inorganics	2013
PH Meter-54	Thermo Orion 710A	X08035	None	None	Inorganics	2013
PH Meter-55	Thermo-Orion	X10686	None	None	Inorganics	2014
pH Meter-57	VWR Symphony B10P	1411150002	None	None	Inorganics	2014
pH Meter-59	VWR Symphony B10P	14087S0006	None	None	Inorganics	2014
pH Meter-60	VWR Symphony B10P	1413950006	None	None	Inorganics	2014
pH-eH Meter-22	Thermo Orion 4 Star	SN00742	None	None	Inorganics	2008
pH Meter-62	VWR Symphony B10P		None	None		
SCON Meter	Amber Science 1056	01020851056-101	None	None	Inorganics	2001
SCON Meter	Orion 145+	78035	None	None	Inorganics	2004
Solvent Evaporator	Horizon SPE-DEX 3000XL	09-1031	None	None	Inorganics	2010
Solvent Evaporator	Horizon SPEED VAP III	09-0739	None	None	Inorganics	2010

Equipment (General Chem Lab cont'd)	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchase
TCLP Rotator 4	Assoc. Design and Mfg. Co. 3740-24-BRE-TM	N/A	None	None	Inorganics	2000
TCLP Rotator 5	Analytical Testing Corp. 42R5BCI-E3	0685KZJP0013	None	None	Inorganics	2002
TCLP Rotator 7&8	Assoc. Design and Mfg. Co. 3740-48BRE	N/A	None	None	Inorganics	2000
TCLP Rotator 9&10	Assoc. Design and Mfg. Co. 3740-48BRE	2132337	None	None	Inorganics	1996
TOC-L Analyzer	Shimadzu TOC-L	H52516900071	Shimadzu TOC Control	Shamadzu TOC Control	Inorganics	2012
TOC-L Analyzer	Shimadzu TOC-L	H52515000114NK	Shimadzu TOC Control	Shamadzu TOC Control	Inorganics	2013
TOC-V Analyzer	Shimadzu TOC-V CSH	H52504400192NK	Shimadzu TOC Control	Shimadzu TOC Control	Inorganics	2007
TOX Analyzer	Mitsubishi TOX-100	N/A	None	None	Inorganics	1996
TOX Analyzer	Mitsubishi TOX-100	A7M 42997	None	None	Inorganics	2008
UVVIS Spec E	Spectronix 20 Genesys	3SGD.352011	None	None	Inorganics	2007
UVVIS Spec J	Thermo Electron Corp. Genesys 20	3SGQ235018	None	None	Inorganics	20012
UVVIS Spec L	Thermo Electron Corp. Genesys 20	3SGS073003	None	None	Inorganics	2014
UVVIS Spec M	Spectronix 20 Genesys	3SG82480005	None	None	Inorganics	2013
UVVIS Spec N	Spectronix 20 Genesys	3SGS247010	None	None	Inorganics	2013
Pensky Martens	Pensky Martens 35000-0	1043454	None	None		
Lachat Module	Lachat Ammonia Distillation Module	16-107-06-S-J	None	None		

Equipment (General Chem Lab cont'd)	Manufacture & Description	Serial Number	Operating System Software	Data Processing Software	Location	Purchased
TOC Analyzer	Scimadzu	H544114900158 AE	None	None		
TOC Analyzer	Scimadzu, Autosampler	H571149000354 SA	None	None		
TOC Analyzer	Scimadzu, Autosampler	52514900066 NK	None	None		
PH Meter-23	Thermo Orion Model 310	SN013786	None	None	Inorganics	2008
Hot Block 8	Environmental Express	N/A	None	None	Mercury Prep	
Hot Block 7	Environmental Express	N/A	None	None	Mercury Prep	
Automatic Pensky Martens	Seta PM-93 Flash Point Closed Cup Tester	1043454	None	None	Gen Chem	2017

Equipment (Metals)	Manufacturer & Description	Serial Number	Operating System	Data Processing System	Location	Purchase
ICP	Thermo ICP 6500 Duo	ICP-20074909	ITEVA	ITEVA	Metals	2007
ICP	Thermo ICP 6500 Duo	ICP-20114506	ITEVA	ITEVA	Metals	2011
ICP	Thermo ICP 6500 Duo	ICP-20072601	ITEVA	ITEVA	Metals Analysis	2007
ICP	Thermo ICP 6500 Duo	IC5D20122506	ITEVA	ITEVA	Metals Analysis	2012
ICP	Thermo ICP 6500 Duo	IC76DC134708	ITEVA/QTEGRA	ITEVA/QTEGRA	Metals Analysis	2014
ICP-MS	Agilent 7700 Series	JP12412081	MassHunter Workstation	MassHunter Workstation	Metals Analysis	2014
ICP-MS	Agilent 7700 Series	JP10340551	MassHunter Workstation	MassHunter Workstation	Metals Analysis	2010
ICP Auto-Sampler	Express AutoSampler	071406XPS	None	None		
Hot Block 1	Environmental Express	N/A	None	None	Metals Prep	
Hot Block 2	Environmental Express	N/A	None	None	Metals Prep	
Hot Block 3	Environmental Express	N/A	None	None	Metals Prep	
Hot Block 4	Environmental Express	N/A	None	None	Metals Prep	
Hot Block 5	Environmental Express	N/A	None	None	Metals Prep	
Hot Block 6	Environmental Express	N/A	None	None	Metals Prep	
Balance- Top Load	Ohaus Scout II (B-20)	BJ320905	None	None	Methanol Prep	2002
Balance- Top Load	Ohaus Scout II (B-25)	BJ514770	None	None	Methanol Prep	2004
Balance- Top Load	Ohaus Adventurer AR3130 (B-26)	1240-P	None	None		
Balance – Analytical	Ohaus Adventurer (B-24)	1225032523P	None	None		
Hg Analyzer	HYDRAA II	64013	Envoy	Envoy		
Hg Analyzer	Leeman Mercury Analyzer HYDRAAF Gold+	9003	WIN Hg Runner	WIN Hg Runner		
Hg Analyzer 7	Hydra II	64631	Envoy	Envoy		

Equipment (Microbiology Lab)	Manufacture & Description	Serial Number	Operating System	Data Processing System	Location	Purchase
Autoclave	Tuttnauer	1308435	None	None	Microbiology	2011
Incubator BOD	VWR	702499	None	None	Microbiology	2011
Incubator (Plates)	Theclo Precision	11T3	None	None	Microbiology	N/A
Incubator(BOD)	ISOTEMP	317646	None	None	Microbiology	2010
Incubator-Water Bath	INC-2	1200991	None	None	Microbiology	N/A
Refrigerator	R-44	0503MCBR980W0087	None	None	Microbiology	N/A
Incubator (Plates)	Thelco Precision	4-D-5	None	None	Microbiology	N/A

Equipment (Organic Prep)	Manufacture & Description	Serial Number	Operating System	Data Processing Software	Location	Purchase
Balance- Top Load (B-46)	Ohaus Adventurer Pro (B-46)	B304755401	None	None	Organic Prep	Pre-2000
Balance- Top Load (B-45)	Ohaus Adventurer Pro (B-45)	B033051054	None	None	Organic Prep	2002
Balance- Top Load (B-42)	Ohaus Adventurer Pro (B-42)	B031331113	None	None	Organic Prep	2007
Balance- Top Load (B-47)	Ohaus Adventurer Pro (B-47)	4755411	None	None	Organic Prep	2013
Buchi -1	Buchi Concentrator System	1000175446	None	None	Organic Prep	2014
Buchi -2	Buchi Concentrator System	1000175108	None	None	Organic Prep	2014
Buchi-3	Buchi Concentrator System	1000175657	None	None	Organic Prep	2014
Buchi-4	Buchi Concentrator System	Not in service	None	None	Organic Prep	N/A
Centrifuge	Thermo Scientific	41394883	None	None	Organic Prep	2014
GPC4	Waters 717	717-000152	None	None	Organic Prep	1992
Microwave-3	MARS 6 CEM	MJ2659 (warranty expires June 2014)	None	None	Organic Prep	2013
Microwave-4	MARS 6 CEM	MJ2198	None	None	Organic Prep	2013
Microwave-5	MARS 6 CEM	MJ2197	None	None	Organic Prep	2013
Microwave-6	MARS 6 CEM	MJ2670	None	None		
Mini Water Bath	Thermo Scientific	234221-1379	None	None	Organic prep	2014
N-EVAP 1	Organomation	59301	None	None	Organic Prep	2014
N-EVAP 2	Organomation	58202	None	None	Organic Prep	2014
Sonicator	Fisher	F550	None	None	Organic Prep	N/A
Sonicator	Bransen	BIO3037527	None	None	Organic Prep	N/A
Sonicator	Misonix	S3000	None	None	Organic Prep	1997
Water Bath 1	Organomation	13385	None	None	Organic Prep	2010
Water Bath 10	Organomation	58394	None	None	Organic prep	2014
Water Bath 11	Organomation	58384	None	None	Organic prep	2014
Water Bath 3	Organomation	58471	None	None	Organic Prep	2010

Water Bath 4	Organomation	58421	None	None	Organic Prep	2014
Equipment (Organic Prep, cont'd)	Manufacturer & Description	Serial Number	Operating System	Data Processing Software	Location	Purchase
Water Bath 5	Organomation	58422	None	None	Organic Prep	2014
Water Bath 8	Organomation	58424	None	None	Organic Prep	2014
Water Bath 9	Organomation	58425	None	None	Organic prep	2013
Water Bath 6	Organomation	58423	None	None	Organic Prep	2014
Water Bath 7	Organomation	58379	None	None	Organic Prep	2014

Equipment (OrganicsLab)	Manufacturer & Description	Serial Number	Operating System	Data Processing Software	Location	Purchase
GC-SC	Hewlett-Packard 5890 / FID / OI4551 / 4560	2443AO3797	HP Chemstation	HP Enviroquant	Organics; Screening	1990
GC-SR	Hewlett-Packard 5890 / FID / Tekmar 7000	2612A07448	HP Chemstation	HP Enviroquant	Organics; Screening	1992
GC-ST	Hewlett-Packard 5890 / FID / NPD / HP 7673 AS / Tek	314OA38871	HP Chemstation	HP Enviroquant	Organics; Screening	1996
GC-SV	Hewlett-Packard 5890 / FID / OI4551 / 4560	LR47-359C / N244460743 / 3336A58859	HP Chemstation	HP Enviroquant	Organics; Screening	1996
GC 7Y/7Zz	Agilent Technologies 6890N / 7683	US00043006 / US12211759 / CN52926441 / CN60931595	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC-5G	Agilent Technologies 7890N/7693	CN12131022 / CN12060027 / CN12070097 / U20782/U20781	HP Chemstation	HP Enviroquant	Organics; SVOCs	2008
GC-5Y-5Z	Agilent Technologies 7890N / 7683	CN11461115 / CN11380009 / CN11390012 / CN73342671	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC-6G	Agilent Technologies 6890N 7683	CN10611064 / CN44330971 / CN40334835 / U4788 / U18013	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC-6y-6z	Agilent Technologies 7890N / 7683	CN11461118 / CN10310044 / CN83252932 / CN73342695	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC-7G	Agilent Technologies 6890N 7683	US10606009 / CN53236207 / CN40434847 / U23574/ U24374	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC-8Y/8Z	Agilent Technologies 6890N / 7683	US10240121 / GT030513A / CN43038210 / CN40334821	HP Chemstation	HP Enviroquant	Organics; SVOCs	2011
GCMS-4P	Agilent Technologies 5973 / 6890N AS 7683 AS	CN10251017 / US102440773 / CN34727122 / CN61031719	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GCMS-5P	Agilent Technologies 5973 / 6890N AS 7683 AS	CN10222060 / US21844818 / CN52834726 / CN21725012	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC-XX	Hewlett-Packard 6890 / Dual ECD / HP 7683 AS	US00022968 / CN32023953 / CN32030876 / U0109 / U0905	HP Chemstation	HP Enviroquant	Organics; SVOCs	1998
GC-UV	Hewlett-Packard 5890 / Dual FID / OI 4551 / 4560	2921A23322	HP Chemstation	HP Enviroquant	Organics; Volatiles	1996
GC-2Y/2Z	Agilent Technologies 6890N 7683	CN10407032 / CN61633946 / US94209706 / US01112207	HP Chemstation	HP Enviroquant	Organics; SVOCs	2004
GC-OA	Agilent Technologies 6890N / 7683	US10240147 / CN23021337 / CN320308791 / U5591 / U7670	HP Chemstation	HP Enviroquant	Organics; SVOCs	2002

Equipment (OrganicsLab)	Manufacturer & Description	Serial Number	Operating System	Data Processing Software	Location	Purchase
GC-YZ/ZZ	Hewlett-Packard 6890 / 6890	US00011065 / 3527A39121 / 3521A42714 / 3511A42110	HP Chemstation	HP Enviroquant	Organics; SVOCs	2008
GC-EF	Hewlett-Packard 5890 / Dual ECD / HP 7673 AS	2541A06786 / 2942A20889 /F1916 / F5562	HP Chemstation	HP Enviroquant	Organics; Volatiles	1992
GC-LM	Hewlett-Packard 6890 / PID / FID / OI 4551 / 4560 P&T	US00008927	HP Chemstation	HP Enviroquant	Organics; Volatiles	1998
GCMS-L	Hewlett-Packard 5890 / 5970 MSD / OI 4551 / 4560 P&T	2921A22898 / 2623A01291	HP Chemstation	HP Enviroquant	Organics; Volatiles	1992
GC-SY	Hewlett-Packard 5890 / FID / OI4551A / 4560	2643A10503	HP Chemstation	HP Enviroquant	Organics; Screening	1990
GC-1G	Agilent Technologies 6890N / 7683	US10322012 / CN23821917 / CN23326744 / U21778 / U5597	HP Chemstation	HP Enviroquant	Organics; SVOCs	2003
GC-2G	Agilent Technologies 6890N / 7683	CN10450110 / CN24922557 / CN45022276 / U17684 / U7668	HP Chemstation	HP Enviroquant	Organics; SVOCs	2005
GC-3G	Agilent Technologies 6890N / 7683	CN10450109 / CN24922566 / CN45022167 / U7666 / U7667	HP Chemstation	HP Enviroquant	Organics; SVOCs	2005
GC-3Y/3Z	Agilent Technologies 7890A / 7683B	CN10735014 / CN74345941 / CN83252932 / CN73342695	HP Chemstation	HP Enviroquant	Organics; SVOCs	2007
GC-4G	Agilent Technologies 6890N / 7693	CN10361136 / CN10340093 / CN10310033 / U17615 / U17614	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC-4Y/4Z	Agilent Technologies 7890A / 7693B	CN10832133 / CN84451068 / CN83252936 / CN73342671	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GCMS-2M	Agilent Technologies 5975 / 6890N AS 7683	CN10612028 / US60532578 / CN4593809290 / US82601187	HP Chemstation	HP Enviroquant	Organics; SVOCs	2012
GCMS-2P	Agilent Technologies 5975C / 7890A / 7693	US10237403 / CN10241022 / CN10210021 / CN10180007	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010
GC – 8G	Agilent 7890A	CN1039N62 / CN10370238	HP Chemstation	HP Enviroquant	Organics; SVOCs	
GC – 9G	Agilent 6890	US00041387	HP Chemstation	HP Enviroquant	Organics; SVOCs	
GCMS-3E	Agilent Technologies 5975 / 6890N / 7683	CN10614011 / US61332852 / CN23326747 / US93901916	HP Chemstation	HP Enviroquant	Organics; SVOCs	2011
GCMS-3M	Agilent Technologies 5975B / 6890N / Agilent 7683B	US65125107 / CN10703029 / CN73943902 / US83801832	HP Chemstation	HP Enviroquant	Organics; SVOCs	2007
GCMS-3P	Agilent Technologies 5975C / 7890A / 7693	CN10361100 / CN10361163 /	HP Chemstation	HP Enviroquant	Organics; SVOCs	2010

GCMS-4M	Agilent Technologies 5975C / 7890A / 7683B	US73317574 / CN1074251 / CN74043923 / CN74145736	HP Chemstation	HP Enviroquant	Organics; SVOCs	2007
Equipment (OrganicsLab)	Manufacturer & Description	Serial Number	Operating System	Data Processing Software	Location	Purchase
GCMS-4P	Agilent Technologies 5973 / 6890N AS 7683 AS	CN10251017 / US102440773 / CN34727122 / CN61031719	HP Chemstation	HP Enviroquant	Organics; SVOCs	2011
GCMS-6P	Agilent Technologies 5973 / 6890N AS 7683 AS	CN10536029 / US52420712 / US10310521 / CN55230259	HP Chemstation	HP Enviroquant	Organics; SVOCs	2011
GCMS-F	Agilent 6890 / 5973 MSD / 7683 AS	US00034179 / US01140200 / CN40327643 / CN138822139	HP Chemstation	HP Enviroquant	Organics; SVOCs	1998
GCMS-M	Hewlett-Packard 6890 / 5973 MSD / HP 7683 AS	US00021813 / US802111003 / US81501001 / CN61038860	HP Chemstation	HP Enviroquant	Organics; SVOCs	1999
GCMS-P	Agilent Technologies 5973 / 6890N AS 7683 AS	US10251064 / US21844598 / CN74145733 / CN24828486	HP Chemstation	HP Enviroquant	Organics; SVOCs	2003
GCMS-R	Agilent Technologies 6890 / 5973 MSD / 7683	US00021820 / US81211033 / US84202752 / CN61639349	HP Chemstation	HP Enviroquant	Organics; SVOCs	2008
GCMS-Z	Agilent Technologies 5973 / 6890N AS 7683 AS	US10251028 / US21844586 / CN24828485 / CN23321564	HP Chemstation	HP Enviroquant	Organics; SVOCs	2003
Balance- Top Load (B-28)	Ohaus Sport (B-28)	7124230518	None	None	Organics; Volatiles	2005
Balance- Top Load (B-34)	Ohaus Adventure AV412 (B-34)	8028391117	None	None	Organics; Volatiles	2007
GC-GH	Hewlett-Packard 5890	2938A25059	HP Chemstation	HP Enviroquant	Organics; Volatiles	1990
GCMS-1A	Agilent Technologies 5973 / 6890N AS 4551A / 4660	CN10314026 / US30945331	HP Chemstation	HP Enviroquant	Organics; Volatiles	2003
GCMS-1B	Agilent Technologies 7890A / 5975C /Teledyne / Tekmar AquaTek AS	CN10845177 / US83111119	HP Chemstation	HP Enviroquant	Organics; Volatiles	2008
GCMS-1C	Agilent Technologies 5973 / 6890N AS 4551 / 4560	CN10425085 / US41746667	HP Chemstation	HP Enviroquant	Organics; Volatiles	2004
GCMS-2A	Agilent Technologies 5973 / 6890N AS Tekmar Solatek 72	CN10314028 / US30945325	HP Chemstation	HP Enviroquant	Organics; Volatiles	2003
GCMS-2B	Agilent Technologies 5973 / 6890N AS 4551A / 4660	CN10441033 / US 43146954	HP Chemstation	HP Enviroquant	Organics; Volatiles	2004
GCMS-2C	Agilent Technologies 5973 / 6890N AS 4551A / 4560	CN10441035 / US 43146953	HP Chemstation	HP Enviroquant	Organics; Volatiles	2004

Equipment (OrganicsLab)	Manufacturer & Description	Serial Number	Operating System	Data Processing Software	Location	Purchase
GCMS-2D	Agilent Technologies 5973 / 6890N AS 4552 / 4560	CN10432038 / US43146771	HP Chemstation	HP Enviroquant	**Organics; Volatiles**	**2004**
GCMS-2E	Agilent Technologies 5975 / 6890N AS 4551A / 4660	CN10612046 / US60532596	HP Chemstation	HP Enviroquant	Organics; Volatiles	2006
GCMS-2H	Agilient Technologies 6890 / 5973	US10123019 / US10440806	HP Chemstation	HP Enviroquant	Organics; Semi-Volatiles	
GCMS-3A	Agilent Technologies 5973 / 6890N AS 4551A / 4660	CN10432042 / US43146776	HP Chemstation	HP Enviroquant	Organics; Volatiles	2004
GCMS-3B	Agilent Technologies 6890 / 5973 / OI 4551A / 4660	US10240044 / US21844015	HP Chemstation	HP Enviroquant	Organics; Volatiles	2002
GCMS-3C	Agilent Technologies 5973 / 6890N AS 45551A / 4660	CN10517038 / US44621480	HP Chemstation	HP Enviroquant	Organics; Volatiles	2005
GCMS-3D	Agilent Technologies 5975B / 6890N AS 4551A / 4660	CN10637120 / US62724193	HP Chemstation	HP Enviroquant	Organics; Volatiles	2006
GCMS -3H	Agilent Technologies 5975B / 6890A/7683	US10250091 / CN24227710	HP Chemstation	HP Enviroquant	Organics; Semi-Volatiles	
GCMS-3V	Agilent Technologies 5975C/7890A/OI 4552/ 4560	US1321790 / CN13141045	HP Chemstation	HP Enviroquant	Organics; Volatiles	2013
GCMS-4B	OI 4660/ OI 4551A/Agilent Technologies 5975C / 7890A	G0444466534P/ F04345BI44/ US10323601 / CN10361158	HP Chemstation	HP Enviroquant	Organics; Volatiles	2010
GCMS-4D	Agilent Technologies 5975C / 7890A	US10237301 / CN10241019	HP Chemstation	HP Enviroquant	Organics; Volatiles	2010
GCMS-4V	Agilent Technologies 5975C/7890A/OI 4100/ 4660	Us13307901 / CN13331029	HP Chemstation	HP Enviroquant	Organics; Volatiles	2013
GCMS-A	Hewlett-Packard 6890 / 5973 MSD / OI 4552 / 4560 ARCHON	US00033272 / US94212183	HP Chemstation	HP Enviroquant	Organics; Volatiles	2000
GCMS-C	Hewlett-Packard 6890 / 5973 MSD / OI 4552 / 4560 ARCHON	2643A122671 / 2807A1146	HP Chemstation	HP Enviroquant	Organics; Volatiles	1990
GCMS-D	Hewlett-Packard 6890 / 5973 MSD / OI 4551 / 4560 ARCHON	US00030551 / US93122843	HP Chemstation	HP Enviroquant	Organics; Volatiles	2001
GCMS-E	Hewlett-Packard 6890 / 5973 MSD / OI 4551 / 4560 ARCHON	US00031161 / US93112044	HP Chemstation	HP Enviroquant	Organics; Volatiles	2001

GCMS-G	Hewlett-Packard 5890ll / 5970 MSD / OI 4552 / 4660	2919A22540 / 2807A11004	HP Chemstation	HP Enviroquant	Organics; Volatiles	1989
Equipment (OrganicsLab)	Manufacturer & Description	Serial Number	Operating System	Data Processing Software	Location	Purchase
GCMS-I	Hewlett-Packard 5890 / 5970 MSD / OI 4551 / 4560	2623A08318 / 2637A01687	HP Chemstation	HP Enviroquant	Organics; Volatiles	1986
GCMS-J	Hewlett-Packard 5890 / 5970 MSD / OI 4552 / 4560 P&T	2643A11557 / 3034A12779	HP Chemstation	HP Enviroquant	Organics; Volatiles	1990
GCMS-K	Hewlett-Packard 5890l1 / 5970 MSD / OI 4551 / 4560 P&T	2750A116838 / 2905A11628	HP Chemstation	HP Enviroquant	Organics; Volatiles	1990
GCMS-N	Hewlett-Packard 5890 / 5970 MSD / Tekmar 2000 / 2032 P&T	2750A17088 / 2716A10218	HP Chemstation	HP Enviroquant	Organics; Volatiles	1988
GCMS-S	Hewlett-Packard 6890 / 5973 MSD /OI 660 ARCHON	US00024322 / US82311313/ H216466453P / 13295	HP Chemstation	HP Enviroquant	Organics; Volatiles	2000
GCMS-T	Hewlett-Packard 6890 / 5973 MSD / OI 4551A / 4660 P&T	US00024323 / US82311482	HP Chemstation	HP Enviroquant	Organics; Volatiles	2000
GCMS-U	Hewlett-Packard 6890 / 5973 MSD / HP 4551A / 4660	US00032623 / US94212203	HP Chemstation	HP Enviroquant	Organics; Volatiles	1999
GCMS-V	Agilent Technologies 5973 / 6890N AS 4552 / 4560	US10149085 / US10441917	HP Chemstation	HP Enviroquant	Organics; Volatiles	2002
GCMS-X	Agilent Technologies 5973 / 6890N AS 4552 / 4660	US21843889 / US10239071	HP Chemstation	HP Enviroquant	Organics; Volatiles	2002
GCMS-Y	Agilent Technologies 5973 / 6890N AS 4552 / 4560	US10240013 / US21844012	HP Chemstation	HP Enviroquant	Organics; Volatiles	2002
GC-PF	Agilent Technologies 6890N AS 4552 / 4560	US10235024 / 12995 / J542460192	HP Chemstation	HP Enviroquant	Organics; Volatiles	2002
PH Meter-13	VWR IS B20	5942	None	None	Sample Management	2010
Balance- Top Load (B-33)	Ohaus Adventure AV412 (B-33)	8028391184	None	None	Sample Management	2007
Balance- Top Load (B-30)	Ohaus Adventurer AV412 (B-30)	8026391160	None	None	Screen	2005

APPENDIX

B STANDARD OPERATING PROCEDURES

FIELD STANDARD OPERATING PROCEDURE #2

UTILITY LOCATING PROCEDURE

The purpose of this procedure is to ensure that all required and appropriate procedures are followed to locate and mark subsurface utilities (e.g., electrical lines, natural gas lines, communication lines) before initiating any intrusive field activities (e.g., drilling, test pits, trenching, excavation). The company's preference, as indicated in our subcontractor agreement templates, is for our contractors to be responsible for both public and private utility mark-outs; this includes contacting the public authority and obtaining a subcontractor for private utility locating services, if needed. Guidance for contractors to follow to conduct a utility clearance is provided in our request for proposal (RFP) template and must be included in all RFP's for intrusive field activities.

In rare circumstances, the company may choose to accept responsibility for clearing utilities, which will require a change to the language of our subcontractor agreement. This assumption of increased liability by the company requires written rationale and approval from the cognizant District Business Leader, with written concurrence from the Chief Operating Officer. The written approvals **MUST** be obtained prior to submitting the Request for Subcontract to Contract Administration.

Compliance with this procedure for projects where the company will be responsible for clearing utilities is mandatory. **ALL** deviations from this standard operating procedure (SOP) **MUST** be approved by the project manager and a District Business Leader, with confirmation from the Chief Operating Officer **BEFORE** beginning intrusive work.

Field personnel have the authority and responsibility to postpone intrusive activities if a contractor has not completed utility clearances to the company's satisfaction; if sufficient information, as stipulated in this SOP, is not available; or, if onsite reconnaissance identifies inconsistencies in the findings of utility locators. In these instances, field personnel must notify the project manager or the health and safety officer, or their designee, before proceeding with the proposed work; approval from a District Business Leader, with confirmation from the Chief Operating Officer, is required before the work commences.

The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities.

2.1 ACRONYMS AND ABBREVIATIONS

HASP	health and safety plan
PSP	project safety plan
RFP	request for proposal
SOP	standard operating procedure

2.2 MATERIALS

- Utility Locating Form (Attachment 1)
- Field book
- Wood stakes
- Spray paint
- Flagging tape
- As-built drawings for sub-grade utilities (if available)
- Hand auger or post-hole digger

2.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel

and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses; and, are properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This procedure is intended to allow the work to proceed safely and minimize the potential for damaging underground and aboveground utilities. Intrusive work includes all activities that require the company's employees or its subcontractors to penetrate the ground surface. Examples of intrusive work include, but are not limited to, hand augering, probing, drilling, injections, test pit excavations, trenching, and remedial excavations.

This SOP assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1).

2.4 PRE-FIELD MOBILIZATION PROCEDURES

Public rights-of-way and private property must be cleared of buried utilities and overhead utilities must be identified before any intrusive work can begin regardless of who is responsible for completing these activities (company or a contractor). The first step in this process is notifying the state public utility locating service of the planned work. These services provide a link between the entities performing the work and the various utility operators (e.g., the water company, the electric company, etc.). All the public utility locating service call centers in the United States have been streamlined under a single "Call Before You Dig" phone number: 811. However, the appropriate state or provincial call center (http://call811.com/811-your-state) will need to be contacted[1].

When the appropriate call center is contacted, information regarding the site (e.g., location, nearest cross street, township, etc.) and work activity (e.g., drilling, excavation) will need to be provided to the operator to aid in locating the likely utilities at the work site. The information provided on the Utility Locating Form (Attachment 1) must be recorded (by the contractor or the company) and a completed copy of this form must be maintained as part of the project file. Be aware that several states, including California, require that the proposed drilling locations be marked with white spray paint before contacting the locating services.

The following information must always accompany the field team during the field project:

- The utility clearance ticket number
- The ticket's legal dig date
- The ticket's expiration date
- Utility providers that were contacted

The ticket number serves as a point of reference for both the utility service providers and for the company or contractor should follow up (e.g., renewing the ticket) with the locating service be required. The legal dig and expiration dates reflect the times when it will be legal to perform the proposed work. Recognize that the legal dig date reflects the lead time necessary, typically between 48 and 72 hours after you call, for the utility service providers to mark the utilities in you work area. Be sure to include this delay when scheduling your work. Most utility clearance tickets expire about 2 weeks after the legal dig date. If your work is delayed beyond the expiration date, the 811 utility locating service will need to be called again and the ticket renewed. The renewed ticket will have a new legal dig date that incorporates the same lead-time (48 to 72 hours) as the original ticket.

[1] Some state or provincial laws require that the person who will be conducting the intrusive work must be the person who places the call to the public utility locating service. This means that the company cannot make this call on the contractor's behalf; the contractor must place the call in those states where required. If there is any doubt about the requirements for the state where a project is located, the relevant state authority must be contacted (http://call811.com/811-your-state).

The locating service will also provide the caller with a list of utility companies that will be notified. Compare this list with utilities generally expected at all sites (e.g., sewer, water, gas, communication, and electric). Some utilities (e.g., sewer, water, cable television) may not be included. If any expected utilities are absent from the contact list, the utilities **MUST** be contacted directly for clearance before the start of intrusive activities. All contacts should be recorded on the Utility Locating Form.

2.4.1 PRIVATE UTILITY LOCATORS AND OTHER SOURCES

Public utility service providers will generally mark their underground lines within the public right-of-way up to the private property boundary. A public utility locating service must be contacted prior to any intrusive work, regardless of whether the intrusive work is located on public or private property. However, be aware that most public utility locating services will not locate utilities on private property. If your work is to be conducted on private property, a private utility locating service **MUST** be used to clear the work area. These companies typically use a variety of methods (e.g., electromagnetic detectors, ground-penetrating radar, acoustic plastic pipe locator, trace wire) to locate utilities in the work area, including those that may be buried beneath onsite buildings. Pseudoscientific methods (e.g., dowsing, divining, witching) are not acceptable utility locating methods.

For all operating facilities and to the extent possible for closed facilities, identify a site contact familiar with the utilities on the property (e.g., plant manager, facility engineer, maintenance supervisor), and provide this individual with a site plan showing the proposed locations of all soil borings, monitoring wells, test pits, and other areas where intrusive activities will be conducted. These individuals often have knowledge of buried structures or process-specific utilities that may not be identified by the private utility locator. This is particularly important for work performed inside industrial buildings where reinforced concrete and other metallic components of the structure may interfere with the scanning devices used by the private utility locator. Ask the site contact for all drawings concerning underground utilities in the proposed work areas for future reference.

Keep in mind that no intrusive work may be done before the legal dig date provided by the state utility locating service and no digging, drilling, or other ground-breaking activities may be begin until all utilities on the list have been marked and visually verified in the work area (see below). It is **NOT ACCEPTABLE** to rely solely on as-built drawings or verbal utility clearances from the site contact (these should be used as guides only). A private locator may not be necessary in rare instances; however, nonconformity with the private locate requirement must be approved by the project manager **AND** a District Business Leader, with confirmation from the Chief Operating Officer.

2.5 SITE MOBILIZATION PROCEDURES

Upon arrival, the first step in determining if you are clear of buried and overhead utilities is to locate all the proposed drilling and trenching locations and mark them with (white) spray paint, stakes, or other appropriate markers. This will help you judge distances from marked drilling and trenching locations to underground and overhead utilities and minimizes any potential misunderstandings regarding the locations between you, the subcontractors (drillers, excavators, private utility locator), and the site contact.

Once you have the proposed work areas marked, verify that ALL utility companies listed by the state public utility locating service, and any contacted directly by the company or the contractor, have either marked the underground lines in the specified work areas or have responded (via telephone, facsimile, or e-mail) with “no conflict.” Document on the Utility Locating Form (Attachment 1) and in the field book as each utility mark is visually confirmed. When receiving verbal clearances by telephone from utility companies, or their subcontractors, it is imperative that you verify the utilities that are being cleared, particularly when dealing with subcontractors that may be marking more than one utility.

Review all available as-built utility diagrams and plans for your general work area and conduct a site walk to identify potential areas where underground lines may be present; include the site contact in these activities. It is a good idea to survey your surroundings during the walk to identify any features that may indicate the presence of underground utilities, such as linear depressions in the ground, cuts in concrete or asphalt, old road cuts, catch basins, or manholes. Keep in mind that many sewer lines can be offset from catch basins. The presence of aboveground utilities, such as parking lot lights or pad-mounted transformers, is also a good indicator of

buried electrical lines. Check these items against the Utility Locating Form checklist and discuss the locations with the private utility locating service.

2.5.1 SAFE WORKING DISTANCES AND HAND CLEARING

A minimum of 5-feet clearance must exist between utilities and proposed drilling locations, and a minimum of 6-feet between utilities and proposed trenching locations. Be aware that some clients, states and localities (e.g., New York City, Long Island) may require greater minimum working distances, depending on the utility (e.g., for high pressure gas mains). A minimum distance of 15 feet must be maintained by heavy equipment (e.g., excavator buckets, drill rig towers and rods) from overhead power lines and a safe distance of 25 feet must be maintained from high-tension overhead power lines. If work must be conducted within 25 feet of high-tension wires, the lines must be wrapped and insulated by the local utilities. Increase these minimum distances whenever possible to offer additional assurance that buried or overhead utilities will not be encountered.

If a utility conflict is identified within the minimum safe clearance distance, adjust the proposed location(s) using the criteria given above. It is recommended to have the private utility locator sweep a relatively large area (e.g., a 20-foot circle around a proposed drilling location) to provide room for adjustment should the proposed drilling or excavation area need to be moved to avoid a buried utility. Subsurface work within five feet of a confirmed or suspected utility or other subsurface structure must be done by nondestructive clearing techniques to the point where either the utility/structure is visually located and exposed, or in the case of soil borings, where the bottom depth of the structure is surpassed and drilling may begin.

Uncertainty may exist in some circumstances (e.g., inside a building) even after the area has been swept for utilities. In these cases, advance the first few feet of a soil boring (or probe the area for excavation) using a hand auger or post-hole digger. If hand digging is unable to penetrate the subsurface soils, soft dig or air knife equipment service providers may be retained to clear the location. This equipment applies high pressure air to penetrate, loosen, and extract subsurface soils in the borehole, thereby safely exposing any utilities. If using either hand digging or soft digging, the probe hole should be advanced a minimum of 5 feet below ground surface at each proposed drilling or excavation location. Complete a sufficient number of probe holes so that the area is cleared for the proposed intrusive activity (i.e., use several holes for a proposed excavation). The use of hand digging or soft digging methods **does not** replace the need for state and private utility locating services.

Protect and preserve the markings of approximate locations of facilities until the work activities are completed. If the markings of utility locations are destroyed or removed before excavation commences or is completed, stop work. Notify the utility company, utility protection service, or the utility locating service to inform them that the markings have been destroyed. Do not continue work until the utilities have been re-marked.

2.5.2 EXPANDED WORK AREAS AND TICKET RENEWAL

Many projects begin with well-defined work areas only to expand quickly as the investigation or remediation progresses. If the scope of intrusion expands or includes new onsite or offsite area(s), you will need to review the existing ticket and work performed by the private utility locator to determine whether work can progress into the new area safely. It may be necessary, depending on the scope, to contact (or for the Contractor to contact) the state locating service and request another clearance for the new area(s) of investigation and retain a private locating service. Remember, the new request will provide a new legal dig date before which NO INTRUSIVE WORK CAN BEGIN. Additionally, if a clearance ticket will expire while the work is ongoing (typically after 2 weeks), a new clearance must be requested before the first ticket expires so that work can continue uninterrupted. Refer to the Utility Locating Form (Attachment 1) for the legal dig date time frame required by the state locating service.

2.5.3 UTILITY DAMAGE

It is possible, even if you followed all the procedures outlined in this SOP, to damage an underground or overhead utility. Assuming it can be done safely, quickly turn off the drilling or excavating equipment, or move the equipment from the damaged line. Avoid contact with escaping liquids, live wires, and open flames. Abandon the equipment, evacuate the personnel from the area, and

maintain a safe perimeter if there are any concerns about safety. If a fiber optic cable is damaged, do not handle the cable or look into the end of the cable as serious eye damage may occur. Once personnel are in a secure location, immediately notify the facility operator or site contact and 811; additionally, send an immediate alert or notification via iSMS and send an email to SafetyTeam@wsp.com. You should also, as applicable, contact your immediate supervisor, human resources and sector management in accordance with company policy. If the damaged utility has the potential to cause, or is causing, dangerous conditions, immediately notify the local emergency response number listed in your HASP or PSP.

** This form is mandatory for all intrusive work, regardless of who is responsible for the public and/or private locate.

Utility Locating Form

Project Name	Project No. and Task	Work being done for (Company or Individual Name)		Project Manager
Office Address	**Office Phone**	**Field Contact**		**Field Contact Phone**
Project Location: Street Address		**City/Township**	**County**	**State**
Nearest Intersecting Street				
Description of Work Area (street working on, which side of street, how far in which direction from nearest intersecting street; etc.)				
Type of Work	**Explosives (Y/N)**	**Directional Borings (Y/N)**	**Dig Locations Marked (Y/N)**	**Mark Type (e.g., stake)**
Scheduled Work Start (Date & Time)	**Estimated Work Stop Date**	**One-call Phone Number/Website Address**		**One-call Service Name**
Call/Web Notification Made By (Name, Title and Company)		**Date & Time of Call/Web Notification**		**Operator Name**
Ticket No.	**Legal Dig Date**	**Ticket Expiration Date**		**Ticket Renewal Date**

Utilities Notified		Complete After Receiving Notification (e.g., e-mail, facsimile) from Utilities or Subcontractor		
		Utilities Present (Y/N)	**Onsite Meeting (Y/N; if "Y" Date & Time)**	**Contact Name and Phone**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Form Completed By (Signature)	
	(e-mail completed page 1 to Project Manager)

** This form is mandatory for all intrusive work, regardless of who is responsible for the public and/or private locate.

Utility Locating Form

Private Utility Locator Information			
Company	**Contact Name**	**Phone**	**E-mail**
Who Contracted Locator?		**Scheduled Start (Date & Time)**	**Contract Executed (Y/N/NA)**

Onsite Visual Confirmation of Utilities			
Marking Color	**Utility Type and Visual Clues**	**Cleared or Marked (Y/N)**	**No Markings - Comments**
Blue	Potable water: fire hydrant, manholes; water meter, ASTs, interior connections, hose bib, valve box		
Yellow	Gas, oil steam, petroleum: gas meter, manholes; yellow bollards, interior connections, valve box		
Red	Electric power lines, lighting cables, parking lot lights, overhead lines (telephone poles), conduits: interior connections, underground vaults, manholes, transformers/switchgear, conduit on buildings		
Green	Sewer and drain lines: underground vaults, manholes, drain grates, leach field, sand mound, no evidence of sanitary sewer (for septic system)		
Orange	Communication, alarm or signal lines, cables or conduits: red/orange bollards, telephone poles, interior connections; manholes; conduit on buildings		
Purple	Reclaimed water, irrigation, and slurry lines: sprinkler heads, hose bibs		
Pink	Survey markings		
White	Proposed locations for excavation and drilling		

Project Manager Notified of any Conflicts? (Y/N)

Notes:

Marks Verified By (Signature)	
	(scan and save to client file)

FIELD STANDARD OPERATING PROCEDURE #3

SAMPLE PACKAGING AND SHIPMENT PROCEDURE

Shipping samples is a basic but important component of field work. The majority of field activities include the collection of environmental samples. Proper packing and preservation of those samples is critical to ensuring the integrity of our work product. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

3.1 ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
IATA	International Air Transport Association
HASP	Health and safety plan
PPE	Personal protective equipment
PSP	Project safety plan
SOP	Standard operating procedure

3.2 MATERIALS

- Suitable shipping container (e.g., plastic cooler)
- Chain-of-custody forms
- Custody seals
- Sample container custody seals (as necessary)
- Mailing address labels (as necessary)
- Shipping form (with account number, as necessary)
- Tape (e.g., strapping, clear packing)
- Permanent marker
- PPE
- Bubble wrap or other packing material

Temperature-preserved samples:

- Large plastic garbage bag
- Wet ice
- Heavy-duty zipper-style plastic bags
- Universal sorbent materials

Note: Some materials will be supplied by the laboratory, while others are must be supplied by the sampler. Confirm supplier of materials prior to mobilizing to the field.

