5 Sullivan Street
Cazenovia, NY 13035
Main: 315 655 3900
www.wspgroup.com/usa

VIA ELECTRONIC MAIL

May 4, 2015

Ms. Tara L. Rutland
Project Manager, Bureau of Eastern Remedial Action
Division of Environmental Remediation, 11th Floor
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-7015

RE: Deep Soil Characterization Work Plan
Former TransTechnology Corporation Facility Glen Head, New York

Dear Tara:

WSP USA Corp. (WSP), on behalf of our client, Breeze-Eastern Corporation (BEC), has prepared this work plan for additional investigation at the former TransTechnology Corporation (TTC) facility at 1 Robert Lane in Glen Head, New York. The work, which includes soil sampling in the western and northern portions of the site, is part of BEC's ongoing effort, in cooperation with the New York State Departments of Environmental Conservation (NYSDEC) and Health (NYSDOH), to facilitate the redevelopment of the TTC property. The first phase of the pre-development investigation was performed with Department approval[1] in November 2013 and included systematic grid-based soil sampling across the accessible[2] portions of the site. The objective of that work was to lessen the potential soil management issues during the initial grading process by pre-characterizing the upper 2 feet of soil over the entire property. The proposed activities for this plan continue the investigation by characterizing the soils between 2 feet and 15 feet below ground surface (bgs) in select areas of the site. Data from these deeper borings will be used to support a broader effort to reclassify soils on a portion of the site from the current 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 *Restricted Residential* land use category to the *Residential* land use so that single family homes can be constructed during the redevelopment. This "reclassification area" is zoned for single family house construction.

The background, approach, and detailed procedures for the work, along with the proposed schedule, are presented below.

Background and Approach

The proposed 2.7 acre reclassification area, as depicted on Figure 1, is located along the northern and western margins of the TTC property. The area has been the subject of several investigations dating back to the mid-2000s, including a shallow soil evaluation conducted as part of the 2005 remedial investigation (RI) and, more recently, the pre-characterization work in the northern portion of the property. Soil sampling associated with the RI was performed at relatively low frequency (as compared to the rest of the property) commensurate with the previous use of these portions of the site. The

[1] Approval for the pre-characterization work was requested under the requirements of the 2002 Order on Consent (Index #WI-0913-02-02); however, the work performed was outside the scope of the remedial investigation required by the 2006 Record of Decision (ROD) for Operable Unit No.1. See the *Pre-development Site-wide Soil Characterization Report (Phase 1)*, dated February 19, 2014, for additional information.

[2] The pre-development soil characterization work includes sampling the upper 2 feet of soil across the entire site; however, only the accessible portions of the site (i.e., those outside of the main and outbuilding footprints) have been completed to date. The balance of the work will be completed after the main building has been demolished.

western property line, for example, consists of a paved driveway leading from the main entrance to the northern portion of the site and the administrative portion of the main building. Likewise, the area north of the main building was used as a parking lot for the facility employees. Both areas were away from the active manufacturing portions of the property (mostly located in the south and eastern portions of the site) and were considered unlikely to have been impacted by the onsite activities. Indeed, the western property line was used for background soil sampling during the RI. None of the soil samples collected revealed concentrations of organic or inorganic compounds indicative of a release. These findings (and approach) were later corroborated during the pre-development work, which included systematic grid-based shallow soil sampling for the full list[3] of analytes. No compounds of concern were detected in samples from any of the 19 borings (SB-48, SB-103 through SB-106, SB-111 through SB-114, SB-116, SB-118, and SB-119 through SB-126) at concentrations above the site-specific[4] soil cleanup objectives (SCOs) or the more restrictive SCOs *Residential* land use category[5].

These data are significant not only for what they demonstrate in the shallow soil but for what they implicate for the deeper underlying soil in the proposed reclassification area. Groundwater at the site is more than 100 feet bgs and, without a surface release in the area, the likelihood of a subsurface impact is low. No transport mechanism[6] capable of impacting the soil between 2 and 15 feet bgs is present in the area. Accordingly, the data, operational history and subsurface geology all suggest a low probability of soil contamination exceeding Part 375 Residential SCOs in the reclassification area.

To confirm this, WSP is proposing to install 11 soil borings, designated SB-127 through SB-137 (Figure 2). The borings will be positioned approximately 110 feet apart with the selected locations roughly corresponding to the center of the grid cells that were established as part of the first phase of pre-development work. Borings SB-127 through SB-134 and SB-136 will be positioned within grid cells 8, 10, 12, 14, 16, 18, 20, 22, and 24 to characterize the soils along the western margin of the site. The two remaining borings, SB-135 and SB-137, will be installed in grid cells 23 and 25 to evaluate the soils within the proposed reclassification zone along the northern property line. Each of the borings will be installed to a depth of 15 feet bgs with analytical samples collected from the 6 to 8 foot and 13 to 15 foot depth intervals. The samples will be analyzed for the site-related compounds (i.e., target compound list [TCL] VOCs, target analyte metals [TAL] metals, and hexavalent chromium). This frequency equates to approximately 1 boring per 10,500 square feet of the proposed reclassification area; about half that average sampling density[7] for the site during the RI. WSP believes the proposed sampling plan, including the frequency and analyte list, is sufficient to demonstrate that the reclassification area meets the Part 375 Residential SCOs and is appropriate for single-family house residential use given the former land use and the previous investigation findings.

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[3] The full list of analytes includes target analyte list (TAL) metals and hexavalent chromium; target compound list (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), TCL pesticides, and polychlorinated biphenyls (PCBs).

[4] Criteria for *Restricted Residential* sites are typically the SCOs derived from Table 375-6.8(b) in 6 New York code of Rules and Regulations Part 375; however, in the case of the TTC site, site-specific use-based SCOs were developed during the remedial design/remedial action phase of the project (See the Final Engineering Report, dated June 25, 2012, for additional information on the remedial SCOs). To harmonize the site-specific SCOs and the Part 375 criteria for the pre-development work, WSP used the lower of the two values for each parameter.

[5] As presented in Table 1 of the *Soil Cleanup Guidance under Commissioner Policy-51 (CP-51),* dated October 10, 2010.

[6] The remedial investigations also included evaluating several subsurface drainage structures within the proposed reclassification zone that were initially identified as leach pits (shown on Figure 1). Subsequent investigation showed that the structures within the proposed reclassification zone were shallow storm water catch basins with hard bottoms. The exception was LP-15, which was an infiltration structure for storm water with a soft bottom at 27 feet bgs, which is well below the soil interval of interest for this investigation. The subsurface structure was cleaned and confirmation soil sampling was performed in 2011. No constituents of interest were identified in the confirmation samples. See the *Final Engineering Report* for additional information.

[7] Based on 65 background, surface, and subsurface soil sample locations over the 7.75-acres site. Estimate does not include subsurface drainage structure sampling performed during the RI.

The sampling will be performed in accordance with New York State Department of Environmental Conservation's (NYSDEC's) *DER-10, Technical Guidance for Site Investigation and Remediation*, dated May 3, 2010, the *Soil Cleanup Guidance* under *Commissioner Policy-51 (CP-51)*, dated October 10, 2010, and WSP's standard operating procedures (SOPs; Enclosure A). The methods for the sample collection are summarized below.

