June 27, 2008

Mr. Jaspal Walia
Project Manager
New York State Department of Environmental Conservation
270 Michigan Avenue
Buffalo, NY 14203

Re: Supplemental Groundwater Investigation Work Plan – MW-09 Area
Former Buffalo Service Center and Related Sites
(C915194, C915195, C915203, V00362)
Buffalo, New York

Dear Mr. Walia,

On behalf of QLT Buffalo LLC, WSP Engineering of New York, P.C. prepared this supplemental groundwater investigation work plan to develop additional information with respect to groundwater conditions in the vicinity of MW-09. The scope of the investigation is consistent with discussions held with the New York State Department of Environmental Conservation (NYSDEC) during a meeting held on May 7, 2008. The information obtained through the execution of this work plan will be used to characterize conditions in the vicinity of MW-09 resulting from potential offsite conditions and, if necessary, prepare a focused feasibility study that evaluates remedial options to address conditions at this location. The site layout and analytical data are shown on Figure 1.

Background Information for the MW-09 Area

The 4 New Seventh Street site (C915203) (7th Street Site), is located to the east of the Former Buffalo Service Center and MW-09 Area. Historically, the 7th Street Site was used as a fuel filling station (i.e., source of petroleum release). The 7th Street Site was remediated under the NYSDEC Brownfield Cleanup Program. The remediation consisted of an excavation program in which petroleum impacted soil/fill material at the 7th Street Site was removed. As indicated by confirmation samples #2, #3, and #5, soils/fill material left in place due to a utility corridor along the northern edge of the excavation remain contaminated by the historic petroleum release (Figure 1).

Historic groundwater elevations (i.e., before the remedial excavation and dewatering activities) indicate that MW-09 is in a location that could be downgradient of both the Former Buffalo Service Center and the 7th Street Site or areas north of these sites along the sewer system alignment(Attachment A). Historic groundwater data indicated that elevated concentrations of benzene were limited to MW-31 (replaced by MW-03) east of MW-09 (Figure 1); petroleum impacted soil/fill material is present upgradient of MW-31/MW-03. Conversely, the most recent historic (prior to remediation) data collected from wells located on the Former Buffalo Service Center Site (MW-01-26, MW-00-09, and MW-00-10) did not contain elevated concentrations of benzene (Figure 1).

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The nearest excavation associated with the Former Buffalo Service Center is shown on Figure 1. This excavation was required due to elevated polycyclic aromatic hydrocarbons concentrations ([PAHs] i.e., total PAHs exceeded 500,000 micrograms per kilogram). Benzene was not detected or detected below site-specific action levels at this location before remediation.

As previously discussed with NYSDEC, MW-09 was likely impacted by conditions associated with the former fuel filling station (east of MW-09) or an unknown upgradient source to the north associated with the historical industrial uses of the area. As discussed with NYSDEC on May 7, 2008, the following investigation/feasibility objectives were defined:

- Determine the source of the benzene
- Identify an action that would reduce the benzene concentrations in the vicinity of MW-09 relatively quickly

The following information discusses the investigation approach proposed to satisfy these objectives.

Field Procedures

WSP will complete all field activities in accordance with WSP Engineering's Standard Operating Procedures (SOPs) (Attachment B), as well as the Site-specific Health and Safety Plan and Site Management Plan. Sample custody is controlled and maintained through a set of chain-of-custody procedures that track the possession and handling of the samples from the field to the laboratory. A sample is considered to be in an individual's custody if it is physically in their possession or stored in an appropriate shipping container that has been secured to prevent tampering. WSP Engineering field personnel will be responsible for the custody of samples from the time they are collected until they are transferred to the laboratory. The cooler will remain in the sampler's view or locked in the sampling vehicle for temporary storage. A copy of the chain-of-custody form will accompany each sample shipment. The sampling team will sign, date, and note the time on the chain-of-custody form before shipping the samples. The completed original chain-of-custody form will be placed in a plastic bag, sealed, and taped to the inside lid of the shipping container. If multiple shipping containers are used, separate chain-of-custody forms will be placed in each container. Signed and dated custody seals will be placed on each sample cooler before shipping to verify that the container was not opened or tampered with in transit. WSP Engineering will retain the carbon copy of the completed chain-of-custody form as part of the project file. The laboratory will assume custody of the samples upon receipt.

Groundwater Elevation Measurements

Depth to groundwater measurements will be collected from MW-09, MW-11, MW-03, BCP-MW-02, BCP-MW-04, and BCP-MW-05 in accordance with WSP SOP No. 3. The depth to groundwater (feet) measurements will be converted to feet mean sea level (elevation) by subtracting the depth to water from the elevation of the surveyors mark (top of casing).