3.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel

and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field standard operating procedures, and the Quality Management System.

This SOP is designed to provide the user with a general outline for shipping samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample collection and quality assurance procedures (SOP 4), and investigation derived waste management procedures (SOP 5).

Most environmental samples are classified non-hazardous materials due to unknown characteristics and hazardous classes, however environmental samples can meet the definition of U.S. Department of Transportation (DOT) hazardous materials when shipped by air, ground, or rail from a project site to the laboratory (e.g., free product, samples preserved with a hazardous material [TerraCore® samplers]). As such, field staff must work with their assigned company compliance professional to determine whether the sample shipment is subject to any specific requirements (e.g., packaging, marking, labeling, and documentation) under the DOT hazardous materials regulations.

3.4 SAMPLE SHIPMENT PROCEDURES

The two major concerns in shipping samples are incidental breakage during shipment and complying with applicable DOT and courier requirements for hazardous materials shipments.

> **NOTE: Many couriers, including Federal Express and United Parcel Service, have requirements that the company register with them before shipping hazard materials. In most cases, it is the sampling location, not the company office address, which needs to be registered. Therefore, each project will likely have unique requirements. Please contact your company compliance professional to determine whether or not you will be required to register for your shipment.**

Protecting the samples from incidental breakage can be achieved using "common sense." Pack all samples in a manner that will prevent them from moving freely about in the cooler or shipping container. Do not allow glass surfaces to contact each other. When possible, repack the sample containers in the same materials that they were originally received in from the laboratory. Cushion each sample container with plastic bubble wrap, styrofoam, or other nonreactive cushioning material. A more detailed procedure for packing environmental samples is presented below.

3.4.1 NON-HAZARDOUS MATERIAL ENVIRONMENTAL SAMPLES

The first step in preparing your samples for shipment is securing an appropriate shipping container. In most cases, the analytical laboratory will supply the appropriate container for bottle shipment, which can be used to return samples once they have been collected. Be sure that the container is large enough to contain the samples plus a sufficient amount of packing materials, and if applicable, enough wet ice to maintain the samples at the preservation temperature (usually 4 degrees Celsius). Use additional shipping containers as needed so that sample containers are protected from breakage due to overcrowding. Do not use lunch-box sized coolers or soft sided coolers, which do not offer sufficient insulation or protection from damage.

3.4.1.1 TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Temperature-preserved samples should be shipped to the laboratory in an insulated container (e.g., cooler). If using a plastic cooler with a drain, securely tape the inside of the drain plug with duct tape or other material to ensure that no water leaks from the cooler during shipment. Place universal sorbent materials (e.g., sorbent pads) in the bottom of the insulated container. The amount of sorbent material must be sufficient to absorb any condensation from the wet ice and a reasonable volume of water from melted wet ice (if a bag were to rupture) or a damaged (aqueous) sample container.

The next step is to line the insulated container with a large, heavy-duty plastic garbage bag. If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples, including a temperature blank, on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between the sample containers. Place large or heavy sample containers on the bottom of the cooler with lighter samples placed on top to minimize the potential for breakage. Place all sample containers in the shipping container right-side up. Do not overfill the cooler with samples; room must be left for a sufficient volume of wet ice. Wet ice must be double-bagged in heavy-duty zipper-style plastic bags (1 gallon-sized, or less); properly seal both bags before placing in the insulated container. Place the bags of ice on top of or between the samples. Place as much ice as possible into the cooler to ensure the samples arrive at the lab at the required preservation temperature, even if the shipment is delayed. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice. Securely close the top of the heavy-duty plastic bag and knot or seal with tape.

3.4.1.2 NON-TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Non-temperature-preserved samples should be shipped to the laboratory in a durable package (e.g., hard plastic container or cardboard box). If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between and on top of the sample containers. Place large or heavy sample containers on the bottom of the container with lighter samples placed on top to minimize the potential for breakage. Place all sample containers within the shipping container right-side up. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice.

3.4.1.3 CONTAINER SHIPMENT

Samples in the container should be cross-checked against the chain-of-custory before signing off on the form and sealing the cooler. Place the original chain-of-custody form (i.e., laboratory copy) into a heavy-duty zipper-style plastic bag, affix/tape the bag to the shipping container's inside lid, and then close the shipping container; as required, include return shipping labels for the laboratory to return company-owned coolers. Only one chain-of-custody form is required to accompany one of the shipping containers per sample shipment; the other coolers in the shipment do not need to include chain-of-custody forms, unless required by the project. At this point, sample shipment preparations are complete if using a laboratory courier.

Once the shipping container is sealed, shake test the shipping container to make sure that there are no loose sample containers. If loose sample containers are detected, open the shipping container, repack the contents, and reseal the shipping container. If sending the sample shipment through a commercial shipping vendor, place two signed and dated chain-of-custody seals on alternate sides of the shipping container lid so that it cannot be opened without breaking the seals. Securely fasten the top of the shipping container shut with clear packing tape; carefully tape over the custody seals to prevent damage during shipping.

Affix a mailing label with the ship to and return to addresses to the top of the shipping container using clear shipping tape. Use the pre-printed return mailing label from the laboratory, if provided, or complete a new mailing label from the shipping carrier. Ship environmental samples to the contracted analytical laboratory using an appropriate delivery schedule. **Note: Samples can be shipped for Saturday delivery once the lab has been verified to be open and receiving samples on the weekend.**

Verify whether the shipment cost should be billed to the sender or recipient, and ensure the internal billing reference section on the mailing label includes either the laboratory's billing reference number, if the shipment is billed to the laboratory, or the project billable number, if the shipment is billed to WSP.

Declare the value of samples on the shipping form for insurance purposes, if applicable. When shipping samples to a lab, identify a declared value equal to the carrier's default value ($100); additional fees will be charged based on a higher value declared. Our preferred carrier, Federal Express, will only reimburse for the actual value of the cooler and its contents if a sample shipment is lost; they will not reimburse for the cost of having to re-collect the samples. [Please note: if you are shipping something other than samples, such as field equipment, declare the replacement value of the contents.]

Record the tracking numbers from the shipping company forms (i.e., the airbill number) in the field book and retain a copy of the shipping airbill. On the expected delivery date, confirm sample receipt by contacting the laboratory or tracking the package using the tracking number; provide this confirmation information to the project manager.

> **NOTE: Most shipping carriers adhere to transit schedules with final pickup times each day; these schedules are subject to change and vary by service location. If shipping containers are dropped off at a service location after the final pickup time, transit to the laboratory will not be initiated until the following day, and samples may not be properly preserved. Therefore, confirm transit schedules in advance of each sampling event, and ensure samples are delivered to the carrier before the final pickup time of the day.**

3.4.2 HAZARDOUS MATERIALS SAMPLES

Employees rarely ship hazardous materials due to DOT shipping requirements. If you find that your samples could be considered a DOT hazardous material, first coordinate with the assigned company compliance professional and project manager to make a hazardous material classification and, if necessary, establish the necessary protocols and to receive the appropriate training/certification.

> **NOTE: Employees shipping samples regulated as hazardous materials or exempt hazardous materials by air must have International Air Transport Association (IATA) training. IATA training is a separate training required in addition to DOT hazardous materials training for such shipments. Most of our employees do not have IATA training and therefore, anyone who needs to ship by air MUST consult with a company IATA-trained compliance professional.**

FIELD STANDARD OPERATING PROCEDURE #4

SAMPLE COLLECTION AND QUALITY ASSURANCE PROCEDURE

The purpose of this procedure is to assure that sample volumes and preservatives are sufficient for analytical services required under U.S. Environmental Protection Agency (EPA) or other agency approved protocols. This operating procedure describes sample identification procedures, sampling order for select analytes, quality control and quality assurance (QA/QC) sampling procedures, and custody documentation. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

4.1 ACRONYMS AND ABBREVIATIONS

ºC	degrees Celsius
COC	chain-of–custody [form]
DI	laboratory-grade, analyte-free deionized water
DOT	US Department of Transportation
EDD	electronic data deliverable
EPA	US Environmental Protection Agency
HASP	health and safety plan
ID	identification [number]
MS/MSD	matrix spike and matrix spike duplicate
MSA	master services agreement
PPE	personal protective equipment
PSP	project safety plan
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
SOP	standard operating procedure
VOCs	volatile organic compounds

4.2 MATERIALS

- Field book
- Indelible (waterproof) markers or pens
- PPE
- Sampling containers and labeling/shipping supplies

- Deionized (DI) water
- Cleaned or dedicated sampling equipment

4.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for collecting environmental and quality assurance samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), investigation derived waste management procedures (SOP 5), and equipment decontamination (SOP 6). This SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics are more appropriately addressed in a site-specific work plan or a dedicated quality assurance project plan (QAPP). This SOP does not include an special handling requirements for specific parameters such as low-level mercury or per- and polyfluoroalkyl substances. These requirements should be included in the QAPP.

4.4 SAMPLE IDENTIFICATION PROCEDURES

All sample containers (e.g., glass bottles, plastic jars, foil bags, plungers, etc.) should be identified by an affixed sample label. Unless otherwise approved by your project manager or specified in your site-specific work plan/QAPP, information on the sample container labels must include the site/project name, project/task number, unique alpha-numeric sample identification (ID) number, sample collection date, time of collection using the military or 24-hour clock system (i.e., 0000 to 2400 hours), analytical parameters, preservative, and the initials of the sampling personnel. Employees are advised to use pre-printed waterproof mailing labels (e.g., Avery® 5xxx-series Waterproof Address Labels) for all sample identification. Electronic label templates are available.

The sample identification (ID) number must, unless otherwise approved by your project manager or specified in your site-specific work plan/QAPP, follow the company's naming protocol. This protocol was developed to aid in determining the type of sample collected (e.g., soil, groundwater, vapor, etc.), the sample location, and, where appropriate, the sample depth. This protocol was also designed to ensure consistency across the company.

Construct sample IDs in the following format:

SB-10A (4-6)

Where, in this example:

- SB = the first two or three characters will define the sample type (see list of approved prefixes below); in this case, a soil boring
- 10A = the next two or three alpha-numeric digits (separated by a dash from the sample type identifier) indicate the location of the boring on the site; in this case, boring number 10A
- (4-6) = the depth the sample was collected, with the first number (including decimals, if necessary) indicating the top of the sample interval (in feet) and the second number indicating the bottom of the sample interval (in feet); not all sample types will include depth information.

Additional label information may be added after the last character of the sample ID number (e.g., sample date, underground storage tank number, area of concern number, "Area" number, client identifier, etc.). Separate any additional information from the required portion of the sample name by dash(es).

Sample Prefix	Permitted Use
AA	Ambient outdoor air sample
CC	Concrete core/chip sample
CS	Confirmation/verification soil sample collected from an excavation
HA	Soil sample collected with a hand auger
IAB	Indoor air sample – basement
IAC	Indoor air sample – crawl space
IAF	Indoor air sample – first floor
MW	Soil sample collected from a monitoring well borehole or a groundwater sample collected from a monitoring well
PZ	Groundwater sample collected from a piezometer
SB	Soil sample collected from boreholes that will not be converted to monitoring wells
SED	Sediment sample
SG	Soil gas sample other than a sub-slab sample (e.g., sample collected from a temporary or permanent polyvinyl chloride sample point or stainless steel screen implant)
SL	Sludge sample
SS	Surface soil sample collected using hand tools (e.g., trowel, spoon, etc.) and typically at depths less than 2 feet below ground surface
SSV	Sub-slab vapor sample
SW	Surface water sample
TC	Tree core sample
TP	Soil sample collected from a test pit
WC	Waste characterization sample
WP	Wipe sample
WW	Wastewater

4.5 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

The first step in sample collection is to verify that the correct number and type of sample containers were provided, and that each contains the appropriate preservatives for the proposed project (i.e., check against the sampling plan requirements outlined in the site-specific QAPP or, for those projects without a site-specific QAPP, the laboratory Task Order). Inspect all containers and lids for flaws (cracks, chips, etc.) before use. Do not use any container with visible defects or discoloration. Report non-receipt and any discrepancies of specific types of sample containers to the team leader or project manager immediately. Make arrangements to have missing or additional sampling containers provided on an expedited basis.

Precautions must be taken to prevent cross-contamination and contamination of the environment when collecting samples. Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***In no case should gloved hands be used as a sampling device: always use the appropriate sampler to move the sample from the sampling device to the laboratory-supplied containers.***

Sample collection must follow all appropriate SOPs, state and federal regulations, or guidance, for the collection of environmental samples; the recommended order of sample collection is:

- Geochemical measurements (e.g., temperature, pH, specific conductance)
- Volatile organic compounds (VOCs)
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Per- and Polyfluoroalkyl substances
- Total metals
- Dissolved metals
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Fill the sample bottles to the appropriate level for the parameter analyzed including eliminating head space, as appropriate. Collected samples that require thermal preservation must be immediately (within 15 minutes) placed in a cooler with wet ice and maintained at a preservation temperature of 4° Celsius (ºC).

4.6 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Field quality assurance/quality control (QA/QC) samples may include equipment blanks, trip blanks, temperature blanks, duplicates, matrix spike and matrix spike duplicate samples, field blanks, and split samples. The project manager or QAPP must specify the type and frequency of QA/QC sample collection. The QA/QC sample identification number must, unless otherwise approved by your project manager or specified in your site-specific work plan, follow the company's naming protocol as discussed in the sections below. QA/QC samples must be clearly identified on our copy of the chain-of-custody (COC) form (described below) and in the field book. Failure to properly collect and submit required QA/QC samples can result in invalidation of an entire sampling event.

Several blanks, discussed below, require laboratory-grade analyte-free, deionized water (DI) be used. Only if all options to obtain laboratory-grade DI have been exhausted should store-grade distilled water be used to prepare blanks. If store-grade distilled water is used, be sure to record the source and lot number in the field book.

Collect, preserve, transport and document split samples using the same protocols as the related samples.

4.6.1 EQUIPMENT BLANKS

Equipment blanks, or rinsate blanks, are used to document contamination attributable to using non-dedicated equipment (i.e., equipment that must be decontaminated after each use). Collect equipment blanks in the field at a rate of one per type of sampling equipment per day, unless otherwise specified. If the site-specific work plan or QAPP indicates that an equipment blank is to be collected from dedicated sampling equipment, collect the equipment blank in the field before sampling begins. If field decontamination of sampling equipment is required, prepare the equipment blanks after the equipment has been used and field-decontaminated at least once.

Prepare equipment blanks by filling or rinsing the pre-cleaned equipment with DI and collecting the rinsate in the appropriate sample containers. Record the type of sampling equipment used to prepare the blank and how the equipment blank was generated in the field book. Decontamination of the equipment following equipment blank procurement is not required.

The samples must be labeled, preserved, and filtered (if required) in the same manner as the environmental samples. Have the equipment blanks analyzed for all the analytes for which the environmental samples are being analyzed, unless otherwise specified. Designate equipment blanks using "EB", followed by the date, and in the order of equipment blanks collected that day. For example, the first equipment blank collected on July 4, 2015, would be designated EB070415-1.

4.6.2 TRIP BLANKS

Trip blanks are used to document VOC contamination attributable to shipping and field handling procedures. Trip blanks are only required when analyzing samples for VOCs. The blanks are prepared by the analytical laboratory and shipped along with the empty sample containers. These pre-filled blanks should accompany the environmental sample containers wherever they are stored onsite (i.e., keep the trip blank sample bottles in the same shipping container used to ship and store VOC sample bottles during the sampling event). Never open the laboratory-supplied trip blank sample bottles. Only as a last resort, store-grade distilled water, can be poured into empty VOC sample bottles to generate event-specific trip blanks (or augment the laboratory-supplied ones, if they are provided in insufficient numbers).

The trip blanks, even those provided by the analytical laboratory, should be labeled in the field like other environmental samples collected during the investigation activities. Identify trip blanks using the prefix "TB", followed by the date. For example, the trip blank shipped with a cooler of samples on July 4, 2019, would be designated TB070419-1. If a second trip blank is needed on that same day, the designation would be TB070419-2. A minimum of one trip blank should accompany each shipping container of VOC samples, unless more stringent project requirements are in place. The number of trip blanks needed per shipment can be minimized by shipping all the VOC samples in the same shipping container (if possible).

4.6.3 FIELD BLANKS

The field blank is analogous to the trip blank in that it is designed to assess and document any contamination to the environmental samples that can be attributable to the (ambient) field conditions. Not all projects require the use of field blanks. Their use, if required, and the frequency of collection (often 1 blank per 10 or 20 environmental samples collected) is detailed in the QAPP and the site-specific work plan. The sample is collected by pouring DI water into empty glassware at the site during the sampling event. The intent is to expose the field blank to the same conditions in the atmosphere as those present when the environmental samples were collected.

Identify field blanks using the prefix "FB", followed by the date. For example, the field blank shipped collected on August 22, 2019, would be designated FB082219. If a second field blank is needed on that same day, the designation would be FB082219-2. At least one field blank should be collected for each analytical parameter identified in the sampling event.

4.6.4 TEMPERATURE BLANKS

Temperature blanks are used to determine if the samples are at the appropriate temperature for preservation at the time the sample container (cooler) is received by the analytical laboratory. The temperature is determined by measuring the temperature blank, which provides a proxy for the temperature of the sample container upon arrival at the laboratory. These temperature blanks are typically provided by the laboratory and should be included in each sample cooler used to ship and store the sample bottles during the sampling event. If laboratory-provided temperature blanks are not available, fill a clean, unpreserved sample bottle with potable, DI, or store-grade distilled water and identify the bottle as a temperature blank.

4.6.5 DUPLICATES

Duplicate samples, which are used for measuring the variability and documenting the precision of the sampling process, should be collected at a rate of at least 1 duplicate per 20 environmental samples collected, unless specific project requirements (as detailed in a QAPP) are in place. Be sure that the location selected for duplication has sufficient sample volume and is within the area of contamination, if known. Under no circumstances can equipment or trip blanks be used as duplicates.

Collect each duplicate sample at the same time, from the same sample aliquot, and in the same sampling order (i.e., volatile organic compounds, then semivolatile organic compounds, then inorganics, etc.) as the corresponding environmental sample. Sample bottle aqueous duplicate samples, for example, should be alternately filled with the environmental sample bottles (i.e., the actual sample bottle and the bottle to be used for the duplicate) from the same sampling device. If the sampling device does not hold enough volume to fill the sample containers, fill the first container with equal portions of the sample, and pour the remaining sample into the next

sample containers. Obtain additional sample volume and pour the first portion into the last sample container, and pour the remaining portions into the first containers. Continue with these steps until all containers have been filled.

Duplicate samples will be assigned arbitrary sample ID and a false collection time so that they are not identified as duplicates by the laboratory (i.e., submit the duplicates samples as *blind* to the lab). The blind duplicate sample "location designation" will be left up to the project manager; however, in no case will "Dup" be allowed to appear in the sample name. The duplicate samples should be analyzed for the same analytes as the original environmental sample. Be sure to record the sampling method, duplicate sample ID, the false time, and the actual time of collection in the field notebook. The duplicate should also be indicated in separate documentation, such as on our carbon copy of the chain-of-custody (i.e., the yellow copy), and not on the original chain-of-custody that accompanies the samples to the laboratory.

4.6.5 MATRIX SPIKE AND MATRIX SPIKE DUPLICATES

Matrix spike and matrix spike duplicate samples (i.e., MS/MSD samples) are used to determine the bias (accuracy) and precision of an analytical method for a specific sample matrix. Many of the company's projects require the collection of MS/MSD samples; however, laboratory generated MS/MSD samples are sufficient for some projects (as detailed in the QAPP or site-specific work plan). Collect MS/MSD samples at a rate of 1 MS and 1 MSD (i.e., 2 samples) for every 20 environmental samples, unless more stringent project requirements (as detailed in a QAPP) are in place. Clearly convey the MS/MSD identity to the laboratory by adding "MS" or "MSD" after the sample name (e.g., MW-01MS) and/or in the comments section of the chain-of-custody on the same line as the parent sample. Under no circumstances can equipment or trip blanks be used as MS/MSD samples.

4.6.6 SPLIT SAMPLES

Split samples may be collected as a means of determining compliance or as an added measure of quality control. Split samples measure the variability between laboratories and not the variability of sample collection and laboratory procedures (i.e., they are not equivalent to duplicate samples). The split samples must be subsamples of the same parent material used for the environmental sample: soil should be collected from the same in-place material (for VOCs) or, for non-discrete samples, the same mixing vessel after homogenization. Collect aqueous split samples using the same alternating bottle approach detailed in the duplicate sample description above. These procedures will ensure that the split samples are valid and are representative of the environmental sample collected as part of the investigation.

Collecting split samples of soil, sediment, waste, and sludge is not recommended because the homogenization necessary for a true split sample in these matrices is not possible and the resulting laboratory results would not be comparable.

Spilt samples should have the same sample location designation (e.g., MW-01, SB-03 (4-6), but are differentiated from each other by inserting the laboratory analyzing or the agency/consultant collecting the sample after the sample location (e.g., MW-01-WSP and MW-01-EPA).

4.7 CUSTODY DOCUMENTATION

Sample custody protocols are used to demonstrate that the samples and sample containers were handled and transferred in such a manner as to prevent tampering. Legal COC begins when the pre-cleaned sample containers are dispatched to the field from the laboratory and continues through sample analysis and eventual disposal of the sample and sample containers. Maintaining custody requires that samples must be in the actual possession or view of a person who is authorized to handle the samples (e.g., sample collector, laboratory technician, etc.), secured by the same person to prevent tampering, or stored in a designated secure area.

It is a good idea to limit, to the extent possible, the number of individuals who physically handle the samples. Samples must be placed in locked storage (e.g., locked vehicle, locked storeroom, etc.) when not in the possession or view of authorized personnel. Do not leave samples in unoccupied motel or hotel rooms or other areas where access cannot be controlled by the person(s) responsible for custody without first securing samples and shipping or storage containers with tamper indications in place (i.e., custody seals).

The COC form is used to trace sample possession from the time of collection to receipt at the analytical laboratory. It is recommended that the company's COC be used rather than the laboratory-supplied COC form to ensure that all necessary data are recorded. Submit one COC form per sample shipment, unless more stringent project requirements are in place (as detailed in the QAPP or site-specific work plan). The COC needs to have a unique COC number (pre-printed on the form), accompany all the samples, and include all appropriate project-specific information, such as:

- Project number, name, and location
- Sampler's printed name(s) and signature(s)
- Sample identification number
- Date and time (using the 24-hour clock) of collection
- Sample matrix (e.g., soil, aqueous, solid, etc.)
- Total number of containers per sample
- Parameters requested for analysis including number of containers per analyte.
- Remarks (e.g., irreducible headspace, field filtered sample, expected concentration range, specific turn-around time requested, etc.)
- Signatures of all persons involved in the chain of possession in chronological order
- Requested turn-around-time
- Name and location of analytical laboratory
- Custody seal numbers
- Shipping courier name and tracking information
- Internal temperature of shipping container upon shipment to laboratory, as needed
- Internal temperature of shipping container upon delivery to laboratory
- Employee contact information

Affix custody seals to all storage and shipping container closures when transferring or shipping sample container kits or samples to an off-property party. Place the seal so that the closure cannot be opened without breaking the seal. In the field book, record the time, date and signatures of responsible personnel affixing and breaking all seals for each sample container and shipping container. Affix new custody seals every time a seal is broken until continuation of evidentiary custody is no longer required.

FIELD STANDARD OPERATING PROCEDURE #5

INVESTIGATION DERIVED WASTE MANAGEMENT PROCEDURE

The purpose of this standard operating procedure (SOP) is to provide instructions for handling, storing, and managing investigation derived waste (IDW) pending disposal. All IDW, which includes (but is not limited to) soil cuttings, development water, purge water, drilling fluids, decontamination fluids, personal protective equipment (PPE), and sampling equipment, must be managed in compliance with applicable or relevant and appropriate requirements. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper PPE must be selected and used appropriately.

5.1 ACRONYMS AND ABBREVIATIONS

DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
IDW	investigation derived waste
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PSP	project safety plan
RCRA	Resource Conservation and Recovery Act
SOP	standard operating procedure
TSCA	Toxic Substances Control Act

5.2 MATERIALS

- Pre-printed weatherproof waste labels (e.g., non-hazardous waste, hazardous waste, polychlorinated biphenyls [PCBs], etc.)
- IDW log (Figure 1)
- Permanent ink marking pen, paint, stick/pen
- Sampling equipment (refer to sampling SOPs)
- Impermeable covers (tarps), as needed
- Duct tape, rope, or other material to secure tarp
- Copy of the waste manifest or bill of lading

5.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version

of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field standard operating procedures, and the Quality Management System.

This SOP is designed to provide the user with a general outline for handling, storing, and managing IDW pending disposal and assumes the user has received current U.S. Department of Transportation (DOT) training, Hazardous Waste Operations and Emergency Response training, and Resource Conservation and Recovery Act (RCRA) training (if required) and is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), and equipment decontamination (SOP 6). The SOP does not cover investigation planning; DOT, RCRA, and Toxic Substances Control Act (TSCA) regulations; nor does it cover the evaluation of the analytical results. **Consult and involve the company's compliance professionals during all phases of IDW management and disposal.**

It is important to note that information contained in this SOP is based on federal regulations and interpretive guidance provided by the U.S. Environmental Protection Agency (EPA) and other federal regulatory sources; therefore, information provided in this SOP may be superseded by state or local-specific statutes or regulations. Field personnel must plan for and discuss the handling procedures with the project manager and assigned company compliance professional before mobilizing to the field.

5.4 IDW GENERAL PROCEDURES

Nearly all intrusive field activities will generate solid or liquid wastes. Examples include:

Solid Waste

- Soil cuttings
- Drilling mud
- Plastic sheeting
- Spent carbon or filters
- PPE (e.g., Tyvek coveralls, gloves, respirator cartridges)
- Disposable or dedicated sampling equipment (e.g., bailers, hoses, clamps, buckets, cartridge filters)
- Field analytical waste (e.g., HACH kits, Chlor-n-Soil kits, Gastech tubes)
- Compressed gas cylinders (e.g., isopropylene, helium)
-
- Disposable cleaning materials (e.g., wipes or rags)

Liquid Waste

- Decontamination water
- Development water
- Drilling fluids
- Purge water
- Soap or wash solutions
- Reagents (e.g., hexane, nitric acid, methanol)

The specific procedures for dealing with these materials after the field activities have been completed will vary depending on whether the materials are considered to be non-hazardous, RCRA hazardous (characteristic or listed wastes), TSCA-regulated PCB waste, and/or DOT hazardous materials. The characterization of the wastes to be generated should be determined in conjunction with a company compliance professional before the field event occurs, based on previously generated data; however, in some cases, particularly for new sites, the status of the wastes may not be known. In these cases, handle IDW as hazardous waste until the status can be verified. Field personnel must consult their assigned company compliance professionals for assistance in proper waste characterization and to determine waste management requirements applicable to the site.

5.4.1 WASTE MINIMIZATION

As possible, select investigation methods and techniques that will minimize the amount of wastes generated during field activities, particularly if the IDW is hazardous. Examples include using direct-push methods instead of hollow stem augers (to minimize soil cuttings) during a soil investigation, if appropriate, eliminating the use of solvents or solvent-based cleaners for decontamination, if

possible, and limiting contact with the materials to reduce the amount of PPE required. Minimizing the amount of waste generated will reduce handling requirements and overall project costs, and is consistent with the company's corporate goals for sustainability.

5.5 ONSITE IDW MANAGEMENT PROCEDURES

Onsite handling procedures typically involve containerization of the IDW for offsite disposal at a regulated facility or, in the case of certain non-hazardous wastes, onsite disposal. Should more than one waste stream be present onsite, segregate the IDW containers by waste stream to facilitate the future waste disposal. The procedures for each type of waste are presented below.

5.5.1 NON-HAZARDOUS WASTE MANAGEMENT

If the IDW is classified as non-hazardous waste, the following procedures must be implemented only if approved by the applicable regulatory agency and after being discussed and approved by the project manager, project compliance professional, client, and facility personnel:

- Soil can be either:
  - spread around the borehole or other onsite location
  - placed back in the boring or excavated test pit
  - containerized and disposed of offsite
- Groundwater and decontamination fluids can be either:
  - poured onto the ground next to the well to allow infiltration
  - discharged to either the publically-owned treatment works or storm sewer
  - discharged to the onsite wastewater treatment plant
  - containerized and disposed of offsite
- After rendering the IDW unusable (e.g., cutting or tearing material), PPE, plastic sheeting, disposable cleaning materials, and spent bag filters can be double bagged and disposed of as general trash or containerized and disposed of offsite.
- Compressed gas cylinders should be depressurized and disposed of as general trash, recycled as scrap metal, or containerized and disposed of offsite.
- Field analytical waste (e.g., HACH® kits, Chlor-n-Soil® kits) can be disposed of in accordance with the manufacturer's instructions provided the disposal method is approved by the company's project manager and compliance professional.
- Minimize the volume of reagents as much as possible. Consult a company compliance professional to determine the proper disposal of any quantity of unused reagents. Empty reagent containers may be disposed of as general trash after removing all chemical name and warning labels, or may be containerized and disposed of offsite.
- Spent water treatment media (e.g., carbon, resin) should be containerized and disposed of offsite.
- Exploration and production exempt waste derived from material that was downhole at an oil and gas production site.

If the IDW is containerized and is classified as non-hazardous, the following procedures will apply:

- Place the non-hazardous IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are in good condition and will not leak.
- Drums used as containers must remain closed except when adding, sampling, or inspecting the waste. The drums cannot be used as a work surface once waste is put in the container.
- Mark the container with the appropriate waterproof, self-adhesive non-hazardous waste label. The label must include a description of the contents of the container (e.g., soil cuttings, purge water) and the generator name (the client or the facility, never the company). **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- The IDW containers must be properly closed, wiped clean, and stored in a secure onsite location.

5.5.2 HAZARDOUS WASTE MANAGEMENT

If site data or generator knowledge indicates that the IDW is RCRA hazardous, the following procedures will apply:

- Place IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are appropriate for the type of IDW generated (e.g., solid in containers authorized for transport of solids), in good condition and will not leak.

- Containers must remain closed except when adding, sampling, or inspecting the material. The containers cannot be used as a work surface once waste is put in the container.
- Mark the container with an appropriate waterproof, self-adhesive hazardous or radiological waste label. The label must include the accumulation start date, a description of the contents of the container (e.g., soil cuttings, purge water), the EPA identification number, the generator name (the client or the facility, never the company), and the hazardous waste codes, if known. **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- The IDW containers must be properly closed, wiped clean, and stored in a secure onsite location (i.e., a designated facility hazardous waste storage area) to limit access. At a minimum, place the drums on an impermeable surface (if available) in an area of limited access. If stored outside, cover the containers with a secured tarp at the end of each field day until the containers are picked up for disposal.
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- If applicable, ensure that weekly inspections are conducted, and the proper inspection forms for documentation are completed during the entire time the waste is stored onsite. **Field personnel must consult the project compliance professional for help to determine if weekly inspections are required.**

If the IDW is presumed to be hazardous and sampling is required to confirm its classification, it must be labeled "Hazardous Waste-Pending Analysis" and sampled for the parameters specified by the project compliance professional or project manager before leaving the site. Any waste confirmation samples must be collected in accordance with the company's SOPs. Treatment, storage, and disposal facilities will usually specify the required analysis for waste profiles.

5.5.3 PCB WASTE MANAGEMENT

If information exists to classify PCB-containing IDW as TSCA-regulated IDW (i.e., PCBs greater than 50 milligrams per kilogram), the following procedures must be implemented:

- Place the PCB-containing IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are in good condition and will not leak.
- Containers must remain closed except when adding, sampling, or inspecting the material. The containers cannot be used as a work surface once waste is put in the container.
- Mark the container with an appropriate waterproof, self-adhesive yellow label with the words "Caution Contains PCBs", the "removed from service" date (the accumulation start date), and a description of the contents of the container (e.g., soil cuttings). Complete the label with the name and phone number of the company personnel to contact in the event of an accident or spill. **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- The IDW containers must be properly closed, wiped clean, and stored in a secure PCB storage area onsite. If a PCB storage area is not available, construct a temporary PCB storage area. Cover the containers with a secured tarp at the end of each field day until the drums are picked up for disposal. Place one yellow 6" x 6" "Caution Contains PCBs" label on the outside of the tarp, and note the "Removed from service date" on the label.
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- If applicable, inspect the area and the containers for leaks once every 30 days in accordance with TSCA requirements during the entire period the waste is stored onsite. **Field personnel must consult the project compliance professional for help to determine if weekly inspections are also required.**

5.6 POST-FIELD IDW MANAGEMENT ACTIVITIES

Field personnel must follow up on the management of the IDW after returning from the field. RCRA hazardous and TSCA-regulated PCB-containing wastes have storage time limits and periodic inspection requirements to remain in compliance with federal, state, or local regulations. Arrangements for proper disposal of wastes must be made within the required time limits and must be consistent with all applicable regulatory requirements, as well as the company's contracting procedures and policies for waste disposal. Copies of waste disposal documentation (e.g., bill of lading, waste manifest, land disposal restriction form, etc.) should be provided to the project manager and saved with the project files.

INVESTIGATION DERIVED WASTE LOG

Date/Time:_____

Site Information:
Site Name: _____ Site EPA ID #: _____
Site Contact: _____ Site Address: _____
Site Contact Telephone No: _____

Origin of Material: _____
Type of Waste Generated:
- ☐ Soil Cuttings ☐ PPE ☐ Decontamination Water
- ☐ Groundwater ☐ Storm Water ☐ Drilling Fluids
- ☐ Other (Describe): _____

Field Activities that Generated the Waste:
- ☐ Soil Borings ☐ Well Sampling ☐ Well Installation
- ☐ Decontamination ☐ Excavation ☐ Pumping Tests
- ☐ Other (Describe): _____

Generation Date: _____ ***90/180/270-Day Deadline(for hazardous waste)***: _____
Quantity of Waste Generated and Container Type: _____
_____
Storage Location: _____
Waste Identification:
- ☐ Non-hazardous Waste (pending analysis)
- ☐ Non-hazardous Waste (based on site information or generator knowledge)
- ☐ Hazardous Waste (pending analysis)
- ☐ Hazardous Waste (based on site information or generator knowledge)
- ☐ PCB-containing Waste
- ☐ Radiological Waste

If generator knowledge or site information was used for identification, explain: _____
_____
_____
Type of Label Applied to Container: ☐ Non-hazardous ☐ Hazardous ☐ PCB ☐ Radiological
WSP Information (Note: One copy to site contact - the original copy to project manager)
Personnel/Contact: _____ Project No.:_____
Telephone: _____

Date Removed: _____ Signature: _____

FIELD STANDARD OPERATING PROCEDURE #6

DECONTAMINATION PROCEDURE

The decontamination procedures outlined in this standard operating procedure (SOP) are designed to ensure that all sampling equipment is free from the analytes that could potentially interfere with sample results. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

6.1 ACRONYMS AND ABBREVIATIONS

DI	deionized water
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure

6.2 MATERIALS

- Field book
- PPE
- Polyethylene sheeting and/or garbage bags
- Laboratory-grade non-phosphate detergent[1] (e.g., Luminox® or Liquinox®)
- Cleaning reagents, as needed (e.g., isopropyl alcohol, methanol, hexane, nitric acid)
- Potable water
- Deionized (DI) water
- Containers (e.g., plastic buckets)
- Bristle brushes
- Aluminum foil
- Spray bottles
- Paper towels
- Pressurized steam cleaner (e.g., steam jenny), as needed
- Waste collection containers (e.g., drums), as needed
- Decontamination pad, as needed

6.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel

[1] Not all laboratory-grade detergents are phosphate free. Be sure to verify the detergent's phosphate content before use.

and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for decontamination and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), and investigation-derived waste management procedures (SOP 5). All decontamination references must be available for consultation in the field, including:

- Company's SOPs
- Applicable state and federal guidelines or procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

6.4 GENERAL PROCEDURES

The cleaning and decontamination procedures described below are designed to ensure that the equipment used for sample collection is free of analytes that could potentially alter the analytical results. These procedures are primarily targeted at preventing the incidence of cross-contamination (i.e., compounds of interest being transferred on the sampling equipment from one sample to another) in order to produce high quality, representative sample results. As with all analytical sampling, the effectiveness of the cleaning procedures must be demonstrated with the collection of equipment blanks; equipment blank sample collection procedures and frequency are discussed in SOP 4.

6.4.1 EQUIPMENT AND REAGENT SELECTION

It is important for employees to evaluate the expected types of contamination before mobilization to a site. State programs (or the U.S. Environmental Protection Agency [EPA], depending on the site) may require more stringent decontamination procedures than those listed in this SOP, specify the types and grades of various cleaning detergents and reagents (e.g., acids and solvents), or allow the use of phosphate-containing detergents, such as Liquinox® liquid detergent (preferred[2]) or the powdered Alconox®. Decontamination equipment (e.g., spray bottles, brushes, etc.) should be constructed of non-reactive, non-leachable materials (e.g., metal, glass, Teflon®-coated, polyethylene, etc.) which are compatible with the reagents and solvents being used for decontamination.

Many of the cleaning reagents (e.g., nitric acid, hexane, methanol) are U.S. Department of Transportation (DOT) hazardous materials and must be shipped using a ground delivery service. The Safety Data Sheets (SDSs) for any hazardous cleaning reagents to be used onsite must be reviewed before the commencement of work, and the potential hazards and protective measures to be employed must be addressed in the HASP. Do not use decontamination liquids that have been improperly stored (e.g., unsealed containers).

In specific cases, it may be necessary to steam clean the field equipment before proceeding with the decontamination steps presented in Section 6.5 (e.g., hollow stem augers). Generally, the company's subcontractors are responsible for bringing or building a decontamination pad, if necessary, to contain the spray from a steam jenny. As possible, decontamination pads should be constructed on a level, paved surface in an area known or believed to be free of surface contamination, and should be of sufficient size to contain the decontamination water. Equipment that is steam cleaned should be placed on racks or saw horses and not on the floor of the

[2] Liquinox® liquid detergent, manufactured by Alconox, Inc., is phosphate-free and does not contribute to nutrient loading or algae blooms in the environment.

decontamination pad. Decontamination water should be removed from the decontamination pad frequently to minimize the potential for leaks or overflow.

Consult and involve the company's compliance professionals for storage procedures and disposal requirements of cleaning reagents, detergents, wastes, and other decontamination-related materials.

6.4.2 OTHER CONSIDERATIONS

In preparing for decontamination, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify a decontamination (pad) area and evaluate the accessibility to and safety of the location.
- If working in a hazardous waste exclusion area, the decontamination area should be located in the contaminant reduction zone.
- Record a description of the decontamination (pad) area.

Survey the breathing zone around the decontamination area with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate. When decontaminating equipment, it is important to find a suitable location away from any sources of cross-contamination that could compromise the integrity of the decontamination. As possible, position the decontamination area away from fuel-powered equipment, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling).

6.5 DECONTAMINATION PROCEDURES

The decontamination procedures described below are a four- to nine-step process, depending on the the applicable federal or state guidelines, the project-specific work plan, or the QAPP. Sampling activities must be initiated with clean, decontaminated equipment. Decontaminate all non-dedicated equipment that contacts the sample directly (e.g., spoons, trowels, pumps), before and between each sample location and sampling interval. record decontamination procedures in the field book. Disposable, single use items, such as bailers or tubing, do not require decontamination.

The decontamination process includes the following four basic steps:

1. Physical removal of soil or debris
2. Wash with non-phosphate detergent, such as Liquinox®, and nylon brush
3. Potable water rinse
4. Laboratory-supplied deionized (DI), analyte-free water rinse (distilled water can be used as a substitute, if necessary)

The first step is to remove as much soil or other debris from the sampling device as possible near the sampling area to limit the spread of potentially-contaminated materials into clean areas of the site. Containerize all soil or debris in DOT-compliant containers in accordance with SOP 5 or the project-specific work plan. Dispose of all wastes in conformance with the project-specific work plan and applicable regulations.

Cleaning and decontamination should occur at a designated area(s) (i.e., decontamination pad) on the site. If gross contamination or an oily film or residue is observed on the equipment, use a steam jenny or wash by hand, using a brush, to remove the particulate matter or surface film. Heavy oils or grease may be initially removed with paper towels soaked with isopropyl alcohol.