Scope of Work

The soil sampling will be performed using a track-mounted direct-push drill rig (e.g., Geoprobe® 6600 Series, or equivalent) equipped with a macro-core or split spoon soil sampler. The sampler will be advanced from the surface to a depth of approximately 15 feet bgs. The headspace in the recovered soil cores will be screened using a photoionization detector (PID) in accordance with WSP's SOP 9 (Enclosure A) with the samples for the discrete VOC analysis selected from within the pre-selected sampling intervals (i.e., 6 to 8 feet and 13 to 15 feet bgs) based on the PID results or, if present, staining or odors. If no PID readings or other obvious signs of impact are observed, the discrete samples will be collected from the midpoint of the 2-foot-long sample interval. The balance of the soil from the sample interval will be placed in a dedicated stainless steel bowl and composited using dedicated stainless steel implements in accordance with WSP SOP 9.

The soil samples will be shipped to a New York-certified laboratory for analysis of TCL VOCs by U.S. Environmental Protection Agency (EPA) Method 8260 and TAL metals/hexavalent chromium by EPA Method 6010/7000 series. All of the samples will be handled and shipped in accordance with WSP's SOP 3 (Enclosure A).

After completing the sampling activities, the boreholes will be backfilled with native soil or clean sand in accordance with the procedures in *DER-10* for Class 2 inactive hazardous waste sites (the surface will not be restored because of the planned redevelopment activities). All of the sample locations will be marked in the field with spray paint, wooden stakes, or other means for later location by a New York-licensed land surveyor.

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 soil 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 WSP's SOP 4 (Enclosure A).

Decontamination Procedures

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 and laboratory-supplied deionized water, as appropriate, in accordance with WSP's SOP 6 (Enclosure A). The decontamination rinsate will be placed in Department of Transportation-approved (DOT-approved) 55-gallon drums and moved to a designated onsite storage area.

Investigation-Derived Wastes

Investigation-derived waste (IDW) generated during the drilling and sampling activities, including decontamination rinsate, residual soil cuttings, and other solid waste (e.g., poly sheeting, personal protective equipment, etc.) will be placed in DOT-approved 55-gallon steel drums and managed during the investigation in accordance with WSP's SOP 5. The drums will be staged onsite at the conclusion of the field activities for later offsite disposal in accordance with state and federal regulations.

Project Schedule and Reporting

The proposed sampling will be performed, pending your approval, after the main building demolition to enable access to the entire investigation area. The soil investigations are anticipated to require up to 3 days to complete with the preliminary analytical results expected within 2 weeks of sample collection. The results of the soil investigation, which will be compared to the Part 375 *Residential* land use criteria, will be summarized in a letter or report submitted to NYSDEC within 6 weeks of receiving the validated sample results. The document will include, at a minimum, summary tables of the results, figures, and copies of the analytical reports.

WSP and BEC will coordinate with the Departments once the report is complete to discuss the potential for reclassification.

Please do not hesitate to contact me at (315) 655-3900 if you have any questions or comments regarding this work plan.

Sincerely yours,

David P. Bouchard
Senior Project Director

DPB:dpb:paw
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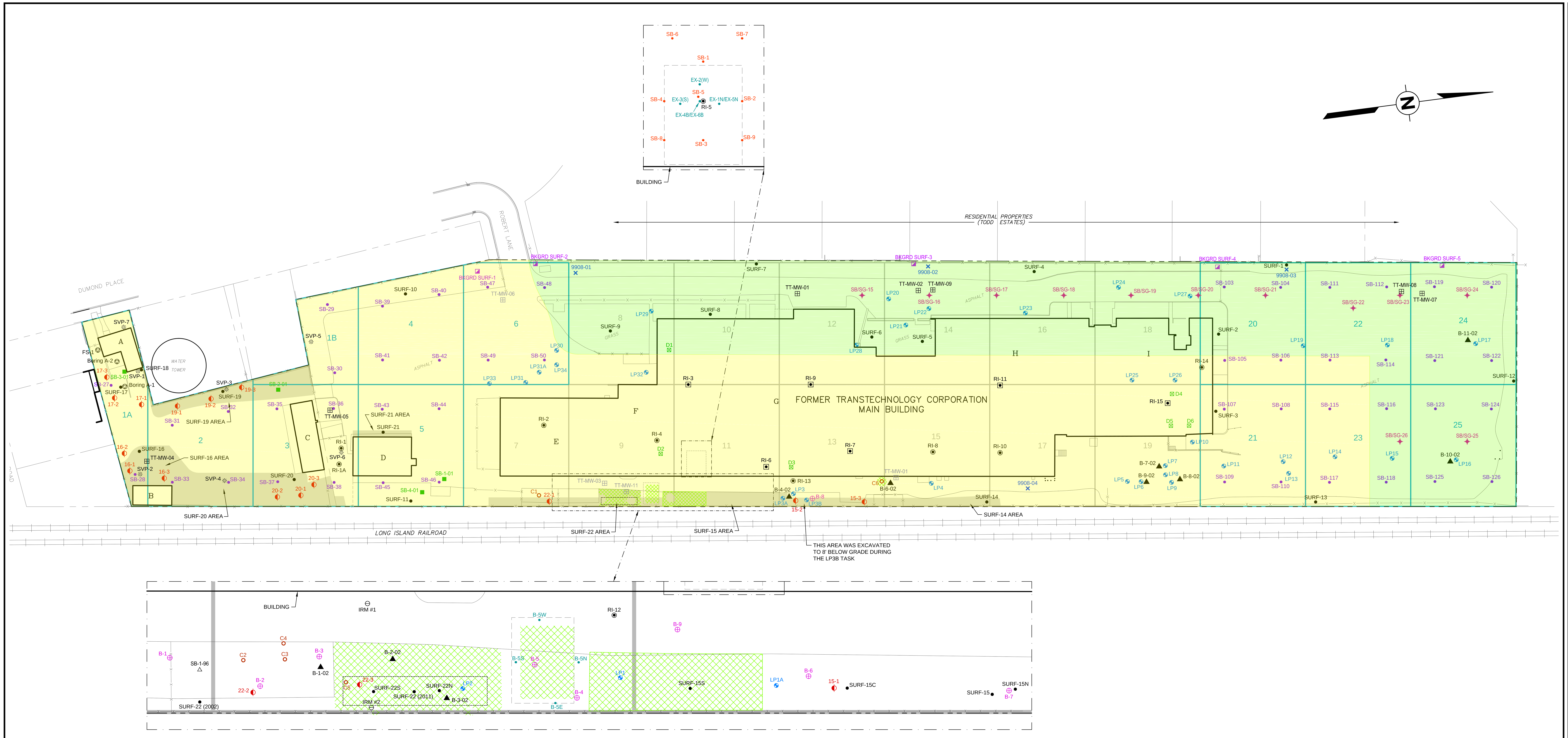
cc/encl: Mr. Anthony C. Perretta, New York State Department of Health
Mr. Carlos Pareja, Nassau County Department of Health
Mr. Morris Mehraban, One Robert Lane LLC
Mr. James D. Cashel, Breeze-Eastern Corporation
Mr. John A. Simon, Gnarus Advisors LLC
Michael Bogin, Esquire, Sive, Paget & Riesel, P.C.