Groundwater Sampling – Direct Push Locations

Groundwater samples will be collected from three direct-push boring locations (DP-08-04, DP-08-05 and DP-08-06) (Figure 1). The field engineer has the authority to add sample locations based on field conditions. Prior to the installation of the borings, underground utilities will be located in accordance with WSP SOP No. 23.

The borings will be advanced with a direct-push drill rig to approximately 24 feet below ground surface (ft-bgs) (approximate base elevation of MW-09) or refusal. Continuous soil samples will be collected from all borings with a Macro-Core® sampler (or similar) equipped with a disposable acetate liner. The soils will be screened with a portable flame ionization detector for organic vapors and logged using the USCS classification system.

Groundwater samples will be collected with a screen point sampler. The sampler will be driven to the termination depth, at which point the outer sheath will be retracted, and the screen exposed. Grab groundwater samples will be collected directly from the screen point sampler using a bailer or a peristaltic pump set at a low flow rate after approximately 1 volume of groundwater is removed from the sampler and rods. Depth to water and water quality parameters will not be measured.

After removal of the sampler and drill rods, the borehole will be backfilled with bentonite chips and capped with asphalt, concrete, or topsoil. All downhole equipment will be decontaminated before commencing site activities, and between boreholes, with a non-phosphate soap wash, followed by a potable water rinse.

Groundwater Sampling – Monitoring Well Locations

Groundwater samples will be collected from MW-09 and MW-11. To obtain representative samples, each well will be purged by removing a minimum of three well volumes. The wells will be purged using a bailer or a peristaltic pump set at a low flow rate. Water quality parameters (pH, specific conductance, turbidity, and temperature) will be measured before, during, and after purging. Purging will be considered complete when three volumes or more have been removed and turbidity readings are less than 50 NTU. Wells evacuated to dryness before the removal of three well volumes will be considered purged.

All non-dedicated equipment will be decontaminated before use and between sampling locations with a non-phosphate soap wash, followed by a distilled water rinse.

Laboratory Handling and Protocols

All groundwater samples will be analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX) analysis by EPA Method 8260, polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270, turbidity by EPA Method 180.1, and total suspended solids (TSS) by EPA Method 160.2. The groundwater samples will be collected in the appropriate, pre-preserved, laboratory provided container. The samples will be properly labeled and placed in an ice-filled cooler in preparation for transport to STL Buffalo for analysis. WSP Engineering will handle samples under strict chain-of-custody procedures.

Data Summary

The data from the supplemental investigation will be tabulated and presented on a figure similar to Figure 1. If the investigation determines that further action is necessary and is QLT's responsibility, the need for a focused feasibility study will be addressed at that time.

Proposed Schedule

The schedule is dependent on obtaining access from the City of Buffalo and Waterfront School representatives. The three proposed sampling locations and permanent wells (MW-09 and MW-11) are situated on the City of Buffalo/school property. After access is obtained, field work can begin in approximately two weeks.

If you have any questions, please do not hesitate to contact me at (412) 604-1040.