The physical removal of debris process is followed by soaking (a simple dunk of the equipment is insufficient) and hand scrubbing the equipment with a solution of potable water and non-phosphate detergent (mixed to the manufacturer's instructions) followed by a potable water rinse. If not using a decontamination pad, the most common set-up uses multiple 5-gallon plastic buckets (or equivalent) for washing and rinsing. The decontamination containers should be labeled as to their contents and pertinent information from original source, such as the date opened or transferred, and the expiration date (as well as any applicable hazardous labels), placed on polyethylene sheeting (to contain drips of decontamination fluids during the decontamination process), and sealed when not in use to prevent accidental release of the fluids. If decontaminating sealed submersible pumps, pump both the non-phosphate detergent wash

fluid and the potable water rinse through the pump body itself (usually done in separate buckets) to ensure that the internal components are thoroughly cleaned. Replace the detergent solution and rinse water at least daily or when it becomes oily or silty.

Next, place the DI water for the rinse in a small spray bottle or pour over the equipment after the potable water rinse.

Typically, this level of decontamination (i.e., steps 1 through 4) is sufficient.

Following Steps 1 through 4, additional decontamination (steps 5 through 9) may be required by the applicable federal or state guidelines, the project-specific work plan, or the QAPP. Typically, these decontamination steps are performed when sampling for inorganics or oil-related substances using non-motorized equipment. These steps include:

5 10% nitric acid rinse (if metals are part of the analyses)
6 Laboratory-supplied DI water rinse
7 Pesticide-grade solvent rinse (e.g., acetone [preferred], hexane, or isopropyl alcohol)
8 Air dry (solvent must evaporate)
9 Laboratory-supplied DI water rinse

Isopropyl alcohol is the recommended solvent for organic contaminants because it is readily available and is not a DOT hazardous material; where possible, lab-grade isopropyl alcohol should be used . However, other solvents (e.g., hexane and methanol) may be more effective in removing certain contaminants, such as oils or polychlorinated biphenyls, but any waste generated using these solvents must be managed accordingly. Solvents are never used for decontamination if sampling for volatiles organic compounds.

Handle the solvents and acid with care and store unused chemicals in their original, labeled, protective containers when not in use. It is a good idea to transfer small quantities of each solution into labeled, laboratory-grade spray bottles, which offer a convenient and controllable way to rinse the equipment. The equipment can then be rinsed over a 5-gallon plastic bucket or other suitable container placed on plastic sheeting as with the first part of the cleaning process. Nitric acid rinses must be used only on non-carbon steel sampling devices. Do not spray acid or solvent into pumps.

Decontamination steps used at sites where radioactive materials are contaminants of concern are similar with a few special considerations. Radiation contamination monitoring is used to help locate contamination and guide the success of the decontamination process. The liberal use of water and fluids as a decontamination agents are minimized, where practicable, because of the expense that can be incurred with disposing of radioactively contaminated decontamination water. Containerized decontamination wastes must be evaluated for radioactive content and disposed of appropriately depending on their content.

6.6 HANDLING DECONTAMINATED EQUIPMENT

Handle any decontaminated equipment using clean gloves to prevent re-contamination. Place the equipment away (preferably upwind) from the decontamination area once the process has been completed on clean plastic sheeting to allow it to air-dry. Once the equipment is dry, protect it from re-contamination by securely wrapping and sealing with aluminum foil (shiny side out) or clean, disposable plastic bags (inorganics only). Plastic bags may be wrapped directly around wet or dry equipment except when the expected contaminants include volatile and extractable organics; under those circumstances, allow the equipment to completely dry or wrap it in aluminum foil.

All sampling equipment must be decontaminated at the end of the investigation (i.e., prior to departure from the site). Label each piece of equipment with the date of decontamination, the initials of personnel performing the decontamination, and the type of decontamination solution(s) used. Containerize all decontamination fluids, and other disposable decontamination materials in DOT-compliant containers in accordance with SOP 5 or the project-specific work plan. Dispose of all wastes, including open and unused solvents or acids, in conformance with the project-specific work plan and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #9

SOIL SAMPLING PROCEDURE

The soil sampling procedures outlined in this standard operating procedure (SOP) are designed to ensure that collected soil samples are representative of current site conditions. Soil samples can be collected for onsite screening or for laboratory analysis. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

9.1 ACRONYMS AND ABBREVIATIONS

ºF	degrees Fahrenheit
HASP	health and safety plan
IDW	investigation derived waste
PID	photoionization detector
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
SOP	standard operating procedure
USCS	Unified Soil Classification System

9.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment, (e.g., photoionization detector [PID]), as needed
- Field test kits, as needed
- Sampling containers and labeling/shipping supplies
- Ruler or tape measure
- Zipper-style plastic bags, as needed
- Plastic sheeting
- Soil sampling method specific materials, as needed:
- Stainless steel trowels, probes, or shovels
- Stainless steel spatulas or spoons
- Bucket augers, auger extension rods, auger handle, pipe wrenches
- Split-spoon samplers, pipe wrenches
- Direct-push acetate liners, including catchers and opening tools, as needed
- Shelby tube samplers, plastic or wax caps
- Mixing tray or bowl
- Munsell color chart
- Decontamination supplies

9.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting soil sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation-derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), and use and calibration of sampling and monitoring equipment (SOPs 7 and 8). This SOP does not cover investigation planning, nor does it cover the evaluation of the analytical results. These topics are more appropriately addressed in a project-specific work plan. Before soil sampling, be sure to review the project-specific work plan or Quality Assurance Project Plan (QAPP) and any applicable state and federal guidelines or sampling procedures.

Consult and involve your assigned compliance professional during all phases of soil sampling. Do not ship hazardous waste samples without first consulting a company compliance professional.

All sampling and monitoring references must be available for consultation in the field, including:

- Company's SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

9.4 GENERAL PROCEDURES

Soil samples are collected using a variety of techniques and equipment, depending on the type (e.g., surface, subsurface) and purpose (e.g., lithological logging, headspace evaluation, laboratory analysis) of the sampling, and most sampling events employ more than one equipment type or methodology. Subsurface soil sampling, for example, often includes sample collection from split-spoon, macro-core, or other dedicated sampling devices advanced into the subsurface. Recovered cores are often logged (using a Munsell color chart and other logging aids), screened for volatile organic compounds (VOCs) using a PID, and sampled for laboratory analysis using disposable stainless steel spoons or other discrete sampling devices.

Each sampling configuration is associated with a unique set of sampling equipment requirements and techniques. The selected procedures and equipment are project-specific and should be discussed by the project team before arriving onsite. All types of soil sampling, regardless of the equipment used, share common handling and management procedures that are designed to ensure the integrity of the samples collected. These procedures include:

- The use of new, disposable or decontaminated sampling equipment
- The use and rotation of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the

previous sample. The gloves must not come in contact with the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***Gloved hands should not be used as a sampling device; always use the appropriate equipment to move the sample from the sampling device to the laboratory-supplied containers.*** If the soil cannot be transferred directly from the sampling device to the laboratory-supplied containers, use a stainless steel spoon or spatula to transfer the soil from the sampling device to the laboratory-supplied containers.

9.4.1 EQUIPMENT SELECTION

Collect all samples using either new, disposable equipment, such as polyethylene liners or single-use stainless steel spoons; or properly decontaminated sampling equipment, such as hand augers, split-spoon samplers, or trowels. Soil sampling equipment should be selected based on the analytical requirements of the project and the project-specific conditions likely to be encountered. The equipment should be constructed of non-reactive, non-leachable materials (e.g., stainless steel, Teflon®, Teflon®-coated steel, polyethylene, polypropylene) which are compatible with the chemical constituents at the site. When choosing sampling equipment, give consideration to:

- the types of soil or fill present
- the required depth of the sample
- the volume of sample required
- the analytes of interest

Select the types of equipment and decontamination procedures based on the types of sampling to be performed. Decontamination may require multiple steps or differing cleaning methods, depending on the sampling goals (see SOP 6 for decontamination procedures). In no case should disposable, single use materials (e.g., acetate liners, soil baskets) be used to collect more than one sample.

9.4.2 SAMPLING CONSIDERATIONS

In preparing for sampling, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify sampling locations and evaluate the accessibility (physical obstructions, slope, overhead and underground utilities) to the sampling location.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions in the field book. In addition, any site-specific conditions or situations that could potentially affect the samples should be recorded.
- Record a description of the sampling location and the approximate distance to and direction from at least one permanent feature.
- Should any sample location require a vertical or horizontal offset from the proposed location, indicate the reason and record the actual sample location in the field book.

Survey the breathing zone around the sampling location with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate. When sampling soil, it is important to find a suitable sampling location away from any sources of cross-contamination that could compromise the integrity of the samples. Consider the following:

- Position the sample collection area away from fuel-powered equipment, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling, decontamination) that could influence the sample. This is particularly important when screening samples in the field for VOCs with a PID, but should not be limited to the active sample collection.
- Store samples already collected from the field for laboratory analysis in clean containers in an ice-filled cooler (as required) and securely stage, if possible, in an uncontaminated area of the site.

9.5 SOIL SAMPLE COLLECTION

Soil samples can be collected from surface or subsurface depths, depending on the project requirements. Surface soils are generally those collected at depths less than 2 feet below ground surface (bgs) and can be collected using trowels, soil probes, shovels, or hand augers. Be aware that some states have specific definitions of what constitutes a surface soil sample. Subsurface soils are generally

deeper and require specialized equipment to recover the samples. In most cases, subsurface soils will be collected using a drill rig or excavator to prevent the soil from being mixed with soils from a shallower interval.

Push or drive the method-specific sampling equipment (e.g., trowel, hand auger, hollow corers, split-spoon, direct push sampler, rotosonic core barrel sampler, excavator bucket) into the soil to the desired sampling depth using decontaminated equipment. Record in the field book the depth interval through which the sampler was advanced and, when using a drilling rig and split-spoon sampler, the number of blows needed to drive the sampler 6 inches. If additional soil is needed to provide sufficient sample volume, repeat this step taking care to ensure that the same depth interval is collected during the resample. Use core catchers on the leading end of the sampler (if available) for soils that lack cohesiveness and are subject to falling out of the sampler (i.e., poor recovery).

Withdraw the sampling equipment from the interval, open the sampler (as appropriate), and collect the sample in a safe location (e.g., avoid entering an excavation by collecting the sample from an excavator bucket at ground surface). When collecting a sample from an excavator bucket, the sampler should watch the bucket as the excavated material is retrieved and collect the sample from the desired sampling material.

Recovered soils should be placed on plastic sheeting in a consistent manner such that the orientation of the sample (i.e., which end is "up") and the depth interval is readily apparent to the sampling personnel. Measure the length of the material recovered relative to the interval the sampler was advanced in percent notation (e.g., 75%) or as a fraction of the total length of the sample interval (i.e., [3/4] indicating 3 out of 4 feet) and record this information in the field book. If field screening for organic vapors is required, break or cut the soil core every 3 to 4 inches and quickly scan the breaks in the core material with the appropriate air quality monitoring equipment (e.g., PID) and record the readings and approximate depth in the field book. These measurements can be used to select appropriate soil samples for VOC or headspace analysis, if required (see procedures below).

9.5.1 UNDISTURBED SAMPLE COLLECTION

Undisturbed soil samples collected for geotechnical parameters (e.g., porosity, permeability) generally require the use of specialized undisturbed sampling equipment (e.g., Shelby tube or sealed Geoprobe® liner) and collection procedures. The sampling device, once retrieved, is typically capped or sealed (to maintain the sample in its relatively undisturbed state), labeled with the sample name, orientation of the sample (i.e., top and bottom), depth interval, and shipped to the appropriate geotechnical laboratory. Follow sample labeling, preparation, and shipping procedures in SOPs 3 and 4.

9.5.2 VOLATILE ORGANIC COMPOUND SAMPLING

Analytical soil samples for VOC analysis should be collected immediately after screening with the PID to avoid loss of constituents to the atmosphere. Transfer the soil from the portion of the soil core to be sampled (usually the area where the highest PID readings were observed) directly into the sample containers; do not homogenize soils for VOC analysis. Place the soil in the sampling container such that no headspace is present above the soil when the cover is placed on the jar. If U.S. Environmental Protection Agency Method 5035 (e.g., Encore® samplers) is required, follow manufacturer's specifications and company recommended shipping procedures. Collect quality assurance/quality control (QA/QC) samples, if appropriate, in accordance with SOP 4, the project-specific work plan, and the QAPP.

9.5.3 SOIL HEADSPACE ANALYSIS

Collect soil samples for field-based headspace analysis, if required as part of the project-specific work plan, after collecting the VOC sample. First, examine the soil and remove coarse gravel, organic material (e.g., roots, grass, and woody material) and any other debris. Transfer the soil from the portion of the soil core to be sampled and place in a heavy-duty zipper-style plastic bag and seal the bag. Label the sample indicating the sampling location, depth, and date. Shake the sample vigorously for approximately 15 seconds to disaggregate the sample and expose as much surface area of the soil as possible (to release the VOCs to the atmosphere within the bag). If necessary, warm the sample to room temperature (70º Fahrenheit, [ºF]) by placing the bag in a heated room or vehicle. This step is critical when the ambient temperature is below 32ºF.

The VOCs, if present, will volatilize into the sealed bag. Allow the bag to stand (to achieve equilibrium) for approximately 15 minutes. Carefully open the bag slightly and place the tip of the PID into the opening. Do not insert the tip of the probe into the soil material and avoid the uptake of water droplets. Allow the PID to equilibrate and record the highest PID measurement noted. Erratic PID responses may result from high organic vapor concentrations or elevated headspace moisture. If these conditions exist, qualify the headspace data in the field book. It is also important to record the ambient temperature, humidity, and whether moisture was present in plastic bag. Duplicate 10% of the headspace samples by collecting two samples from the same location. Generally, duplicate sample values should be consistent to ±20%. Samples collected for headspace screening cannot be retained for laboratory analysis.

9.5.4 SEMI- AND NON-VOLATILE ANALYTICAL SAMPLE COLLECTION

For metal sulfide analysis, sediment should be maintained in anoxic conditions to limit exposure to oxygen. Samples should be collected immediately and stored with zero headspace.

Collect remaining organic samples then inorganic samples in the following order of volatilization sensitivity:

- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Metals
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

If homogenization is required, mix the soils (using stainless steel bowls and spoons, or other appropriate equipment) to a homogeneous particle size and texture. Transfer the soils from the sampler or mixing bowl to the sample container using a decontaminated or dedicated stainless steel spoon or spatula. Collect QA/QC samples in accordance with SOP 4, the project-specific work plan, and the QAPP.

If approved by the appropriate regulatory agency and specified in the project-specific work plan, composite soil samples can be collected to minimize the total number of analytical samples. Composite samples consist of equal aliquots (same sample size) of soil from each location being sampled (e.g., from each borehole or from multiple areas of a soil pile), by mixing the soil to a homogeneous particle size and texture using new or decontaminated stainless steel bowls and a stainless steel spoon or trowel. Transfer the contents to the appropriate laboratory supplied sample container using a stainless steel spoon. Collect QA/QC samples in accordance with SOP 4, the project-specific work plan, and the QAPP, if required.

If necessary, conduct field tests or screening on soils in accordance with the project-specific work plan and manufacturer's specifications for field testing equipment.

9.5.5 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Once collected, prepare the soil samples for offsite laboratory analysis:

1. Clean the outside of the sample container with paper towels or appropriate materials, if necessary
2. Affix a sample tag or label to each sample container and complete all required information (sample number, date, time, depth interval, sampler's initials, analysis, preservatives, place of collection)
3. Place clear tape over the tag or label (if non-waterproof labels are used)
4. Preserve samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius (if required by analytical method)
5. Record the sample designation, date, time, depth interval, number of sampling containers, analytical methods, and the sampler's name in the field book and on the chain-of-custody form
6. Complete the chain-of-custody forms with appropriate sampling information, including:
   - Location
   - Sample name
   - Sample collection date and time

- Number of sample containers
- Analytical method

7 Complete sample packing and ship in accordance with proper procedures

Do not ship hazardous waste samples without first consulting a company compliance professional.

9.6 SOIL CLASSIFICATION

Soil classification should be performed whenever soil samples are being collected to provide context for the analysis. Unless required to follow a different soil classification (e.g., US Department of Agriculture), follow the Unified Soil Classification System (USCS) logging procedures as described in ATSM D2488[1] . The emphasis of soil classification in the field must be on describing the soils using ALL of the required descriptors; categorization of the USCS group name or symbol alone may not provide details about the soils that could later prove useful. Avoid geologic interpretation or the use of local formation names, which are often difficult to determine in the field without the regional framework. Record ALL of the following information for each sample interval/soil type in the field book:

- Depth interval
- USCS group name (e.g., lean clay, elastic silt, well-graded gravel)
- USCS group symbol (e.g., cl, mh, gw)
- Color, using Munsell chart (in moist condition)
- Percent of cobbles, boulders, gravel, sand, and fines (approximate; by volume). Use the following standard descriptors for the textural percentages:
- Trace: <5%[2]
- Few: 5-10%
- Little: 15-25%
- Some: 30-45%
- Mostly: 50-100%
- Particle-size range:
- Gravel—fine (0.2-inch to 0.75-inch), medium, coarse (0.75-inch to 3 inch)
- Sand—fine (0.003-inch to 0.02-inch), medium (0.02-inch to 0.08-inch), coarse (0.08-inch to 0.2-inch)
- Fines – clay or silt
- For gravel and sand:
- Particle angularity: angular, subangular, subrounded, rounded
- Particle shape: (if appropriate) flat, elongated, flat and elongated
- Maximum particle size or dimension
- Hardness (under hammer blow) of coarse sand and larger particles
- For fine-grained soil (i.e., clay and silt):
- Plasticity: non-plastic, low, medium, high
- Dry strength: none, low, medium, high, very high
- Dilatancy: none, slow, rapid
- Toughness: low, medium, high
- Odor (mention only if organic or unusual; factual descriptions only, no interpretations)
- Moisture: dry, moist, wet
- Additional comments: presence of roots or root holes, presence of mica, gypsum, etc., surface coatings on coarse-grained particles, caving or sloughing of auger hole or trench sides, difficulty in augering or excavating, etc.

For intact samples also include:

- Consistency (fine-grained soils only): very soft, soft, firm, hard, very hard
- Structure: stratified, laminated, fissured, lensed, homogeneous

[1] Note that certain states/regulatory programs may require soil classification under a secondary system (e.g., US Department of Agriculture) or the use of hydrochloric acid to test the reaction with soil (none, weak, strong).

[2] The use of "Trace" for describing the fraction of clay soils is inappropriate for field-based logs as clay contents of less than 20% in fine-grained soils cannot be reliably determined in the field.

- Cementation: weak, moderate, strong

Example descriptions, using the information listed above, would read as follows:

- 8-10' – Well Graded Sand, SW (5YR 2/6) fine- to medium-grained sand, trace medium sub-angular rounded gravel (less than 0.5-inch diameter); medium dense to dense; wet; moderate petroleum-like odor between 9 feet bgs and 10 feet bgs.
- 10-12' – Lean Clay with Gravel, CL (5YR 2/6) some fine- to coarse-grained angular to subangular gravels (less than 0.25-inch diameter), trace fine- to medium-grained rounded sands; very stiff; low plasticity; low dry strength; no dilatancy; moist; no odors.

9.7 CLOSING NOTES

Once sampling is completed, restore and mark all sample locations with spray paint, stakes, or other appropriate marker for future reference or survey, including collecting Global Positioning System coordinates and photographs, or survey in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and IDW in conformance with SOP 6, the project-specific work plan, and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #11

GROUNDWATER SAMPLING PROCEDURE

Groundwater sampling procedures outlined in this Standard Operating Procedure (SOP) are designed to ensure that collected samples are representative of current site conditions. These procedures can be applied to permanently or temporarily installed monitoring wells, direct-push sample points, water supply wells with installed plumbing, extraction wells for remedial groundwater treatment systems, and excavations where groundwater is present. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

11.1 ACRONYMS AND ABBREVIATIONS

ID	inside diameter
DI	deionized
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DTW	depth-to-water
HASP	health and safety plan
IDW	investigation-derived waste
l/min	liters per minute
LNAPL	light non-aqueous phase liquid
mg/l	milligrams per liter
mV	millivolts
NAPL	non-aqueous phase liquid
NTU	nephelometric turbidity unit
ORP	oxygen reduction potential
PID	photoionization detector
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure
SU	standard units
TD	total depth
TOC	top-of-casing
VOCs	volatile organic compounds

11.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment (e.g., photoionization detector [PID]) with calibration reagents and standards, as needed
- Electronic water level indicator or interface probe
- Water quality meter(s) with a flow-through cell, and calibration reagents and standards, as needed
- Field test kits, as needed
- Adjustable wrench or manhole wrench, as needed
- Well key(s), as needed
- Power supply, as needed
- Sampling containers and labeling/shipping supplies
- Deionized (DI) water
- Container(s) for water storage (e.g., bucket, drum)
- Pump or bailers, tubing, and associated lanyard materials
- Filters, as needed
- Decontamination supplies

11.3 PRECONDITIONS AND BACKGROUND

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WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting groundwater sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), and use and calibration of all sampling and monitoring equipment (SOPs 7 and 8). This SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics are more appropriately addressed in a project-specific work plan. Before groundwater sampling, be sure to review the project-specific work plan or quality assurance project plan (QAPP) and any applicable state and federal guidelines or sampling procedures. All sampling and monitoring references must be available for consultation in the field, including:

- Company SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

11.4 GENERAL PROCEDURES

Although the techniques used to sample groundwater are varied, most sampling events can be broken down into a three-step sequence:

1. Gauging: The measurement of the water column height (i.e., total well depth less depth-to-water) within the well.

2 Purging: The removal of stagnant water from the well bore to ensure that samples collected are representative of groundwater conditions in the water-bearing zone surrounding the well.
3 Sample Collection: After purging, the collection of aliquots of groundwater in method-specific, preserved (as needed) containers.

The procedures and equipment that are used to accomplish these steps are project-specific and should be discussed by the project team before arriving onsite. All types of groundwater sampling, however, regardless of the equipment used, share common handling and management procedures that are designed to ensure the integrity of the samples collected. These procedures include:

- The use of new, disposable, decontaminated, or dedicated sampling equipment
- The use and rotation of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***Gloved hands should not be used as a sampling device; always use the appropriate equipment to move the sample from the sampling device to the laboratory-supplied containers.***

11.5 EQUIPMENT SELECTION

Collect all samples using either new, disposable equipment or properly decontaminated sampling equipment. Groundwater purging and sampling equipment should be selected based on the analytical requirements of the project and the project-specific conditions (e.g., well diameter, depth to water, dissolved constituents, etc.) likely to be encountered. The equipment should be constructed of non-reactive, non-leachable materials (e.g., stainless steel, Teflon®, Teflon®-coated steel, polyethylene, polypropylene, etc.) that are compatible with the chemical constituents at the site. Note that project or regulatory guidance may limit the type of equipment for groundwater sampling.

Consider the following when choosing groundwater purging and sampling equipment:

- the diameter and depth of the well
- the depth to groundwater
- the volume of water to be withdrawn
- the sampling and purging technique
- the volume of sample required
- the analytes of interest

Select the decontamination procedures based on the types of sampling to be performed and media encountered; decontamination may require multiple steps or differing cleaning methods (see SOP 6 for decontamination procedures). In no case, should disposable, single-use materials be used to collect more than one sample.

11.6 PRE-SAMPLING CONSIDERATIONS

You should perform the following activities in preparing for sampling with all observations and measurements noted in the field book and on the project-specific groundwater monitoring log, if appropriate:

- Perform a quick reconnaissance of the site to identify sampling locations and evaluate the accessibility to the sampling location.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions. In addition, any site-specific conditions or situations that could potentially affect the samples at the sample locations should be recorded.
- Record temporary sampling locations with respect to approximate distance to and direction from at least one permanent feature.
- Survey the breathing zone around the sampling location with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate.
- Install the pump, tubing, passive sampler or other appropriate sampling equipment to the depth prescribed in the project-specific work plan or QAPP.

- Containerize and manage purge water in accordance with the project-specific work plan.

It is important to minimize any sources of cross-contamination that could compromise the integrity of the groundwater samples. Consider the following:

- Position fuel-powered equipment away from the sample collection area, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling, decontamination) that could influence the sample. This is particularly important when screening samples in the field for volatile organic compounds with a PID but should not be limited to the active sample collection.
- Establish a secure sample staging area in an uncontaminated area of the site.

11.7 GAUGING PROCEDURES

All wells should be opened to the atmosphere in advance of sampling to allow any pressure differentials, which could artificially raise or depress the water column in the well, to dissipate. The wells should be inspected to ensure that the protective casing is intact and has not been damaged. Remove the well covers and all standing water around the top of the well casing (for flush mounted-protective covers), as necessary, before opening the inner well cap or plug. Unlock and carefully remove well cap and allow the well to stand undisturbed for a minimum of 15 minutes, or as required by the project-specific work plan, before conducting any down-hole testing or measurements. If required by the HASP, survey the open well casing and the breathing zone around the wellhead with a PID to ensure that the level of PPE is appropriate.

11.7.1 GROUNDWATER LEVEL AND TOTAL DEPTH MEASUREMENT PROCEDURES

Depth to water (DTW) and total depth (TD) measurements are collected prior to sampling and are used to determine the volume water to be purged from the well (if using techniques other than no-purge or low flow sampling). The DTW measurements are also used after the field event to establish the groundwater elevation, flow direction, and gradient. Unless otherwise directed, do not place any objects inside the casing of private water wells; accordingly, DTW and TD measurements should not be collected at private water wells. Measurements of TD are not required for low flow and no-purge sampling applications and should not be measured before sampling the well.

Water level measurements must be collected within the shortest interval possible from all the wells to be gauged during the event before beginning any purge and sampling procedures at the site. This will ensure a nearly instantaneous snapshot of the water levels before the formations are disturbed by pumping or acted upon by other outside influences, such as tides, precipitation, barometric pressure, river stage, or intermittent pumping of production, irrigation, or supply wells.

Record the following observations and measurements (and the time when they were collected) in the field book:

- Measure the casing inside diameter (ID) and record in inches
- Measure the DTW with an electronic water level indicator (or an interface meter, if non-aqueous phase liquid [NAPL] is potentially present – see procedures below) from the top-of-casing (TOC) at the surveyor's mark, if present, and record the depth (to the nearest 0.01 foot) in feet below TOC
- If no mark is present, measure from the north side of the casing and mark the measuring point with a knife, metal file (if the inner casing is metal) or indelible marker for future reference
- Measure the TD from TOC at the surveyor's mark or north side of the casing, as appropriate.

Measuring the depth of deep wells with long water columns can be problematic due to tape buoyancy and weight effects or sediment in the bottom of the well casing. Care must be taken, and proper equipment selection must be used in these situations to ensure accurate measurements. Multiple TD measurements in silt-laden wells can provide a more precise assessment of the bottom depth.

11.7.2 GAUGING WELLS WITH NON-AQUEOUS PHASE LIQUID

If NAPL is potentially present at the site, the DTW and NAPL thickness measurements are collected using an interface meter capable of distinguishing between the NAPL and the groundwater, or a weighted tape coated with the appropriate reactive indicator paste for the suspected NAPL. Measuring NAPL thicknesses must be done with care to avoid agitating the liquids and generating an emulsion. This is particularly the case for light NAPL (LNAPL; those having a density less than water), which are typically viscous oils that

cling to the probe. Oil coating the probe can result in thickness measurements that are biased high (i.e., overestimate the thickness of the NAPL).

Conduct the following procedures to ensure an accurate measurement of the NAPL thickness:

- For LNAPL, slowly lower the electronic interface probe in the well casing until the electronic tone indicates the probe is at the top of the LNAPL layer; measure the depth below the TOC to the nearest 0.01 foot.
- To gauge the NAPL thickness, advance the probe slowly through the layer until the electronic tone indicates top of the water column and then slowly bring the probe back up to the bottom of the LNAPL. Repeat this process several times to ensure an accurate measurement of the bottom of the LNAPL layer (which can include bubbles and an emulsion layer).
- For dense NAPL (DNAPL), advance the probe through the water column until the tone indicates the top of the DNAPL layer; record the depth below TOC.
- To gauge the DNAPL thickness, advance the probe through the layer to the bottom of the well.

11.8 GROUNDWATER PURGING PROCEDURES

Purging is a process whereby potentially stagnant water is removed allowing the collection of samples that are representative of groundwater conditions in the water-bearing zone. The water in a well bore that has not been purged may be different than the surrounding formation due to exposure to ambient air. There are several purging (and no-purge) methods that may be used, depending on specific conditions encountered (e.g., DTW, hydraulic conductivity of the formation, etc.) and the sampling requirements. The purge/no purge options are described below.

- *Multiple Volume Purge:* Traditional well purging technique that relies on the withdrawal of the volume of the well bore and the surrounding filter pack (if present); three to five well volumes are typically removed using pumps or bailers. This methodology relies on equipment that is easy to obtain and use and is generally accepted in most states as an appropriate purging method.
- *Temporary Well Purge:* A variation of the multiple volume purge technique that often uses inertia lift pumps, peristaltic pumps, or bailers to remove water from a temporary well or discrete groundwater sampler (e.g., a groundwater profiler or direct-push screen point sampler). This is a less stringent technique that is typically done to minimize the turbidity of the samples, which can be high due to the lack of a well filter pack.
- *Private Water Well or In-Place Plumbing Purge:* A variation on the multiple volume purge technique whereby a tap or faucet is opened on a fixed water supply pipe and is allowed to remain open until the potentially stagnant water within the well casing and other components of the system (e.g., fixed piping, pressure tanks, etc.) has been removed and groundwater representative of the water-bearing zone is discharged at the tap.
- *Low Flow (Minimal Drawdown/Low Stress) Purge (and Sampling):* A modified purging technique that establishes an isolated, discrete, horizontal flow zone directly adjacent to the pump intake; this method requires the pump to be placed within a screened-interval or open borehole. Pumping rates are typically 0.1 to 0.5 liters per minute (l/min) or less to minimize the stress on the surrounding formation and reduce the geochemical alteration of the groundwater caused by pumping.
- *No-Purge/Passive Sampling Techniques:* These techniques use specialized equipment, such as trap-style samplers or permeable diffusion bags, to sample the undisturbed water column within a screened interval or open borehole. This methodology assumes that the water in the well is representative of the surrounding formation. This approach is well suited for some volatile organic compounds (VOCs), metals, and hydrophobic compounds, depending on the sampling device used.

11.8.1 CALCULATING ONE PURGE VOLUME

Multiple volume purging techniques require that a ***minimum*** of three well volumes of water must be removed before sample collection. The actual amount of water removed may be greater than the three volumes, depending on geochemical parameter stabilization (the field measurement of these parameters is discussed below).

Calculate the volume of water in a well or boring using the following equation:

$$\textbf{Volume (gallons)} = (\textbf{TD} - \textbf{DTW}) \times \textbf{ID}^2 \times \textbf{0.041}$$

where:

TD = total depth (feet)

DTW = depth to water (feet)

ID = inner diameter (inches)

Alternately, the volume of water in a well or boring may also be calculated by multiplying the water column height by the gallons per foot of water for the appropriate well or boring diameter:

ID	Gallons per foot of water	Gallons per three water columns
1-inch	0.04	0.12
2-inch	0.16	0.48
3-inch	0.37	1.11
4-inch	0.65	1.98

Calculate the total volume of the pump, associated tubing and container for in situ measurements (flow-through cell), using the following equation:

Volume (in gallons) = P + ((0.0041)*D2*L) + fc

where:

P = volume of pump (gallons)
D = tubing diameter (inches)
L = length of tubing (feet)
fc = volume of flow-through cell (gallons)

11.8.2 MULTIPLE VOLUME PURGE PROCEDURES

Begin purging at a rate that will not cause excessive turbulence and drawdown in the well; commonly less than 1 gallon per minute for a typical 2-inch diameter monitoring well. You may need to observe the water elevation after the pump is started and adjust the flow rate to minimize the amount of drawdown in the well casing. The objective is to remove the stagnant water in the casing and surrounding filter pack or open borehole allowing water from the surrounding water-bearing zone to enter the well for sampling with as little disturbance as possible. Excessive pump rates or well dewatering can result in higher turbidity, potential volatilization, and geochemical alteration of dissolved parameters.

Typically collect geochemical parameters (i.e., pH, specific conductance, dissolved oxygen [DO], oxygen-reduction potential [ORP], and temperature) at a minimum frequency of once for every well volume of water removed during the purge process. Record the measurements in the field book along with any other pertinent details, such as the visual quality of the water (e.g., color, odor, and presence of suspended particulates) and the approximate withdrawal rate (this can be estimated using a calibrated container and stopwatch). Review the geochemical measurements to ensure that readings have stabilized (after the minimum purge volume has been achieved). This is a proxy for determining that you are purging formation water rather than potentially stagnant water in the casing. Stabilization occurs when at least three consecutive measurements are within the following tolerances:

Multiple Volume Purge Stabilization Parameters	
pH	± 0.1 standard units (SU)
Specific Conductance	± 3%
Temperature	± 3%
Dissolved Oxygen (DO)	± 0.2 milligrams per liter (mg/l) or 10% (flow-through cell only)
Turbidity	± 10% for values greater than 10 nephelometric turbidity units (NTU)
Oxygen Reduction Potential (ORP)	± 10 millivolts (mV; flow-through cell only)

Parameter stabilization that does not occur within five well volumes may require you consult your project manager to decide whether to collect a sample or to continue purging. Wells with extremely slow recharge may also be problematic. Purging these wells, in some cases, may result in dewatering the well before the minimum purge can be completed. Allow wells or borings purged dry to recharge to a level of approximately 90% of the static (pre-purge) water elevation and proceed immediately to sample collection. If recovery exceeds 2 hours, sample as soon as sufficient sample volume is available, in accordance with applicable regulations.

11.8.3 LOW FLOW PURGE PROCEDURES

Low flow purging and sampling is used to obtain representative groundwater samples without removing all the water within the well. The protocol uses relatively low pumping rates (i.e., less than 0.5 l/min) to establish an isolated zone around the inlet of the pump where flow is horizontal (i.e., from the water bearing zone) rather than from the stagnant water in the well casing above and below the pump. Selection of an appropriate pump is critical to establishing the flow zone: it must be well suited for both low pumping rates and the analytes being sampled. Bailers are not appropriate for low flow sampling.

The set-up for low flow sampling includes positioning the pump at the appropriate depth within the casing such that the pump inlet is within the screened section of the well. Slowly lower the pump, where appropriate, and tubing into the water column to avoid agitating the water column; use of a lanyard is recommended (i.e., do not use the extraction tubing to lift or lower the pump). Secure the pump and/or tubing at the wellhead once the specified sampling depth has been achieved and record the depth in the field book. Avoid contacting the bottom of the well by using pre-cut tubing at the appropriate length or by lowering the pump/tubing simultaneously with an electronic water level indicator. Once the pump/tubing has been inserted and secured, allow the water levels to return to static conditions before initiating the purge.

The discharge tubing must be connected to an in-line flow-through cell equipped with a multi-parameter real-time water quality meter. The flow-through cell minimizes the exposure of the groundwater to ambient air, which can influence DO and ORP measurements.

Start the pump and maintain a steady flow rate that results in a stabilized water level (less than 0.3 feet of drawdown or as specified in the project-specific work plan). The pumping rate may need to be adjusted depending on the response of the water levels in the well. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment. Purging should not exceed 0.5 l/min.

During purging, monitor and record the flow rate and geochemical parameters at 30 seconds to 5-minute intervals (depending on the hydraulic conductivity of the aquifer, diameter of the well, and pumping rate). Stabilization occurs once the following criteria have been met over three successive measurements made at least three minutes apart:

Low Flow Purge Stabilization Parameters	
Water Level Drawdown	<0.3 feet
pH	± 0.1 SU
Specific Conductance	± 3%
Temperature	± 3%
DO	± 0.2 mg/l or 10% (flow-through cell only)
Turbidity	± 10% for values greater than 10 NTU
ORP	± 10 mV (flow-through cell only)

Record any other notable observations in the field book (e.g., groundwater color).

11.8.4 NO-PURGE SAMPLING TECHNIQUES

Several alternate sampling devices are available, such as equilibrated grab samplers, passive diffusion samplers, and other in situ sampling devices, that will allow sample collection without purging the well. These devices may be particularly useful for sampling low permeability geologic materials, assuming the device is made of materials compatible with the analytical parameters, meets data quality objectives, and has been properly evaluated.

No-purge grab or trap samplers are placed in the well before sampling and typically remain closed (i.e., no water is allowed into the sampler during insertion) until the sampler is activated. This allows the sampler device to equilibrate with the surrounding groundwater (to prevent adsorption to the sampler materials) and for the groundwater to recover and re-establish the natural flow after the disturbance caused by the sampler insertion into the well. Typical equilibration times depend on the well recovery rates and the type of sampler used. Samples recovered using the no-purge devices are either transferred to containers at the well head or the sampler itself is shipped to the laboratory for analysis. Examples of equilibrated grab samplers include HydraSleeve™, Snap Sampler™, and Kemmerer samplers.

Equilibration time for diffusion samplers are generally dictated by the diffusion rate through the permeable membrane and, thus, are less sensitive to changes induced within the well during deployment. Most diffusion bag samplers have a minimum equilibration time of 14 days prior to sample collection. The samplers may be deployed for an extended period (e.g., three months or longer), although the continuous exchange between the sampler and the well water means that the sampler will likely reflect only the conditions in the few days preceding the sample collection.

11.8.5 TEMPORARY WELL PURGE PROCEDURES

Procedures used to purge temporary groundwater monitoring wells differ from permanent wells because temporary wells are installed for immediate sample acquisition. Wells of this type may include open bedrock boreholes, standard polyvinyl chloride well screen and riser placed in open boreholes, or drilling rod-based sampling devices (e.g., Wellpoint®, Geoprobe® screen point or Hydropunch® samplers). Purging temporary wells of this type may not be necessary because stagnant water is typically not present. However, if water is used in the drilling process, purging would be necessary. Purging can minimize the turbidity in the sample, which can be significant due to the disturbance caused by the sampler installation and to rinse the sampling system with groundwater. The exception is for groundwater profiling applications (e.g., using a Waterloo Profiler®) where a more rigorous purge is used (using the multiple volume purge techniques described above) to limit the potential for cross-contamination between sample intervals.

11.8.6 PRIVATE WATER WELL OR IN-PLACE PLUMBING PURGE PROCEDURES

The configuration and construction of private water wells varies widely and access points for obtaining groundwater samples may be limited. WSP personnel should coordinate with the property owner or site representative to access functioning ports and valves to avoid causing any inadvertent damage.

Collect the groundwater sample as close to the well as possible (e.g., from a sample port at the well head) to ensure the sample is representative. Ideally, the sample should be collected upstream of the piping and treatment equipment (e.g., particulate filter, water softener, carbon filters, ultra-violet lights), heating unit, or storage tanks. The following potential sampling locations are presented in order of preference:

- Sampling port or spigot near the well head or piping system prior to entry into the storage tank
- Sampling port or spigot at storage tank
- Sampling port or spigot downstream of the pressure tank or holding tank but upstream of any water treatment equipment
- Tap or faucet

If purging from a tap or faucet, try to remove any aerators, filters, or other devices from the tap before purging and work with the property owner or site representative to bypass any water treatment systems. Document where the sample was collected and any steps that were taken to minimize the potential alteration of the water sample in the field book.

Purge the system by opening the tap or spigot and allowing the water to run for several minutes. Observe and record the purge rate for the system. The minimum purge volume must be more than the combined volume of the pump, tanks, piping, etc. Review the geochemical measurements (after the minimum purge volume has been removed) to ensure that readings have stabilized using the same procedures as those used for the multiple volume purge detailed above. Purge the system for a minimum of 15 minutes if the minimum volume is unknown. Sample only after the geochemistry parameters have stabilized and no there are no suspended particles (e.g., iron or rust) visible. Record the final purge volume in the field book and any water quality observations.

11.9 GROUNDWATER SAMPLE COLLECTION PROCEDURES

Collect groundwater samples as soon as possible after the geochemical parameters indicate representative groundwater is present. As practically possible, reduce the pump flow rate, but maintain a flow rate high enough to deliver a smooth stream of water without splashing or undue agitation. Collect samples directly from the tubing as it exits the well bore; do not sample on the downstream side of flow-through cells or any other instrumentation. If using a bailer for sample collection, lower and raise the bailer slowly and smoothly to minimize the disturbance to the water within the well.

Collect groundwater samples in order of volatilization sensitivity with organic compounds sampled first followed by inorganic compounds:

- VOCs
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Per- and Polyfluoroalkyl substances
- Total metals
- Dissolved metals (see filtering procedures below)
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Collect quality assurance/quality control samples in accordance with SOP 4 and the project-specific work plan or QAPP.