Enclosures

Figures



LEGEND

Symbol	Description
TT-MW-09	MONITORING WELL (1993–1996)
TT-MW-03	DAMAGED OR DESTROYED MONITORING WELL
SB-1-96	SOIL BORING (1996)
C6	CESSPOOL LOCATION (2001)
D2	DRAIN (2001)
LP20	LEACH POOL LOCATION (2001)
SURF-14	SURFACE SOIL SAMPLE (2002)
SB-42	SOIL BORING (01–2014)
SB-4-01	SOIL BORING (2001)
B-4-02	SOIL BORING (2002)
BKGRD SURF-3	BACKGROUND SURFACE SOIL SAMPLE (2002)
RI-2	RI SOIL BORING (2002)
RI-9	RI SOIL AND SOIL GAS SAMPLE (2002)
IRM #2	IRM SOIL BORING (2002)
20-3	SUPPLEMENTAL RI SOIL BORING (2003)
SVP-7	SUPPLEMENTAL RI SOIL GAS SAMPLE (2003)
Building A-2	BUILDING A SUPPLEMENTAL RI SOIL BORING (2003 AND 2004)
9908-02	PRE-EXCAVATION SAMPLE (2008)
B-6	SUBSURFACE SOIL INVESTIGATION (08–2009)
EX-4(B)	EXCAVATION CONFIRMATION SAMPLE (2011)
SB-5	DELINEATION SOIL BORING (2011)
SB/SG-20	OU2 SUPPLEMENTAL RI SOIL AND SOIL GAS SAMPLE (2012)

LEGEND

- RI-7 ZONED (SINGLE FAMILY) (PENDING FINAL APPROVAL)
- RMF-16 ZONED (MULTI-FAMILY) (PENDING FINAL APPROVAL)
- SURFACE SOIL EXCAVATION AREA (APPROXIMATE)
- RESIDUAL IMPACTED SOIL OR SEDIMENT
- PROPERTY BOUNDARY

NOTES:

1. LOCATIONS OF BORING B-12 AND SAMPLES SURF-23, SURF-24, AND SURF-25 WERE NOT PROVIDED TO WSP AND ARE UNKNOWN.

2. ANALYTICAL DATA FOR THE FOLLOWING LOCATIONS WERE NOT PROVIDED TO WSP: SB-1-01, SB-2-01, C-1, D-1, D-2, D-5, D-6, LP-4, LP-25, LP-26, LP-28, LP-29, AND LP-32.

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

REVISIONS

REV	DESCRIPTION	DATE

SEAL

DRAWN BY

CHECKED

APPROVED

SAMPLING LOCATIONS WITH PROPOSED RECLASSIFICATION

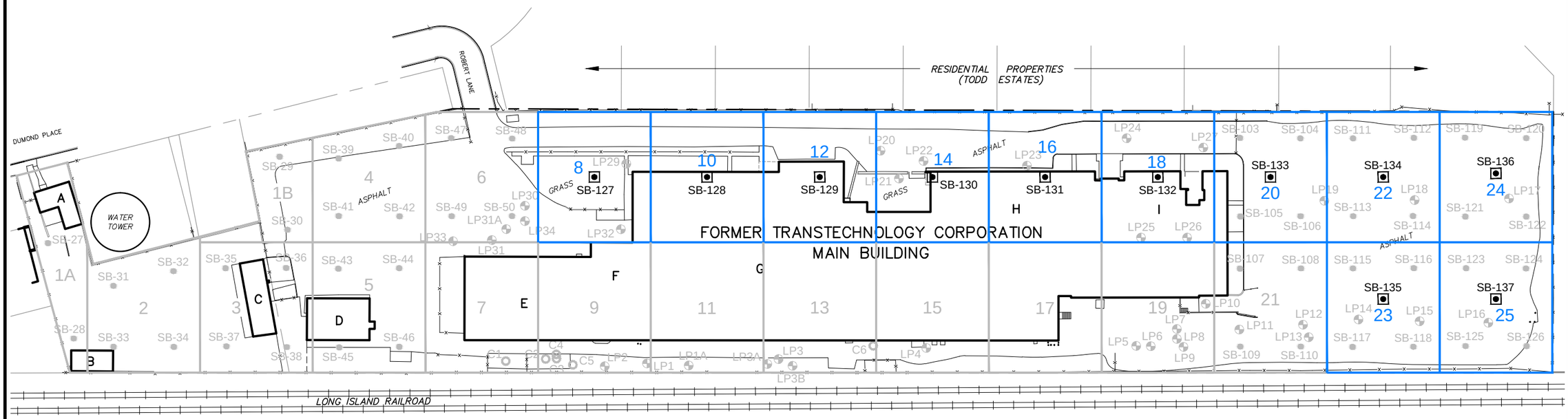
FORMER TRANSTECHNOLOGY CORPORATION FACILITY
GLEN HEAD, NEW YORK

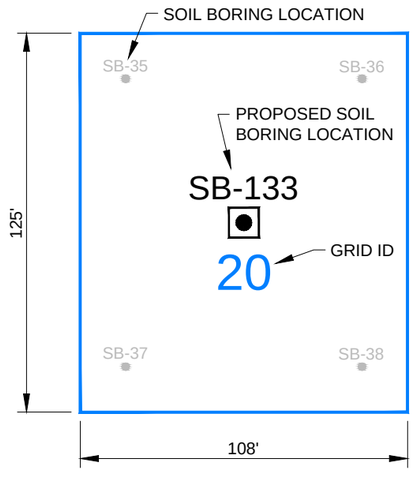
PREPARED FOR
BREEZE-EASTERN CORPORATION
WHIPPANY, NEW YORK

WSP USA Corp.
11190 Sunrise Valley Drive, Suite 300
Reston, Virginia 20191
(703) 709-6500
www.wspgroup.com/usa

FIGURE 1

Drawing Number
00028873-D32





EXAMPLE SAMPLE LAYOUT

LEGEND

SB-133 ◉	PROPOSED SEEP SOIL BORING
SB-50 ●	PRE–DEVELOPMENT SOIL BORING (2014)
C1 ○	CESSPOOL LOCATION
LP20 ◔	LEACHING POOL LOCATION
——— – – ———	PROPERTY BOUNDARY

NOTES:

1. GRID SIZE SELECTED BASED ON THE RECOMMENDATIONS PRESENTED IN THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION'S DER-10, TECHNICAL GUIDANCE FOR SITE INVESTIGATION AND REMEDIATION, DATED MAY 3, 2010. SEE TEXT FOR FURTHER INFORMATION.

2. COMPOSITE SAMPLES INCLUDE MATERIAL FROM ALL FOUR BORING LOCATIONS WITHIN EACH GRID; DISCRETE SAMPLES FOR VOLATILE ORGANIC COMPOUNDS WERE COLLECTED FROM TWO LOCATIONS WITHIN EACH GRID. SEE TEXT FOR FURTHER EXPLANATION.

3. GRIDS 7 THROUGH 19, WHICH WERE NOT SAMPLED DUE TO THE PRESENCE OF BUILDINGS OR OTHER OBSTACLES, WILL BE EVALUATED AS PART OF A FOLLOW-UP PHASE OF WORK TO BE PERFORMED AFTER THE MAIN AND OUTBUILDINGS HAVE BEEN DEMOLISHED. SEE TEXT FOR FURTHER INFORMATION.

REFERENCE:

GEOMATRIX DRAWING TITLED, "SITE PLAN", FIGURE 2, DATED 05/07/2002, FILE NAME: 6238–001.