Sincerely,

Glen E. Rieger
Senior Project Director

GER:EMH:eal
K:\QLT Buffalo\080190\MW-09 Work Plan\WP MW-09 062708.doc

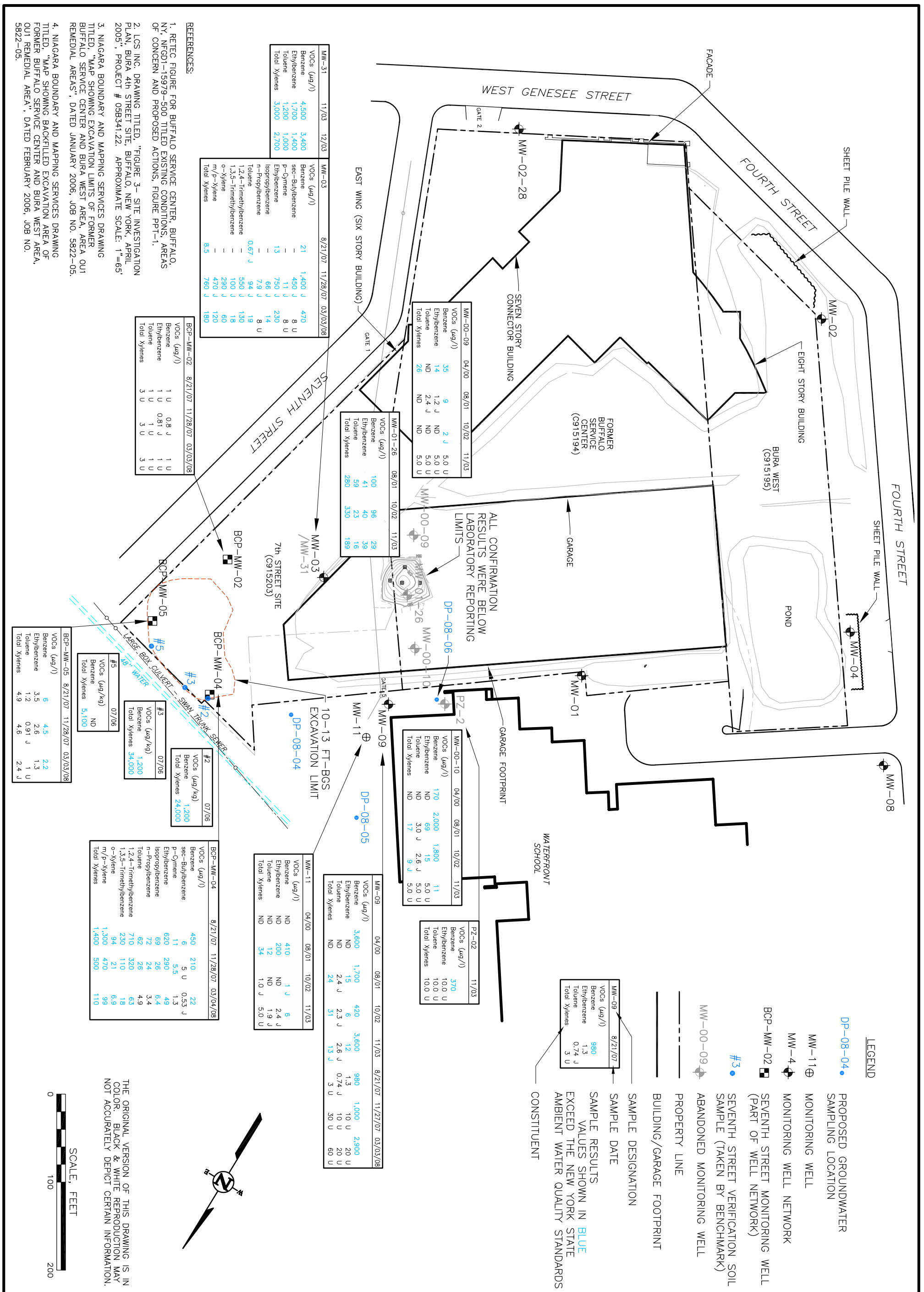
Enclosures

cc: James Clark, National Fuel Gas Distribution Corp.
David Flynn, Phillips Lytle, LLP
Pat Shea, Duke Realty Corporation
Dennis Harkawik, Jaekle Fleischmann & Mugel, LLP
Tanya Alexander, National Fuel Gas Distribution Corp.
Gary Litwin, New York State Department of Health
Maura C. Desmond, Esq., New York State Department of Environmental Conservation

Enclosures

Figure

R:\AutoCAD DWGs\080\080190 QLT Buffalo\080190B08.dwg, 5/31/2008 10:17:50 AM, usrz01165



MW-31	11/03	12/03
VOCs (µg/l)		
Benzene	4,500	3,400
Ethylbenzene	1,700	1,400
Toluene	1,200	1,000
Total Xylenes	3,000	2,700

MW-03	8/21/07	11/28/07	03/03/08
VOCs (µg/l)			
Benzene	21	1,400 J	470
sec-Butylbenzene	–	450 J	8 U
p-Cymene	–	11 J	8 U
Ethylbenzene	13	750 J	230
Isopropylbenzene	–	66 J	14
n-Propylbenzene	–	7.9 J	8 U
Toluene	0.67 J	94 J	19
1,2,4-Trimethylbenzene	–	550 J	130
1,3,5-Trimethylbenzene	–	100 J	18
o-Xylene	–	290 J	60
m/p-Xylene	–	470 J	120
Total Xylenes	8.5	760 J	180

MW-00-09	04/00	08/01	10/02	11/03
VOCs (µg/l)				
Benzene	35	9	2 J	5.0 U
Ethylbenzene	14	1.2 J	ND	5.0 U
Toluene	ND	2.4 J	ND	5.0 U
Total Xylenes	26	ND	ND	5.0 U

MW-01-26	08/01	10/02	11/03
VOCs (µg/l)			
Benzene	100	96	29
Ethylbenzene	41	40	39
Toluene	59	23	16
Total Xylenes	280	330	189

MW-00-10	04/00	08/01	10/02	11/03
VOCs (µg/l)				
Benzene	170	2,000	1,800	11
Ethylbenzene	ND	69	15	5.0 U
Toluene	ND	3.0 J	2.6 J	5.0 U
Total Xylenes	17		9 J	5.0 U

PZ-02	11/03
VOCs (µg/l)	
Benzene	370
Ethylbenzene	10.0 U
Toluene	10.0 U
Total Xylenes	10.0 U