As necessary, conduct field tests or screening in accordance with the project-specific work plan and manufacturer's specifications for field testing equipment. Field samples must be directly transferred from the sampling equipment to the container that has been specifically prepared for that given parameter; intermediate containers should be avoided. If field chemical preservation is required, check the pH preservation by pouring a small portion of sample onto a pH test strip Adjust pH with additional preservative, if necessary.

Record the sample depth interval, if applicable, in the field book. Note the volume, phases, odor, and color of the groundwater.

11.9.1 GROUNDWATER FILTRATION PROCEDURES

Filtered groundwater samples are sometimes used for field kit analyses and should only be collected for laboratory analysis after approval from the appropriate regulatory agency or project manager. The filtered samples can be collected by attaching the in-line filter directly to the outlet tubing for a pressurized bailer, a submersible pump or a peristaltic pump. Intermediate containers can be used with a peristaltic pump if the well is too deep to use the pump to recover the sample directly. The intermediate container should be unpreserved laboratory-supplied glassware to avoid any cross-contamination during the filtering process.

Filtered samples using pumps should use the following procedures:

- Use a variable speed peristaltic pump with the in-line filter fitted on the outlet end of the tubing and the pump inlet tubing into the intermediate container holding the unpreserved groundwater sample; or,
- If a submersible pump is used to collect the groundwater sample, attached the in-line filter to the outlet end of the tubing (do not allow the groundwater to pass through flow-through cells or any other instrumentation while sampling)

Once the filter is connected:

- Turn on the pump and maintain a flow rate high enough to deliver a smooth stream of water without splashing or undue agitation. Hold the filter upright with the inlet and outlet in the vertical position and pump groundwater through the filter until all atmospheric oxygen has been removed and the minimum volume of water has been flushed through the filter, in accordance with the manufacturer's specifications
- Collect the filtered samples by placing the filtered output directly into the sample container
- If sediment is visible in the sample container after filtration, filter break-through has occurred and the sampling and filtering process should be repeated
- Discard the tubing and filter appropriately

Record sample filtration in the field book.

11.9.2 NON-AQUEOUS PHASE LIQUID SAMPLING PROCEDURES

Non-aqueous phase liquid is typically sampled to identify the compound, usually through an analytical "fingerprint" analysis. If samples are to be collected, the sampling options and techniques should be discussed with the assigned WSP compliance professional and project manager to ensure that the NAPL is either not considered to be a hazardous material for shipping to the laboratory or is properly shipped by qualified personnel using appropriate shipping containers (SOP 3). Samples of NAPL should be collected using the same procedures as above and placed in the appropriate laboratory-supplied containers, packed on ice, and shipped to the analytical laboratory using procedures outlined in SOP 3.

11.9.3 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Groundwater samples for offsite laboratory analysis should be prepared as follows:

1. Clean the outside of the sample container, if necessary
2. Affix a sample tag or label to each sample container and complete all required information (sample number, date, time, sampler's initials, analysis, preservatives, place of collection)
3. Place clear tape over the tag or label (if non-waterproof labels are used), as needed
4. If needed, preserve samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius
5. Record the sample designation, date, time, and the sampler's initials in the field book and on a sample tracking form, if appropriate
6. Complete the chain-of-custody forms with appropriate sampling information, including:
   - location
   - sample name
   - sample collection date and time
   - number of sample containers

- analytical method
- field filtration status

7 Secure the sample packing and shipping in accordance with proper procedures

Do not ship hazardous waste samples without first consulting a WSP compliance professional.

11.10 CLOSING NOTES

Secure and restore the site once sampling is completed. This may include locking permanent monitoring wells, staging the IDW, and disposing of (in conformance with applicable regulations) sampling expendables, such as plastic sheeting, tubing, and PPE. All locations where temporary wells or other sampling devices (e.g., profilers or direct-push equipment) should be marked with spray paint, stakes, or other appropriate method for future reference or survey, including collecting Global Positioning System coordinates and photographs, in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and investigation-derived wastes in conformance with SOP 6, the project-specific work plan, and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #13

AIR SAMPLING PROCEDURE

The procedures outlined in this Standard Operating Procedure (SOP) are designed to ensure that air samples are representative and have not been altered or contaminated by the sampling and handling methods. Air sampling is generally conducted to assess the presence of volatile compounds (e.g., volatile organic compounds [VOCs], mercury) in ambient air as the result of site operations, materials storage, or vapor intrusion (VI). Air sampling is also conducted to assess the presence of volatile compounds in remediation system air streams. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

13.1 ACRONYMS AND ABBREVIATIONS

IDW	investigation derived waste
HASP	health and safety plan
PID	photoionization detector
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure
SSV	sub-slab vapor
VI	vapor intrusion
VOCs	volatile organic compounds

13.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment (e.g., photoionization detector [PID]) with calibration reagents and standards, as needed
- Camera
- Portable weather station , as needed
- Sampling containers and labeling/shipping supplies
- Step-ladders, shelves, stationary tables, or other objects for placement of sample canisters , as needed
- Strapping (e.g., rope, bungee cords) to secure sample canisters , as needed
- Tubing (e.g., Teflon®, Tygon®)
- Air purging pump or syringe , as needed
- Adjustable wrenches , as needed
- Air sampling pump , as needed
- Inline flow meter , as needed
- Tedlar® bags, , as needed
- Needle and syringe, with stopcock , as needed

13.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOP. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting air sampling activities and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), and the use and calibration of air sampling and monitoring equipment (SOP 7). This SOP does not cover other vapor sampling activities, such as sub-slab vapor (SSV) sampling (SOP 14) or soil vapor sampling (SOP 15). Additionally, this SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics require a significant amount of planning and are more appropriately addressed in a project-specific work plan. Before implementing the air sampling, be sure to review the project-specific work plan or Quality Assurance Project Plan (QAPP) and any applicable state and federal guidelines or sampling procedures.

All sampling and monitoring references must be available for consultation in the field, including:

- Company SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

13.4 GENERAL PROCEDURES

Consult the project-specific work plan or regulatory guidance to determine if there are any requirements on the scope, timing, and/or sequence of the sampling activities. When collected as part of a VI investigation, air sample collection is generally sequenced after a building inspection and materials survey and contemporaneously with SSV samples (See SOP 14). Performance monitoring samples collected from a vapor treatment system should be collected while the system is in operation.

Although the specific procedures used to sample air vary, most sampling can be broken down into a two-step sequence:

1. Inspection: a detailed survey of the subject building in an indoor/ambient air sampling investigation, including an evaluation of all of the materials used or stored in the structure that could potentially interfere with the sample collection; or, an operational inspection for a vapor system performance monitoring sampling event to confirm air flow and remove any condensate from the air stream to be sampled.
2. Sample Collection: collecting samples over a specified period (typically grab, 1-hour, 8-hour, or 24-hour), using a laboratory-supplied container, such as an evacuated sample canister with the appropriate regulator, a Tedlar® bag, or glass vial.

Information regarding weather conditions, including temperature, barometric pressure, wind speed and direction, and precipitation, should be noted and recorded in the field book during all steps. A portable weather station is often sufficient for documenting the weather conditions. Consult the project-specific work plan and applicable regulatory guidance to determine if fixed weather monitoring during the sample collection is required.

The project team should discuss the project-specific sampling procedures and equipment in advance of site mobilization. While the investigation is underway, the project team should avoid other environmental activities which may release volatile vapors into the investigation area, including soil sampling, excavation, and groundwater monitoring.

To ensure the integrity of the samples collected, the following common procedures shall be employed:

- The use of new, disposable or decontaminated sampling equipment
- The use, changing, and disposal of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised.

13.5 PRE-SAMPLING CONSIDERATIONS

In preparing for sampling, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance to identify sampling locations.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions in the field book. In addition, any site-specific conditions or situations that could potentially affect the samples at the sample locations should be recorded.
- Record sampling locations with respect to approximate distance to and direction from at least one permanent feature.
- Survey the breathing zone around the sampling location with a PID, as necessary (see HASP), to ensure that the level of PPE is appropriate.
- Establish a secure sample staging area in an uncontaminated area of the site.

13.6 BUILDING INSPECTION AND MATERIALS SURVEY

A building inspection and materials inventory is often a prerequisite activity before initiating indoor air sampling; this task is not typically performed when sampling a treatment system. The scope of this activity, including completion of an inspection questionnaire (with a building representative, if possible), shall be performed in accordance with the project-specific work plan and applicable regulatory guidance. Before embarking on the inspection, confirm that there are no access limitations for the inspection, sampling activities, or photography.

Components of a typical building walkthrough and survey include:

- Identification of potential background sources of volatile compounds, such as vapor releases from neighboring properties, or materials stored within the building, such as paint, fuels, solvents, cleaners, etc. Some states may require scanning of the potential background sources with an appropriately sensitive PID.
- Review of current and historical building operations and chemical use.
- Assessment of the building construction and condition (e.g., whether or not a basement is present, poured or block foundation, concrete slab present, air flow, etc.).
- Identifying areas of potential VI into a building (e.g., cracks in the concrete slab or walls, pipe penetrations, sumps, etc.).
- Inspection and photographic documentation, if necessary, of proposed sample locations.
- Identification of building pressure/ventilation system location and specifications.

At the conclusion of the building inspection and survey, discuss the sampling procedures with the occupants and prepare the building for the indoor air sampling in accordance with the project-specific work plan. Preparations typically include requesting that the owners close the windows, remove sources of background VOCs (e.g., paint, fuels, solvents, household cleaners, beauty items), and refrain from smoking in the investigation area during sampling activities.

13.7 TREATMENT SYSTEM INSPECTION

Perform a check on the overall treatment system, including the sample port, to ensure proper operation prior to sample collection. The system review should include:

- Check that the system is powered on and operating in accordance with the performance monitoring or appropriate work plan requirements (e.g., operations and maintenance manual, manufacturer's specifications); record any discrepancies.
- Shut the air valve to the sampling port, and inspect its integrity and cleanliness; if there is an air sample septum, inspect the septum for any tears. Clean and replace materials as necessary, but avoid using chemicals which may release volatile vapors.
- Open the applicable valves in-line with the sample location; allow sufficient time to drain any condensate buildup from the air stream.

13.8 AIR SAMPLING PROCEDURES

Air samples are collected using clean, evacuated stainless steel canisters (e.g., Entech-style or SUMMA®-equivalent) supplied by the analytical laboratory, or active equipment, such as a Tedlar® bag, hand-powered pump, or syringe with a laboratory-supplied glass sample vial. The canister sampling equipment typically includes a canister under vacuum, a flow regulator with an in-line vacuum gauge, and in-line particulate filters. The flow regulator is pre-set by the laboratory to collect a sample over the collection period specified in the project-specific work plan. Instructions for connecting the sample canister to the flow regulator are typically provided by the laboratory. Active sampling methods (Tedlar® bag or syringe and glass sample vial), that uses mechanical vapor extraction, are only appropriate for the collection of "grab" samples; syringe and glass sample vial sampling is typically used for collecting samples from high-vacuum treatment systems.

At each sampling location, record the initial conditions at the sample location in accordance with the project-specific work plan or regulatory guidance, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations. Record sample locations with respect to a permanent feature and record a description of the sampling location.

If conducting performance monitoring of a vapor treatment system, ensure the air sample collection method is appropriate for the vacuum pressure measured at each sample location.

Collect quality assurance/quality control samples in accordance with SOP 4 and the project-specific work plan.

13.8.1 CANISTER SAMPLING

1. Ensure that the canister is in a stable position and will not fall or be relocated during the sampling process. As necessary, use a strapping device (e.g., bungee cords or rope) to secure the canister to a fixed object. If monitoring indoor/ambient air quality, place each air canister within the breathing zone or approximately 4 to 5 feet above the concrete slab or ground surface using a stationary object (e.g., step ladder, shelf, or table).
2. Place physical and visual barriers around the canisters, as necessary, so they are not disturbed during sample collection. The barriers should be placed in a manner so as not to compromise air flow around the canisters.
3. Open the canister's intake valve, record initial vacuum, and begin sample collection. Do not use canisters that show unacceptable initial vacuum readings as provided in the laboratory instructions or project-specific work plan.
4. Attach a label to the sample container and enter information (sample number, start date, start time, sampler's initials, analysis, initial vacuum readings, and place of collection).
5. As possible, check the canister vacuum gauge reading at least once during the sample collection period to ensure the canister's pressure is changing at the appropriate rate. If the canister's pressure is not changing at the appropriate rate, contact your project manager.
6. Once the sample collection period is completed, record the final vacuum, close the canister's intake valve, and disconnect the pre-set flow controller from the canister. Residual vacuum should be measurable after the collection period is completed; recommended residual vacuum is between -2 and -5 inches of mercury. The sample results may be subject to rejection during validation if vacuum was not maintained during the entire sample collection period. If vacuum readings are outside of the

recommended range, inform your project manager as soon as possible. Enter the remaining information on the sample label and field book (stop date, stop time, and final vacuum reading).

7 Record the final conditions at the sample location in accordance with the project-specific work plan or regulatory guidance, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations (e.g., odor, staining, or spills).

13.8.2 TEDLAR® BAG SAMPLING

1 Attach a new, appropriately-sized section of Teflon® or Teflon®-lined tubing to the air sampling pump. Note- an air sampling pump may not be necessary for treatment system sample collection if the vacuum pressure at the sample port is sufficient for sample collection.
2 Purge the tubing by operating the pump in accordance with the manufacturer's specifications, or by opening the valve at the sample port on a vapor treatment system. (This will remove the air present in the tube and pump mechanism, allowing the air to be sampled to enter the sampling assembly.)
3 Connect the pump's discharge to the Tedlar® bag sample port.
4 Open the Tedlar® bag valve.
5 Turn on the air sampling pump (or use the hand-powered pump), if necessary, and begin filling the Tedlar® bag. For active vapor treatment system samples, open the valve at the sample port and begin filling the Tedlar® bag. Ensure the air sampling pump's flow rate (or system flow rate) meets any requirements in the project-specific work plan or regulatory guidance, using a calibrated air sampling pump or inline flow meter.
6 Once the Tedlar® bag is approximately two-thirds full, close the valve on the Tedlar® bag and the treatment system valve, if necessary.
7 Discontinue pumping and disconnect the air sampling pump from the Tedlar® bag. For vapor treatment system samples, close the valve at the sample port and disconnect the sample port from the Tedlar® bag.
8 Attach a label to each bag and enter information (sample number, date, start/stop time, sampler's initials, analysis, and place of collection).
9 Record the final conditions at the sample location in accordance with the project-specific work plan or regulatory guidance, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations (e.g., odor, staining, or spills).

13.8.3 SYRINGE AND VIAL SAMPLING

1 Open all applicable valves to ensure there is air flow to the sampling location.
2 Attach a new stopcock to a new syringe, then attach a new needle on the end of the stopcock, in accordance with laboratory instructions.
3 Insert the needle into the sampling septum for the air stream to be sampled.
4 Purge the syringe using the air stream in accordance with the project-specific work plan: open the stopcock, gently/slowly pull the air stream into the syringe, then withdraw the needle perpendicular from the sampling septum and compress the plunger to evacuate the syringe.
5 Insert the needle into the sample septum again, gently/slowly pull the volume of air specified in the laboratory instructions, and hold the plunger at the specified volume for at least 30 seconds.
6 Close the stopcock and withdraw the needle perpendicular from the sampling septum.
7 Immediately insert the syringe needle through the laboratory-supplied sample vial septum. Minimize hole puncture size by keeping the syringe 'in-line' with the sample bottle.
8 Open stopcock and compress plunger to transfer sample into sample vial.
9 While keeping the plunger compressed, gently/quickly remove the vial from the needle.
10 As necessary, repeat this procedure from step 6 until the full sample volume (as specified by the analytical laboratory) has been attained.

11 Label the sample vials in accordance with laboratory instructions; note that extra labels or tape should not be added as they have the potential to damage the laboratory equipment. Record the amount of sample provided to the laboratory in the field book.

13.9 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Once sample collection is complete, prepare the air sample canisters, bags, or sample vials for offsite laboratory analysis:

1 Clean the outside of the sample container, if necessary.
2 Ensure all required information is completed on each sample label (see above).
3 Record the sample designation, date, time, and the sampler's initials in the field book and on a sample tracking form, if appropriate
4 Complete chain-of-custody forms with appropriate sampling information, including:
   - Location
   - Sample name
   - Sample collection start and end dates and times
   - Initial vacuum measurement, if applicable
   - Ending vacuum measurement, if applicable
   - Sample regulator number, if applicable
   - Sample canister number, if applicable
   - Sample volume, if applicable
   - Analytical method
5 Complete sample packing and ship in accordance with proper procedures.

Note that air samples are typically shipped under ambient temperatures.

13.10 CLOSING NOTES

Once sampling is completed, secure the sample port, if applicable, and mark all sample locations with spray paint, stakes, or other appropriate marker for future reference, as needed, or survey, including collecting Global Positioning System coordinates and photographs, in accordance with the project-specific work plan. Once sampling is completed, properly manage all PPE and IDW in conformance with SOP 6, the project-specific work plan, and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #14

SUB-SLAB VAPOR SAMPLING PROCEDURES

Sub-slab vapor sampling involves the collection of samples from the space beneath a concrete slab and above the soil column, and is typically conducted within a building footprint. The procedures outlined in this Standard Operating Procedure (SOP) are designed to ensure that sub-slab vapor (SSV) samples are representative and have not been altered or contaminated by the sampling and handling methods. Sub-slab vapor sampling is generally conducted to assess the presence of volatile organic compounds (VOCs) beneath a concrete slab, but, in special cases, may also include semivolatile organic compounds, such as naphthalene, elemental metals, such as mercury, or other organic compounds, such as polychlorinated biphenyls. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

14.1 ACRONYMS AND ABBREVIATIONS

IDW	investigation derived waste
HASP	health and safety plan
PID	photoionization detector
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure
SSV	sub-slab soil vapor
VI	vapor intrusion
VOCs	volatile organic compounds

14.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment (e.g., photoionization detector [PID]) with calibration reagents and standards, as needed
- Camera
- Portable weather station, as needed
- Sampling containers and labeling/shipping supplies
- Sample point installation materials:
  - Concrete drill or corer and appropriately sized bits (e.g., hammer drill)
  - SSV point assembly
  - Teflon®, Teflon®-lined, or stainless steel tubing
  - Tube fittings (e.g. Swagelok®, Qwik-Lok®)
  - Non-volatile sealant material (e.g., hydrated bentonite, silicone stopper, non-shrinking clay)
  - Permanent cover assembly, if necessary
  - Potable water
- Leak testing materials, as needed:
  - Tracer compound detector (e.g., helium gas detector)
  - Tracer compound gas (e.g., helium)

  - Shroud (e.g., 5-gallon bucket, stainless steel dome)
  - Shroud sealant material (e.g., bentonite pellets or modeling clay)
  - Tedlar® bags (to capture purged soil gas), as required
- Tubing (e.g., Teflon®, Tygon®)
- Air purging pump or syringe, as needed
- Adjustable wrenches, as needed
- Air sampling pump, as needed
- Inline flow meter, as needed

14.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOP. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting SSV sampling activities and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), and the use and calibration of SSV sampling and monitoring equipment (SOP 7). This SOP does not cover other vapor sampling activities, such as air sampling (SOP 13) or soil vapor sampling (SOP 15). Additionally, this SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics require a significant amount of planning and are more appropriately addressed in a project-specific work plan. Before implementing the SSV sampling, be sure to review the project-specific work plan or Quality Assurance Project Plan (QAPP) and any applicable state and federal guidelines or sampling procedures.

All sampling and monitoring references must be available for consultation in the field, including:

- Company SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

14.4 GENERAL PROCEDURES

Sub-slab vapor can be affected by temporal, structural, and meteorological factors. It is important to carefully note the use of the building and minimize the number of factors that could influence the SSV results (e.g., keeping the windows closed during the sampling). The user should also be aware that a number of regulatory agencies have specific guidelines as to timing or the sequence of the sampling activities, particularly if performed as part of a vapor intrusion (VI) investigation.

Although the specific procedures used to sample SSV vary between investigations, most sampling can be broken down into a five-step sequence:

1. Inspection (if sampling is performed within a building): a detailed survey the subject building including an evaluation of all materials used or stored in the structure that could potentially interfere with the sample collection
2. Sample Point Installation: installing the SSV point in the sub-slab material.
3. Leak Testing: testing the integrity of the SSV sample point (if required).
4. Purging: removing any non-representative vapor from the SSV sample point.
5. Sample Collection: collecting samples over a specified period (typically grab, 1-hour, 8-hour or 24-hour), using a laboratory-supplied container, such as an evacuated sample canister with the appropriate regulator, or a Tedlar® bag with an air sampling pump.

Information regarding weather conditions, including temperature, barometric pressure, wind speed and direction, and precipitation, should be noted and recorded in the field notebook during all steps. A portable weather station is often required for documenting the weather conditions. Consult the project-specific work plan and applicable regulatory guidance to determine if fixed weather monitoring during the sample collection is required.

The project team should discuss the project-specific sampling procedures and equipment in advance of site mobilization. While the investigation is underway, the project team should avoid other environmental activities which may release volatile vapors into the investigation area, including soil sampling, excavation, and groundwater monitoring.

To ensure the integrity of the samples collected, the following common procedures shall be employed:

- The use of new, disposable or decontaminated sampling equipment
- The use, changing, and disposal of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised.

14.4.1 PRE-SAMPLING CONSIDERATIONS

In preparing for sampling, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify sampling locations.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions in the field book. Any site-specific conditions or situations that could potentially affect the samples at the sample locations should also be recorded.
- Record sampling locations with respect to approximate distance to and direction from at least one permanent feature.
- Survey the breathing zone around the sampling location with a PID, as necessary (see HASP), to ensure that the level of PPE is appropriate.
- Establish a secure sample staging area in an uncontaminated area of the site.
- All construction materials must be selected in accordance with the project-specific work plan and relevant regulatory guidance.

14.5 BUILDING INSPECTION AND MATERIALS SURVEY

A building inspection and materials inventory is often a prerequisite activity before initiating SSV sampling. The scope of this activity, including completion of an inspection questionnaire (with a building representative, if possible), shall be performed in accordance with the project-specific work plan and applicable regulatory guidance. Before embarking on the inspection, confirm that there are no access limitations for the inspection, sampling activities, or photography.

Components of a typical building walkthrough and survey include:

- Identification of potential background sources of volatile compounds, such as vapor releases from neighboring properties, or materials stored within the building, such as paint, fuels, solvents, cleaners, etc. Some states may require scanning of the potential background sources with an appropriately sensitive PID.
- Review of current and historical building operations and chemical use.
- Assessment of the building construction and condition (e.g., whether or not a basement is present, poured or block foundation, concrete slab present, air flow, etc.).
- Identifying areas of potential VI into a building (e.g. cracks in the concrete slab or walls, pipe penetrations, sumps, etc.).
- Inspection and photographic documentation, if necessary, of proposed sample locations.
- Identification of building pressure/ventilation system location and specifications.

At the conclusion of the building inspection and survey, discuss the sampling procedures with building occupants and prepare the structure for the SSV sampling in accordance with the project-specific work plan. Building preparations typically include requesting that the building occupants close windows and remove sources of background VOCs (e.g., paint, fuels, solvents, household cleaners, beauty items), and that they refrain from smoking in the investigation area during sampling activities.

14.6 SAMPLE POINT INSTALLATION

Ensure each proposed SSV location is clear of potential hazards, including utilities prior to breaking the ground surface (see SOP 2). SSV points are installed through the concrete floor slab to sample the space beneath the slab and above the soil column, and are installed on ground level (slab-on-grade construction) or basement level of a structure. If the building floor is not made of concrete (e.g., earthen), you must contact the project manager to determine if soil vapor or indoor air samples are more appropriate for the conditions encountered in the field. The samples are typically collected through a small diameter (typically less than 1-inch) core hole drilled in the concrete floor to allow access to the soil and soil vapor directly beneath the slab. Before drilling, inspect the proposed location for potential hazards, including utilities (see SOP 2). In buildings with an earthen floor on the lowest level, consult the project-specific work plan and applicable regulatory guidance to determine if SSV samples collected from the available concrete area (e.g., concrete pads beneath a furnace, hot water heater, or other equipment) should be collected concurrently with either air samples (SOP 13) or soil vapor samples (SOP 15) collected from the space overlying the earthen floor.

Depending on the type of SSV sample point selected for the project, one or two concentric holes are drilled in or through the concrete slab with a hammer drill (or similar). If two holes are drilled, first the larger diameter hole (typically 1-inch), is advanced from the ground surface to a depth of approximately 1 inch to 2 inches deep. This hole will serve as an annular space to be filled with a seal (e.g., hydrated bentonite, a silicone stopper, or non-shrinking, non-volatile clay) or to house a flush-mount cover. Once the outer hole is complete, a second, smaller diameter hole (typically 3/8-inch) is drilled through the center of the outer hole, and advanced through the concrete slab and into the sub-slab material (e.g., soil, gravel); the thickness of the concrete should be recorded in the field notebook. The intent is to create a small space suitable for insertion of the sampling tubing or soil vapor sampling implant (if required) below the slab. Once the targeted depth has been reached, remove the drill from the hole and use a hand vacuum or shop vacuum to remove concrete dust from the hole and surrounding work area.

Next, based on the work plan and slab thickness, construct the SSV point; typically, the base of the point extends through the slab. SSV points can be purchased from various manufacturers, constructed of stainless steel tubing and various fitting, or constructed of simply Teflon®/Teflon®-lined tubing. If using purchased points, place the assembled point into the hole, and seal in place as per manufactures instructions. If assembling points by hand, place a small amount of clay or a silicon stopper on the point where, when inserted, the outer hole meets the inner hole (i.e., slab thickness less 1- to 2-inches). Insert assembled point into the hole snugly to create an airtight seal. The seal can be augmented, if necessary, by adding a non-shrinking, non-volatile material, such as modeling clay or grout. SSV points can be completed with protective covers (flush-mount preferred) for permanent points. Attach the appropriate fittings (e.g., a 3-way valve) and additional tubing, as necessary, and seal the point. Be sure that the tubing is clamped or otherwise closed off to avoid discharging vapor to the air.

Sampling must not be performed until the subsurface equilibrium has been re-established below the slab and, if sampling indoors as part of a VI investigation, any vapors that have escaped from the subsurface during the implant installation have had a chance to

dissipate. Equilibrium is typically re-established approximately 24 hours after the sample point installation, or as otherwise specified in the project-specific work plan or regulatory guidance.

14.7 LEAK TESTING PROCEDURES

If required, the integrity of the seal between the concrete slab and the SSV point and sample train can be verified using a tracer gas such as helium. This type of leak testing is typically performed before sampling and involves creating an enclosure above the sample point, which is then charged with the tracer gas. A meter capable of detecting the tracer is then connected to the sampling tube and monitored to ensure that the gas (an analog for indoor air) is not passing through the seal and being introduced into the sample train.

The user should verify the leak testing procedures in the project-specific work plan and/or relevant regulatory guidance.

The generic leak testing procedures are as follows:

1. Select a container to serve as the shroud (e.g., 5-gallon bucket or stainless steel dome). This The device should be of sufficient size to cover the SSV sample. Dedicated testing shrouds with fittings and sample ports are available from some laboratories or can be purchased/constructed.
2. Fit the shroud with two hose barbs or quick-lock connectors, one sized appropriately to connect to the sample tubing and the other sized appropriately for tubing from the tracer gas. These fittings allow the tracer gas to be introduced to the enclosure and the SSV sample point tubing to be connected to the detector outside of the shroud.
3. Connect the sample tubing to the appropriate connector inside the shroud and then place it over the sample point and aboveground tubing and fittings. The shroud should be sealed to the floor using modeling clay, bentonite, or other appropriate material.
4. Connect the detector to the shroud via a short length of tubing and start the detector. The detector's pump rate should not exceed a maximum of 200 milliliters per minute.
5. Charge the shroud with a tracer gas through the second hose barb or quick-lock connector. A target concentration of 10% to 20% is generally recommended for within the shroud, or as otherwise specified in the project-specific work plan and relevant regulatory guidance.
6. Measure the tracer compound concentrations by alternatingly connecting the gas detector to the first and second quick-lock connectors.
7. Monitor the SSV sample point over a period of at least 2 minutes, or as otherwise specified in the site-specific work plan or regulatory guidance. A leak is occurring if the tracer gas is detected within the sample train above background concentrations, or as otherwise specified in the project-specific work plan and relevant regulatory guidance. If a leak is detected, the seal around the SSV sample point must be repaired or augmented and the process repeated until the results indicate the seal is competent.
8. Record the leak detection procedures and observations in the field book.
9. Disassemble the shroud.

14.8 SSV POINT PURGING PROCEDURES

Before collecting the SSV sample, the sample point and sample train (tubing, connectors, valves, etc.) must be purged to remove any ambient air. Purging can be accomplished by connecting a hand-powered air pump or vapor syringe to the SSV discharge tubing. A "low-flow" purge rate (typically a maximum of 200 milliliters per minute) is required by many regulatory agencies to avoid potential short-circuiting or desorbing of volatile compounds from soil particles; a calibrated sampling pump or inline flow meter may be used to ensure the flow rate is maintained. A minimum of 3 tubing/point volumes should be purged from the SSV sampling assembly prior to sample collection. The volume is calculated as follows:

$$\textbf{Purge Volume} = (3 * \pi * r2 * h)_{point} + (3 * \pi * r2 * h)_{tubing}$$

Where:

r = the inner radius of the point and connecting tubing
h = the height of the point and the connected tubing

Purged vapor from the SSV point should be contained in Tedlar® bags to prevent the release of SSV into the indoor airspace. As required by the project-specific work plan or regulatory guidance, collect air quality readings from the purged air (e.g., PID).

14.9 SSV SAMPLE COLLECTION

SSV samples are collected using clean, evacuated stainless steel canisters (e.g., Entech-style or SUMMA®-equivalent), or active (requires a pump) equipment, such as a Tedlar® bag and hand-powered pump. The canister sampling equipment typically includes a canister under vacuum, a flow regulator with an in-line vacuum gauge, and in-line particulate filters. The flow regulator is pre-set by the laboratory to collect a sample over the collection period specified in the project-specific work plan and the laboratory task order. Instructions for connecting the sample canister to the flow regulator are typically provided by the laboratory. Tedlar® bag sampling is only appropriate for "grab" samples.

At each sampling location, record the initial conditions at the sample location in accordance with the project-specific work plan or regulatory guidance, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations. Record sample locations with respect to a permanent feature and record a description of the sampling location.

Collect quality assurance/quality control samples in accordance with SOP 4 and the project-specific work plan. Duplicate samples may be collected by using a "T" fitting attached to the sample tubing.

14.9.1 CANISTER SAMPLING

1. Connect the sample canister to its dedicated[1] , pre-set flow controller with an in-line vacuum gauge. If using a SUMMA®-equivalent canister, tighten (hand-tight) the fitting with adjustable wrenches. Do not overtighten. If using an Entech-style canister, connect the canister to the flow controller by sliding back the collar on the female end of the regulator's fitting and inserting it into the male end of the canister's fitting.
2. Ensure that the canister is in a stable position and will not fall or be relocated during the sampling process. Place physical and visual barriers around the canisters, as necessary, so they are not disturbed during sample collection.
3. Open the appropriate valve port on the SSV discharge tubing to allow vapor flow from the SSV point to the sample canister.
4. Open the canister's intake valve, record initial vacuum, and begin sample collection. Do not use canisters that show unacceptable (as detailed in the laboratory instructions or project-specific work plan) initial vacuum readings.
5. Attach a label to the sample container and enter information (sample number, start date, start time, sampler's initials, analysis, initial vacuum readings, and place of collection).
6. As possible, check the canister vacuum gauge reading at least once during the sample collection period to ensure the canister's pressure is changing at the appropriate rate. If the canister's pressure is not changing at the appropriate rate, contact your project manager.
7. Once the sample collection period is completed, record the final vacuum, close the canister's intake valve, close the valve port connected to the SSV discharge tubing, disconnect the sample canister's intake port to the tubing from the SSV point, and disconnect the pre-set flow controller from the canister. Residual vacuum should be measurable after the collection period is completed; recommended residual vacuum is typically between -2 and -5 inches of mercury. The sample results may be subject to rejection during validation if vacuum was not maintained during the entire sample collection period. If vacuum readings are outside of the recommended range, inform your project manager as soon as possible. Enter the remaining information on the sample label and field book (stop date, stop time, and final vacuum reading).
8. Record the final conditions at the sample location in accordance with the project-specific work plan or regulatory guidance, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations (e.g., odor, staining, or spills).

[1] [1] Some laboratories match and pre-test specific flow controller and canister assemblies at the laboratory prior to shipment to the field for sample collection; be sure to assemble the equipment in the field using the matched components.

14.9.2 TEDLAR® BAG SAMPLING

1. Attach a new, appropriately-sized section of Teflon® or Teflon®-lined tubing to the air sampling pump.
2. Purge the tubing by operating the pump in accordance with the manufacturer's specifications (this will remove whatever air was present in the tube and pump mechanism allowing the air to be sampled to enter the sampling assembly).
3. Connect the pump's intake to the SSV discharge tubing, and the pump's discharge to the Tedlar® bag sample port.
4. Open the Tedlar® bag valve and the appropriate valve port for the SSV discharge tubing to allow air flow from the SSV point to the Tedlar® bag.
5. Turn on the air sampling pump (or use the hand-powered pump) and begin filling the Tedlar® bag. Ensure the air sampling pump's flow rate meets any requirements in the project-specific work plan or regulatory guidance, using a calibrated air sampling pump or inline flow meter.
6. Once the Tedlar® bag is approximately two-thirds full, close the valve on the Tedlar® bag and the valve on the SSV discharge tubing.
7. Discontinue pumping and disconnect the air sampling pump from the Tedlar® bag.
8. Attach a label to each bag and enter information (sample number, date, start/stop time, sampler's initials, analysis, and place of collection).
9. Record the final conditions at the sample location in accordance with the project-specific work plan or regulatory guidance, often including the weather conditions (e.g., precipitation, barometric pressure, and indoor and outdoor temperature), PID readings, and any observations (e.g., odor, staining, or spills).

14.10 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Once sample collection is complete, prepare the air sample canisters for offsite laboratory analysis:

1. Clean the outside of the sample container, if necessary.
2. Ensure all required information is completed on each sample label (see above).
3. Record the sample designation, date, time, and the sampler's initials in the field book and on a sample tracking form, if appropriate
4. Complete chain-of-custody forms with appropriate sampling information:
   - Location
   - Sample name
   - Sample collection start and end date and times
   - Initial vacuum measurement, if applicable
   - Ending vacuum measurement, if applicable
   - Sample regulator number, if applicable
   - Sample canister number, if applicable
   - Analytical method
5. Complete sample packing and ship in accordance with proper procedures.

Note that air samples are typically shipped under ambient temperatures.

14.11 CLOSING NOTES

Once sampling is completed, secure the sample port or abandon the location boreholes/locations in accordance with the project-specific work plan. Mark all sample locations with spray paint, stakes, or other appropriate marker for future reference, as needed, or survey, including collecting Global Positioning System coordinates and photographs, in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and IDW in conformance with SOP 6, the project-specific work plan, and applicable regulations.

ENCLOSURE B – UPDATED HEALTH AND SAFETY PLAN

SHORT FORM HEALTH AND SAFETY PLAN

FORMER TRANSTECHNOLOGY CORPORATION

BREEZE-EASTERN LLC

PROJECT NO.: 31400522.000
DATE: SEPTEMBER 1, 2022

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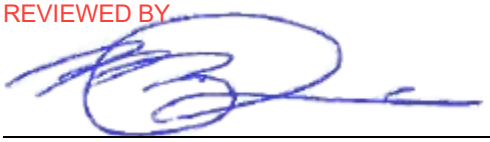

Michael Donaldson
Health and Safety Manager
Central Region and Earth & Environment

This Health and Safety Plan (HASP) was prepared by WSP USA (WSP) for our client, Breeze-Eastern LLC, in accordance with the master services agreement, dated October 4, 2017. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party that are the result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

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	Site contact information
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	Hazards inherent to site (regardless of contaminants, such as operations and environmental hazards
	Site topography
	Accessibility by road and air
	Contaminants of concern
	Site security
	Obtain detailed WSP work plan
	Review WSP's standard operating procedures (SOPs)
	Underground utility clearance and communication record (WSP SOPs)
	Decontamination procedures (WSP SOPs)
	National Institute for Occupational Safety and Health (NIOSH) pocket guide pages for all constituents
	HAZWOPER Certificates
	Respirator fit test forms
	First-aid/CPR cards
	All form fields in the Health and Safety Plan (HASP) completed
	HASP reviewed by competent WSP staff member
	Project manager reviewed HASP and signed signature page
	All WSP site personnel signed signature page

1 INTRODUCTION

Table 1.1 Site Location and Contact Information

Project No.	31400522.000
Site Name	Former TransTechnology Corporation Facility
Street Address	1 Robert Lane
City	Glen Head
State/Country	New York
Site Contact	John Simon (Gnarus LLC, on behalf of Breeze-Eastern LLC)
Phone Number	(202) 505-1906
Start Date of Work	August 1, 2021 (current version of HASP)
Projected End Date of Work	Ongoing

1.1 ORGANIZATIONAL STRUCTURE

Every health and safety plan (HASP) WSP prepares is organized to ensure that information regarding site conditions, potential exposure to hazards, and worker safety flows freely within the project team. The HASP also establishes a chain of command with lines of authority, responsibility, and communication, as required by the Occupational Safety and Health Administration (OSHA). Each project will have a *General Supervisor* (as designated by OSHA), a *Task Manager*, and a *Site Health and Safety Coordinator* (SHSC). The *General Supervisor* is typically the WSP project director who is ultimately responsible for the overall implementation of the project. The project director's role as the *General Supervisor* is to staff and support the work appropriately. This includes securing company funds for the personal protective equipment (PPE) and monitoring equipment recommended for the site in this HASP.

The designated *Task Manager* is responsible for the safe and proper implementation of the work plan activities detailed below. They have authority to expend company resources for PPE and other safety equipment. The *Task Manager* oversees all field work associated with the project and will communicate with the project director regarding implementation of the work. The SHSC is responsible for the implementation of this HASP. The SHSC will communicate any issues with changing site conditions, upgrades in PPE, decontamination procedures and needs for monitoring equipment with the *Task Manager*. The SHSC will confirm that other workers[1] assigned to the project are following the HASP.

It is expected that all other employees assigned to the project will follow the HASP and report all potential safety concerns to the SHSC.

[1] Other personnel required to conduct the proposed work will be assigned to the project and this HASP, as appropriate.

1.2 PERSONNEL ASSIGNMENTS

Certificates documenting the training for field personnel are provided in Appendix A.

Table 1.2 Project Personnel

Project Manager	Dave Bouchard
Task Manager	
SHSC	
Field Personnel	
Field Personnel	

2 SITE BACKGROUND

The former TransTechnology Corporation (TTC) facility is located at 1 Robert Lane, Glen Head, Nassau County, New York (Figure 1). The facility formerly consisted of a 96,000-square-foot main manufacturing building with several smaller outbuildings that was originally developed in the late 1950s (Sheet 1). The plant was used to produce aircraft actuators, printed circuit boards, and other computer components operating first as Lundy Electronics Company through 1984; and, after its purchase, as TTC[2] until the factory was decommissioned in 1994. Portions of the main and outbuildings were leased to small business from the mid-1990s through 2004, after which the site was vacated in preparation for the remedial work. The property is currently unoccupied, and all the onsite buildings have been razed in advance of redevelopment. No above grade features remain at the site except for limited areas of pavement near the facility entrance (i.e., Robert Lane).

The rectangular-shaped 7.75-acre site is in a mixed-use commercial and residential area of Long Island (Sheet 2). The property is bordered to the north by a Nassau County storm water recharge basin and North Shore High School; to the east by the Long Island Railroad; the south by mixed residential and commercial properties and a water tower; and to the west by residential properties along Dumond Place and Todd Drive East (Todd Estates).

The site is accessible by road via paved drive leading from Dumond Place, which connects to Robert Lane (Sheets 1 and 2). The site is also accessible by air, if necessary.

2.1 PREVIOUS INVESTIGATIONS AND REMEDIATION

Chlorinated volatile organic compounds (VOCs), including trichloroethene (TCE; used at the plant until 1978 for vapor degreasing and chrome plating), were first detected in the early 1990s during the removal of an underground fuel oil tank (Sheet 1). The findings resulted in several follow-up environmental investigations in the late 1990s and early 2000s designed to characterize the soil in and around suspected source areas, and further evaluate the extent of chlorinated VOCs in the groundwater. The investigations included onsite borings to delineate affected soil; the installation (and sampling) of 11 groundwater monitoring wells, designated TT-MW-01 through TT-MW-11, screened[3] in the upper portion of the water table (at approximately 110 feet below ground surface [bgs]); and soil gas (vapor) sampling points in and around the buildings. Affected soil was detected in surface and subsurface samples, and in select drainage structures (catch basins, leach pits, and cesspools) associated with the facility. The soil samples revealed concentrations of chlorinated VOCs, and, in select locations, metals (including chromium), and polycyclic aromatic hydrocarbons (PAHs).