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

0 100 200
SCALE, FEET

B

Drawn By: RAZ 04/22/2015
Checked:
Approved:
DWG Name: 00028873–B22

FORMER TRANSTECHNOLOGY CORP. FACILITY
GLEN HEAD, NEW YORK

PREPARED FOR
BREEZE–EASTERN CORPORATION
WHIPPANY, NEW YORK

FIGURE 2

SAMPLING GRID AND PROPOSED BORING LOCATIONS

WSP
WSP USA Corp.
5 Sullivan Street
Cazenovia, New York 13035
(315) 655-3900
www.wspgroup.com/usa

Enclosure A - Standard Operating Procedures

FIELD STANDARD OPERATING PROCEDURE #3
Sample Packaging and Shipment Procedure

Shipping samples is a basic but important component of field work. Nearly all of the WSP activities include the collection of environmental samples. Proper packing and preservation of those samples is critical to ensuring the integrity of WSP's work product. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) before beginning any onsite activities. In accordance with the HASP, 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
SOP	standard operating procedure

3.2 Materials

- Suitable shipping container (e.g., plastic cooler or lab-supplied styrofoam-insulated cooler)
- Chain-of-custody forms
- Custody seals
- WSP mailing labels
- Tape (strapping, clear packing, or duct tape)
- Heavy-duty zipper-style plastic bags
- Knife or scissors
- Permanent marker
- PPE
- Large plastic garbage bag
- Wet ice (as necessary)
- Bubble wrap or other packing material
- Universal sorbent materials
- Sample container custody seals (if required)
- Shipping form (with account number)

3.3 Preconditions and Background

This SOP has been prepared as part of the WSP USA Corp. 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 WSP employees and will be revised periodically to reflect updates to WSP policies, work practices, and the applicable state and/or federal guidance. WSP employees must verify that this document is the most recent version of the WSP SOPs. WSP employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

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), and has a current certificate for WSP's U.S. Department of Transportation (DOT) Hazardous Materials training.

> **NOTE: WSP 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 WSP employees do not have IATA training and therefore, anyone who needs to ship by air MUST consult with a WSP IATA-trained compliance professional. The remainder of Section 3.3 covers shipments regulated by DOT only.**

Environmental samples can meet the definition of DOT hazardous materials when shipped by air, ground, or rail from a project site to the laboratory. As such, field staff must work with their assigned WSP 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.

Title 49 Code of Federal Regulations (CFR) Section 171.8 defines a "hazardous material" as a substance which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. DOT hazardous materials are listed in the hazardous materials table at 49 CFR 172.101.

In most cases, WSP is collecting environmental samples in order to determine whether any hazardous chemicals are present in the sampled media. Therefore, we would not have the appropriate information to make a hazardous materials classification for the samples prior to shipment. 49 CFR 172.101(c)(11) allows the use of a tentative classification where the shipper is uncertain of the material's hazard class. Where WSP does not know the physical characteristics of the samples, a non-hazardous material classification may be made. Non-hazardous materials are not subject to the DOT hazardous materials regulations.

There are certain cases where the characteristics and hazard class of the samples are known (e.g., samples of free product, samples preserved with a hazardous material [TerraCore® samplers]). Contact your assigned WSP compliance professional or an internal DOT contact for guidance on shipment of these materials.

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 UPS, have requirements that WSP register with them before shipping hazard materials. In most cases, it is the sampling location, not the WSP office address, which needs to be registered. Therefore, each project will likely have unique requirements. Please contact your WSP 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° 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 Samples 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, Pig-brand absorbent blankets) in the bottom of the shipping 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 shipping container with a large, heavy-duty plastic garbage bag. Place 2 to 4 inches of bubble wrap or other appropriate packing material inside the heavy-duty plastic bag in the bottom of the shipping container to form a cushion for the sample containers. Place the samples 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; leave sufficient room for the wet ice if the samples are to be preserved during transit. Place wet ice to be used for sample preservation inside two sealed heavy-duty zipper-style plastic bags (1 gallon-sized, or less). 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 in-transit melting of ice. Securely close the top of the heavy-duty plastic bag and seal with tape.

3.4.1.2 Non-Temperature-Preserved Samples 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.

3.4.1.3 Container Shipment

Place the original, white top copy chain-of-custody form into a heavy-duty zipper-style plastic bag, affix the bag to the shipping container's inside lid, and then close the shipping container. 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. At this point, sample shipment preparations are complete if using a laboratory courier.

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. 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 sample containers, and reseal the shipping container.

Using clear tape, affix a mailing label with WSP's return address to the top of the shipping container. Ship environmental samples to the contracted analytical laboratory using an appropriate delivery schedule. If applicable, check the appropriate box on the airbill for Saturday delivery (you need to verify with the laboratory that someone will be at the lab on a Saturday to receive the sample shipment). Declare the value of samples on the shipping form for insurance purposes, if applicable, and be sure to include the project billable number on the shipping form's internal billing reference section. 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, FedEx, 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 on the chain-of-custody form 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 WSP 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 dropped off before the final pickup time of the day.**

3.4.2 Hazardous Materials Samples

WSP personnel 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 WSP 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. **Do not ship hazardous materials samples without first consulting a WSP 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 the ways and means of selecting the appropriate sampling containers for environmental sampling. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) 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	deionized water
DOT	U.S. Department of Transportation
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
MS/MSD	matrix spike and matrix spike duplicate
MSA	Master Service Agreement
PPE	personal protective equipment
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
- Sample containers
- Sample labels
- Clear tape
- Deionized (DI) water
- Cleaned or dedicated sampling equipment

4.3 Preconditions and Background

This SOP has been prepared as part of the WSP USA Corp. 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 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 WSP employees and will be revised periodically to reflect updates to WSP policies, work practices, and the applicable state and/or federal guidance. WSP employees must verify that this document is the most recent version of the WSP SOPs. WSP employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

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.

4.4 Sample Identification Procedures

Information on the sample labels must contain the site/project name, project/task number, unique alpha-numeric sample identification (ID) number, sample date, time of collection using the military or 24-hour clock system (e.g., 0000 to 2400 hours), analytical parameters, preservative, and sampling personnel. WSP personnel are advised to use pre-printed waterproof mailing labels (e.g., Avery® 5xxx Waterproof Address Labels) for all sample identification. WSP templates for the labels are available in each office.

The sample identification number must, unless otherwise approved by your project manager or specified in your site-specific work plan, follow the WSP 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. The 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 and the second number indicating the bottom of the sample interval; not all sample types will include depth information.

Additional label information may be added after the last character of the sample ID (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 samples
CC -	Concrete core/chip sample
CS -	Confirmation/verification soil samples collected from an excavation
HA -	Soil samples collected with a hand auger
IAB -	Indoor air samples – basement
IAC -	Indoor air samples – crawl space
IAF -	Indoor air samples – first floor
MW -	Soil samples collected from a monitoring well borehole or a groundwater sample collected from a monitoring well
PZ -	Groundwater samples collected from a piezometer
SB -	Soil samples collected from boreholes that will not be converted to monitoring wells
SED -	Sediment samples
SG -	Soil gas samples other than sub-slab samples (e.g., samples collected from temporary or permanent PVC sample points or stainless steel screen implants)
SL -	Sludge samples
SS -	Surface soil samples collected using hand tools (e.g., trowel, spoon, etc.) and typically at depths less than 2 feet below ground surface
SSV -	Sub-slab vapor samples
SW -	Surface water samples
TC -	Tree core samples
TP -	Soil samples collected from a test pit
WC -	Waste characterization samples
WP -	Wipe samples

4.5 Sample Containers, Preservatives, and Holding Times

The first step in sample collection is to verify that the analytical laboratory has provided the correct number and type of sample containers and each contains the appropriate preservatives for the proposed project (i.e., check against the sampling plan requirements outlined in the site-specific Quality Assurance Project Plan [QAPP]). Inspect all containers and lids for flaws (cracks, chips, etc.) before use. Do not use any container with visible defects or discoloration. Report any discrepancies, or non-receipt, of specific types of sample containers to the team leader or project manager immediately. Make arrangements with the laboratory to immediately ship missing or additional sampling containers.

Take special effort to prevent cross contamination and contamination of the environment when collecting samples. Protect equipment, sample containers and supplies from accidental contamination. Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to sampling. 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. Sample collection must follow all appropriate SOPs and 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
- Total metals
- Dissolved metals
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

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 (C).