Groundwater monitoring well samples collected during the early investigations contained up to 1,800 micrograms per liter (µg/l) of TCE and 16,000 µg/l of tetrachloroethene (PCE) with substantially lower concentrations of *cis*-1,2-dichloroethene (*cis*-1,2-DCE), and vinyl chloride. The dissolved TCE, when plotted, appeared to outline a shallow (i.e., in the upper 10 to 20 feet of the water-bearing zone) groundwater plume extending from the southeast corner of the facility (near the former vapor degreasing and chrome plating operations) north-northwest towards the property line along the interpreted groundwater flow direction (Sheet 1). Concurrent onsite soil gas samples collected during the groundwater investigation showed a similar pattern of TCE-affected soil gas. The distribution of the PCE in groundwater and soil gas, which was detected primarily in the southern portion of the site away from the former manufacturing areas of the facility, suggested an offsite upgradient release.

The New York State Department of Environmental Conservation (NYSDEC), based on these (and other) findings, listed the former TTC facility as a Class 2 Inactive Hazardous Waste Disposal site (#1-30-101) and launched separate investigations (the *2000 Preliminary Site Assessment for the Glen Head Region Groundwater Plume* and, later, the *2007 Site*

[2] TransTechnology Corporation changed its name to Breeze-Eastern, the current owners of the site, in 2006.

[3] All onsite monitoring wells were screened in similar geologic materials consisting primarily of coarse sand and gravel with occasional silty and micaceous sand interbeds and clay seams. These materials are comparable with the descriptions of the Pleistocene-aged Upper Glacial and the upper portions of the Cretaceous-aged Magothy Formations, hydraulically connected unconsolidated units that underlie much of Long Island and are the primary source of potable water for Nassau County.

Characterization Report, Glen Head Groundwater Plume) into the suspected upgradient[4] release of PCE from nearby dry-cleaners (Sheet 2). The work also led to an *Order on Consent* (Index #WI-0913-02-02) filed with the Nassau County Clerk's Office by NYSDEC in May 2002. The order required that TTC undertake remedial work at the site to address the impacts to soil and groundwater beginning with a remedial investigation and feasibility study (RI/FS). Approval of the RI/FS work plan was granted in September 2002. The RI was conducted in 2003 with the FS completed in 2005.

2.1.1 REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

The results of the 2003 RI investigations confirmed earlier findings revealing metals from past chrome plating operations and chlorinated VOCs from the facility's degreasers (Sheet 1). These constituents were present in surface soil (and, in limited locations, the subsurface soil); the soil gas and groundwater (chlorinated VOCs only); and, in the sediment within select subsurface drainage structures at the site. Concurrent groundwater monitoring determined that dissolved concentrations of both PCE and TCE were present, but only the TCE was attributable to the manufacturing activities at the site (the PCE was, as was previously concluded, likely the result of an offsite release at the nearby dry-cleaning facilities). The soil vapor investigation also revealed concentrations of PCE and TCE (and several other daughter products associated with these compounds) in the soil gas, which were not correlated with the impacted soil and were, instead, attributed to the affected groundwater.

The remedy outlined in the 2005 FS targeted affected soil and impacted subsurface drainage structures at the site. The NYSDEC approved the approach in the FS and, in June 2006, issued a 2006 *Record of Decision* (ROD[5]) for the remediation of affected soil at the site, designated as Operable Unit No. 1 (OU-1[6]). The ROD specified the excavation of organic and inorganic-impacted soil (primarily chlorinated VOCs and metals, respectively) for offsite disposal, and the remediation of the known subsurface drainage structures at the site.

Findings associated with the groundwater and soil gas, designated as Operable Unit No. 2 (OU-2), presented in the 2005 FS are detailed below.

OPERABLE UNIT NO. 1 REMEDIATION

The first phase of soil remediation was performed in the summer and early fall of 2009. The activities included the excavation of impacted surface soil in locations distributed around the main and outbuildings (designated with the SURF prefix); select deeper excavations to address identified affected (subsurface) soi1 (e.g., the B-5 excavation along the eastern property line); and the planned cleanout of the identified drainage structures (Sheet 1). Follow-up phases of remediation conducted between 2010 and 2012 included addressing previously unknown drainage structures (primarily catch basins and leach pools) discovered during the activities. The previously unknown structures were evaluated and remediated, as necessary, on an *ad hoc* basis after they were uncovered in the field.

The OU-1 remedial activities, completed in 2012, were documented in the *OU-1 Remedial Action Construction Completion Report* (CCR), dated November 9, 2015. The report detailed not only the soil and structure remediation at the site but included the *Interim Site Management Plan* (SMP). This document, which includes detailed the soil management areas (depicted on Sheet 1); the characteristics of, and the procedures for, managing *Discovered Contamination* (as defined in the SMP); and an *Excavation Work Plan* for any onsite (intrusive) activities, is being used to govern the post-closure investigation and remediation conducted at the site to support the redevelopment of the property.

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[4] The NYSDEC investigations focused on former and active dry-cleaning facilities south and southeast (upgradient) of the TTC facility, all of which had documented releases of PCE to the environment. Dissolved chlorinated VOCs, including PCE (10 to 18,000 µg/l), detected in groundwater monitoring well samples (installed south and west of the TTC site) outlined a plume extending from Glen Head Road (near the intersection of the LIRR tracks) northwest parallel to the regional groundwater flow direction. The affected groundwater (and an associated plume of chlorinated VOC-affected soil gas) was detected beneath the adjacent residential neighborhoods and the southern portion of the former TTC site.

[5] *Record of Decision*, TransTechnology, Operable Unit No. 1, Glen Head, Nassau County, New York, Site Number 1-30-101, dated June 2006.

[6] Affected groundwater and soil gas associated with the site were grouped as Operable Unit No. 2 (OU-2). The details regarding the OU-1 soil remediation and the OU-2 groundwater and soil vapor investigation (and soil vapor mitigation) are presented separately from the soil work in the *Operable Unit No. 2* Section below.

The NYSDEC approved the OU-1 CCR (and the accompanying SMP) in a letter, dated February 9, 2016. The approval acknowledged the completion (and closure) of the OU-1 soil remediation at the site.

2.1.2 OPERABLE UNIT NO.2 INVESTIGATION

The RI OU-2 activities evaluated the water quality conditions at the site and assessed the extent of affected groundwater. The investigation results supported the earlier investigation findings that the TCE-affected groundwater (and the co-located TCE dominated soil gas) was likely attributable to the TTC facility. The data also revealed that the TCE-based plume was comingled with the onsite portions of the PCE-dominated (regional) plume associated with the dry-cleaning facilities. The conclusion presented in the RI was that it would be technically impractical to remediate the relatively minor TCE-affected groundwater without addressing the larger, regional plume and, because of a lack of current or (likely) future use of the onsite groundwater for potable purposes, remediation was not warranted.

The NYSDEC provided comments based on the RI data and requested additional delineation of the groundwater flow direction and offsite extent of VOCs in groundwater (the findings in the RI led to the erroneous conclusion that the TCE-affected groundwater had not migrated offsite). Repeat groundwater monitoring and property line groundwater profiling (at locations GP-1 and GP-2) performed in response to the Department's request verified that dissolved TCE was present at the downgradient edge of the site warranting additional offsite investigation (Sheets 1 and 2).

SUPPLEMENTAL GROUNDWATER REMEDIAL INVESTIGATION

Follow-up groundwater investigations between 2010 and 2012 used multi-depth *offsite* groundwater profiling, concurrent soil gas sampling, and additional monitoring of the onsite and offsite groundwater wells to further evaluate the extent of affected groundwater (Sheet 2). The groundwater analytical data revealed that the previously described plume of TCE-affected groundwater originating from the manufacturing areas of the former site (i.e., the former vapor degreasing and chrome plating and area; Sheet 1) extended beyond the western property line. The defined plume is approximately 1,200-feet-long, relatively narrow (approximately 400 feet wide at the western property line) and is present beneath the adjacent Todd Estates and the neighborhood beyond Glen Cove Avenue. The TCE plume was found to be comingled with the regional PCE plume, which was significantly larger than previously understood extending from the nearby dry cleaners to the northwest beneath the southern portion of the TTC site and most of the adjoining neighborhoods. A general outline of the affected groundwater from both plumes is depicted on Sheet 2.

Vapor sampling performed concurrent with the groundwater profiling activities indicated TCE and PCE were present in the shallow soil gas in locations directly over the groundwater plumes. Follow-up indoor air and sub-slab soil gas testing in residences directly adjacent the former TTC facility resulted in the NYSDEC-approved installation and operation of vapor mitigation systems in two homes and annual indoor air monitoring in two additional homes (Sheet 2).

WSP implemented an annual indoor air monitoring and mitigation system inspection regime, and a voluntary groundwater monitoring program at the site following supplemental groundwater investigations. Both programs are ongoing with indoor air sampling conducted in select homes on an annual basis and groundwater sampled on a semiannual basis. The sampling procedures (and the associated risks) for the vapor and groundwater monitoring activities are detailed in the *Current Onsite Activities Section* (Section 3) below.

2.2 POST-CLOSURE ACTIVITIES

Post-closure activities were conducted to facilitate the sale and redevelopment of the property. The work, begun in 2016, consisted of demolition of the main and outbuildings; an evaluation of the soil beneath the former main building slab; and the in-place pre-characterization of the site-wide surface and, in select locations, subsurface soil (Sheet 1). The activities also included the abandonment (by removal or partial deconstruction) of the subsurface drainage structure drainage structure network[7] at the site. The decommissioning work was performed on the previously remediated structures and additional pits or

[7] The location of the 77 structures identified in the dedicated subsurface drainage network is not shown on Sheet 2, for clarity. Additional information regarding the abandonment of the structures is presented in the *Subsurface Drainage Structure Abandonment and Soil Remediation Report* on July 22, 2019, and the Additional Subsurface Drainage Structure Abandonment Activities *Letter Report*, dated June 10, 2020.

basins uncovered during the abandonment activities (after they were remediated following the procedures used during the OU-1 activities). Any potentially affected soil identified around the structures or the associated piping during the uncovering process was addressed following the procedures outlined in the *Excavation Work Plan* of the SMP.

The subsurface abandonment work was performed between 2016 and 2019. A total of 77 subsurface structures were abandoned in accordance with the approved engineering procedures. The site was subsequently graded and vegetated to minimize runoff and stabilize the ground surface.

Periodic inspections are conducted at the site to ensure that the storm water controls at the site (grading, silt fence, ground cover, etc.) remain in place and are functioning as designed. The inspection regime is detailed in the *Current Onsite Activities Section* (Section 3) below.

2.3 CHEMICALS OF CONCERN

The four chlorinated VOCs listed above (PCE, TCE, *cis*-1,2-DCE, and vinyl chloride) are the primary constituents of concern at the site and are potentially present in the soil gas and groundwater. These compounds, along with metals and select PAHs, were excavated for offsite disposal during the OU-1 remediation and the subsequent post-closure activities and, except for the soil inside management areas depicted in the SMP (and on Sheet 1), are unlikely to be encountered as part of the activities listed in the scope of work.

National Institute of Occupational Safety & Health (NIOSH) data sheet (obtained from the NIOSH Pocket Guide) for each of the chlorinated VOCs listed above is presented in Appendix B.

3 CURRENT ONSITE ACTIVITIES

WSP has completed the OU-1 soil remediation and post-closure activities designed to prepare the site for sale and redevelopment. The current work at the site and the surrounding area (i.e., the study area) is focused on the affected groundwater and soil gas (as part of the OU-2 activities), the maintenance of storm water controls for the now vacated property, and limited surface soil sampling associated with the replacement[8] of the adjoining elevated water tank. The projected activities include:

Annual Vapor Monitoring and Mitigation Activities – Four homes in the Todd Estates neighborhood directly downgradient (west) of the former TTC facility were identified for sub-slab depressurization systems (SDSs; two homes) or, for the two homes not mitigated, annual indoor air monitoring. The annual activities include operation, monitoring, and maintenance (OM&M) inspections of the installed SSDs; and, for the remaining homes, concurrent sub-slab, indoor, and ambient (outdoor) air sampling. The procedures for each activity are detailed below.

Storm Water Pollution Prevention Plan Inspections – The *State Pollutant Discharge Elimination System (SPDES) General Permit for Storm Water Discharges from Construction Activity* permit issued for the site as part of the building demolition, subsurface drainage structure abandonments, and other redevelopment activities requires periodic inspections of the site. The inspections detailed in the associated *Storm Water Pollution Prevention Plan* (SWPPP), are intended to verify that all storm water controls at the site are working as designed. The inspection activities are summarized below.

Supplemental Groundwater Investigation Activities – The supplemental groundwater investigation includes groundwater profiling and concurrent groundwater monitoring well sampling (the procedures for the sampling are detailed in the section below). The investigation is intended to evaluate the current water quality conditions between the historical source area and the downgradient property line in advance of a groundwater focused feasibility study. The profiling will use a direct-push drill rig equipped groundwater sampling device. An outline of the scope of work is presented below.

Groundwater Monitoring – Periodic monitoring samples are collected from five onsite and seven offsite groundwater monitoring wells installed within the study area. The samples are for site-specific chlorinated VOCs and typically use passive diffusion bag samplers (PDBs). The PDB deployment and recovery procedures are detailed below.

Surface Soil Sampling – Surface soil samples will be collected to address a potential lead impact to the site (from lead-based paint) due to the abandonment and disassembly of a New York American Water (NYAW) elevated water tank on the adjacent site. An overview of the soil sampling procedures is provided below.

It is important to note that, while these activities are part of the current work at the site, other similar activities (e.g., monitoring well installation or soil borings) may be conducted in the future. The document will be modified for any proposed activities that are not detailed below, as necessary.

A summary of the planned work and the associated hazards are presented below.

3.1 ANNUAL VAPOR MITIGATION SYSTEM INSPECTIONS AND INDOOR AIR MONITORING

WSP is conducting annual vapor mitigation and monitoring activities at the former TTC facility. The work includes the annual OM&M inspection of SSD mitigation systems; and follow-up vapor monitoring in private residences near[9] the facility. These activities are a continuation of the offsite indoor air evaluation conducted in 2012, which identified the

[8] The Sea Cliff Operations District of New York American Water abandoned and replaced a 500,000-gallon elevated steel water tank (on the 0.25-acre lot located on 8 Dumond Place) in 2019 and 2020 using a leased portion of the former TTC property.

[9] The location of the homes with SSDs installed, and those where annual indoor air monitoring is conducted is not shown on the maps associated with this plan. See the *Offsite Indoor Air Evaluation Work Plan (Revision 1)*, dated March 1, 2012 for additional information regarding these private residences.

potential for impacts to the indoor air quality of nearby homes due to the presence of chlorinated VOCs in the underlying soil gas. Two homeowners elected to have mitigation systems installed with two additional homeowners agreeing to periodic (annual) vapor monitoring as a precautionary measure.

The inspection and sampling activities will be performed in accordance with the NYSDEC-approved *Work Plan for Vapor Mitigation Systems*, dated June 7, 2012; the *Offsite Indoor Air Evaluation Work Plan (Revision 1),* dated March 1, 2012; the New York State Department of Heath's (NYSDOH's) *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated May 2017; and WSP's SOPs. Sampling for the periodic monitoring will be limited to the site-related compounds: PCE, TCE, *cis*-1,2-DCE, and vinyl chloride.

3.1.1 ANNUAL VAPOR MITIGATION SYSTEM INSPECTIONS

The vapor mitigation system OM&M work is designed to ensure that the systems continue to operate satisfactorily. The work for the existing systems located at two homes on Todd Drive East will include:

- a visual inspection of the entire system including the fan (to ensure proper operation and continued effectiveness in providing the appropriate vacuum), piping, warning devices (liquid-filled manometers), labeling on the system, and any membranes installed as a soil vapor retarder;
- an examination of all sealed joints and cracks in the concrete floor, foundation walls, vacuum points; and,
- verification that no new air intakes for the home have been installed within the minimum distances (specified by the NYSDOH guidance) from the mitigation system exhaust discharge point (Sheet 2).

Any leaks or other minor SSD issues identified will be addressed by the WSP inspector, as appropriate. System components requiring repair work will be addressed as soon as possible (based on contractor availability) after the inspection has been completed.

3.1.2 ANNUAL SUBSLAB SOIL GAS AND INDOOR AIR EVALUATION

The onsite activities include sub-slab soil gas and indoor air sampling as part of an annual monitoring program for two homeowners in the Todd Estates neighborhood. The specific procedures for the work are detailed in the *Offsite Indoor Air Evaluation Work Plan*, dated March 1, 2012, and are summarized below.

PRE-SAMPLING INTERVIEW, BUILDING INSPECTION AND MATERIALS INVENTORY

A pre-sampling site inspection and materials inventory will be conducted at each property a minimum of two days before conducting the annual sampling activities. WSP will verify the building construction, complete the NYSDOH's required indoor air quality questionnaire with the homeowner, and catalogue (manufacturer's name, ingredients, etc.) any chemicals or other items stored in the basement (if present) and first floor living spaces that could potentially interfere with the vapor sampling. The containers will be scanned with a high-sensitivity photoionization detector (i.e., a RAE Systems ppbRAE®, or equivalent) for potential vapor emissions.

WSP will request, based on the findings of the inventory, that homeowners either remove any materials and equipment that are emitting VOCs from the structure, or seal the containers or equipment in plastic bags at least 24 hours before the scheduled sampling time. WSP will also discuss with the residents the activities that should be avoided within 24 hours of sample collection, as per the NYSDOH guidance.

SUB-SLAB SAMPLE COLLECTION

The sub-slab soil gas sampling[10] will use Vapor Pins® manufactured by Cox-Colvin of Plain City, Ohio, previously installed in each of the homes where annual monitoring is conducted. The pins were installed with self-sealing silicone sleeves (no grout or clay was required) in the basement of both homes and capped and fitted with protective flush-mounted covers.

The integrity of the probe seals may be verified using a tracer gas (in accordance with the NYSDOH guidelines) prior to sampling. Each sample point will be covered with a laboratory-supplied 18-inch-diameter stainless-steel dome equipped with two stainless-steel quick-lock fittings, or equivalent. The dome will be charged, and the sample point will be monitored for a period of 2 minutes to verify that the system is not short-circuiting to the helium atmosphere inside the dome. If helium is detected in the sample line, the seal will be repaired, and the process repeated until the results indicate the seal is competent.

The sub-slab soil gas samples will be collected by attaching an appropriately sized section of Teflon® or Teflon®-lined tubing to the Vapor Pin® and conducting a pre-sample purge to remove dilution air from the tubing and probe assembly. One to three probe volumes of air will be evacuated from each sample location at a rate not exceeding 0.2 liter per minute using a peristaltic pump, hand pump, or syringe. The purged air will be collected in a Tedlar® bag to prevent vapors from being released into the indoor air where they could interfere with the sampling process.

Sub-slab vapor samples will be collected using evacuated 1-liter Entech Instruments, Inc., (Entech) canisters, or equivalent, fitted with a 24-hour sample flow regulator pre-set by the analytical laboratory. The canister will be opened to commence sample collection, and the initial canister vacuum will be recorded in the field logbook. The canister will be closed (after the sample time has elapsed) and the flow regulator will be removed from the canister to complete the sample collection. The samples will be shipped, or transported by courier, under ambient conditions to a NYSDOH-approved laboratory for analysis of VOCs by U.S. Environmental Protection Agency (EPA) Method TO-15.

The Vapor Pin® sampling probes will be capped, and the flush-mounted protective covers replaced after the sampling activities have been completed.

INDOOR AND AMBIENT AIR SAMPLING

Indoor air samples will be collected from the basement and living space of each residence, as appropriate. In addition, concurrent ambient (i.e., outdoor) air samples will be collected approximately 3 to 5 feet above the ground using a tripod (or similar) and away from wind obstructions, if possible (e.g., trees, brush, wooden fences) in accordance with the NYSDOH Guidance.

The air samples will be collected using evacuated 1-liter Entech canisters, or equivalent, fitted with a sample flow regulator pre-set by the analytical laboratory. The canister will be opened to begin sample collection (the initial canister vacuum will be recorded in the field logbook), allowed to stand undisturbed for the collection time, and then closed and the flow regulator removed to complete the sample collection. The samples will be shipped under ambient conditions to a NYSDOH-approved laboratory for analysis of VOCs by EPA Method TO-15.

3.2 STORM WATER POLLUTION PREVENTION PLAN INSPECTIONS

WSP is conducting SWPPP inspections at the former TTC facility. The inspections are part of the requirements[11] of the SPDES *General Permit for Storm Water Discharges from Construction Activity* at the site and are intended to ensure that the controls and procedures detailed in the associated SWPPP have been implemented and are effective.

[10] Sub-slab vapor samples historically collected by installing a temporary probe through the home's concrete floor slab, as detailed in the 2012 *Offsite Indoor Air Evaluation Work Plan*. The conversion to Vapor Pins® was implemented in 2018. WSP does not anticipate installing temporary probes for future sub-slab sampling.

[11] As detailed in the *New York State Department of Environmental Conservation SPDES General Permit for Storm Water Discharges from Construction Activity*, date January 29, 2015.

The SWPPP requires a "self-inspection" of the site performed by a *qualified professional*[12]. The inspector will walk the site and verify:

- the erosion and sediment control practices implemented to minimize slope disturbance, channel formation, and sediment discharge from the site (e.g., silt fences, hay bales, vegetative covers, etc.) are performing as designed; and
- pollution prevention controls, including the truck decontamination station and other measures to prevent spills or exposure of materials that could leach compounds to the storm water, are being implemented at the site.

The frequency of the inspection is dependent on the onsite activities. The inspections will occur on a twice weekly basis during the period when more than 5 acres of the site has been disturbed, or, if less than 1 acres is disturbed, once every 30 days. The site is currently stabilized with vegetation and other cover and the site is inspected monthly.

The results of each onsite inspection will be documented in a report that meets the requirements detailed in the *General Permit* guidance. The *qualified professional* will notify Breeze-Eastern, One Robert Lane LLC (the future owners of the site), and their associated subcontractors, if necessary, of any corrective actions that may be required to maintain compliance with the SWPPP within one day of their discovery.

3.3 SUPPLEMENTAL GROUNDWATER INVESTIGATION

WSP will conduct supplemental groundwater investigation activities at the former TTC facility. The work includes direct-push-based groundwater profiling at onsite locations along transect lines oriented perpendicular to the groundwater flow, and the concurrent collection of groundwater samples from select onsite wells. The intent is to characterize both the horizontal and, through the collection of multiple samples per profile boring, vertical extent of TCE-affected groundwater at the site. The data from these profiles (and the wells) will be used to refine the delineation of the plume and will aid in the identification and screening of potentially-applicable remedial technologies and development of the proposed remedial alternative.

The groundwater profiling scope of work is presented below. The groundwater monitoring well sampling for the supplemental investigation is consistent with the description of monitoring activities elsewhere in this plan and, thus, is not presented in this section for clarity.

3.3.1 GROUNDWATER PROFILING

The planned onsite groundwater profile borings will be installed using a direct-push drilling rig equipped with 2.25-inch diameter drilling rods, a Geoprobe® screen point 15 groundwater sampler, and an expendable drill point. The drilling rods will be advanced from the ground surface to the bottom of the interval to be profiled: approximately 135 feet bgs (nominally 20 feet below the upper surface of the water table at 115 feet bgs). The rods will be retracted approximately 4 feet to expose the screen point sampler to the surrounding formation and allow groundwater to enter the drill string once the maximum depth has been achieved. A minimum of three rod-volumes of groundwater will be purged from the drilling/sampling apparatus using new polyethylene tubing fitted with a stainless-steel check-ball valve. Analytical samples will be collected using the same polyethylene tubing and stainless-steel check-ball valve once the purge is complete. The drilling rods will then be retracted approximately 10 feet (with the screen point sampler exposed) to the upper sample interval (125 feet bgs) and the purge and sample process repeated.

The analytical samples, including the appropriate quality assurance and quality control (QA/QC) samples, will be placed in the appropriate laboratory-supplied glassware, labeled, and packed in coolers with wet ice. The samples will be shipped via overnight express to an analytical laboratory for analysis of site-specific VOCs (i.e., PCE, TCE, and their breakdown products, *cis*- 1,2-dichloroethene, and vinyl chloride) by EPA Method 8260C.

[12] Defined as a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control, Registered Landscape Architect, or other NYSDEC-endorsed individuals.

3.4 GROUNDWATER MONITORING

The supplemental groundwater investigation includes groundwater monitoring of select onsite groundwater monitoring wells. The sampling procedures (and the associated hazards), including the deployment of PDB samplers, the monitoring well gauging, and PDB recovery are the same as those used for both onsite and offsite monitoring wells.

3.4.1 GAUGING

The depth-to-groundwater from the monitoring wells in advance of the PDB deployment or recovery[13]. Each well will be uncapped and allowed to stand for a minimum of 15 minutes (for equilibrium with the atmosphere) and then gauged using an electronic water-level indicator. The groundwater elevations will be measured in advance of the PDB sampler recovery and the collection of the analytical samples (described below) to ensure the water levels are at equilibrium with the formation (i.e., they were at static conditions) before the sampler is removed. The depth-to-water measurements will be made to the nearest 0.01-foot using an electronic water level meter with the results recorded in the field notebook.

3.4.2 PASSIVE DIFFUSION BAG GROUNDWATER SAMPLING

Water quality samples will be collected[14] from each monitoring well using PDB samplers. The PDBs consist of 24-inch long, 1.25-inch diameter, heat-sealed, low-density polyethylene bags that will be pre-filled by the laboratory with 220 milliliters of laboratory-grade analyte-free, de-ionized water. The samplers will be suspended at the midpoint of the screened interval in each well a minimum of two weeks in advance of the sample recovery (and the planned groundwater profile investigation) to allow equilibration with the surrounding formation water. Upon retrieval, each bag will be sliced open at one end using decontaminated field scissors, and the contents poured into the appropriate laboratory-supplied, pre-cleaned sample vials. The samples will be labeled, packed on ice, and shipped to the analytical laboratory for analysis of site-specific VOCs by EPA Method 8260C, consistent with the groundwater profile work.

3.5 SURFACE SOIL SAMPLING

WSP will implement a soil sampling program at the site to address the concern of potential lead impact to the soil at the site associated with the water tank replacement. The sampling will include the collection of 5 composite surface soil samples after the tower deconstruction activities have been completed. The pre-deconstruction sampling will assess the current concentrations of lead (if any) in the soil within the proposed staging area. These data will be compared to the (lead) baseline to assess the potential release of lead. The procedures for the soil sampling at the site are presented below.

3.5.1 SOIL SAMPLING

WSP will collect composite surface soil samples at five locations[15] within the NYAW staging area at the southern end of the site. The samples (including the appropriate QA/QC samples; see below) will be collected from the selected locations using single-use (dedicated) stainless-steel hand tools (spoons or trowels), placed in a stainless-steel mixing bowl, and homogenized in accordance with WSP SOPs. All the surface soil samples will be collected from the 0 to 0.5-foot depth interval of the staging area. The homogenized samples will then be transferred into labeled laboratory-supplied glassware,

[13] The groundwater elevations will be measured in advance of the PDB sampler recovery and the collection of the analytical samples to ensure the water levels are at equilibrium with the formation (i.e., they were at static conditions) before the sampler is removed.

[14] The samplers will be deployed and collected in accordance with the methods outlined in Vroblesky's 2001 *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells*, the approved 2011 *Residential Reclassification and Feasibility Study Work Plan*, and WSP's SOPs.

[15] The sample locations, selected to provide a representative assessment of the post-deconstruction lead content of the soil, are detailed in the *Scope of Work for Surface Soil Sampling in Support of Water Tower Replacement*, dated August 30, 2019. The locations are not shown or discussed for clarity.

placed on wet ice (for preservation), and shipped to the analytical laboratory for analysis of lead by EPA Method 6010/7000 series.

4 JOB HAZARD ANALYSIS

WSP has completed a Job Hazard Analysis (JHA) for each task detailed in the *Proposed Activities* Section above. The JHA is an evaluation of the risks associated with the proposed work. The analysis considers the impacted media likely to be encountered during the work and the associated physical, chemical, and environmental hazards; and the severity and the likelihood that the identified hazards will impact WSP personnel (i.e., the baseline risk). The JHA also includes task-specific measures and procedures (i.e., control measures) that are designed to mitigate or eliminate the identified hazards. These measures range from recommendations to use the proper lifting technique when handling heavy items to guidance on the use of personal protective equipment to minimize chemical or physical hazards.

The generalized hazardous associated with each task in the proposed activities is presented below. The risk evaluation for each task, including the baseline *Risk Score* and the controlled *Risk Score*, is presented in a JHA form in Appendix C.

WSP has also included guidance associated with the *Novel Coronavirus 2019,* which is a pandemic at the time this HASP was prepared. The guidance associated with the virus is presented in Section 4.5 below.

4.1 HAZARD EVALUATIONS

WSP identified the following (generalized) hazards and risks associated with proposed work outlined above.

Table 4.1.1 Impacted Media

Impacted Media ("X" indicates impacted media)		Tasks
X	Soil	Supplemental groundwater investigation; storm water pollution prevention plan inspections; surface soil samples
	Sediment	
X	Groundwater	Supplemental groundwater investigation; groundwater monitoring
	Surface Water	
X	Air/Vapor	Annual vapor monitoring and mitigation; supplemental groundwater investigation; groundwater monitoring
	Building Materials (e.g., concrete, paint)	
	Non-aqueous Phase Liquid (NAPL)	
	Waste	Supplemental groundwater investigation; groundwater monitoring

Table 4.1.2 Chemical Hazards

Chemical Hazards ("X" indicates chemical hazard)		Tasks
X	Volatile (boiling point less than 250 degrees Celsius [°C])	Annual vapor monitoring and mitigation; supplemental groundwater investigation; groundwater monitoring
	Corrosive (e.g., acids, bases, cement)	
	Flammable (flash point less than 37.8 °C)	
	Combustible (flash point at or above 37.8 °C and below 93.3 °C)	
X	Toxic	Annual vapor monitoring and mitigation; supplemental groundwater investigation; groundwater monitoring; surface soil sampling

Chemical Hazards ("X" indicates chemical hazard)		Tasks
	Reactive (e.g., explosives, oxidizers, reducers, acid sensitive, air sensitive, unstable)	
	Radioactive	

PHYSICAL HAZARDS

- Electrical (fire): Use of electrical power that results in electrical overheating or arcing to the point of combustion or ignition of flammables, or electrical component damage
- Electrical (shock/short circuit): Contact with exposed conductors or a device that is incorrectly or inadvertently grounded
- Ergonomics (strain): Damage of tissue due to overexertion such as strain and sprains, or repetitive motion
- Fall (slip, trip): Conditions that result in falls (impacts) from height or traditional walking surfaces
- Fire/Heat: Temperatures that can cause burns to the skin or damage other organs. Fire requires a heat source, fuel, and oxygen
- Mechanical failure: Typically occurs when devices exceed designed capacity or are inadequately maintained
- Mechanical: Skin, muscle, or body part exposed to crushing, caught-between, cutting, tearing, shearing items or equipment
- Mechanical/vibration (chaffing/fatigue): Vibration that can cause damage to nerve endings, or material fatigue that results in a safety-critical failure
- Noise: Noise levels (> 85 decibels [dBA] 8-hour time weighted averages [TWA]) that results in hearing damage or inability to communicate safety-critical information
- Stuck by (mass acceleration): Accelerated mass that strikes the body causing injury or death
- Struck against: Injury to a body part resulting from contact with a surface in which action was initiated by the person

ENVIRONMENTAL HAZARDS

- Visibility: Lack of lighting or obstructed vision that results in hazards
- Radiation (non-ionizing): Ultraviolet, visible light, infrared, and microwaves that can cause injury to tissue by thermal or photochemical means
- Weather phenomena: rain and thunderstorms, wind, ice, and snow; extreme temperatures (hot and cold)
- Biological hazards: Direct contact with poisonous plants or insects (e.g., poison ivy, biting or venomous ants, chiggers [mite larvae], bees, wasps, yellow jackets, ticks, potentially venomous spiders, and potentially venomous snakes), or, in work within residences or residential areas, encounters with uncontrolled pets.

4.2 HAZARD CONTROLS AND REQUIRED PERSONAL PROTECTIVE EQUIPMENT

Modified Level D PPE has been designated for all tasks and is described below in Table 4.2.1 below. WSP personnel shall be prepared to upgrade to Level C respiratory PPE, if necessary.

Table 4.2.1 Personal Protective Equipment

Type	PPE (list all required PPE)
Respiratory	Level D, upgrade to full-face APR with organic vapor cartridges (as necessary); cloth facemask when working near other WSP personnel, subcontractors or public (viral protection; see Section 4.5 below)
Clothing	Work clothes (e.g., long pants, WSP-branded shirt)

Type	PPE (list all required PPE)
Gloves	Work (hammer drill, if used for indoor air sampling), nitrile (handling sample train for groundwater and soil)
Boots	Steel toe
Hearing protection	Ear plug or muff (hammer drill and work near direct-push drill rig)
Other PPE	Safety glasses

NO CHANGES TO THE SPECIFIED LEVEL OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE SITE HEALTH AND SAFETY OFFICER OR THE PROJECT GENERAL SUPERVISOR.

4.3 MONITORING PROCEDURES

Monitoring Equipment ("X" indicates required monitoring equipment)	
X	Photoionization Detector (PID) 10.6 eV (e.g., chlorinated ethenes)
	PID 11.7 eV (e.g., chlorinated ethanes)
	Flame Ionization Detector (FID; e.g., petroleum)
	Particulate Monitor (PM; e.g., metals, polychlorinated biphenyls)
	Combustible Gas Indicator (CGI; combustibles, oxygen, carbon monoxide, hydrogen sulfide)
	Chemical Name Colorimetric Tube (or similar)

Action Levels for Protective Equipment Upgrades (assume all work begins in Level D): ☒ C ☐ B

- All breathing zone monitoring will be conducted continuously (except when using colorimetric tubes); and,
- All battery-operated equipment will undergo a battery check and will be calibrated per the manufacturer's recommendations.

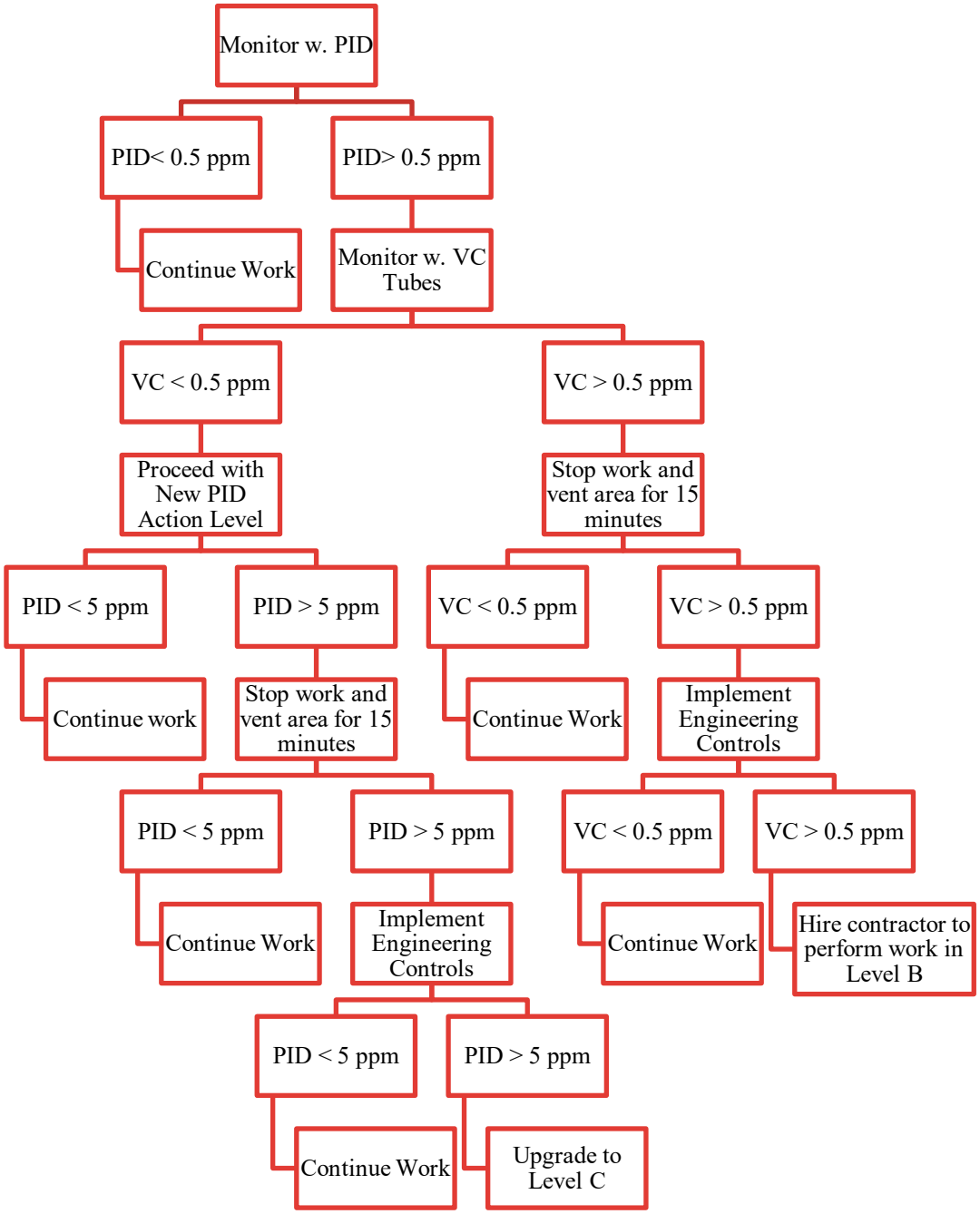
4.4 ACTION LEVELS

Chlorinated VOCs are the primary concern at the site and, thus, the basis for the monitoring and the associated action levels. Those action levels are:

- **0.5 parts per million (ppm),** based on half the Threshold Limit Value (TLV) for **vinyl chloride** (VC; 1 ppm);
- **5 ppm**, based on half the TLV for TCE (10 ppm), the VOC with the next most stringent TLV

Work will be initiated in Level D. The SHSC, or his designated representative, will scan the breathing zone of the workers before and during all proposed activities with a calibrated PID with a **10.6 eV** lamp to monitor levels of organic vapors. Compound-specific monitoring will be performed for **VC** with colorimetric tubes (or similar) if the action level is exceeded. The following tiered monitoring approach (Diagram 1) will be implemented.

Diagram 1 - Tiered Monitoring Approach



The maximum use concentration (MUC) for a full-face air-purifying respirator (APR) calculated for TCE is 250 ppm.

4.5 OTHER HAZARDS

This HASP was prepared during a global pandemic associated with the *Novel Coronavirus 2019* (i.e., COVID 19). The disease caused by the virus is contagious and can result in symptoms that range from no response (i.e., asymptomatic), to relatively mild flu-like conditions[16], to life-threatening cardiovascular problems. Transmission of the virus is via moisture droplets and other airborne particles shed by the infected (during exhalation), which then enter the body of an uninfected individual via the respiratory tract. The risk increases with proximity to infected individuals and is highest for indoor settings. Infection can also be the result of contact with contaminated fluids entering the eyes, nose, or mouth; and, although relatively rare, via contaminated surfaces. Infected individuals can be contagious (reportedly) up to 20 days after the initial exposure to the virus even if they are asymptomatic.

WSP has developed guidelines for field work when required by the client. The guidance, detailed in WSP's *COVID-19 Playbook*, is generalized and includes company-specific requirements for travel and overnight stays that are based on, but may be more stringent than, state or federal recommendations[17]. WSP has also developed an online tool, the *WorkingTogether* Application, that aids in conducting a health self-assessment and tracking individuals who may display symptoms associated with an infection. WSP personnel should review the WSP *Playbook* to understand updates to the recommendations and company procedures (including the current position on vaccinations) and complete the *WorkingTogether* form in advance to conducting field work. Both the *Playbook* (with the latest updates) and *WorkingTogether* Application can be accessed at the following path on WSP's intranet:

http://intranet.wspgroup.com/en-GB/WSP-PB-USA/USA/Corporate-Services/Health--Safety/Coronavirus-Disease-2019-COVID-19-/).

The site-specific guidance relative to the work described in this HASP are presented below.

4.5.1 GENERAL

The work detailed in the *Current Onsite Activities* above includes risk to potential virus exposure. Two of the activities, the SWPPP inspections and the groundwater monitoring, are generally conducted by one or two WSP personnel outdoors with minimal personal contact between the two workers or the public (members of the public are not allowed at the site and the offsite groundwater monitoring work is in the streets surrounding the site). The risk for virus transmission between the individuals is relatively low. Nevertheless, the personnel should follow the guidance for field activities detailed below to minimize the associated hazard.

The two remaining activities have differing levels of potential exposure to the virus. The supplemental groundwater investigation work will be conducted outside with the groundwater profiling restricted to the vacant TTC site; however, the sampling will require a subcontractor crew to operate the direct-push drill rig. The risk for virus transmission is higher than the groundwater monitoring or SWPPP inspection activities due to contact with individuals with another company. WSP personnel selected for this work should, in additional to the guidelines outlined below, maintain a social distance of at least 6 feet and avoid sharing a confined space (e.g., inside of a vehicle) with the subcontractor.

The indoor air and vapor mitigation work has the highest (relative) level of potential exposure to the virus. The work requires entering private residences to conduct the inventory, set-up, and sample retrieval for the indoor air monitoring; or, to inspect the equipment associated with the SSD for those homes that have already been mitigated. WSP personnel should maintain a social distance of at least 6 feet, minimize the amount of time within the homes or in direct contact with the homeowner, and wear a cloth mask.

[16] Symptoms may include (but are not limited to) fever or chills, cough, shortness of breath, fatigue, muscle or body aches, headache, recent loss of taste or smell, sore throat, congestion or runny nose, nausea, vomiting, or diarrhea. WSP personnel should check the *Centers for Disease Control and Prevention* (CDC) for symptom and viral updates before mobilizing to the field.

[17] WSP's approach to COVID-19 is based on the guidance provided by International SOS (iSOS), the Society for Human Resource Management, the U.S. State Department, the CDC, and the World Health Organization.

WSP personnel should review the tasks and the following prior to mobilizing to the former TTC site[18]:

- Review the *COVID-19 Playbook* for the latest updates regarding the virus and the associated recommendations for field work;
- assess your health and, if you are not well, stay home and contact your *Human Resources Business Partner* (HRBP; see WSP's *COVID-19 Playbook* for the HRBP associated with work in the region);
- maintain a social distance of 6 feet or more from other individuals, including other WSP personnel;
- practice good hygiene (e.g., frequent hand washing) and avoid direct contact with others (i.e., no hand shaking); and,
- complete WSP's *WorkingTogether* Application prior to mobilizing to the site and for everyday field work is conducted at the site.

WSP personnel that feel ill after they arrive at the site for field work should self-isolate (i.e., avoid contact with others), and contact their HRBP. Health-compromised employees should not continue field work.

4.5.2 TRAVEL AND FIELD EQUIPMENT

The *Current Onsite Activities* listed above require travel[19] to the site to complete the work. All the work is anticipated to be completed from local (i.e., New York, New Jersey, Massachusetts, or Connecticut) offices reachable by automobile that do not require public transportation. WSP personnel, when traveling by car to the site, should:

- limit the number of individuals in a vehicle being used to mobilize to the site to a maximum of two (healthy) individuals (two vehicles with one person per vehicle is a better approach); and,
- clean and disinfect (to the extent possible) contact points within a rental vehicle such as the steering wheel, gear shifter, directional switches, armrests, radio and climate controls, and door handles.

Similar procedures should be implemented for equipment used in the field, such as water level gauges, PIDs, and water quality meters. Specifically, WSP personnel should:

- minimize contact at the shipping facility (e.g., FedEx) by having the equipment delivered in advance of the project;
- load and unload the equipment away from others (i.e., maintaining social distances of 6 feet or more); and,
- clean and disinfect the equipment before and after use or, if this is not practical, handling the equipment with nitrile, vinyl, or latex gloves (gloves should be worn during the disinfection process).

Ancillary field work, such as filling out the field notebook or observing a subcontractor, should be accomplished within the vehicle, if possible.

The annual vapor mitigation system inspection and indoor air evaluation, and the supplemental groundwater investigation are anticipated to require more than one day at the site. WSP personnel, when staying overnight, should:

- Select a reputable hotel that is cleaning and disinfecting the rooms between each guest and is implementing other protocols (e.g., limited maid service, restrictions on gatherings, etc.) that will aid in guest safety; and,
- Avoid congregating in hotel common spaces, such as bars, restaurants and pools.

The SWPPP inspections and groundwater sampling typically require only one day and, thus, do not require overnight accommodations.

WSP personnel should, in addition to the company recommendations, follow all appropriate public health guidance from your origination of destination area (or both). There may be local travel orders or restrictions requiring proof of vaccination or testing and quarantining procedures for those individuals traveling between states.

[18] Breeze-Eastern does not have a specific pandemic response or requirements for PPE associated with the former TTC site.

[19] Field work requiring air travel or for those projects including an overnight stay must obtain written approval from the WSP Regional President or Business Line Director in advance of mobilizing to the site.

5 DECONTAMINATION PROCEDURES

Decontamination is not required for Level D PPE; however, site workers are expected to shower each night after site activities have occurred, at home or at the hotel. All sampling equipment will be decontaminated in accordance with WSPs SOPs. The rinsate from decontamination procedures will be placed in 55-gallon drums and temporarily stored onsite pending receipt of analytical results to determine the appropriate method of disposal.

WSP personnel should also follow the COVID-19 procedures for personal protection and the cleaning of rental cars and equipment.

6 ONSITE CONTROL

The prevailing wind conditions are not known and will be determined onsite (cardinal direction). No contamination reduction zone or support zone will be established downwind of a work/exclusion zone.

All WSP employees are responsible for onsite control. During work activities, the following zones will be established:

Work/Exclusion Zone – No unauthorized personnel will be permitted within 20 feet of any sampling area.

Contamination Reduction Zone – For this project, all decontamination procedures will be conducted within the work/exclusion zone.

Support Zone – All areas outside of the work/exclusion zones will be treated as a support zone. No work or contaminated materials will be removed from the work area or taken into the support zone.

7 STANDARD OPERATING PROCEDURES

- Whenever possible, use the buddy system.
- At least one WSP employee onsite must have a first aid kit onsite that includes, at a minimum, the following:
  - 1 absorbent compress, 32 sq. in. (81.3 sq. cm.) with no side smaller than 4 in. (10 cm)
  - 16 adhesive bandages, 1 in. x 3 in. (2.5 cm x 7.5 cm)
  - 1 adhesive tape, 5 yd. (457.2 cm) total
  - 10 antiseptic, 0.5g (0.14 fl. oz.) applications
  - 6 burn treatment, 0.5 g (0.14 fl. oz.) applications
  - 4 sterile pads, 3 in. x 3 in. (7.5 x 7.5 cm)
  - 1 triangular bandage, 40 in. x 40 in. x 56 in. (101 cmx 101 cm x 142 cm)
- Conduct a pre-entry (i.e., tailgate) briefing before beginning site activities each day and record in field book.
- Practice good work practice controls: Never sit down or kneel in contaminated areas; never lay equipment on the ground where contaminated groundwater or soil may be present; and avoid unnecessary contact with onsite contaminated objects.
- Do not eat, drink, or use tobacco products outside the designated support zone(s).
- Whenever possible, do not use contact lenses while onsite.
- Thoroughly wash hands and face before eating, drinking, etc.
- Keep copies of the HASP available in the support zone.
- In the event PPE is ripped or torn, stop work and remove and replace PPE as soon as possible.
- In the event of direct skin contact, immediately wash the affected area with soap and water.
- flush eyes with clean water for 15 minutes to remove any contaminated media.
- Ensure that all subcontractors have a site-specific HASP that is maintained onsite.
- Report all accidents, injuries, and environmental releases as required by the WSP USA Health and Environmental Safety Program.

7.1 WORKING ALONE

Employees should not be set out to work alone in the field whenever possible. This must be considered during the proposal phase of the project. Should lone working be required, the following must be adhered to:

- Section 9.1 includes provisions for communication prior to departure, during the work, and upon completion of the task whether returning to the office or going to another location.
- Section 9.1 shall include specific tasks to be performed while working alone and may require the support of additional personnel should the task not be deemed acceptable as a risk for lone working.
- Project managers must consider the level of competence of the individual being sent to perform the work. Under no circumstances shall interns be sent out to work alone. By signing the HASP, the project manager acknowledges that the appropriate staff is selected for all work especially for lone working conditions.

7.2 CONFINED SPACE ENTRY

No WSP employee may conduct **ANY TYPE** of confined space entries. All non-permit required confined space entries **MUST BE** approved by the Direct of Environment or their designee before any entry attempt is made. Therefore, no attempt will be made to enter any type of confined space without approval.

8 MEDICAL SURVEILLANCE

All employees, regardless of the exposure involved, are required to participate in the medical monitoring program established by WSP. OSHA regulations state that employees involved in certain activities that may expose them to hazardous materials at or above permissible exposure limits (PELs) or above the published exposure limit for greater than 30 days per year, or all employees who wear a respirator are required to participate in the monitoring program.

The purposes of the medical monitoring program are to identify any illness or condition that might be aggravated by exposure to hazardous materials or work conditions; to certify that each employee can use negative-pressure respirators as required by OSHA and withstand heat or cold stress; to ensure that employees are able to physically perform their assigned tasks and to establish and maintain a medical record to monitor for abnormalities that may be related to work exposure that could increase injury risk for the employee. WSP's medical monitoring program includes the following:

- a baseline physical examination
- annual physical examination
- a medical determination of fitness for duty, including work restrictions after any injury or illness that may affect employee safety
- a review of potential exposures to determine the need for specific biological and medical monitoring

List any site specific medical monitoring/needs here, based on the hazard analysis, if applicable:

(e.g., severe allergies of site personnel to flora/fauna, need for an epinephrine pen, additional testing during annual physicals [e.g., Polychlorinated biphenyls, pesticides])

9 COMMUNICATION PROCEDURES

All onsite personnel will practice constant communication with other WSP personnel, subcontractors, and facility personnel during active work. Generally, verbal and/or cellular telephone communication will be used while onsite.

9.1 WORKING ALONE

No employee will be permitted to work alone without the completion of this section. The employee must be familiar with and follow the contact procedures listed below. Specifically, the employee will be required to contact the following:

Prior to departure contact (face-to-face, phone, text message or email)

Dave Bouchard
dave.bouchard@wsp.com
+1 774-413-5109 [direct]
+1 315-374-8494 [mobile]

During work contact (by phone, text message or email morning and mid-day)

Dave Bouchard

Daily upon completion of the task (by phone, text message or email morning and mid-day)

Dave Bouchard

When returned home (by phone, text message or email when arriving at home airport, office, or town/city)

Dave Bouchard

9.2 OTHER COMMUNICATION PROCEDURES

Special Communication Procedures (e.g., two-way radios for large sites with multiple workers):

None

9.3 EMERGENCY HAND SIGNALS

The following standard hand signals will be used in case injury or circumstance does not allow for verbal or other communication:

- Hand gripping throat = Out of air, can't breathe
- Grip partner's wrist or both hands around waist = Leave area immediately
- Hands on top of head = Need assistance
- Thumbs up = Ok, I'm all right, I understand
- Thumbs down = No, negative

10 EMERGENCY PROCEDURES

The following standard emergency procedures will be used by onsite personnel. First, WSP employees will review the emergency action plan (EAP) for any active site to be familiar with evacuation procedures established by the facility. While onsite, the site health and safety coordinator shall be notified of any onsite emergency and shall be responsible for ensuring that the appropriate procedures are followed.

10.1 AIR RELEASE OR FIRE/EXPLOSION

On notification of an air release or a fire/explosion, all personnel will travel at a right angle to the upwind direction. The site health and safety officer will then account for all personnel and notify the proper emergency agencies.

If the site health and safety officer is not available, the task manager or appropriate field personnel will assume these responsibilities.

10.2 PERSONAL INJURY IN THE WORK/EXCLUSION ZONE WITH BUDDY SYSTEM/ONSITE CONTRACTOR

If onsite personnel require emergency medical treatment, and the buddy system is used, the following steps will be taken:

- evaluate the nature of the injury and obtain the onsite copy of this HASP
- contact local emergency service
- decontaminate to the extent possible before administration of first aid
- stay with the injured person

10.3 PERSONAL INJURY IN THE WORK/EXCLUSION ZONE WHILE WORKING ALONE

If onsite personnel are working alone, the following steps will be taken before beginning work each day:

- A cellular telephone MUST be kept with the employee always (before starting work, ensure that there is emergency service at a minimum).
- Inform an onsite contact (if they will be present throughout all active work activities) or senior member of WSP of your plans for the day and your expected active work schedule.

If an injury has occurred:

- Evaluate the injury and decide whether emergency services are required.
- Contact emergency services, if necessary, with cell phone.
- If emergency services are not necessary, attempt first aid alone or contact an onsite contact or WSP contact for assistance.

10.4 BASIC FIRST AID PROCEDURES

- Skin Contact: Remove any contaminated clothing. Wash immediately with water for at least 15 minutes.
- Inhalation: Remove from contaminated atmosphere. Contact emergency services.

- Ingestion: Never induce vomiting on an unconscious person. Never induce vomiting when acids, alkalis, or petroleum products are suspected. Contact the poison control center.

10.5 PERSONAL PROTECTIVE EQUIPMENT FAILURE

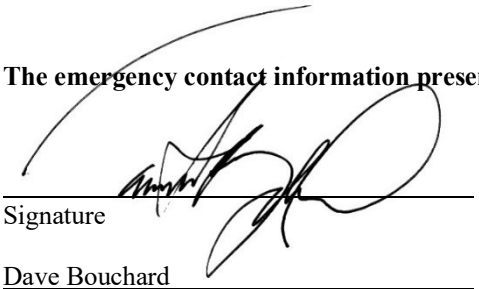
If any worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and his or her buddy shall immediately leave the exclusion zone. Reentry shall not be permitted until the equipment has been replaced or repaired.

11 EMERGENCY CONTACT INFORMATION

Table 11.1 Emergency Contact Information

Local Ambulance Company Phone Number:	911 or +1 516-719-5000, North Shore-LIJ Center for Emergency Medical Services
Hospital/Emergency Room Name:	Glen Cove Hospital
Phone Number:	+1 516-674-7300
Hospital Address:	101 St. Andrews Lane, Glen Cove, NY 11542
Hospital Services verified by:	Dave Bouchard
Local Police Phone Number:	911 or +1 516-676-1000 (non-emergency)
Local Fire Department Phone Number:	911 or +1 516-676-0366 (non-emergency)
State Poison Control Center Phone Number:	+1 800.222.1222

The emergency contact information presented above was verified by:



Signature

Dave Bouchard
Name

Senior Project Director
Title

09/01/22
Date

A map providing the route to the nearest emergency medical care is provided in Appendix D.

12 CERTIFICATION AND SIGNATURES

All site personnel MUST sign this page to acknowledge the requirements of this HASP.

SIGNATURE	NAME	DATE	TITLE

13 ACRONYM LIST

APR	air-purifying respirator
bgs	below ground surface
CCR	Construction Completion Report
CDC	Centers for Disease Control and Prevention
CGI	combustible gas indicator
cis-1,2-DCE	*cis*-1,2-dichloroethene
COVID-19	Novel Coronavirus 2019
dba	decibels
EAP	emergency action plan
EPA	U.S. Environmental Protection Agency
FID	flame ionization detector
HASP	health and safety plan
iSOS	International SOS
JHA	Job Hazard Analysis
MUC	maximum use concentration
NAPL	Non-aqueous Phase Liquid
NIOSH	National Institute for Occupational Safety and Health
NYAW	New York American Water
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM&M	operation, monitoring, and maintenance
OSHA	Occupational Safety and Health Administration
OU-1	Operable Unit No. 1
OU-2	Operable Unit No. 2
PAH	polycyclic aromatic hydrocarbons
PCE	tetrachloroethene
PDB	passive diffusion bag
PID	photoionization detector
PEL	permissible exposure limit
PM	particulate monitor
PPE	personal protective equipment
PPM	parts per million
QA/QC	quality assurance and quality control

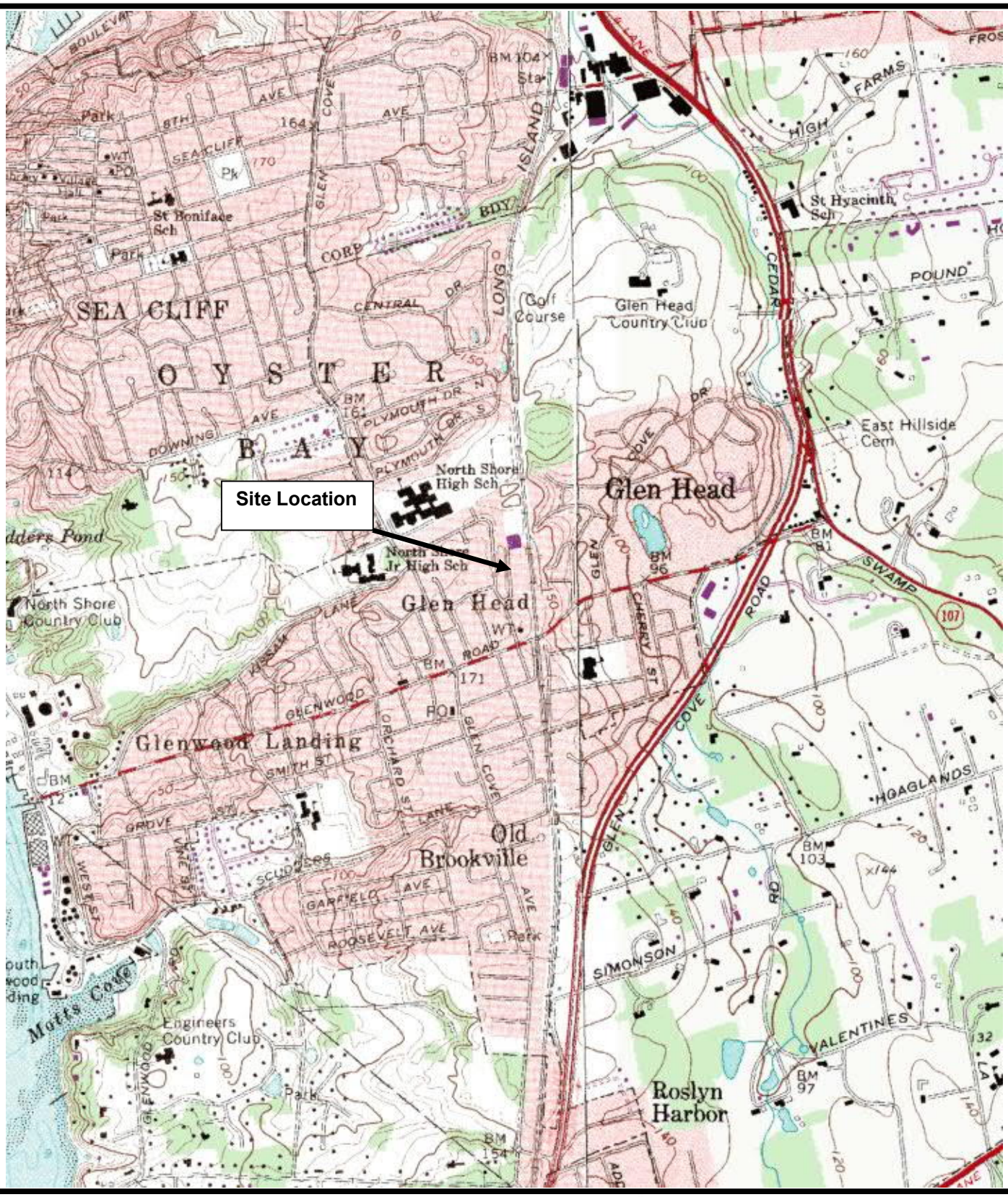
RI/FS	remedial investigation and feasibility study
ROD	Record of Decision
SMP	Interim Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SOP	standard operating procedure
SWPPP	Storm Water Pollution Prevention Plan
TCE	trichloroethene
TLV	Threshold Limit Value
TTC	TransTechnology
TWA	time-weighted average
SHSC	site health and safety coordinator
µg/l	micrograms per liter
VC	vinyl chloride
VOC	volatile organic compound

FIGURES

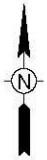
DWG Name:

Checked: Approved:

Drawn By: A



Reference
7.5 Minute Series Topographic Quadrangle
Sea Cliff, New York
Photorevised 1979; Scale 1:24,000



0 1000 2000 4000
SCALE, FEET

WSP USA Inc.
100 SUMMER STREET, 13TH FLOOR
BOSTON, MASSACHUSETTS 02110
TEL: +1 617.426.7330

FIGURE 1

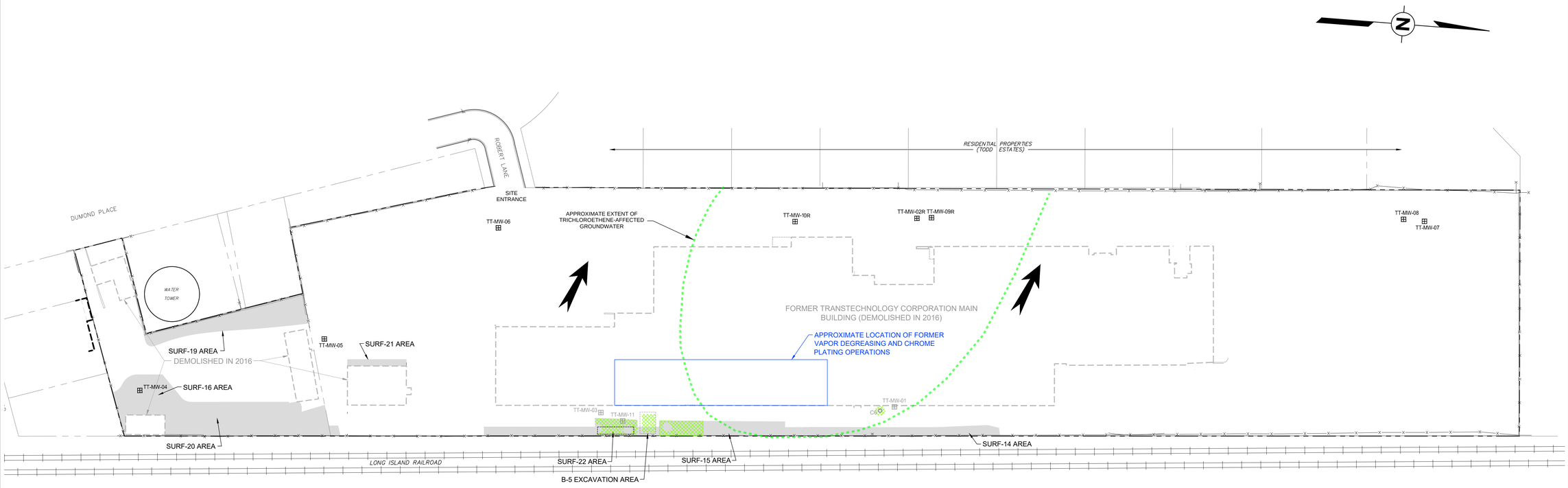
SITE LOCATION MAP

FORMER TRANSTECHNOLOGY CORPORATION
FACILITY — GLEN HEAD, NEW YORK

PREPARED FOR

Breeze-Eastern LLC
Whippany, New Jersey

SHEETS



LEGEND

- TT-MW-09 ⊞ MONITORING WELL (1993–1996)
- TT-MW-03 ⊞ DAMAGED OR DESTROYED MONITORING WELL
- C6 ○ CESSPOOL LOCATION (2001)
- OPERABLE UNIT NO. 1 – SURFACE SOIL EXCAVATION AREA (APPROXIMATE)
- RESIDUAL IMPACTED SOIL OR SEDIMENT (SOIL MANAGEMENT AREA)
- PROPERTY BOUNDARY
- FORMER BUILDING LOCATION
- GROUNDWATER FLOW DIRECTION

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

50 0 50 100
SCALE, FEET

SAMPLING LOCATIONS ARE APPROXIMATE

REFERENCE:

REMEDIAL INVESTIGATION REPORT, TRANSTECHNOLOGY CORPORATION, GLEN HEAD, NEW YORK SITE, SITE NUMBER 1-30-101, PREPARED BY GEOMATRIX ENGINEERING, LLC, SEPTEMBER 2005.

D

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REVISIONS

REV	DESCRIPTION							
1	Revised:	Chkd:	Appr.:	Revised:	Chkd:	Appr.:	Revised:	Chkd:	Appr.:

SEAL

DATE

DRAWN BY

CHECKED

APPROVED

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT IN ANY WAY.

SITE LAYOUT

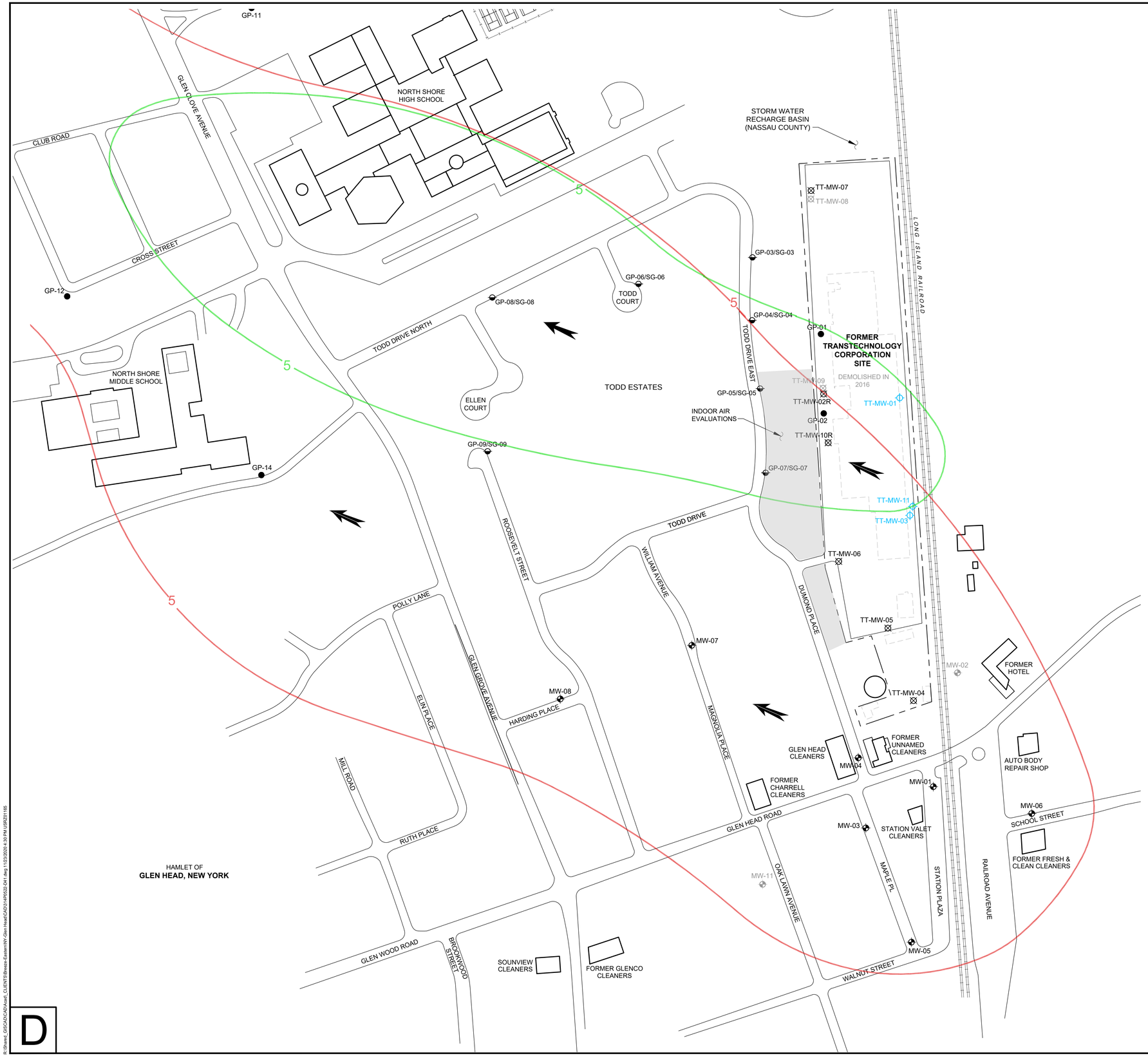
FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE–EASTERN LLC
WHIPPANY, NEW YORK

WSP USA Inc.
100 SUMMER STREET, 13th FLOOR
BOSTON, MA 02110
TEL: +1 617.426.7330

SHEET 1

Drawing Number
314P0522–D28



LEGEND

- NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION GROUNDWATER MONITORING WELL (HALFTONE WHEN NOT SAMPLED)
- TRANSTECHNOLOGY CORPORATION GROUNDWATER MONITORING WELL (HALFTONE WHEN NOT SAMPLED)
- MONITORING WELL DESTROYED
- CO–LOCATED GROUNDWATER PROFILE AND SOIL GAS SAMPLE
- GROUNDWATER PROFILE LOCATION
- STRUCTURE DEMOLISHED IN 2016
- GROUNDWATER FLOW DIRECTION
- 5 TCE CONCENTRATION COUNTOUR IN MICROGRAMS PER LITER (2012)
- 5 PCE CONCENTRATION COUNTOUR IN MICROGRAMS PER LITER (2012)
- INDOOR AIR EVALUATIONS (2012)

NOTES:

1. ONSITE GROUNDWATER MONITORING WELLS TT–MW–01, TT–MW–03, AND TT–MW–11 WERE INADVERTENTLY DESTROYED DURING THE OPERABLE UNIT NO. 1 REMEDIAL EXCAVATION ACTIVITIES ALONG THE WESTERN PROPERTY LINE IN 2011; ONSITE MONITORING WELLS TT–MW–06, TT–MW–08, AND TT–MW–09 WERE NOT SAMPLED AS PART OF THE OPERABLE UNIT NO. 2 REMEDIAL INVESTIGATION REPORT FOLLOW–UP MONITORING CONDUCTED BETWEEN 2018 AND 2020.
2. OFFSITE GROUNDWATER MONITORING WELL MW–02 IS DAMAGED BELOW THE GROUND SURFACE AND COULD NOT BE ACCURATELY GAUGED OR SAMPLED.

120 60 0 120 240
SCALE, FEET

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

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REVISIONS

REV	DESCRIPTION			
1	Revised:	Chkd:	Appr.:	
2	Revised:	Chkd:	Appr.:	
3	Revised:	Chkd:	Appr.:	

SEAL

DATE

DRAWN BY RKF 11/23/2020
CHECKED
APPROVED AM 11/23/2020

SITE LOCATION AND GROUNDWATER MONITORING WELLS

FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE–EASTERN LLC
WHIPPANY, NEW YORK

WSP USA Inc.
100 SUMMER STREET, 13th FLOOR
BOSTON, MA 02110
TEL: +1 617.426.7330

SHEET 2

Drawing Number
314P0522.000–D41

APPENDIX

A WSP PERSONNEL RECORDS

APPENDIX

A-1 HAZWOPER CERTIFICATES

APPENDIX

A-2 FIRST AID CERTIFICATES

APPENDIX

A-3 FIT TESTING FORMS

APPENDIX

B NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

APPENDIX

C JOB HAZARD ANALYSIS

Prepared By:	Prepared Date:
Dave Bouchard	8/19/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, New York	Surface Soil Sampling	Dedicated (single-use) stainless steel sampling implements (spoons, hand trowel, and mixing bowls); no decontamination necessary

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
Tetrachloroethene (PCE) and degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride); lead-impacted soil	None	1.) Vinyl chloride - 0.5 ppm; and, 2.) Trichloroethene - 5 ppm (see action level flow chart)
Level D PPE:	**PPE Upgrades:**	**Health & Safety Equipment:**
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, high visibility vest.	Level C PPE: Full face air purifying respirator, organic vapor cartridges, hooded Tyvek coveralls, chemical resistant gloves and boot covers.	Vinyl chloride colorimetric tubes, photoionization detector (PID), first aid kit, sunscreen, and insect repellent.

Basic Job Step	Potential Hazards (From HASP)																														Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Mobilize/Demobilize								X		X	X	X	X	X		X								X	X	X		6	3	18	Inspect vehicle for unsafe conditions; stay alert and be aware of other traffic; obey traffic laws; do not drive when tired; reduce speed in inclement weather or poor road conditions; do not drive through standing water; park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X							X						X	X	X	X	X	3	2	6	Use proper lifting techniques; stay alert; park in designated parking/loading area; wear work gloves and steel toe boots; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Collect Surface Soil Samples							X			X											X			X	X		X	X	3	2	6	Follow standard operating procedures (SOPs); stay alert; wear nitrile gloves, steel toe boots, and safety glasses; perform air monitoring as per the Health and Safety Plan (HASP); wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Collect groundwater sample							X			X			X	X		X	X	X		X	X			X	X	X	X	X	3	2	6	Follow SOPs; stay alert; wear nitrile gloves, and steel toe boots and a high-visibility vest (in high traffic areas); perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Decontamination (dedicated, single-use sampling equipment only)										X											X			X	X	X	X	X	3	1	3	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, and safety glasses; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Pack and ship soil samples for analysis							X			X							X	X			X			X	X	X	X	X	3	1	3	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, safety glasses, and a high-visibility vest (in high traffic areas); perform air monitoring as per HASP; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Waste management (minimal waste generation; no containerization anticipated)							X	X		X							X	X	X		X			X	X	X	X	X	2	2	4	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, and safety glasses; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	2	1	2	WSP

Color Key:
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§Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.

Prepared By:	Prepared Date:
Dave Bouchard	8/19/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, NY	Groundwater Monitoring (Passive Diffusion Bags)	Passive Diffusion Bags; water level meter

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
tetrachloroethene (PCE) and degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride).	None	1) Vinyl chloride - 0.5 ppm 2) Trichloroethene - 5 ppm
Level D PPE:	**PPE Upgrades:**	**Health & Safety Equipment:**
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, high visibility vest.	Level C PPE: Full face air purifying respirator, organic vapor cartridges, hooded Tyvek coveralls, chemical resistant gloves and boot covers.	Vinyl chloride colorimetric tubes, photoionization detector (PID), first aid kit, sunscreen, and insect repellent.

Basic Job Step	Potential Hazards (From HASP)																																Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical (Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Mobilize/Demobilize								X		X	X	X	X	X		X								X	X	X		6	3	18	Inspect vehicle for unsafe conditions; stay alert and be aware of other traffic; obey traffic laws; do not drive when tired; reduce speed in inclement weather or poor road conditions; do not drive through standing water; park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X							X							X	X	X	X	X	3	2	6	Use proper lifting techniques; stay alert; park in designated parking/loading area; wear work gloves and steel toe boots; wear high visibility vest in high traffic areas; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET; inspect and properly secure compressed gas cylinders (used to drive bladder pumps).	3	1	3	WSP
Tailgate meeting (daily)										X														X	X		X	X	3	1	3	Wear steel toe boots; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Deploy Passive Diffusion Bag Samplers							X			X											X			X	X	X	X	X	3	2	6	Follow standard operating procedures (SOPs); stay alert; wear nitrile gloves, steel toe boots, safety glasses, and high-visibility vest (in high traffic areas); perform air monitoring as per the Health and Safety Plan (HASP); wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Collect groundwater sample							X			X			X	X		X	X	X			X	X		X	X	X	X	X	3	2	6	Follow SOPs; stay alert; wear nitrile gloves, and steel toe boots and a high-visibility vest (in high traffic areas); perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Decontamination										X											X			X	X	X	X	X	3	1	3	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, safety glasses, and a high-visibility vest (in high traffic areas); perform air monitoring as per HASP; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP

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§Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.

Prepared By:	Prepared Date:
Dave Bouchard	8/19/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, NY	Groundwater Monitoring (Passive Diffusion Bags)	Passive Diffusion Bags; water level meter

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
tetrachloroethene (PCE) and degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride).	None	1) Vinyl chloride - 0.5 ppm 2) Trichloroethene - 5 ppm
Level D PPE:	**PPE Upgrades:**	**Health & Safety Equipment:**
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, high visibility vest.	Level C PPE: Full face air purifying respirator, organic vapor cartridges, hooded Tyvek coveralls, chemical resistant gloves and boot covers.	Vinyl chloride colorimetric tubes, photoionization detector (PID), first aid kit, sunscreen, and insect repellent.

Basic Job Step	Potential Hazards (From HASP)																																Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
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Pack and ship groundwater samples							X			X							X	X			X			X	X	X	X	X	3	1	3	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, safety glasses, and a high-visibility vest (in high traffic areas); perform air monitoring as per HASP; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Waste management							X	X		X	X	X	X	X		X	X	X	X		X			X	X	X	X	X	5	3	15	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, safety glasses, and a high-visibility vest (in high traffic areas); perform air monitoring as per HASP; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	4	1	4	WSP

Prepared By:	Prepared Date:
Dave Bouchard	8/19/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, NY	Supplemental Groundwater Investigation (Direct-push groundwater profiling)	Direct-push drill rig, dedicated tubing and check-valves (no decontamination required)

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
tetrachloroethene (PCE) and degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride).	None	1) Vinyl chloride - 0.5 ppm 2) Trichloroethene - 5 ppm
Level D PPE:	**PPE Upgrades:**	**Health & Safety Equipment:**
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, high visibility vest.	Level C PPE: Full face air purifying respirator, organic vapor cartridges, hooded Tyvek coveralls, chemical resistant gloves and boot covers.	Vinyl chloride colorimetric tubes, photoionization detector (PID), first aid kit, sunscreen, and insect repellent.

Basic Job Step	Potential Hazards (From HASP)																																	Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Mobilize/Demobilize								X		X	X	X	X	X	X		X								X	X	X		6	3	18	Inspect vehicle for unsafe conditions; stay alert and be aware of other traffic; obey traffic laws; do not drive when tired; reduce speed in inclement weather or poor road conditions; do not drive through standing water; park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X							X							X	X	X	X	X	3	2	6	Use proper lifting techniques; stay alert; park in designated parking/loading area; wear work gloves and steel toe boots; wear high visibility vest in high traffic areas; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Tailgate meeting (daily)										X														X	X		X	X	3	1	3	Wear steel toe boots; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Direct-push drilling (profiling)				X			X			X	X		X	X	X	X	X				X			X	X	X	X	X	4	3	12	Stay alert and maintain distance from the drill rig; wear steel toe boots, hearing protection, safety glasses, and high-visibility vest; perform air monitoring as per the Health and Safety Plan (HASP); wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Collect groundwater sample							X			X								X		X	X			X	X	X	X	X	2	2	4	Follow SOPs for groundwater sampling; stay alert; wear nitrile gloves, and steel toe boots and a high-visibility vest; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	2	1	2	WSP
Decontamination (limited drilling rods/sampler)										X											X			X	X	X	X	X	3	1	3	Follow SOPs and allow subcontractor to decontaminate equipment; stay alert; wear nitrile gloves, steel toe boots, safety glasses, and a high-visibility vest; perform air monitoring as per HASP; ; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP
Pack and ship groundwater samples							X			X							X	X			X			X	X	X	X	X	3	2	6	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, safety glasses, and a high-visibility vest ; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP

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Prepared By:	Prepared Date:
Dave Bouchard	8/19/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, NY	Supplemental Groundwater Investigation (Direct-push groundwater profiling)	Direct-push drill rig, dedicated tubing and check-valves (no decontamination required)

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
tetrachloroethene (PCE) and degradation products (trichloroethene, cis - 1,2-dichloroethene, and vinyl chloride).	None	1) Vinyl chloride - 0.5 ppm 2) Trichloroethene - 5 ppm
Level D PPE:	**PPE Upgrades:**	**Health & Safety Equipment:**
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, high visibility vest.	Level C PPE: Full face air purifying respirator, organic vapor cartridges, hooded Tyvek coveralls, chemical resistant gloves and boot covers.	Vinyl chloride colorimetric tubes, photoionization detector (PID), first aid kit, sunscreen, and insect repellent.

Basic Job Step	Potential Hazards (From HASP)																																	Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical (Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Waste management							X	X		X	X	X	X	X		X	X	X	X		X			X	X	X	X	X	5	3	15	Follow SOPs; use proper lifting techniques; stay alert; wear nitrile gloves, steel toe boots, safety glasses, and a high-visibility vest (in high traffic areas); perform air monitoring as per HASP; perform air monitoring as per HASP; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	4	1	4	WSP

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Prepared By:	Prepared Date:
Dave Bouchard	8/19/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, New York	Storm Water Pollution Prevention Plan Inspections	No intrusive activities are planned as part of the inspection regime. No field equipment is required.

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
Tetrachloroethene (PCE) and degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride)	None	1.) Vinyl chloride - 0.5 ppm; and, 2.) Trichloroethene - 5 ppm (see action level flow chart)
Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, high visibility vest.	Level C PPE: Full face air purifying respirator, organic vapor cartridges, hooded Tyvek coveralls, chemical resistant gloves and boot covers.	photoionization detector (PID), first aid kit, sunscreen, and insect repellent.