4.6 Field Quality Assurance/Quality Control Samples

Field quality assurance/quality control (QA/QC) samples include equipment blanks, trip blanks, duplicates, 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 WSP naming protocol as discussed in the sections below. QA/QC samples must be clearly identified on WSP's copy of the COC form and in the field book. Failure to properly collect and submit required QA/QC samples can result in invalidation of an entire sampling event.

Collect, preserve, transport and document split samples using the same protocols as the related samples.

4.6.1 Equipment Blanks

Equipment blanks are used to document contamination attributable to using non-dedicated equipment. Collect equipment blanks in the field at a rate of one per type of 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 laboratory provided analyte-free water and collecting the rinsate in the appropriate sample containers. The samples must be labeled, preserved, and filtered (if required) in the same manner as the environmental samples. Record the type of sampling equipment used to prepare the blank. Have the equipment blanks analyzed for all the analytes for which the environmental samples are being analyzed, unless otherwise specified. Decontamination of the equipment following equipment blank procurement is not required. If laboratory-grade DI water is unavailable, store-grade distilled water can be used to prepare these blanks. If store-grade distilled water is used, be sure to record the source and lot number in the field book. 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, 2013, would be designated EB070413-1.

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. Trip blank(s) will be prepared at the laboratory and will be sent to the facility along with sample containers. Never open trip blank sample bottles, but label them in the field and return them to the laboratory in the same shipping container in which the trip blank sample bottles arrived at the site. Keep the trip blank sample bottles in the same shipping container used to ship and store VOC sample bottles during the sampling event. To minimize the number of trip blanks needed per shipment, if possible, ship all of the VOC samples in the same shipping container with the trip blank. If laboratory-provided trip blanks are not

available, DI water, or store-grade distilled water and clean, empty VOC sample bottles can be used to prepare additional trip blanks. If store-grade distilled water is used, be sure to record the source and lot number in the field book. Identify trip blanks using “TB”, followed by the date. For example, the trip blank shipped with a cooler of samples on July 4, 2013, would be designated TB070413-1. If a second trip blank is needed on that same day, the designation would be TB070413-2.

4.6.3 Temperature Blank

Temperature blanks are used to determine if proper sample thermal preservation has been maintained by measuring the temperature of the sample container upon arrival at the laboratory. A temperature blank 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.

4.6.4 Duplicates

Duplicates are useful for measuring the variability and documenting the precision of the sampling process. Unless more stringent project requirements are in place, collect duplicate samples at least at a rate of 1 per 20 samples collected. Under no circumstances can equipment or trip blanks be used as duplicates. Sample locations where sufficient sample volume is available and where expected contamination is present should be selected for sample duplication.

Collect each duplicate sample at the same time, from the same sample aliquot and in the same order as the corresponding field environmental sample. When collecting aqueous duplicate samples, alternately fill sample bottle sets (i.e., the actual sample bottle and the bottle to be used for the duplicate) with aqueous samples 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 samples 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. Have the duplicate samples analyzed for the same analytes as the original sample. Be sure to record the duplicate sample ID, the false time, and the actual time of collection in the field notebook. The duplicate should also be indicated on WSP’s carbon copy of the chain-of-custody.

4.6.5 Matrix Spike and Matrix Spike Duplicates

Matrix spike and matrix spike duplicate samples, known as MS/MSD samples, are used to determine the bias (accuracy) and precision of a method for a specific sample matrix. Many of WSPs projects require the collection of MS/MSD samples; however, laboratory generated MS/MSD samples are sufficient for some projects. As required by your QAPP or site-specific work plan, collect MS/MSD samples at the required ratio; if the sampling ratio is not specified by your QAPP or site-specific work plan, collect MS/MSD samples at a rate of 1 for every 20 samples. Clearly convey the MS/MSD identity to the laboratory by adding “MS" or "MSD” after the sample name (e.g., MW-01MS) or in the comments section of the chain-of-custody. 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. Unlike duplicate samples that measure the variability of both the sample collection and laboratory procedures, split

samples measure only the variability between laboratories. Therefore, the laboratory samples must be subsamples of the same parent sample and every attempt must be made to ensure sample homogeneity. Collect aqueous split samples in the same manner as a duplicate sample.

Collecting split samples of soils, sediments, wastes, and sludge is not recommended because the homogenization necessary for a true split sample in these matrices is not possible.

Spilt samples should have the same sample location (e.g., MW-01, SB-03 (4-6), but 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 eliminate possible tampering. Legal chain of custody (COC) begins when the pre-cleaned sample containers are dispatched to the field from the laboratory and continues through the sample analysis and eventual disposal. 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), 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.) at all times 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-indicating evidence tape or custody seals

The COC form is used to trace sample possession from the time of collection to receipt at the laboratory. Although laboratories commonly supply their own COC form, it is recommended that WSP's COC be used to ensure that all necessary data are recorded. At a minimum, the COC needs to have a unique COC number, accompany all the samples, and include the following information:

- Project number, name, and location
- Sampler's printed name(s) and signature(s)
- Sample identification number
- Date and time (military time) of collection
- Sample matrix
- 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

- WSP contact information

Affix tamper-indicating evidence tape or 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. Record the time, calendar date and signatures of responsible personnel affixing and breaking all seals for each sample container and shipping container. Affix new 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) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (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
RCRA	Resource Conservation and Recovery Act
SOP	standard operating procedure
TSCA	Toxic Substances Control Act

5.2 Materials

- Non-hazardous waste, hazardous waste, and/or polychlorinated biphenyl (PCB) labels
- Investigation derived waste (IDW) log (figure 1)
- Permanent ink marking pen, paint, stick/pen
- Sampling equipment (refer to sampling SOPs)
- Impermeable covers (e.g., tarps), as needed
- Duct tape, rope, or other material to secure tarp
- Copy of the waste manifest or bills of lading

5.3 Preconditions and Background

This SOP has been prepared as part of the WSP USA Corp. 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 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 WSP employees and will be revised periodically to reflect updates to WSP policies, work practices, and the applicable state and/or federal guidance. WSP employees must verify that this document is the most recent version of the WSP SOPs. WSP employees are also strongly advised to review

relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

This SOP is designed to provide the user with a general outline for handling, storing, and managing IDW pending disposal and assumes the user holds a current U.S. Department of Transportation (DOT) training and Resource Conservation and Recovery training (if required) certificates 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 regulations, nor does it cover the evaluation of the analytical results. **Consult and involve WSP's compliance professionals during all phases of IDW management and disposal.**

5.4 IDW General Procedures

Nearly all intrusive field activities performed at WSP will generate solid or liquid wastes. Examples include:

Solid Wastes	Liquid Wastes
■ Soil Cuttings	■ Decontamination water
■ Drilling mud	■ Development water
■ Plastic sheeting	■ Drilling fluids
■ Spent carbon or filters (e.g., bag filters)	■ Purge water
■ PPE (e.g., Tyvek, gloves, respirator cartridges, etc.)	■ Soap or wash solutions
■ Disposable or dedicated sampling equipment (e.g,, bailers, hose, clamps, buckets, cartridge filters, etc.)	■ Reagents (e.g,, hexane, nitric acid, methanol, etc.)
■ Field analytical waste (HACH kits, Chlor-n-Soil kits, etc.)	

The specific procedures for dealing with these materials after the field activities have been completed will vary depending on whether the materials are considered non-hazardous, Resource Conservation and Recovery Act (RCRA) hazardous (characteristic or listed wastes), or contain PCBs at concentrations above 50 milligrams per kilogram (i.e., PCB wastes regulated under the Toxic Substances Control Act [TSCA]). The characterization of the wastes to be generated is ideally determined in conjunction with a WSP 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 WSP compliance professionals for assistance in proper waste characterization.