Basic Job Step	Potential Hazards (From HASP)																														Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Mobilize/Demobilize								X		X	X	X	X	X		X								X	X	X		6	3	18	Inspect vehicle for unsafe conditions; stay alert and be aware of other traffic; obey traffic laws; do not drive when tired; reduce speed in inclement weather or poor road conditions; do not drive through standing water; park WSP vehicle outside of work zone.	6	2	12	WSP
Conduct Site Inspection							X			X							X						X	X	X	X	X	3	2	6	Use proper lifting techniques; stay alert; park in designated parking/loading area; wear work gloves and steel toe boots; wear weather-appropriate clothing and use SPF 15 or higher sunscreen; work during daylight hours; use insect repellant containing DEET.	3	1	3	WSP

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Prepared By:	Prepared Date:
Dave Bouchard	9/8/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, NY	Depressurization system Inspections and sub-slab, indoor and ambient air samples	Hammer drill (if temporary sub-slab points are used for sampling), hand pump or syringe, Tedlar® bags, tubing, silicone stoppers (for temporary sub-slab sample points, if used), modeling clay, tubing cutter, compressed helium, helium detector, metal shroud for leak testing, sample canister

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
tetrachloroethene (PCE) and degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride).	Working in homes (pets, people, structures not to code)	1) Vinyl chloride - 0.5 ppm 2) Trichloroethene - 5 ppm
Level D PPE:	**PPE Upgrades:**	**Health & Safety Equipment:**
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, hearing protection	Level C PPE: Full face air purifying respirator, organic vapor cartridges.	Vinyl chloride colorimetric tubes, photoionization detector (PID), first aid kit, sunscreen (as necessary), insect repellent (as necessary)

Basic Job Step	Potential Hazards (From HASP)																													Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/ Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/ Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize								X		X	X	X	X	X		X	X						X	X	X	X		6	3	18	Inspect vehicle for unsafe conditions; stay alert; be aware of other traffic; obey traffic laws; do not drive when tired; reduce speed in inclement weather or poor road conditions; do not drive through standing water; park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X			X	X		X	X						X	X	X	X	X	5	2	10	Use proper lifting techniques; stay alert; park in designated parking/loading area; wear work gloves, steel toe boots, and weather-appropriate clothing; work during daylight hours; use SPF 15 or higher sunscreen (as necessary); use insect repellant containing DEET (as necessary).	3	1	3	WSP
Tailgate meeting (daily)										X													X	X	X	X	X	3	1	3	Wear steel toe boots and weather-appropriate clothing; conduct indoors during inclement weather or after dark; use SPF 15 or higher sunscreen (as necessary); use insect repellant containing DEET (as necessary).	3	1	3	WSP
Locate and clear sub-slab location for utilities (indoor sampling only)			X				X	X		X				X													X	3	2	6	Follow SOPs; stay alert; wear steel toe boots and weather-appropriate clothing; inspect work area; communicate with homeowner; be aware of pets and household members.	4	1	4	WSP/Homeowner
Sub-slab depressurization system inspections			X	X			X	X		X	X		X	X	X			X			X						X	5	1	5	Follow SOPs and guidance; stay alert; use proper lifting techniques; wear gloves, safety glasses, hearing protection, and steel toe boots; perform air monitoring as per HASP; wear weather-appropriate clothing; communicate with homeowner; be aware of pets and household members.	4	1	4	WSP/Homeowner
Leak test probe		X																X			X				X			2	2	4	Follow SOPs and guidance; stay alert; use proper lifting techniques; wear gloves, safety glasses, hearing protection, and steel toe boots; perform air monitoring as per HASP; wear weather-appropriate clothing; communicate with homeowner; be aware of pets and household members.	2	1	2	WSP/Homeowner
Purge probe			X	X									X	X			X	X			X				X	X		2	2	4	Follow SOPs and guidance; stay alert; use proper lifting techniques; wear gloves, safety glasses, hearing protection, and steel toe boots; perform air monitoring as per HASP; wear weather-appropriate clothing; communicate with homeowner; be aware of pets and household members.	2	1	2	WSP/Homeowner
Assemble/Disassemble Canisters													X	X			X	X			X				X	X		2	2	4	Follow SOPs and guidance; stay alert; use proper lifting techniques; wear gloves, safety glasses, hearing protection, and steel toe boots; perform air monitoring as per HASP; wear weather-appropriate clothing; communicate with homeowner; be aware of pets and household members.	2	1	2	WSP/Homeowner

Prepared By:	Prepared Date:
Dave Bouchard	9/8/2021
Approved By:	Approved Date:

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

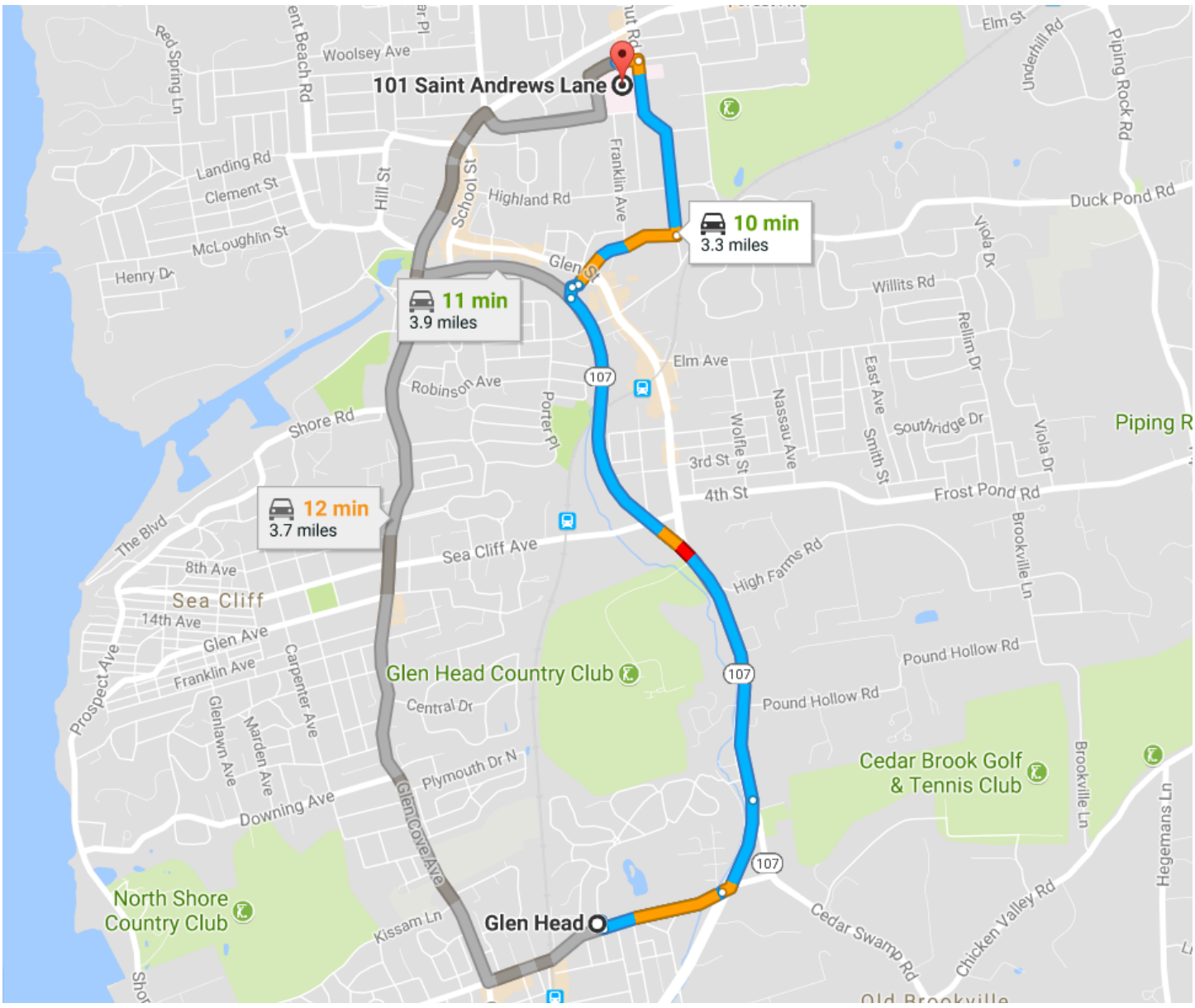
Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former TransTechnology Corporation Facility	31400522	1 Robert Lane Glen Head, NY	Depressurization system Inspections and sub-slab, indoor and ambient air samples	Hammer drill (if temporary sub-slab points are used for sampling), hand pump or syringe, Tedlar® bags, tubing, silicone stoppers (for temporary sub-slab sample points, if used), modeling clay, tubing cutter, compressed helium, helium detector, metal shroud for leak testing, sample canister

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
tetrachloroethene (PCE) and degradation products (trichloroethene, cis-1,2-dichloroethene, and vinyl chloride).	Working in homes (pets, people, structures not to code)	1) Vinyl chloride - 0.5 ppm 2) Trichloroethene - 5 ppm
Level D PPE:	**PPE Upgrades:**	**Health & Safety Equipment:**
Weather appropriate clothing, steel-toed safety shoes, work gloves, nitrile gloves, safety glasses/googles, hearing protection	Level C PPE: Full face air purifying respirator, organic vapor cartridges.	Vinyl chloride colorimetric tubes, photoionization detector (PID), first aid kit, sunscreen (as necessary), insect repellent (as necessary)

Basic Job Step	Potential Hazards (From HASP)																													Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/ Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)		Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Collect Air Samples														X			X	X			X			X	X				2	1	2	Follow SOPs and guidance; stay alert; use proper lifting techniques; wear gloves, safety glasses, hearing protection, and steel toe boots; perform air monitoring as per HASP; wear weather-appropriate clothing; communicate with homeowner; be aware of pets and household members.	2	1	2	WSP/Homeowner
Restoration														X			X	X			X			X	X				3	2	6	Follow SOPs and guidance; stay alert; use proper lifting techniques; wear gloves, safety glasses, hearing protection, and steel toe boots; perform air monitoring as per HASP; wear weather-appropriate clothing; communicate with homeowner; be aware of pets and household members.	3	1	3	WSP/Homeowner
Decontamination														X			X	X			X			X	X				2	1	2	Follow SOPs and guidance; stay alert; use proper lifting techniques; wear gloves, safety glasses, hearing protection, and steel toe boots; perform air monitoring as per HASP; wear weather-appropriate clothing; communicate with homeowner; be aware of pets and household members.	2	1	2	WSP/Homeowner

APPENDIX

D ROUTE TO NEAREST EMERGENCY MEDICAL CARE



Todd Dr E
Glen Head, NY 11545

1. Head **east** on **Depot Pl** toward **Roslyn Dr**	292 ft
2. Turn right at **Roslyn Dr**	315 ft
3. Turn left at **Glen Head Rd**	0.6 mi
4. Turn left at **Cedar Swamp Rd**	1.0 mi
5. Slight right to stay on **Cedar Swamp Rd**	0.6 mi
6. Continue onto **Glen St**	0.2 mi

7. Turn right at **Pearsall Ave**

0.2 mi

8. Slight left at **Walnut Rd**

0.6 mi

9. Turn left at **St Andrews Ln**
Destination will be on the left

472 ft

B 101 St Andrews Ln
Glen Cove, NY 11542

ENCLSOURE C – STANDARD OPERATING PROCEDURES

FIELD STANDARD OPERATING PROCEDURE #3

SAMPLE PACKAGING AND SHIPMENT PROCEDURE

Shipping samples is a basic but important component of field work. The majority of field activities include the collection of environmental samples. Proper packing and preservation of those samples is critical to ensuring the integrity of our work product. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

3.1 ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
IATA	International Air Transport Association
HASP	Health and safety plan
PPE	Personal protective equipment
PSP	Project safety plan
SOP	Standard operating procedure

3.2 MATERIALS

- Suitable shipping container (e.g., plastic cooler)
- Chain-of-custody forms
- Custody seals
- Sample container custody seals (as necessary)
- Mailing address labels (as necessary)
- Shipping form (with account number, as necessary)
- Tape (e.g., strapping, clear packing)
- Permanent marker
- PPE
- Bubble wrap or other packing material

Temperature-preserved samples:

- Large plastic garbage bag
- Wet ice
- Heavy-duty zipper-style plastic bags
- Universal sorbent materials

Note: Some materials will be supplied by the laboratory, while others are must be supplied by the sampler. Confirm supplier of materials prior to mobilizing to the field.

3.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel

and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field standard operating procedures, and the Quality Management System.

This SOP is designed to provide the user with a general outline for shipping samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample collection and quality assurance procedures (SOP 4), and investigation derived waste management procedures (SOP 5).

Most environmental samples are classified non-hazardous materials due to unknown characteristics and hazardous classes, however environmental samples can meet the definition of U.S. Department of Transportation (DOT) hazardous materials when shipped by air, ground, or rail from a project site to the laboratory (e.g., free product, samples preserved with a hazardous material [TerraCore® samplers]). As such, field staff must work with their assigned company compliance professional to determine whether the sample shipment is subject to any specific requirements (e.g., packaging, marking, labeling, and documentation) under the DOT hazardous materials regulations.

3.4 SAMPLE SHIPMENT PROCEDURES

The two major concerns in shipping samples are incidental breakage during shipment and complying with applicable DOT and courier requirements for hazardous materials shipments.

> **NOTE: Many couriers, including Federal Express and United Parcel Service, have requirements that the company register with them before shipping hazard materials. In most cases, it is the sampling location, not the company office address, which needs to be registered. Therefore, each project will likely have unique requirements. Please contact your company compliance professional to determine whether or not you will be required to register for your shipment.**

Protecting the samples from incidental breakage can be achieved using "common sense." Pack all samples in a manner that will prevent them from moving freely about in the cooler or shipping container. Do not allow glass surfaces to contact each other. When possible, repack the sample containers in the same materials that they were originally received in from the laboratory. Cushion each sample container with plastic bubble wrap, styrofoam, or other nonreactive cushioning material. A more detailed procedure for packing environmental samples is presented below.

3.4.1 NON-HAZARDOUS MATERIAL ENVIRONMENTAL SAMPLES

The first step in preparing your samples for shipment is securing an appropriate shipping container. In most cases, the analytical laboratory will supply the appropriate container for bottle shipment, which can be used to return samples once they have been collected. Be sure that the container is large enough to contain the samples plus a sufficient amount of packing materials, and if applicable, enough wet ice to maintain the samples at the preservation temperature (usually 4 degrees Celsius). Use additional shipping containers as needed so that sample containers are protected from breakage due to overcrowding. Do not use lunch-box sized coolers or soft sided coolers, which do not offer sufficient insulation or protection from damage.

3.4.1.1 TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Temperature-preserved samples should be shipped to the laboratory in an insulated container (e.g., cooler). If using a plastic cooler with a drain, securely tape the inside of the drain plug with duct tape or other material to ensure that no water leaks from the cooler during shipment. Place universal sorbent materials (e.g., sorbent pads) in the bottom of the insulated container. The amount of sorbent material must be sufficient to absorb any condensation from the wet ice and a reasonable volume of water from melted wet ice (if a bag were to rupture) or a damaged (aqueous) sample container.

The next step is to line the insulated container with a large, heavy-duty plastic garbage bag. If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples, including a temperature blank, on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between the sample containers. Place large or heavy sample containers on the bottom of the cooler with lighter samples placed on top to minimize the potential for breakage. Place all sample containers in the shipping container right-side up. Do not overfill the cooler with samples; room must be left for a sufficient volume of wet ice. Wet ice must be double-bagged in heavy-duty zipper-style plastic bags (1 gallon-sized, or less); properly seal both bags before placing in the insulated container. Place the bags of ice on top of or between the samples. Place as much ice as possible into the cooler to ensure the samples arrive at the lab at the required preservation temperature, even if the shipment is delayed. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice. Securely close the top of the heavy-duty plastic bag and knot or seal with tape.

3.4.1.2 NON-TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Non-temperature-preserved samples should be shipped to the laboratory in a durable package (e.g., hard plastic container or cardboard box). If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between and on top of the sample containers. Place large or heavy sample containers on the bottom of the container with lighter samples placed on top to minimize the potential for breakage. Place all sample containers within the shipping container right-side up. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice.

3.4.1.3 CONTAINER SHIPMENT

Samples in the container should be cross-checked against the chain-of-custory before signing off on the form and sealing the cooler. Place the original chain-of-custody form (i.e., laboratory copy) into a heavy-duty zipper-style plastic bag, affix/tape the bag to the shipping container's inside lid, and then close the shipping container; as required, include return shipping labels for the laboratory to return company-owned coolers. Only one chain-of-custody form is required to accompany one of the shipping containers per sample shipment; the other coolers in the shipment do not need to include chain-of-custody forms, unless required by the project. At this point, sample shipment preparations are complete if using a laboratory courier.

Once the shipping container is sealed, shake test the shipping container to make sure that there are no loose sample containers. If loose sample containers are detected, open the shipping container, repack the contents, and reseal the shipping container. If sending the sample shipment through a commercial shipping vendor, place two signed and dated chain-of-custody seals on alternate sides of the shipping container lid so that it cannot be opened without breaking the seals. Securely fasten the top of the shipping container shut with clear packing tape; carefully tape over the custody seals to prevent damage during shipping.

Affix a mailing label with the ship to and return to addresses to the top of the shipping container using clear shipping tape. Use the pre-printed return mailing label from the laboratory, if provided, or complete a new mailing label from the shipping carrier. Ship environmental samples to the contracted analytical laboratory using an appropriate delivery schedule. **Note: Samples can be shipped for Saturday delivery once the lab has been verified to be open and receiving samples on the weekend.**

Verify whether the shipment cost should be billed to the sender or recipient, and ensure the internal billing reference section on the mailing label includes either the laboratory's billing reference number, if the shipment is billed to the laboratory, or the project billable number, if the shipment is billed to WSP.

Declare the value of samples on the shipping form for insurance purposes, if applicable. When shipping samples to a lab, identify a declared value equal to the carrier's default value ($100); additional fees will be charged based on a higher value declared. Our preferred carrier, Federal Express, will only reimburse for the actual value of the cooler and its contents if a sample shipment is lost; they will not reimburse for the cost of having to re-collect the samples. [Please note: if you are shipping something other than samples, such as field equipment, declare the replacement value of the contents.]

Record the tracking numbers from the shipping company forms (i.e., the airbill number) in the field book and retain a copy of the shipping airbill. On the expected delivery date, confirm sample receipt by contacting the laboratory or tracking the package using the tracking number; provide this confirmation information to the project manager.

> **NOTE: Most shipping carriers adhere to transit schedules with final pickup times each day; these schedules are subject to change and vary by service location. If shipping containers are dropped off at a service location after the final pickup time, transit to the laboratory will not be initiated until the following day, and samples may not be properly preserved. Therefore, confirm transit schedules in advance of each sampling event, and ensure samples are delivered to the carrier before the final pickup time of the day.**

3.4.2 HAZARDOUS MATERIALS SAMPLES

Employees rarely ship hazardous materials due to DOT shipping requirements. If you find that your samples could be considered a DOT hazardous material, first coordinate with the assigned company compliance professional and project manager to make a hazardous material classification and, if necessary, establish the necessary protocols and to receive the appropriate training/certification.

> **NOTE: Employees shipping samples regulated as hazardous materials or exempt hazardous materials by air must have International Air Transport Association (IATA) training. IATA training is a separate training required in addition to DOT hazardous materials training for such shipments. Most of our employees do not have IATA training and therefore, anyone who needs to ship by air MUST consult with a company IATA-trained compliance professional.**

FIELD STANDARD OPERATING PROCEDURE #4

SAMPLE COLLECTION AND QUALITY ASSURANCE PROCEDURE

The purpose of this procedure is to assure that sample volumes and preservatives are sufficient for analytical services required under U.S. Environmental Protection Agency (EPA) or other agency approved protocols. This operating procedure describes sample identification procedures, sampling order for select analytes, quality control and quality assurance (QA/QC) sampling procedures, and custody documentation. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

4.1 ACRONYMS AND ABBREVIATIONS

ºC	degrees Celsius
COC	chain-of–custody [form]
DI	laboratory-grade, analyte-free deionized water
DOT	US Department of Transportation
EDD	electronic data deliverable
EPA	US Environmental Protection Agency
HASP	health and safety plan
ID	identification [number]
MS/MSD	matrix spike and matrix spike duplicate
MSA	master services agreement
PPE	personal protective equipment
PSP	project safety plan
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
SOP	standard operating procedure
VOCs	volatile organic compounds

4.2 MATERIALS

- Field book
- Indelible (waterproof) markers or pens
- PPE
- Sampling containers and labeling/shipping supplies

- Deionized (DI) water
- Cleaned or dedicated sampling equipment

4.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for collecting environmental and quality assurance samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), investigation derived waste management procedures (SOP 5), and equipment decontamination (SOP 6). This SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics are more appropriately addressed in a site-specific work plan or a dedicated quality assurance project plan (QAPP). This SOP does not include an special handling requirements for specific parameters such as low-level mercury or per- and polyfluoroalkyl substances. These requirements should be included in the QAPP.

4.4 SAMPLE IDENTIFICATION PROCEDURES

All sample containers (e.g., glass bottles, plastic jars, foil bags, plungers, etc.) should be identified by an affixed sample label. Unless otherwise approved by your project manager or specified in your site-specific work plan/QAPP, information on the sample container labels must include the site/project name, project/task number, unique alpha-numeric sample identification (ID) number, sample collection date, time of collection using the military or 24-hour clock system (i.e., 0000 to 2400 hours), analytical parameters, preservative, and the initials of the sampling personnel. Employees are advised to use pre-printed waterproof mailing labels (e.g., Avery® 5xxx-series Waterproof Address Labels) for all sample identification. Electronic label templates are available.

The sample identification (ID) number must, unless otherwise approved by your project manager or specified in your site-specific work plan/QAPP, follow the company's naming protocol. This protocol was developed to aid in determining the type of sample collected (e.g., soil, groundwater, vapor, etc.), the sample location, and, where appropriate, the sample depth. This protocol was also designed to ensure consistency across the company.

Construct sample IDs in the following format:

SB-10A (4-6)

Where, in this example:

- SB = the first two or three characters will define the sample type (see list of approved prefixes below); in this case, a soil boring
- 10A = the next two or three alpha-numeric digits (separated by a dash from the sample type identifier) indicate the location of the boring on the site; in this case, boring number 10A
- (4-6) = the depth the sample was collected, with the first number (including decimals, if necessary) indicating the top of the sample interval (in feet) and the second number indicating the bottom of the sample interval (in feet); not all sample types will include depth information.

Additional label information may be added after the last character of the sample ID number (e.g., sample date, underground storage tank number, area of concern number, "Area" number, client identifier, etc.). Separate any additional information from the required portion of the sample name by dash(es).

Sample Prefix	Permitted Use
AA	Ambient outdoor air sample
CC	Concrete core/chip sample
CS	Confirmation/verification soil sample collected from an excavation
HA	Soil sample collected with a hand auger
IAB	Indoor air sample – basement
IAC	Indoor air sample – crawl space
IAF	Indoor air sample – first floor
MW	Soil sample collected from a monitoring well borehole or a groundwater sample collected from a monitoring well
PZ	Groundwater sample collected from a piezometer
SB	Soil sample collected from boreholes that will not be converted to monitoring wells
SED	Sediment sample
SG	Soil gas sample other than a sub-slab sample (e.g., sample collected from a temporary or permanent polyvinyl chloride sample point or stainless steel screen implant)
SL	Sludge sample
SS	Surface soil sample collected using hand tools (e.g., trowel, spoon, etc.) and typically at depths less than 2 feet below ground surface
SSV	Sub-slab vapor sample
SW	Surface water sample
TC	Tree core sample
TP	Soil sample collected from a test pit
WC	Waste characterization sample
WP	Wipe sample
WW	Wastewater

4.5 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

The first step in sample collection is to verify that the correct number and type of sample containers were provided, and that each contains the appropriate preservatives for the proposed project (i.e., check against the sampling plan requirements outlined in the site-specific QAPP or, for those projects without a site-specific QAPP, the laboratory Task Order). Inspect all containers and lids for flaws (cracks, chips, etc.) before use. Do not use any container with visible defects or discoloration. Report non-receipt and any discrepancies of specific types of sample containers to the team leader or project manager immediately. Make arrangements to have missing or additional sampling containers provided on an expedited basis.

Precautions must be taken to prevent cross-contamination and contamination of the environment when collecting samples. Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***In no case should gloved hands be used as a sampling device: always use the appropriate sampler to move the sample from the sampling device to the laboratory-supplied containers.***

Sample collection must follow all appropriate SOPs, state and federal regulations, or guidance, for the collection of environmental samples; the recommended order of sample collection is:

- Geochemical measurements (e.g., temperature, pH, specific conductance)
- Volatile organic compounds (VOCs)
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Per- and Polyfluoroalkyl substances
- Total metals
- Dissolved metals
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Fill the sample bottles to the appropriate level for the parameter analyzed including eliminating head space, as appropriate. Collected samples that require thermal preservation must be immediately (within 15 minutes) placed in a cooler with wet ice and maintained at a preservation temperature of 4° Celsius (ºC).

4.6 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Field quality assurance/quality control (QA/QC) samples may include equipment blanks, trip blanks, temperature blanks, duplicates, matrix spike and matrix spike duplicate samples, field blanks, and split samples. The project manager or QAPP must specify the type and frequency of QA/QC sample collection. The QA/QC sample identification number must, unless otherwise approved by your project manager or specified in your site-specific work plan, follow the company's naming protocol as discussed in the sections below. QA/QC samples must be clearly identified on our copy of the chain-of-custody (COC) form (described below) and in the field book. Failure to properly collect and submit required QA/QC samples can result in invalidation of an entire sampling event.

Several blanks, discussed below, require laboratory-grade analyte-free, deionized water (DI) be used. Only if all options to obtain laboratory-grade DI have been exhausted should store-grade distilled water be used to prepare blanks. If store-grade distilled water is used, be sure to record the source and lot number in the field book.

Collect, preserve, transport and document split samples using the same protocols as the related samples.

4.6.1 EQUIPMENT BLANKS

Equipment blanks, or rinsate blanks, are used to document contamination attributable to using non-dedicated equipment (i.e., equipment that must be decontaminated after each use). Collect equipment blanks in the field at a rate of one per type of sampling equipment per day, unless otherwise specified. If the site-specific work plan or QAPP indicates that an equipment blank is to be collected from dedicated sampling equipment, collect the equipment blank in the field before sampling begins. If field decontamination of sampling equipment is required, prepare the equipment blanks after the equipment has been used and field-decontaminated at least once.

Prepare equipment blanks by filling or rinsing the pre-cleaned equipment with DI and collecting the rinsate in the appropriate sample containers. Record the type of sampling equipment used to prepare the blank and how the equipment blank was generated in the field book. Decontamination of the equipment following equipment blank procurement is not required.

The samples must be labeled, preserved, and filtered (if required) in the same manner as the environmental samples. Have the equipment blanks analyzed for all the analytes for which the environmental samples are being analyzed, unless otherwise specified. Designate equipment blanks using "EB", followed by the date, and in the order of equipment blanks collected that day. For example, the first equipment blank collected on July 4, 2015, would be designated EB070415-1.

4.6.2 TRIP BLANKS

Trip blanks are used to document VOC contamination attributable to shipping and field handling procedures. Trip blanks are only required when analyzing samples for VOCs. The blanks are prepared by the analytical laboratory and shipped along with the empty sample containers. These pre-filled blanks should accompany the environmental sample containers wherever they are stored onsite (i.e., keep the trip blank sample bottles in the same shipping container used to ship and store VOC sample bottles during the sampling event). Never open the laboratory-supplied trip blank sample bottles. Only as a last resort, store-grade distilled water, can be poured into empty VOC sample bottles to generate event-specific trip blanks (or augment the laboratory-supplied ones, if they are provided in insufficient numbers).

The trip blanks, even those provided by the analytical laboratory, should be labeled in the field like other environmental samples collected during the investigation activities. Identify trip blanks using the prefix "TB", followed by the date. For example, the trip blank shipped with a cooler of samples on July 4, 2019, would be designated TB070419-1. If a second trip blank is needed on that same day, the designation would be TB070419-2. A minimum of one trip blank should accompany each shipping container of VOC samples, unless more stringent project requirements are in place. The number of trip blanks needed per shipment can be minimized by shipping all the VOC samples in the same shipping container (if possible).

4.6.3 FIELD BLANKS

The field blank is analogous to the trip blank in that it is designed to assess and document any contamination to the environmental samples that can be attributable to the (ambient) field conditions. Not all projects require the use of field blanks. Their use, if required, and the frequency of collection (often 1 blank per 10 or 20 environmental samples collected) is detailed in the QAPP and the site-specific work plan. The sample is collected by pouring DI water into empty glassware at the site during the sampling event. The intent is to expose the field blank to the same conditions in the atmosphere as those present when the environmental samples were collected.

Identify field blanks using the prefix "FB", followed by the date. For example, the field blank shipped collected on August 22, 2019, would be designated FB082219. If a second field blank is needed on that same day, the designation would be FB082219-2. At least one field blank should be collected for each analytical parameter identified in the sampling event.

4.6.4 TEMPERATURE BLANKS

Temperature blanks are used to determine if the samples are at the appropriate temperature for preservation at the time the sample container (cooler) is received by the analytical laboratory. The temperature is determined by measuring the temperature blank, which provides a proxy for the temperature of the sample container upon arrival at the laboratory. These temperature blanks are typically provided by the laboratory and should be included in each sample cooler used to ship and store the sample bottles during the sampling event. If laboratory-provided temperature blanks are not available, fill a clean, unpreserved sample bottle with potable, DI, or store-grade distilled water and identify the bottle as a temperature blank.

4.6.5 DUPLICATES

Duplicate samples, which are used for measuring the variability and documenting the precision of the sampling process, should be collected at a rate of at least 1 duplicate per 20 environmental samples collected, unless specific project requirements (as detailed in a QAPP) are in place. Be sure that the location selected for duplication has sufficient sample volume and is within the area of contamination, if known. Under no circumstances can equipment or trip blanks be used as duplicates.

Collect each duplicate sample at the same time, from the same sample aliquot, and in the same sampling order (i.e., volatile organic compounds, then semivolatile organic compounds, then inorganics, etc.) as the corresponding environmental sample. Sample bottle aqueous duplicate samples, for example, should be alternately filled with the environmental sample bottles (i.e., the actual sample bottle and the bottle to be used for the duplicate) from the same sampling device. If the sampling device does not hold enough volume to fill the sample containers, fill the first container with equal portions of the sample, and pour the remaining sample into the next

sample containers. Obtain additional sample volume and pour the first portion into the last sample container, and pour the remaining portions into the first containers. Continue with these steps until all containers have been filled.

Duplicate samples will be assigned arbitrary sample ID and a false collection time so that they are not identified as duplicates by the laboratory (i.e., submit the duplicates samples as *blind* to the lab). The blind duplicate sample "location designation" will be left up to the project manager; however, in no case will "Dup" be allowed to appear in the sample name. The duplicate samples should be analyzed for the same analytes as the original environmental sample. Be sure to record the sampling method, duplicate sample ID, the false time, and the actual time of collection in the field notebook. The duplicate should also be indicated in separate documentation, such as on our carbon copy of the chain-of-custody (i.e., the yellow copy), and not on the original chain-of-custody that accompanies the samples to the laboratory.

4.6.5 MATRIX SPIKE AND MATRIX SPIKE DUPLICATES

Matrix spike and matrix spike duplicate samples (i.e., MS/MSD samples) are used to determine the bias (accuracy) and precision of an analytical method for a specific sample matrix. Many of the company's projects require the collection of MS/MSD samples; however, laboratory generated MS/MSD samples are sufficient for some projects (as detailed in the QAPP or site-specific work plan). Collect MS/MSD samples at a rate of 1 MS and 1 MSD (i.e., 2 samples) for every 20 environmental samples, unless more stringent project requirements (as detailed in a QAPP) are in place. Clearly convey the MS/MSD identity to the laboratory by adding "MS" or "MSD" after the sample name (e.g., MW-01MS) and/or in the comments section of the chain-of-custody on the same line as the parent sample. Under no circumstances can equipment or trip blanks be used as MS/MSD samples.

4.6.6 SPLIT SAMPLES

Split samples may be collected as a means of determining compliance or as an added measure of quality control. Split samples measure the variability between laboratories and not the variability of sample collection and laboratory procedures (i.e., they are not equivalent to duplicate samples). The split samples must be subsamples of the same parent material used for the environmental sample: soil should be collected from the same in-place material (for VOCs) or, for non-discrete samples, the same mixing vessel after homogenization. Collect aqueous split samples using the same alternating bottle approach detailed in the duplicate sample description above. These procedures will ensure that the split samples are valid and are representative of the environmental sample collected as part of the investigation.

Collecting split samples of soil, sediment, waste, and sludge is not recommended because the homogenization necessary for a true split sample in these matrices is not possible and the resulting laboratory results would not be comparable.

Spilt samples should have the same sample location designation (e.g., MW-01, SB-03 (4-6), but are differentiated from each other by inserting the laboratory analyzing or the agency/consultant collecting the sample after the sample location (e.g., MW-01-WSP and MW-01-EPA).

4.7 CUSTODY DOCUMENTATION

Sample custody protocols are used to demonstrate that the samples and sample containers were handled and transferred in such a manner as to prevent tampering. Legal COC begins when the pre-cleaned sample containers are dispatched to the field from the laboratory and continues through sample analysis and eventual disposal of the sample and sample containers. Maintaining custody requires that samples must be in the actual possession or view of a person who is authorized to handle the samples (e.g., sample collector, laboratory technician, etc.), secured by the same person to prevent tampering, or stored in a designated secure area.

It is a good idea to limit, to the extent possible, the number of individuals who physically handle the samples. Samples must be placed in locked storage (e.g., locked vehicle, locked storeroom, etc.) when not in the possession or view of authorized personnel. Do not leave samples in unoccupied motel or hotel rooms or other areas where access cannot be controlled by the person(s) responsible for custody without first securing samples and shipping or storage containers with tamper indications in place (i.e., custody seals).

The COC form is used to trace sample possession from the time of collection to receipt at the analytical laboratory. It is recommended that the company's COC be used rather than the laboratory-supplied COC form to ensure that all necessary data are recorded. Submit one COC form per sample shipment, unless more stringent project requirements are in place (as detailed in the QAPP or site-specific work plan). The COC needs to have a unique COC number (pre-printed on the form), accompany all the samples, and include all appropriate project-specific information, such as:

- Project number, name, and location
- Sampler's printed name(s) and signature(s)
- Sample identification number
- Date and time (using the 24-hour clock) of collection
- Sample matrix (e.g., soil, aqueous, solid, etc.)
- Total number of containers per sample
- Parameters requested for analysis including number of containers per analyte.
- Remarks (e.g., irreducible headspace, field filtered sample, expected concentration range, specific turn-around time requested, etc.)
- Signatures of all persons involved in the chain of possession in chronological order
- Requested turn-around-time
- Name and location of analytical laboratory
- Custody seal numbers
- Shipping courier name and tracking information
- Internal temperature of shipping container upon shipment to laboratory, as needed
- Internal temperature of shipping container upon delivery to laboratory
- Employee contact information

Affix custody seals to all storage and shipping container closures when transferring or shipping sample container kits or samples to an off-property party. Place the seal so that the closure cannot be opened without breaking the seal. In the field book, record the time, date and signatures of responsible personnel affixing and breaking all seals for each sample container and shipping container. Affix new custody seals every time a seal is broken until continuation of evidentiary custody is no longer required.

FIELD STANDARD OPERATING PROCEDURE #5

INVESTIGATION DERIVED WASTE MANAGEMENT PROCEDURE

The purpose of this standard operating procedure (SOP) is to provide instructions for handling, storing, and managing investigation derived waste (IDW) pending disposal. All IDW, which includes (but is not limited to) soil cuttings, development water, purge water, drilling fluids, decontamination fluids, personal protective equipment (PPE), and sampling equipment, must be managed in compliance with applicable or relevant and appropriate requirements. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper PPE must be selected and used appropriately.

5.1 ACRONYMS AND ABBREVIATIONS

DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
IDW	investigation derived waste
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PSP	project safety plan
RCRA	Resource Conservation and Recovery Act
SOP	standard operating procedure
TSCA	Toxic Substances Control Act

5.2 MATERIALS

- Pre-printed weatherproof waste labels (e.g., non-hazardous waste, hazardous waste, polychlorinated biphenyls [PCBs], etc.)
- IDW log (Figure 1)
- Permanent ink marking pen, paint, stick/pen
- Sampling equipment (refer to sampling SOPs)
- Impermeable covers (tarps), as needed
- Duct tape, rope, or other material to secure tarp
- Copy of the waste manifest or bill of lading

5.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version

of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field standard operating procedures, and the Quality Management System.

This SOP is designed to provide the user with a general outline for handling, storing, and managing IDW pending disposal and assumes the user has received current U.S. Department of Transportation (DOT) training, Hazardous Waste Operations and Emergency Response training, and Resource Conservation and Recovery Act (RCRA) training (if required) and is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), and equipment decontamination (SOP 6). The SOP does not cover investigation planning; DOT, RCRA, and Toxic Substances Control Act (TSCA) regulations; nor does it cover the evaluation of the analytical results. **Consult and involve the company's compliance professionals during all phases of IDW management and disposal.**

It is important to note that information contained in this SOP is based on federal regulations and interpretive guidance provided by the U.S. Environmental Protection Agency (EPA) and other federal regulatory sources; therefore, information provided in this SOP may be superseded by state or local-specific statutes or regulations. Field personnel must plan for and discuss the handling procedures with the project manager and assigned company compliance professional before mobilizing to the field.

5.4 IDW GENERAL PROCEDURES

Nearly all intrusive field activities will generate solid or liquid wastes. Examples include:

Solid Waste

- Soil cuttings
- Drilling mud
- Plastic sheeting
- Spent carbon or filters
- PPE (e.g., Tyvek coveralls, gloves, respirator cartridges)
- Disposable or dedicated sampling equipment (e.g., bailers, hoses, clamps, buckets, cartridge filters)
- Field analytical waste (e.g., HACH kits, Chlor-n-Soil kits, Gastech tubes)
- Compressed gas cylinders (e.g., isopropylene, helium)
-
- Disposable cleaning materials (e.g., wipes or rags)

Liquid Waste

- Decontamination water
- Development water
- Drilling fluids
- Purge water
- Soap or wash solutions
- Reagents (e.g., hexane, nitric acid, methanol)

The specific procedures for dealing with these materials after the field activities have been completed will vary depending on whether the materials are considered to be non-hazardous, RCRA hazardous (characteristic or listed wastes), TSCA-regulated PCB waste, and/or DOT hazardous materials. The characterization of the wastes to be generated should be determined in conjunction with a company compliance professional before the field event occurs, based on previously generated data; however, in some cases, particularly for new sites, the status of the wastes may not be known. In these cases, handle IDW as hazardous waste until the status can be verified. Field personnel must consult their assigned company compliance professionals for assistance in proper waste characterization and to determine waste management requirements applicable to the site.

5.4.1 WASTE MINIMIZATION

As possible, select investigation methods and techniques that will minimize the amount of wastes generated during field activities, particularly if the IDW is hazardous. Examples include using direct-push methods instead of hollow stem augers (to minimize soil cuttings) during a soil investigation, if appropriate, eliminating the use of solvents or solvent-based cleaners for decontamination, if

possible, and limiting contact with the materials to reduce the amount of PPE required. Minimizing the amount of waste generated will reduce handling requirements and overall project costs, and is consistent with the company's corporate goals for sustainability.

5.5 ONSITE IDW MANAGEMENT PROCEDURES

Onsite handling procedures typically involve containerization of the IDW for offsite disposal at a regulated facility or, in the case of certain non-hazardous wastes, onsite disposal. Should more than one waste stream be present onsite, segregate the IDW containers by waste stream to facilitate the future waste disposal. The procedures for each type of waste are presented below.

5.5.1 NON-HAZARDOUS WASTE MANAGEMENT

If the IDW is classified as non-hazardous waste, the following procedures must be implemented only if approved by the applicable regulatory agency and after being discussed and approved by the project manager, project compliance professional, client, and facility personnel:

- Soil can be either:
  - spread around the borehole or other onsite location
  - placed back in the boring or excavated test pit
  - containerized and disposed of offsite
- Groundwater and decontamination fluids can be either:
  - poured onto the ground next to the well to allow infiltration
  - discharged to either the publically-owned treatment works or storm sewer
  - discharged to the onsite wastewater treatment plant
  - containerized and disposed of offsite
- After rendering the IDW unusable (e.g., cutting or tearing material), PPE, plastic sheeting, disposable cleaning materials, and spent bag filters can be double bagged and disposed of as general trash or containerized and disposed of offsite.
- Compressed gas cylinders should be depressurized and disposed of as general trash, recycled as scrap metal, or containerized and disposed of offsite.
- Field analytical waste (e.g., HACH® kits, Chlor-n-Soil® kits) can be disposed of in accordance with the manufacturer's instructions provided the disposal method is approved by the company's project manager and compliance professional.
- Minimize the volume of reagents as much as possible. Consult a company compliance professional to determine the proper disposal of any quantity of unused reagents. Empty reagent containers may be disposed of as general trash after removing all chemical name and warning labels, or may be containerized and disposed of offsite.
- Spent water treatment media (e.g., carbon, resin) should be containerized and disposed of offsite.
- Exploration and production exempt waste derived from material that was downhole at an oil and gas production site.