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 discuss the handling procedures with the project manager and assigned WSP compliance professional before mobilizing to the field.

5.4.1 Waste Minimization

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, 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 WSP's corporate goals for sustainability.

5.4.2 Hazardous Waste Generator Status

The hazardous waste generator requirements that pertain to a site depend on how much hazardous waste is generated at a site in a calendar month. In coordination with your assigned WSP compliance professional, determine the site's hazardous waste generator status (conditionally exempt, small, or large quantity generator) before site work begins and inform the site contact and/or client representative of the quantity of hazardous waste that will be generated as a result of its activities.

The following table provides a summary of requirements for each class of hazardous waste generator: Conditionally Exempt Small Quantity Generators (CESQGs), Small Quantity Generators (SQGs), and Large Quantity Generators (LQGs). Note that this is provided for guidance purposes only and should not substitute for close coordination with your assigned WSP compliance professional for all IDW-related activities.

	CESQGs	**SQGs**	**LQGs**
Quantity Limits	≤100 kg/month ≤1 kg/month of acute hazardous waste ≤100 kg/month of acute spill residue or soil §§261.5(a) and (e)	Between 100 - 1,000 kg/month §262.34(d)	≥1,000 kg/month >1 kg/month of acute hazardous waste >100 kg/month of acute spill residue or soil Part 262 and §261.5(e)
EPA ID Number	Not required §261.5	Required §262.12	Required §262.12
On-Site Accumulation Quantity	≤1,000 kg ≤1 kg acute ≤100 kg of acute spill residue or soil §§261.5(f)(2) and (g)(2)	≤6,000 kg §262.34(d)(1)	No limit
Accumulation Time Limits	None §261.5	≤180 days or ≤270 days (if greater than 200 miles) §§262.34(d)(2) and (3)	≤90 days §262.34(a)

	CESQGs	SQGs	LQGs
Storage Requirements	None §261.5	Basic requirements with technical standards for tanks or containers §§262.34(d)(2) and (3)	Full compliance for management of tanks, containers, drip pads, or containment buildings §262.34(a)
Sent To:	State approved or RCRA permitted/interim status facility §§261.5(f)(3) and (g)(3)	RCRA permitted/interim status facility §262.20(b)	RCRA permitted/interim status facility §262.20(b)
Manifest	Not required §261.5	Required §262.20	Required §262.20
Biennial Report	Not required §261.5	Not required §262.44	Required §262.41
Personnel Training	Not required §261.5	Basic training required §262.34(d)(5)(iii)	Required §262.34(a)(4)
Contingency Plan	Not required §261.5	Basic plan §262.34(d)(5)(i)	Full plan required §262.34(a)(4)
Emergency Procedures	Not required §261.5	Required §262.34(d)(5)(iv)	Full plan required §262.34(a)(4)
DOT Transport Requirements	Yes (if required by DOT)	Yes §§262.30-262.33	Yes §§262.30-262.33

5.5 Onsite IDW Management Procedures

Onsite handling procedures typically involve containerization of the IDW for offsite disposal at a regulated facility (RCRA hazardous waste, TSCA PCB waste, or certain non-hazardous wastes) or, in the case of certain non-hazardous wastes, onsite disposal. The procedures for each type of waste are presented below.

5.5.1 Hazardous Waste Management

If site data or generator knowledge indicates that the IDW is determined to be RCRA hazardous, the following procedures will apply:

- Place IDW in DOT-authorized containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that they 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 RCRA hazardous waste label. The label must include the accumulation start date, a description of the contents of the container (e.g., soil cuttings, purge water, etc.), the EPA identification number, the generator name (the client or the facility, never WSP), and the

hazardous waste codes, if known. Field personnel must consult the assigned WSP 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 (facility hazardous waste storage area if one exists) 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 Logs (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- Ensure that weekly inspections are conducted and the proper inspection forms for documentation are completed during the entire time the waste is stored onsite.

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 regulatory specialist or project manager before leaving the site (see sampling SOPs). Treatment, storage, and disposal facilities will usually specify the required analysis for waste profiles (see below).

5.5.2 Polychlorinated Biphenyl Waste Management

If information exists to classify the IDW as TSCA-regulated PCB-containing IDW, the following procedures must be implemented:

- Place the PCB-containing IDW in DOT-authorized containers (55-gallon drum, roll-off container, or temporary storage tank).
- 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 WSP field personnel to contact in the event of an accident or spill. Field personnel must consult the assigned WSP 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.
- Inspect the area and the containers for leaks once every 30 days in accordance with 40 Code of Federal Regulations 761.65(c)(5) during the entire period the waste is stored onsite.
- Complete the IDW Logs (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.

5.5.3 Onsite Non-Hazardous Waste Management

If information exists to classify the IDW as non-hazardous waste, the following procedures must be implemented only after being discussed and approved by the project manager and assigned WSP compliance professional:

- Soil can be spread around the borehole or other onsite location (with the approval of the client and in accordance with any applicable regulatory requirements), placed back in the boring or excavated test pit, or containerized and disposed of offsite.

- Groundwater and decontamination fluids can be poured onto the ground next to well to allow infiltration, or discharged to either the publically-owned treatment works or onsite wastewater treatment plant with approval of the client.
- PPE can be double bagged and deposited in the site dumpster with approval of the client and facility personnel or containerized and disposed of offsite.

If the IDW is containerized and is classified as non-hazardous, the following procedures will apply:

- Place the non-hazardous IDW in DOT-authorized containers (55-gallon drum, roll-off container, or temporary storage tank).
- 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 non-hazardous waste label. The label must include a description of the contents of the container (e.g., soil cuttings, purge water, etc.) and the generator (the client or the facility, never WSP). Field personnel must consult the assigned WSP compliance professional for help in properly completing the labels.
- Complete the IDW Logs (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.

5.6 Post-Field IDW Management Activities

It is important to follow-up on the management of the IDW once the field personnel have returned from the field. RCRA Hazardous and TSCA-regulated PCB-containing wastes have time limits and periodic inspection requirements to remain in compliance with state and federal regulations. The general post-field activities are listed below.

5.6.1 Waste Classification and Waste Profiles

Waste classifications and waste profiles must be reviewed and approved by WSP's project manager, WSP compliance professional, and the client before field work begins. Waste profiles are generated based on new or existing site data (i.e., soil and groundwater results) and generator knowledge, although some disposal facilities may require additional composite or grab samples for characterization of the waste. WSP's compliance professionals must be consulted to verify that proper waste classifications have been identified. Waste profiles for the same waste stream are generally valid for one year; ensure that no additional sampling is required to update existing waste profiles before conducting field activities.

5.6.2 Waste Disposal Oversight

Although exceptions may apply, generally, disposal of RCRA hazardous must be completed within **90 days** of the accumulation start date. If the facility is a small quantity generator, up to **180 days** is allowed for shipment. Disposal of TSCA-regulated PCB-containing IDW must generally be completed within 30 days of the "removal of service" date. WSP's compliance professionals must be consulted to determine if any exemptions apply.

Before the IDW is removed, the waste disposal subcontractor must provide WSP with a copy of the waste profile and printed manifest for review and approval. Your assigned WSP compliance professional must review and approve these documents. WSP must have written authorization from the client on file to act **on behalf of (never "as an agent of")** the client for waste disposal (handled on a site-by-site basis).

- The transport driver will present you with a pre-printed manifest that has been reviewed and approved by WSP. Review and verify that all information is complete and correct and that the total estimated weight of the material is written on the manifest. (Note: Manifests for PCB wastes must be completed in accordance with TSCA regulations. 40 CFR 761.207 requires that the weight of the PCBs be in kilograms and the date removed from service be on the manifest.) Remember, only a DOT-trained WSP employee is allowed to review and sign the manifest.
- Sign the manifest “On behalf of [insert client name].” Do not us “as an agent of.”
- Ensure that all containers are properly labeled and transferred to the transporting vehicle; ensure that the vehicle is properly placarded.
- Once the IDW has been removed from the site, the IDW log must be marked “Removed,” placed in the project file, and a copy must be forwarded to WSP’s DOT compliance manager.

The manifest, certificate of disposal, IDW log, and inspection reports must be maintained on file for at least 3 years.

Investigation Derived Waste Log

Date:_____

Site Information

Site Name: _____ Site EPA ID #:_____

Site Contact: _____ Site Address: _____

Contact Telephone No: _____

Waste Identification:

Type of Waste Generated (check one of the following):

☐ Soil Cuttings ☐ PPE ☐ Decontamination Water

☐ Groundwater ☐ Storm Water ☐ Drilling Fluids

☐ Other (Describe):_____

Field Activities that Generated the Waste:

☐ Soil Borings ☐ Well Sampling ☐ Well Installation

☐ Decon ☐ Excavation ☐ Pumping Tests

☐ Other (Describe): _____

Generation Date:_____ ***90-Day Deadline***: _____

Quantity of Waste Generated and Container Type:

_____

_____

Storage Location:_____

Waste Identification (Check One of the Following):

☐ 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)

If generator knowledge or site information was used for identification, explain: _____

_____

_____

Type of Label Applied to Container: ☐ Non Haz ☐ Hazardous ☐ PCB ☐ Used Oil

WSP Information (Note: One copy to site contact - the original in project file)

Personnel/Contact:_____ Project No.: _____

Telephone:_____

FIELD STANDARD OPERATING PROCEDURE #6 Decontamination

The decontamination procedures outlined in this standard operating procedure (SOP) are designed to ensure that all equipment that contacts a sample during sample collection is free from the analytes that could potentially interfere with the sample results. The user is advised to read the entire SOP and review the site health and safety plan (HASP) before beginning any onsite activities. In accordance with the HASP, 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
IDW	investigation derived waste
PPE	personal protective equipment
SOP	standard operating procedure

6.2 Materials

- Polyethylene sheeting and/or garbage bags
- Non-phosphate detergent (e.g., Luminox®, Liquinox®, or Alconox®)
- Cleaning reagents, as needed (e.g., isopropyl alcohol, methanol, hexane, etc.)
- Tap water
- Deionized (DI) water
- Containers (e.g., garbage cans, buckets, plastic tubs)
- Nylon brushes
- Aluminum foil
- Spray bottles
- Paper towels
- Duct tape
- Pressurized steam cleaner (e.g., steam jenny), as needed
- Portable wet/dry vacuum
- Shovel, funnel, and/or squeegee

6.3 Preconditions and Background

This SOP has been prepared as part of the WSP USA Corp. 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 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 WSP employees and will be revised periodically to reflect updates to WSP policies, work practices, and the applicable state and/or federal guidance. WSP employees must verify that this document is the most recent version of the WSP SOPs. WSP employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

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 IDW management procedures (SOP 5).

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 reducing the incidence of cross-contamination (i.e., compounds of interest being transferred on the sampling equipment from one sample location or depth to another) and, when properly implemented, provide a methodology for obtaining high quality, representative results. As with all analytical sampling, the effectiveness of the cleaning procedures must be supported with the collection of equipment blanks. The sampling procedures and equipment blank collection frequency are discussed in SOP 4.

It is important for WSP personnel to evaluate the expected types of contamination prior to mobilization to a site. Some state programs (or the U.S. Environmental Protection Agency [EPA], depending on the site) may require more stringent decontamination procedures than those listed here or specify the types and grades of various cleaning detergents and reagents (e.g., acids and solvents). Many of these compounds, such as nitric acid or pesticide grade hexane, are available from a limited number of suppliers and can be difficult to obtain in short order (i.e., most solvents and acids must be shipped using a ground service and are not available for overnight delivery). These compounds may also require specialized PPE (e.g., eye protection for concentrated acids) or have other special handling or disposal procedures that must be considered before arriving onsite.

6.4 Decontamination Procedures

The decontamination procedures are based on a nine-step process, which is tailored in the field depending on the samples to be collected. Decontaminate all non-dedicated equipment that contacts the sample directly, including spools, trowels, pumps, etc., before and between each sample location or interval. Disposable, single-use items, such as bailers or tubing, do not require decontamination.

The process includes the following four basic steps[1:]

1. Physical removal of debris
2. Bucket wash with non-phosphate soap such as Alconox®, or equivalent and scrub brush
3. Tap water rinse
4. Deionized (DI) water rinse (distilled water can be used as a substitute)
5. 10% nitric acid rinse (for metals sampling only; see below)
6. DI water rinse
7. Pesticide-grade solvent rinse (e.g., hexane or isopropyl alcohol)
8. Air dry (solvent must evaporate)
9. DI water rinse

[1] Steps 5-9 are for more critical sampling applications and are not typically performed.

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. If gross contamination or an oily film or residue is observed on the equipment, use a brush to remove the particulate matter or surface film. Heavy oils or grease may be removed with paper towels soaked with isopropyl alcohol.

The physical removal is followed by a wash using non-phosphate soap (mixed to the appropriate dilution in tap water) followed by a tap water rinse. The most common set-up uses 5-gallon pails or buckets for the wash and rinse, although garbage pails or plastic tubs can also be used. Place buckets on polyethylene sheeting to limit spillage of the cleaning fluids.

Be sure to scrub the equipment thoroughly and allow enough time for the non-phosphate soap to be effective and clean the surfaces (a simple dunk of the equipment in the soapy water is insufficient). If decontaminating submersible pumps, pump both the non-phosphate soap wash fluid and the tap water rinse through the pump body itself (usually done in the bucket) to ensure that the internal impeller and other components are thoroughly cleaned. Replace the soap solution and rinse water when it becomes oily or silty.

Place the DI water for the rinse in a small squirt bottle or poured over the equipment or device after the tap water rinse. **In some cases, such as decontaminating a split-spoon between sample recoveries or when working with submersible pumps, this level of decontamination (i.e., steps 1 through 4) may be sufficient.**

Steps 5 through 9 are for more critical sampling applications and are typically performed on non-motorized equipment. Isopropyl alcohol is the recommended solvent for organic contaminants because it is readily available (at most drug and department stores) and is not a U.S. Department of Transportation (DOT) hazardous material. 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.

Handle the solvents and acid with care and store them 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 squirt bottles, which offer a convenient and controllable way to rinse the equipment. The equipment can then be rinsed over a 5-gallon bucket or other suitable container placed on plastic sheeting as with the first part of the cleaning process. Steps 5 and 6 are for metals sampling only and must be used only for non-carbon steel sampling devices (do not spray acid into pumps) and can be skipped for projects where inorganics are not included in the sampling scheme.

6.5 Handling Decontaminated Equipment

After decontamination, handle equipment using clean gloves to prevent re-contamination. In addition, move the equipment away (preferably upwind) from the decontamination area to prevent re-contamination. As soon as the equipment is air-dried, protect decontaminated field equipment from environmental contamination by securely wrapping and sealing with aluminum foil (shiny side out) or clean, untreated, disposable plastic bags. 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.