If the IDW is containerized and is classified as non-hazardous, the following procedures will apply:

- Place the non-hazardous IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are in good condition and will not leak.
- Drums used as containers must remain closed except when adding, sampling, or inspecting the waste. The drums cannot be used as a work surface once waste is put in the container.
- Mark the container with the appropriate waterproof, self-adhesive non-hazardous waste label. The label must include a description of the contents of the container (e.g., soil cuttings, purge water) and the generator name (the client or the facility, never the company). **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- The IDW containers must be properly closed, wiped clean, and stored in a secure onsite location.

5.5.2 HAZARDOUS WASTE MANAGEMENT

If site data or generator knowledge indicates that the IDW is RCRA hazardous, the following procedures will apply:

- Place IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are appropriate for the type of IDW generated (e.g., solid in containers authorized for transport of solids), in good condition and will not leak.

- Containers must remain closed except when adding, sampling, or inspecting the material. The containers cannot be used as a work surface once waste is put in the container.
- Mark the container with an appropriate waterproof, self-adhesive hazardous or radiological waste label. The label must include the accumulation start date, a description of the contents of the container (e.g., soil cuttings, purge water), the EPA identification number, the generator name (the client or the facility, never the company), and the hazardous waste codes, if known. **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- The IDW containers must be properly closed, wiped clean, and stored in a secure onsite location (i.e., a designated facility hazardous waste storage area) to limit access. At a minimum, place the drums on an impermeable surface (if available) in an area of limited access. If stored outside, cover the containers with a secured tarp at the end of each field day until the containers are picked up for disposal.
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- If applicable, ensure that weekly inspections are conducted, and the proper inspection forms for documentation are completed during the entire time the waste is stored onsite. **Field personnel must consult the project compliance professional for help to determine if weekly inspections are required.**

If the IDW is presumed to be hazardous and sampling is required to confirm its classification, it must be labeled "Hazardous Waste-Pending Analysis" and sampled for the parameters specified by the project compliance professional or project manager before leaving the site. Any waste confirmation samples must be collected in accordance with the company's SOPs. Treatment, storage, and disposal facilities will usually specify the required analysis for waste profiles.

5.5.3 PCB WASTE MANAGEMENT

If information exists to classify PCB-containing IDW as TSCA-regulated IDW (i.e., PCBs greater than 50 milligrams per kilogram), the following procedures must be implemented:

- Place the PCB-containing IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are in good condition and will not leak.
- Containers must remain closed except when adding, sampling, or inspecting the material. The containers cannot be used as a work surface once waste is put in the container.
- Mark the container with an appropriate waterproof, self-adhesive yellow label with the words "Caution Contains PCBs", the "removed from service" date (the accumulation start date), and a description of the contents of the container (e.g., soil cuttings). Complete the label with the name and phone number of the company personnel to contact in the event of an accident or spill. **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- The IDW containers must be properly closed, wiped clean, and stored in a secure PCB storage area onsite. If a PCB storage area is not available, construct a temporary PCB storage area. Cover the containers with a secured tarp at the end of each field day until the drums are picked up for disposal. Place one yellow 6" x 6" "Caution Contains PCBs" label on the outside of the tarp, and note the "Removed from service date" on the label.
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- If applicable, inspect the area and the containers for leaks once every 30 days in accordance with TSCA requirements during the entire period the waste is stored onsite. **Field personnel must consult the project compliance professional for help to determine if weekly inspections are also required.**

5.6 POST-FIELD IDW MANAGEMENT ACTIVITIES

Field personnel must follow up on the management of the IDW after returning from the field. RCRA hazardous and TSCA-regulated PCB-containing wastes have storage time limits and periodic inspection requirements to remain in compliance with federal, state, or local regulations. Arrangements for proper disposal of wastes must be made within the required time limits and must be consistent with all applicable regulatory requirements, as well as the company's contracting procedures and policies for waste disposal. Copies of waste disposal documentation (e.g., bill of lading, waste manifest, land disposal restriction form, etc.) should be provided to the project manager and saved with the project files.

INVESTIGATION DERIVED WASTE LOG

Date/Time:_____

Site Information:
Site Name: _____ Site EPA ID #: _____
Site Contact: _____ Site Address: _____
Site Contact Telephone No: _____

Origin of Material: _____
Type of Waste Generated:
☐ Soil Cuttings ☐ PPE ☐ Decontamination Water
☐ Groundwater ☐ Storm Water ☐ Drilling Fluids
☐ Other (Describe): _____

Field Activities that Generated the Waste:
☐ Soil Borings ☐ Well Sampling ☐ Well Installation
☐ Decontamination ☐ Excavation ☐ Pumping Tests
☐ Other (Describe): _____

Generation Date: _____ ***90/180/270-Day Deadline(for hazardous waste)***: _____
Quantity of Waste Generated and Container Type: _____

_____

Storage Location: _____
Waste Identification:
☐ Non-hazardous Waste (pending analysis)
☐ Non-hazardous Waste (based on site information or generator knowledge)
☐ Hazardous Waste (pending analysis)
☐ Hazardous Waste (based on site information or generator knowledge)
☐ PCB-containing Waste
☐ Radiological Waste

If generator knowledge or site information was used for identification, explain: _____

_____

_____

Type of Label Applied to Container: ☐ Non-hazardous ☐ Hazardous ☐ PCB ☐ Radiological
WSP Information (Note: One copy to site contact - the original copy to project manager)
Personnel/Contact: _____ Project No.:_____
Telephone: _____

Date Removed: _____ Signature: _____

FIELD STANDARD OPERATING PROCEDURE #6

DECONTAMINATION PROCEDURE

The decontamination procedures outlined in this standard operating procedure (SOP) are designed to ensure that all sampling equipment is free from the analytes that could potentially interfere with sample results. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

6.1 ACRONYMS AND ABBREVIATIONS

DI	deionized water
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure

6.2 MATERIALS

- Field book
- PPE
- Polyethylene sheeting and/or garbage bags
- Laboratory-grade non-phosphate detergent[1] (e.g., Luminox® or Liquinox®)
- Cleaning reagents, as needed (e.g., isopropyl alcohol, methanol, hexane, nitric acid)
- Potable water
- Deionized (DI) water
- Containers (e.g., plastic buckets)
- Bristle brushes
- Aluminum foil
- Spray bottles
- Paper towels
- Pressurized steam cleaner (e.g., steam jenny), as needed
- Waste collection containers (e.g., drums), as needed
- Decontamination pad, as needed

6.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel

[1] Not all laboratory-grade detergents are phosphate free. Be sure to verify the detergent's phosphate content before use.

and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for decontamination and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), and investigation-derived waste management procedures (SOP 5). All decontamination references must be available for consultation in the field, including:

- Company's SOPs
- Applicable state and federal guidelines or procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

6.4 GENERAL PROCEDURES

The cleaning and decontamination procedures described below are designed to ensure that the equipment used for sample collection is free of analytes that could potentially alter the analytical results. These procedures are primarily targeted at preventing the incidence of cross-contamination (i.e., compounds of interest being transferred on the sampling equipment from one sample to another) in order to produce high quality, representative sample results. As with all analytical sampling, the effectiveness of the cleaning procedures must be demonstrated with the collection of equipment blanks; equipment blank sample collection procedures and frequency are discussed in SOP 4.

6.4.1 EQUIPMENT AND REAGENT SELECTION

It is important for employees to evaluate the expected types of contamination before mobilization to a site. State programs (or the U.S. Environmental Protection Agency [EPA], depending on the site) may require more stringent decontamination procedures than those listed in this SOP, specify the types and grades of various cleaning detergents and reagents (e.g., acids and solvents), or allow the use of phosphate-containing detergents, such as Liquinox® liquid detergent (preferred[2]) or the powdered Alconox®. Decontamination equipment (e.g., spray bottles, brushes, etc.) should be constructed of non-reactive, non-leachable materials (e.g., metal, glass, Teflon®-coated, polyethylene, etc.) which are compatible with the reagents and solvents being used for decontamination.

Many of the cleaning reagents (e.g., nitric acid, hexane, methanol) are U.S. Department of Transportation (DOT) hazardous materials and must be shipped using a ground delivery service. The Safety Data Sheets (SDSs) for any hazardous cleaning reagents to be used onsite must be reviewed before the commencement of work, and the potential hazards and protective measures to be employed must be addressed in the HASP. Do not use decontamination liquids that have been improperly stored (e.g., unsealed containers).

In specific cases, it may be necessary to steam clean the field equipment before proceeding with the decontamination steps presented in Section 6.5 (e.g., hollow stem augers). Generally, the company's subcontractors are responsible for bringing or building a decontamination pad, if necessary, to contain the spray from a steam jenny. As possible, decontamination pads should be constructed on a level, paved surface in an area known or believed to be free of surface contamination, and should be of sufficient size to contain the decontamination water. Equipment that is steam cleaned should be placed on racks or saw horses and not on the floor of the

[2] Liquinox® liquid detergent, manufactured by Alconox, Inc., is phosphate-free and does not contribute to nutrient loading or algae blooms in the environment.

decontamination pad. Decontamination water should be removed from the decontamination pad frequently to minimize the potential for leaks or overflow.

Consult and involve the company's compliance professionals for storage procedures and disposal requirements of cleaning reagents, detergents, wastes, and other decontamination-related materials.

6.4.2 OTHER CONSIDERATIONS

In preparing for decontamination, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify a decontamination (pad) area and evaluate the accessibility to and safety of the location.
- If working in a hazardous waste exclusion area, the decontamination area should be located in the contaminant reduction zone.
- Record a description of the decontamination (pad) area.

Survey the breathing zone around the decontamination area with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate. When decontaminating equipment, it is important to find a suitable location away from any sources of cross-contamination that could compromise the integrity of the decontamination. As possible, position the decontamination area away from fuel-powered equipment, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling).

6.5 DECONTAMINATION PROCEDURES

The decontamination procedures described below are a four- to nine-step process, depending on the the applicable federal or state guidelines, the project-specific work plan, or the QAPP. Sampling activities must be initiated with clean, decontaminated equipment. Decontaminate all non-dedicated equipment that contacts the sample directly (e.g., spoons, trowels, pumps), before and between each sample location and sampling interval. record decontamination procedures in the field book. Disposable, single use items, such as bailers or tubing, do not require decontamination.

The decontamination process includes the following four basic steps:

1. Physical removal of soil or debris
2. Wash with non-phosphate detergent, such as Liquinox®, and nylon brush
3. Potable water rinse
4. Laboratory-supplied deionized (DI), analyte-free water rinse (distilled water can be used as a substitute, if necessary)

The first step is to remove as much soil or other debris from the sampling device as possible near the sampling area to limit the spread of potentially-contaminated materials into clean areas of the site. Containerize all soil or debris in DOT-compliant containers in accordance with SOP 5 or the project-specific work plan. Dispose of all wastes in conformance with the project-specific work plan and applicable regulations.

Cleaning and decontamination should occur at a designated area(s) (i.e., decontamination pad) on the site. If gross contamination or an oily film or residue is observed on the equipment, use a steam jenny or wash by hand, using a brush, to remove the particulate matter or surface film. Heavy oils or grease may be initially removed with paper towels soaked with isopropyl alcohol.

The physical removal of debris process is followed by soaking (a simple dunk of the equipment is insufficient) and hand scrubbing the equipment with a solution of potable water and non-phosphate detergent (mixed to the manufacturer's instructions) followed by a potable water rinse. If not using a decontamination pad, the most common set-up uses multiple 5-gallon plastic buckets (or equivalent) for washing and rinsing. The decontamination containers should be labeled as to their contents and pertinent information from original source, such as the date opened or transferred, and the expiration date (as well as any applicable hazardous labels), placed on polyethylene sheeting (to contain drips of decontamination fluids during the decontamination process), and sealed when not in use to prevent accidental release of the fluids. If decontaminating sealed submersible pumps, pump both the non-phosphate detergent wash

fluid and the potable water rinse through the pump body itself (usually done in separate buckets) to ensure that the internal components are thoroughly cleaned. Replace the detergent solution and rinse water at least daily or when it becomes oily or silty.

Next, place the DI water for the rinse in a small spray bottle or pour over the equipment after the potable water rinse.

Typically, this level of decontamination (i.e., steps 1 through 4) is sufficient.

Following Steps 1 through 4, additional decontamination (steps 5 through 9) may be required by the applicable federal or state guidelines, the project-specific work plan, or the QAPP. Typically, these decontamination steps are performed when sampling for inorganics or oil-related substances using non-motorized equipment. These steps include:

5 10% nitric acid rinse (if metals are part of the analyses)
6 Laboratory-supplied DI water rinse
7 Pesticide-grade solvent rinse (e.g., acetone [preferred], hexane, or isopropyl alcohol)
8 Air dry (solvent must evaporate)
9 Laboratory-supplied DI water rinse

Isopropyl alcohol is the recommended solvent for organic contaminants because it is readily available and is not a DOT hazardous material; where possible, lab-grade isopropyl alcohol should be used . However, other solvents (e.g., hexane and methanol) may be more effective in removing certain contaminants, such as oils or polychlorinated biphenyls, but any waste generated using these solvents must be managed accordingly. Solvents are never used for decontamination if sampling for volatiles organic compounds.

Handle the solvents and acid with care and store unused chemicals in their original, labeled, protective containers when not in use. It is a good idea to transfer small quantities of each solution into labeled, laboratory-grade spray bottles, which offer a convenient and controllable way to rinse the equipment. The equipment can then be rinsed over a 5-gallon plastic bucket or other suitable container placed on plastic sheeting as with the first part of the cleaning process. Nitric acid rinses must be used only on non-carbon steel sampling devices. Do not spray acid or solvent into pumps.

Decontamination steps used at sites where radioactive materials are contaminants of concern are similar with a few special considerations. Radiation contamination monitoring is used to help locate contamination and guide the success of the decontamination process. The liberal use of water and fluids as a decontamination agents are minimized, where practicable, because of the expense that can be incurred with disposing of radioactively contaminated decontamination water. Containerized decontamination wastes must be evaluated for radioactive content and disposed of appropriately depending on their content.

6.6 HANDLING DECONTAMINATED EQUIPMENT

Handle any decontaminated equipment using clean gloves to prevent re-contamination. Place the equipment away (preferably upwind) from the decontamination area once the process has been completed on clean plastic sheeting to allow it to air-dry. Once the equipment is dry, protect it from re-contamination by securely wrapping and sealing with aluminum foil (shiny side out) or clean, disposable plastic bags (inorganics only). Plastic bags may be wrapped directly around wet or dry equipment except when the expected contaminants include volatile and extractable organics; under those circumstances, allow the equipment to completely dry or wrap it in aluminum foil.

All sampling equipment must be decontaminated at the end of the investigation (i.e., prior to departure from the site). Label each piece of equipment with the date of decontamination, the initials of personnel performing the decontamination, and the type of decontamination solution(s) used. Containerize all decontamination fluids, and other disposable decontamination materials in DOT-compliant containers in accordance with SOP 5 or the project-specific work plan. Dispose of all wastes, including open and unused solvents or acids, in conformance with the project-specific work plan and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #11

GROUNDWATER SAMPLING PROCEDURE

Groundwater sampling procedures outlined in this Standard Operating Procedure (SOP) are designed to ensure that collected samples are representative of current site conditions. These procedures can be applied to permanently or temporarily installed monitoring wells, direct-push sample points, water supply wells with installed plumbing, extraction wells for remedial groundwater treatment systems, and excavations where groundwater is present. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

11.1 ACRONYMS AND ABBREVIATIONS

ID	inside diameter
DI	deionized
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DTW	depth-to-water
HASP	health and safety plan
IDW	investigation-derived waste
l/min	liters per minute
LNAPL	light non-aqueous phase liquid
mg/l	milligrams per liter
mV	millivolts
NAPL	non-aqueous phase liquid
NTU	nephelometric turbidity unit
ORP	oxygen reduction potential
PID	photoionization detector
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure
SU	standard units
TD	total depth
TOC	top-of-casing
VOCs	volatile organic compounds

11.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment (e.g., photoionization detector [PID]) with calibration reagents and standards, as needed
- Electronic water level indicator or interface probe
- Water quality meter(s) with a flow-through cell, and calibration reagents and standards, as needed
- Field test kits, as needed
- Adjustable wrench or manhole wrench, as needed
- Well key(s), as needed
- Power supply, as needed
- Sampling containers and labeling/shipping supplies
- Deionized (DI) water
- Container(s) for water storage (e.g., bucket, drum)
- Pump or bailers, tubing, and associated lanyard materials
- Filters, as needed
- Decontamination supplies

11.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe, consistent manner; are in accordance with federal and state guidance; and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting groundwater sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), and use and calibration of all sampling and monitoring equipment (SOPs 7 and 8). This SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics are more appropriately addressed in a project-specific work plan. Before groundwater sampling, be sure to review the project-specific work plan or quality assurance project plan (QAPP) and any applicable state and federal guidelines or sampling procedures. All sampling and monitoring references must be available for consultation in the field, including:

- Company SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

11.4 GENERAL PROCEDURES

Although the techniques used to sample groundwater are varied, most sampling events can be broken down into a three-step sequence:

1. Gauging: The measurement of the water column height (i.e., total well depth less depth-to-water) within the well.

2 Purging: The removal of stagnant water from the well bore to ensure that samples collected are representative of groundwater conditions in the water-bearing zone surrounding the well.
3 Sample Collection: After purging, the collection of aliquots of groundwater in method-specific, preserved (as needed) containers.

The procedures and equipment that are used to accomplish these steps are project-specific and should be discussed by the project team before arriving onsite. All types of groundwater sampling, however, regardless of the equipment used, share common handling and management procedures that are designed to ensure the integrity of the samples collected. These procedures include:

- The use of new, disposable, decontaminated, or dedicated sampling equipment
- The use and rotation of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***Gloved hands should not be used as a sampling device; always use the appropriate equipment to move the sample from the sampling device to the laboratory-supplied containers.***

11.5 EQUIPMENT SELECTION

Collect all samples using either new, disposable equipment or properly decontaminated sampling equipment. Groundwater purging and sampling equipment should be selected based on the analytical requirements of the project and the project-specific conditions (e.g., well diameter, depth to water, dissolved constituents, etc.) likely to be encountered. The equipment should be constructed of non-reactive, non-leachable materials (e.g., stainless steel, Teflon®, Teflon®-coated steel, polyethylene, polypropylene, etc.) that are compatible with the chemical constituents at the site. Note that project or regulatory guidance may limit the type of equipment for groundwater sampling.

Consider the following when choosing groundwater purging and sampling equipment:

- the diameter and depth of the well
- the depth to groundwater
- the volume of water to be withdrawn
- the sampling and purging technique
- the volume of sample required
- the analytes of interest

Select the decontamination procedures based on the types of sampling to be performed and media encountered; decontamination may require multiple steps or differing cleaning methods (see SOP 6 for decontamination procedures). In no case, should disposable, single-use materials be used to collect more than one sample.

11.6 PRE-SAMPLING CONSIDERATIONS

You should perform the following activities in preparing for sampling with all observations and measurements noted in the field book and on the project-specific groundwater monitoring log, if appropriate:

- Perform a quick reconnaissance of the site to identify sampling locations and evaluate the accessibility to the sampling location.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions. In addition, any site-specific conditions or situations that could potentially affect the samples at the sample locations should be recorded.
- Record temporary sampling locations with respect to approximate distance to and direction from at least one permanent feature.
- Survey the breathing zone around the sampling location with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate.
- Install the pump, tubing, passive sampler or other appropriate sampling equipment to the depth prescribed in the project-specific work plan or QAPP.

- Containerize and manage purge water in accordance with the project-specific work plan.

It is important to minimize any sources of cross-contamination that could compromise the integrity of the groundwater samples. Consider the following:

- Position fuel-powered equipment away from the sample collection area, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling, decontamination) that could influence the sample. This is particularly important when screening samples in the field for volatile organic compounds with a PID but should not be limited to the active sample collection.
- Establish a secure sample staging area in an uncontaminated area of the site.

11.7 GAUGING PROCEDURES

All wells should be opened to the atmosphere in advance of sampling to allow any pressure differentials, which could artificially raise or depress the water column in the well, to dissipate. The wells should be inspected to ensure that the protective casing is intact and has not been damaged. Remove the well covers and all standing water around the top of the well casing (for flush mounted-protective covers), as necessary, before opening the inner well cap or plug. Unlock and carefully remove well cap and allow the well to stand undisturbed for a minimum of 15 minutes, or as required by the project-specific work plan, before conducting any down-hole testing or measurements. If required by the HASP, survey the open well casing and the breathing zone around the wellhead with a PID to ensure that the level of PPE is appropriate.

11.7.1 GROUNDWATER LEVEL AND TOTAL DEPTH MEASUREMENT PROCEDURES

Depth to water (DTW) and total depth (TD) measurements are collected prior to sampling and are used to determine the volume water to be purged from the well (if using techniques other than no-purge or low flow sampling). The DTW measurements are also used after the field event to establish the groundwater elevation, flow direction, and gradient. Unless otherwise directed, do not place any objects inside the casing of private water wells; accordingly, DTW and TD measurements should not be collected at private water wells. Measurements of TD are not required for low flow and no-purge sampling applications and should not be measured before sampling the well.

Water level measurements must be collected within the shortest interval possible from all the wells to be gauged during the event before beginning any purge and sampling procedures at the site. This will ensure a nearly instantaneous snapshot of the water levels before the formations are disturbed by pumping or acted upon by other outside influences, such as tides, precipitation, barometric pressure, river stage, or intermittent pumping of production, irrigation, or supply wells.

Record the following observations and measurements (and the time when they were collected) in the field book:

- Measure the casing inside diameter (ID) and record in inches
- Measure the DTW with an electronic water level indicator (or an interface meter, if non-aqueous phase liquid [NAPL] is potentially present – see procedures below) from the top-of-casing (TOC) at the surveyor's mark, if present, and record the depth (to the nearest 0.01 foot) in feet below TOC
- If no mark is present, measure from the north side of the casing and mark the measuring point with a knife, metal file (if the inner casing is metal) or indelible marker for future reference
- Measure the TD from TOC at the surveyor's mark or north side of the casing, as appropriate.

Measuring the depth of deep wells with long water columns can be problematic due to tape buoyancy and weight effects or sediment in the bottom of the well casing. Care must be taken, and proper equipment selection must be used in these situations to ensure accurate measurements. Multiple TD measurements in silt-laden wells can provide a more precise assessment of the bottom depth.

11.7.2 GAUGING WELLS WITH NON-AQUEOUS PHASE LIQUID

If NAPL is potentially present at the site, the DTW and NAPL thickness measurements are collected using an interface meter capable of distinguishing between the NAPL and the groundwater, or a weighted tape coated with the appropriate reactive indicator paste for the suspected NAPL. Measuring NAPL thicknesses must be done with care to avoid agitating the liquids and generating an emulsion. This is particularly the case for light NAPL (LNAPL; those having a density less than water), which are typically viscous oils that

cling to the probe. Oil coating the probe can result in thickness measurements that are biased high (i.e., overestimate the thickness of the NAPL).

Conduct the following procedures to ensure an accurate measurement of the NAPL thickness:

- For LNAPL, slowly lower the electronic interface probe in the well casing until the electronic tone indicates the probe is at the top of the LNAPL layer; measure the depth below the TOC to the nearest 0.01 foot.
- To gauge the NAPL thickness, advance the probe slowly through the layer until the electronic tone indicates top of the water column and then slowly bring the probe back up to the bottom of the LNAPL. Repeat this process several times to ensure an accurate measurement of the bottom of the LNAPL layer (which can include bubbles and an emulsion layer).
- For dense NAPL (DNAPL), advance the probe through the water column until the tone indicates the top of the DNAPL layer; record the depth below TOC.
- To gauge the DNAPL thickness, advance the probe through the layer to the bottom of the well.

11.8 GROUNDWATER PURGING PROCEDURES

Purging is a process whereby potentially stagnant water is removed allowing the collection of samples that are representative of groundwater conditions in the water-bearing zone. The water in a well bore that has not been purged may be different than the surrounding formation due to exposure to ambient air. There are several purging (and no-purge) methods that may be used, depending on specific conditions encountered (e.g., DTW, hydraulic conductivity of the formation, etc.) and the sampling requirements. The purge/no purge options are described below.

- *Multiple Volume Purge:* Traditional well purging technique that relies on the withdrawal of the volume of the well bore and the surrounding filter pack (if present); three to five well volumes are typically removed using pumps or bailers. This methodology relies on equipment that is easy to obtain and use and is generally accepted in most states as an appropriate purging method.
- *Temporary Well Purge:* A variation of the multiple volume purge technique that often uses inertia lift pumps, peristaltic pumps, or bailers to remove water from a temporary well or discrete groundwater sampler (e.g., a groundwater profiler or direct-push screen point sampler). This is a less stringent technique that is typically done to minimize the turbidity of the samples, which can be high due to the lack of a well filter pack.
- *Private Water Well or In-Place Plumbing Purge:* A variation on the multiple volume purge technique whereby a tap or faucet is opened on a fixed water supply pipe and is allowed to remain open until the potentially stagnant water within the well casing and other components of the system (e.g., fixed piping, pressure tanks, etc.) has been removed and groundwater representative of the water-bearing zone is discharged at the tap.
- *Low Flow (Minimal Drawdown/Low Stress) Purge (and Sampling):* A modified purging technique that establishes an isolated, discrete, horizontal flow zone directly adjacent to the pump intake; this method requires the pump to be placed within a screened-interval or open borehole. Pumping rates are typically 0.1 to 0.5 liters per minute (l/min) or less to minimize the stress on the surrounding formation and reduce the geochemical alteration of the groundwater caused by pumping.
- *No-Purge/Passive Sampling Techniques:* These techniques use specialized equipment, such as trap-style samplers or permeable diffusion bags, to sample the undisturbed water column within a screened interval or open borehole. This methodology assumes that the water in the well is representative of the surrounding formation. This approach is well suited for some volatile organic compounds (VOCs), metals, and hydrophobic compounds, depending on the sampling device used.

11.8.1 CALCULATING ONE PURGE VOLUME

Multiple volume purging techniques require that a ***minimum*** of three well volumes of water must be removed before sample collection. The actual amount of water removed may be greater than the three volumes, depending on geochemical parameter stabilization (the field measurement of these parameters is discussed below).

Calculate the volume of water in a well or boring using the following equation:

$$\textbf{Volume (gallons)} = (\textbf{TD} - \textbf{DTW}) \times \textbf{ID}^2 \times \textbf{0.041}$$

where:

TD = total depth (feet)

DTW = depth to water (feet)

ID = inner diameter (inches)

Alternately, the volume of water in a well or boring may also be calculated by multiplying the water column height by the gallons per foot of water for the appropriate well or boring diameter:

ID	Gallons per foot of water	Gallons per three water columns
1-inch	0.04	0.12
2-inch	0.16	0.48
3-inch	0.37	1.11
4-inch	0.65	1.98

Calculate the total volume of the pump, associated tubing and container for in situ measurements (flow-through cell), using the following equation:

Volume (in gallons) = P + ((0.0041)*D2*L) + fc

where:

P = volume of pump (gallons)
D = tubing diameter (inches)
L = length of tubing (feet)
fc = volume of flow-through cell (gallons)

11.8.2 MULTIPLE VOLUME PURGE PROCEDURES

Begin purging at a rate that will not cause excessive turbulence and drawdown in the well; commonly less than 1 gallon per minute for a typical 2-inch diameter monitoring well. You may need to observe the water elevation after the pump is started and adjust the flow rate to minimize the amount of drawdown in the well casing. The objective is to remove the stagnant water in the casing and surrounding filter pack or open borehole allowing water from the surrounding water-bearing zone to enter the well for sampling with as little disturbance as possible. Excessive pump rates or well dewatering can result in higher turbidity, potential volatilization, and geochemical alteration of dissolved parameters.

Typically collect geochemical parameters (i.e., pH, specific conductance, dissolved oxygen [DO], oxygen-reduction potential [ORP], and temperature) at a minimum frequency of once for every well volume of water removed during the purge process. Record the measurements in the field book along with any other pertinent details, such as the visual quality of the water (e.g., color, odor, and presence of suspended particulates) and the approximate withdrawal rate (this can be estimated using a calibrated container and stopwatch). Review the geochemical measurements to ensure that readings have stabilized (after the minimum purge volume has been achieved). This is a proxy for determining that you are purging formation water rather than potentially stagnant water in the casing. Stabilization occurs when at least three consecutive measurements are within the following tolerances:

Multiple Volume Purge Stabilization Parameters	
pH	± 0.1 standard units (SU)
Specific Conductance	± 3%
Temperature	± 3%
Dissolved Oxygen (DO)	± 0.2 milligrams per liter (mg/l) or 10% (flow-through cell only)
Turbidity	± 10% for values greater than 10 nephelometric turbidity units (NTU)
Oxygen Reduction Potential (ORP)	± 10 millivolts (mV; flow-through cell only)

Parameter stabilization that does not occur within five well volumes may require you consult your project manager to decide whether to collect a sample or to continue purging. Wells with extremely slow recharge may also be problematic. Purging these wells, in some cases, may result in dewatering the well before the minimum purge can be completed. Allow wells or borings purged dry to recharge to a level of approximately 90% of the static (pre-purge) water elevation and proceed immediately to sample collection. If recovery exceeds 2 hours, sample as soon as sufficient sample volume is available, in accordance with applicable regulations.

11.8.3 LOW FLOW PURGE PROCEDURES

Low flow purging and sampling is used to obtain representative groundwater samples without removing all the water within the well. The protocol uses relatively low pumping rates (i.e., less than 0.5 l/min) to establish an isolated zone around the inlet of the pump where flow is horizontal (i.e., from the water bearing zone) rather than from the stagnant water in the well casing above and below the pump. Selection of an appropriate pump is critical to establishing the flow zone: it must be well suited for both low pumping rates and the analytes being sampled. Bailers are not appropriate for low flow sampling.

The set-up for low flow sampling includes positioning the pump at the appropriate depth within the casing such that the pump inlet is within the screened section of the well. Slowly lower the pump, where appropriate, and tubing into the water column to avoid agitating the water column; use of a lanyard is recommended (i.e., do not use the extraction tubing to lift or lower the pump). Secure the pump and/or tubing at the wellhead once the specified sampling depth has been achieved and record the depth in the field book. Avoid contacting the bottom of the well by using pre-cut tubing at the appropriate length or by lowering the pump/tubing simultaneously with an electronic water level indicator. Once the pump/tubing has been inserted and secured, allow the water levels to return to static conditions before initiating the purge.

The discharge tubing must be connected to an in-line flow-through cell equipped with a multi-parameter real-time water quality meter. The flow-through cell minimizes the exposure of the groundwater to ambient air, which can influence DO and ORP measurements.

Start the pump and maintain a steady flow rate that results in a stabilized water level (less than 0.3 feet of drawdown or as specified in the project-specific work plan). The pumping rate may need to be adjusted depending on the response of the water levels in the well. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment. Purging should not exceed 0.5 l/min.

During purging, monitor and record the flow rate and geochemical parameters at 30 seconds to 5-minute intervals (depending on the hydraulic conductivity of the aquifer, diameter of the well, and pumping rate). Stabilization occurs once the following criteria have been met over three successive measurements made at least three minutes apart:

Low Flow Purge Stabilization Parameters	
Water Level Drawdown	<0.3 feet
pH	± 0.1 SU
Specific Conductance	± 3%
Temperature	± 3%
DO	± 0.2 mg/l or 10% (flow-through cell only)
Turbidity	± 10% for values greater than 10 NTU
ORP	± 10 mV (flow-through cell only)

Record any other notable observations in the field book (e.g., groundwater color).

11.8.4 NO-PURGE SAMPLING TECHNIQUES

Several alternate sampling devices are available, such as equilibrated grab samplers, passive diffusion samplers, and other in situ sampling devices, that will allow sample collection without purging the well. These devices may be particularly useful for sampling low permeability geologic materials, assuming the device is made of materials compatible with the analytical parameters, meets data quality objectives, and has been properly evaluated.

No-purge grab or trap samplers are placed in the well before sampling and typically remain closed (i.e., no water is allowed into the sampler during insertion) until the sampler is activated. This allows the sampler device to equilibrate with the surrounding groundwater (to prevent adsorption to the sampler materials) and for the groundwater to recover and re-establish the natural flow after the disturbance caused by the sampler insertion into the well. Typical equilibration times depend on the well recovery rates and the type of sampler used. Samples recovered using the no-purge devices are either transferred to containers at the well head or the sampler itself is shipped to the laboratory for analysis. Examples of equilibrated grab samplers include HydraSleeve™, Snap Sampler™, and Kemmerer samplers.

Equilibration time for diffusion samplers are generally dictated by the diffusion rate through the permeable membrane and, thus, are less sensitive to changes induced within the well during deployment. Most diffusion bag samplers have a minimum equilibration time of 14 days prior to sample collection. The samplers may be deployed for an extended period (e.g., three months or longer), although the continuous exchange between the sampler and the well water means that the sampler will likely reflect only the conditions in the few days preceding the sample collection.

11.8.5 TEMPORARY WELL PURGE PROCEDURES

Procedures used to purge temporary groundwater monitoring wells differ from permanent wells because temporary wells are installed for immediate sample acquisition. Wells of this type may include open bedrock boreholes, standard polyvinyl chloride well screen and riser placed in open boreholes, or drilling rod-based sampling devices (e.g., Wellpoint®, Geoprobe® screen point or Hydropunch® samplers). Purging temporary wells of this type may not be necessary because stagnant water is typically not present. However, if water is used in the drilling process, purging would be necessary. Purging can minimize the turbidity in the sample, which can be significant due to the disturbance caused by the sampler installation and to rinse the sampling system with groundwater. The exception is for groundwater profiling applications (e.g., using a Waterloo Profiler®) where a more rigorous purge is used (using the multiple volume purge techniques described above) to limit the potential for cross-contamination between sample intervals.

11.8.6 PRIVATE WATER WELL OR IN-PLACE PLUMBING PURGE PROCEDURES

The configuration and construction of private water wells varies widely and access points for obtaining groundwater samples may be limited. WSP personnel should coordinate with the property owner or site representative to access functioning ports and valves to avoid causing any inadvertent damage.

Collect the groundwater sample as close to the well as possible (e.g., from a sample port at the well head) to ensure the sample is representative. Ideally, the sample should be collected upstream of the piping and treatment equipment (e.g., particulate filter, water softener, carbon filters, ultra-violet lights), heating unit, or storage tanks. The following potential sampling locations are presented in order of preference:

- Sampling port or spigot near the well head or piping system prior to entry into the storage tank
- Sampling port or spigot at storage tank
- Sampling port or spigot downstream of the pressure tank or holding tank but upstream of any water treatment equipment
- Tap or faucet

If purging from a tap or faucet, try to remove any aerators, filters, or other devices from the tap before purging and work with the property owner or site representative to bypass any water treatment systems. Document where the sample was collected and any steps that were taken to minimize the potential alteration of the water sample in the field book.

Purge the system by opening the tap or spigot and allowing the water to run for several minutes. Observe and record the purge rate for the system. The minimum purge volume must be more than the combined volume of the pump, tanks, piping, etc. Review the geochemical measurements (after the minimum purge volume has been removed) to ensure that readings have stabilized using the same procedures as those used for the multiple volume purge detailed above. Purge the system for a minimum of 15 minutes if the minimum volume is unknown. Sample only after the geochemistry parameters have stabilized and no there are no suspended particles (e.g., iron or rust) visible. Record the final purge volume in the field book and any water quality observations.

11.9 GROUNDWATER SAMPLE COLLECTION PROCEDURES

Collect groundwater samples as soon as possible after the geochemical parameters indicate representative groundwater is present. As practically possible, reduce the pump flow rate, but maintain a flow rate high enough to deliver a smooth stream of water without splashing or undue agitation. Collect samples directly from the tubing as it exits the well bore; do not sample on the downstream side of flow-through cells or any other instrumentation. If using a bailer for sample collection, lower and raise the bailer slowly and smoothly to minimize the disturbance to the water within the well.

Collect groundwater samples in order of volatilization sensitivity with organic compounds sampled first followed by inorganic compounds:

- VOCs
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Per- and Polyfluoroalkyl substances
- Total metals
- Dissolved metals (see filtering procedures below)
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Collect quality assurance/quality control samples in accordance with SOP 4 and the project-specific work plan or QAPP.

As necessary, conduct field tests or screening in accordance with the project-specific work plan and manufacturer's specifications for field testing equipment. Field samples must be directly transferred from the sampling equipment to the container that has been specifically prepared for that given parameter; intermediate containers should be avoided. If field chemical preservation is required, check the pH preservation by pouring a small portion of sample onto a pH test strip Adjust pH with additional preservative, if necessary.

Record the sample depth interval, if applicable, in the field book. Note the volume, phases, odor, and color of the groundwater.

11.9.1 GROUNDWATER FILTRATION PROCEDURES

Filtered groundwater samples are sometimes used for field kit analyses and should only be collected for laboratory analysis after approval from the appropriate regulatory agency or project manager. The filtered samples can be collected by attaching the in-line filter directly to the outlet tubing for a pressurized bailer, a submersible pump or a peristaltic pump. Intermediate containers can be used with a peristaltic pump if the well is too deep to use the pump to recover the sample directly. The intermediate container should be unpreserved laboratory-supplied glassware to avoid any cross-contamination during the filtering process.

Filtered samples using pumps should use the following procedures:

- Use a variable speed peristaltic pump with the in-line filter fitted on the outlet end of the tubing and the pump inlet tubing into the intermediate container holding the unpreserved groundwater sample; or,
- If a submersible pump is used to collect the groundwater sample, attached the in-line filter to the outlet end of the tubing (do not allow the groundwater to pass through flow-through cells or any other instrumentation while sampling)

Once the filter is connected:

- Turn on the pump and maintain a flow rate high enough to deliver a smooth stream of water without splashing or undue agitation. Hold the filter upright with the inlet and outlet in the vertical position and pump groundwater through the filter until all atmospheric oxygen has been removed and the minimum volume of water has been flushed through the filter, in accordance with the manufacturer's specifications
- Collect the filtered samples by placing the filtered output directly into the sample container
- If sediment is visible in the sample container after filtration, filter break-through has occurred and the sampling and filtering process should be repeated
- Discard the tubing and filter appropriately

Record sample filtration in the field book.

11.9.2 NON-AQUEOUS PHASE LIQUID SAMPLING PROCEDURES

Non-aqueous phase liquid is typically sampled to identify the compound, usually through an analytical "fingerprint" analysis. If samples are to be collected, the sampling options and techniques should be discussed with the assigned WSP compliance professional and project manager to ensure that the NAPL is either not considered to be a hazardous material for shipping to the laboratory or is properly shipped by qualified personnel using appropriate shipping containers (SOP 3). Samples of NAPL should be collected using the same procedures as above and placed in the appropriate laboratory-supplied containers, packed on ice, and shipped to the analytical laboratory using procedures outlined in SOP 3.

11.9.3 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Groundwater samples for offsite laboratory analysis should be prepared as follows:

1. Clean the outside of the sample container, if necessary
2. Affix a sample tag or label to each sample container and complete all required information (sample number, date, time, sampler's initials, analysis, preservatives, place of collection)
3. Place clear tape over the tag or label (if non-waterproof labels are used), as needed
4. If needed, preserve samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius
5. Record the sample designation, date, time, and the sampler's initials in the field book and on a sample tracking form, if appropriate
6. Complete the chain-of-custody forms with appropriate sampling information, including:
   - location
   - sample name
   - sample collection date and time
   - number of sample containers

- analytical method
- field filtration status

7 Secure the sample packing and shipping in accordance with proper procedures

Do not ship hazardous waste samples without first consulting a WSP compliance professional.

11.10 CLOSING NOTES

Secure and restore the site once sampling is completed. This may include locking permanent monitoring wells, staging the IDW, and disposing of (in conformance with applicable regulations) sampling expendables, such as plastic sheeting, tubing, and PPE. All locations where temporary wells or other sampling devices (e.g., profilers or direct-push equipment) should be marked with spray paint, stakes, or other appropriate method for future reference or survey, including collecting Global Positioning System coordinates and photographs, in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and investigation-derived wastes in conformance with SOP 6, the project-specific work plan, and applicable regulations.