On completion of site work, decontaminate all equipment prior to departure, then label each piece of equipment with the date of decontamination, the initials of decontamination personnel, and the type of decontamination solution(s) used. Containerize all solvent rinsate, detergent wastes, and other decontamination materials for offsite or regulated disposal (see SOP 5). Dispose of all wastes in conformance with 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 offsite laboratory analysis. The user is advised to read the entire SOP and review the site health and safety plan (HASP) 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

bgs	below ground surface
F	Fahrenheit
HASP	Health and Safety Plan
IDW	investigation derived waste
PID	photoionization detector
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
SOP	standard operating procedure
VOC	volatile organic compound

9.2 Materials

- Field book
- PPE
- Air quality monitoring equipment
- Utility knife
- Mixing tray or bowl
- Heavy-duty zipper-style plastic bags (quart or snack size)
- Plastic sheeting
- Expanding ruler or tape measure
- Munsell color chart
- Sampling containers and labelling/shipping supplies
- Field test kits, as needed
- Soil sampling method specific materials:
- Stainless steel trowels, shovels, or spoons
- Bucket augers, auger extension rods, auger handle, pipe wrenches

- Split-spoon samplers, pipe wrenches
- Direct push acetate liners
- Shelby tube samplers
- Decontamination supplies

9.3 Preconditions and Background

This SOP has been prepared as part of the WSP USA Corp. 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 WSP employees and will be revised periodically to reflect updates to WSP policies, work practices, and the applicable state and/or federal guidance. WSP employees must verify that this document is the most recent version of the WSP SOPs. WSP employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

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 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 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. All sampling and monitoring references must be available for consultation in the field, including:

- WSP's SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan and HASP
- 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 by a drill rig. Recovered cores are often logged (using a Munsell color chart and other logging aids), screened for volatile organic compounds (VOCs) using a photoionization detector (PID), and sampled for laboratory analysis using disposable stainless steel spoons or other discrete sampling devices.

All types of soil 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 or decontaminated sampling equipment
- The use and rotation of the appropriate PPE

- Selection of a suitable sampling location and staging area

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-spoons cutting shoes, or trowels. Select the types of equipment and decontamination procedures based on the types of sampling to be performed and 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., macro-core liners, soil baskets, etc.) be used to collect more than one sample.

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. In no case should gloved hands be used as a soil sampling device: always use the appropriate spoon, trowel, or sampler to move the soil from the sampling device to the laboratory-supplied containers.

Finding a suitable sampling location involves selecting an area that is away from any sources of cross-contamination that could compromise the integrity of the samples. This includes positioning 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 and securely stage, if possible, in uncontaminated portions of the site.

9.5 Soil Collection

Soils can be collected from surface or subsurface depths, depending on the project requirements. Surface soils are generally those within 0.5 to 1 foot of the ground surface and can be collected using trowels, soil probes, 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.
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 cleaned equipment. Record in the field book the depth interval through which the sampler was advanced and, if appropriate, the number of blows needed to drive the sampling device (i.e., when using a cathead-equipped drill rig; record the blows for every 6 inches the split-spoon sampler is advanced). 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 crumbling and falling out of the sampler.

Withdraw the sampling equipment from the borehole or excavation. Do not physically enter excavations to collect a sample; soil samples can be collected from a backhoe bucket. If the soil sample will be analyzed for geotechnical parameters (i.e., using a Shelby tube), the undisturbed sampler is typically capped, maintaining the sample in its relatively undisturbed state, and shipped to the appropriate geotechnical laboratory. Follow sample preparation and shipping procedures in SOPs 3 and 4. If the soil is to be logged in the field, place soil samplers/soils on plastic sheeting noting the orientation of the sample (i.e., which end is “up”) and the depth interval. Measure the length of the material recovered relative to the interval the sampler was advanced (in percent), 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). Record the readings in the field book.

9.5.1 Volatile Organic Compound Sampling

If part of the sampling plan, immediately collect samples for VOC analysis after screening the soils 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 composite or mix 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 sampling by US Environmental Protection Agency Method 5035 is required, follow manufacturer's specifications to use a closed-system sampler (e.g., Encore samplers). Collect quality assurance/quality control (QA/QC) samples in accordance with SOP 4, the project-specific work plan, and the QAPP.

9.5.2 Soil Headspace Analysis

If required as part of the project-specific work plan, collect samples for field-based headspace analysis after obtaining the sample for VOC analysis. First, examine the contents of the sample and remove coarse gravel, organic material (e.g., roots, grass, and woody material) and any other debris. Collect the sample using decontaminated spoons or trowels 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, F) by placing the bag in a heated room or vehicle. This step is very important when the ambient temperature is below 32ºF.

After waiting 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 and avoid the uptake of water droplets. Record the highest meter response, which typically occurs within the first 2 to 5 seconds. Erratic PID response 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 plus or minus 20%. Samples collected for headspace screening cannot be retained for laboratory analysis.

9.5.3 Semi- and Non-Volatile Analytical Sample Collection

Collect remaining organic samples then inorganic samples in the following order of volatilization sensitivity:

- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Total metals
- Dissolved metals (see filtering procedures below)
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Collect soil samples for semi- and non-volatile parameters by separating clumps of soil material and mixing the soils (using stainless steel bowls and spoons, or other appropriate equipment) to a homogeneous particle size and texture. Transfer the contents to the 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 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 waste 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 and the project-specific work plan or 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.

9.5.4 Sample Labeling and Preparation for Shipment

Once collected, prepare the soil samples for offsite laboratory analysis:

- Cleaning the outside of the sample container
- Affixing 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)
- Placing clear tape over the tag or label (if non-waterproof labels are used)
- Preserving samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius
- Recording the sample designation, date, time, and the sampler's initials in the field book and on a sample tracking form, if appropriate
- Completing the chain-of-custody forms with appropriate sampling information
- Securing the sample packing and shipping in accordance with proper procedures

Do not ship hazardous waste samples without first consulting a WSP compliance professional.

9.5.5 Soil Classification

Soil classification should be performed whenever soil samples are being collected to provide context for the analysis. WSP prefers following 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 soil type:

- Depth interval
- USCS group name
- USCS group symbol
- Color, using Munsell chart (in moist condition)
- Percent of cobbles or boulders, or both (approximate; by volume)
- Percent of gravel, sand, or fines, or all three (approximate; by dry weight)
- Particle-size range:
    - Gravel—fine, medium, coarse
    - Sand—fine, medium, coarse

[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).

- Particle angularity: angular, subangular, subrounded, rounded
- Particle shape: (if appropriate) flat, elongated, flat and elongated
- Maximum particle size or dimension
- Hardness of coarse sand and larger particles
- Plasticity of fines: 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)
- Moisture: dry, moist, wet

For intact samples also include:

- Consistency (fine-grained [clay] soils only): very soft, soft, firm, hard, very hard
- Structure: stratified, laminated, fissured, slickensided, lensed, homogeneous
- Cementation: weak, moderate, strong
- 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.

Use the following standard descriptors for the textural percentages:

- Trace: 0 to 10%[2]
- Little: 11 to 20%
- Some: 21 to 35%
- And: 36 to 50%

Example descriptions, using the information listed above, would read as follows:

8-10' – 5YR2/6 fine- to medium-grained sand, trace medium sub-angular rounded gravel (up to 0.5" in diameter); medium dense to dense; wet with slow dilatancy; moderate solvent-like odor between 9' and 10'.

10-12' – 5YR2/6 low plasticity clay with some fine to coarse grained angular to subangular gravels (up to 0.25" in diameter) and trace fine to medium grained rounded sands, very stiff, moist with no dilatancy, no odors.

9.6 Closing Notes

Once sampling is completed, secure the boreholes/locations in accordance with the project-specific project work plan. Decontaminate all equipment prior to departure and properly manage all PPE and IDW in conformance with applicable regulations.

[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-perent in fine-grained soils cannot be reliably determined in the field.