MW-09	8/21/07
VOCs (µg/l)	
Benzene	980
Ethylbenzene	1.3
Toluene	0.74 J
Total Xylenes	3 U

MW-09	04/00	08/01	10/02	11/03	8/21/07	11/27/07	03/03/08
VOCs (µg/l)							
Benzene	ND	1,700	420	3,600	980	1,000	2,900
sec-Butylbenzene	ND	15	6	12	1.3	10 U	20 U
Ethylbenzene	ND	2.4 J	2.3 J	2.6 J	0.74 J	10 U	20 U
Toluene	ND	24	31	13 J	3 U	30 U	60 U

MW-11	04/00	08/01	10/02	11/03
VOCs (µg/l)				
Benzene	ND	410	1 J	6
Ethylbenzene	ND	200	ND	2.4 J
Toluene	ND	12	ND	1.9 J
Total Xylenes	ND	34	1.0 J	5.0 U

BCP-MW-04	8/21/07	11/28/07	03/04/08
VOCs (µg/l)			
Benzene	450	210	22
sec-Butylbenzene	6	5 U	0.53 J
p-Cymene	11	5.5	1.3
Ethylbenzene	620	290	49
Isopropylbenzene	69	26	6.4
n-Propylbenzene	72	24	3.4
Toluene	62	26	4.9
1,2,4-Trimethylbenzene	710	320	63
1,3,5-Trimethylbenzene	230	110	18
o-Xylene	94	21	6.9
m/p-Xylene	1,300	470	99
Total Xylenes	1,400	500	110

BCP-MW-05	8/21/07	11/28/07	03/03/08
VOCs (µg/l)			
Benzene	6	4.5	2.2
Ethylbenzene	3.5	2.6	1.3
Toluene	1.2	0.91 J	1 U
Total Xylenes	4.9	4.6	2.4 J

BCP-MW-02	8/21/07	11/28/07	03/03/08
VOCs (µg/l)			
Benzene	1 U	0.8 J	1 U
Ethylbenzene	1 U	0.81 J	1 U
Toluene	1 U	1 U	1 U
Total Xylenes	3 U	3 U	3 U

#2	07/06
VOCs (µg/kg)	
Benzene	1,200
Total Xylenes	24,000

#3	07/06
VOCs (µg/kg)	
Benzene	1,200
Total Xylenes	34,000

#5	07/06
VOCs (µg/kg)	
Benzene	ND
Total Xylenes	5,100

REFERENCES:

1. RETEC FIGURE FOR BUFFALO SERVICE CENTER, BUFFALO, NY, NFGD1-15979-500 TITLED EXISTING CONDITIONS, AREAS OF CONCERN AND PROPOSED ACTIONS, FIGURE FPT-1.
2. LCS INC. DRAWING TITLED, "FIGURE 3- SITE INVESTIGATION PLAN, BURA 4th STREET SITE, BUFFALO, NEW YORK, APRIL 2005", PROJECT # 05B341.22. APPROXIMATE SCALE: 1"=65'
3. NIAGARA BOUNDARY AND MAPPING SERVICES DRAWING TITLED, "MAP SHOWING EXCAVATION LIMITS OF FORMER BUFFALO SERVICE CENTER AND BURA WEST AREA, AREA OU1 REMEDIAL AREAS", DATED JANUARY 2006, JOB NO. 5822-05.
4. NIAGARA BOUNDARY AND MAPPING SERVICES DRAWING TITLED, "MAP SHOWING BACKFILLED EXCAVATION AREA OF FORMER BUFFALO SERVICE CENTER AND BURA WEST AREA, OU1 REMEDIAL AREA", DATED FEBRUARY 2006, JOB NO. 5822-05.

LEGEND

- DP-08-04 PROPOSED GROUNDWATER SAMPLING LOCATION
- MW-11 MONITORING WELL
- MW-4 MONITORING WELL NETWORK
- BCP-MW-02 SEVENTH STREET MONITORING WELL (PART OF WELL NETWORK)
- #3 SEVENTH STREET VERIFICATION SOIL SAMPLE (TAKEN BY BENCHMARK)
- MW-00-09 ABANDONED MONITORING WELL
- PROPERTY LINE
- BUILDING/GARAGE FOOTPRINT
- SAMPLE DESIGNATION
- SAMPLE DATE
- SAMPLE RESULTS VALUES SHOWN IN BLUE EXCEED THE NEW YORK STATE AMBIENT WATER QUALITY STANDARDS
- CONSTITUENT

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

SCALE, FEET
0 100 200

WSP ENGINEERING OF NEW YORK, P.C.
750 HOLIDAY DRIVE, SUITE 410
PITTSBURGH, PA 15220 412-604-1040

FIGURE 1

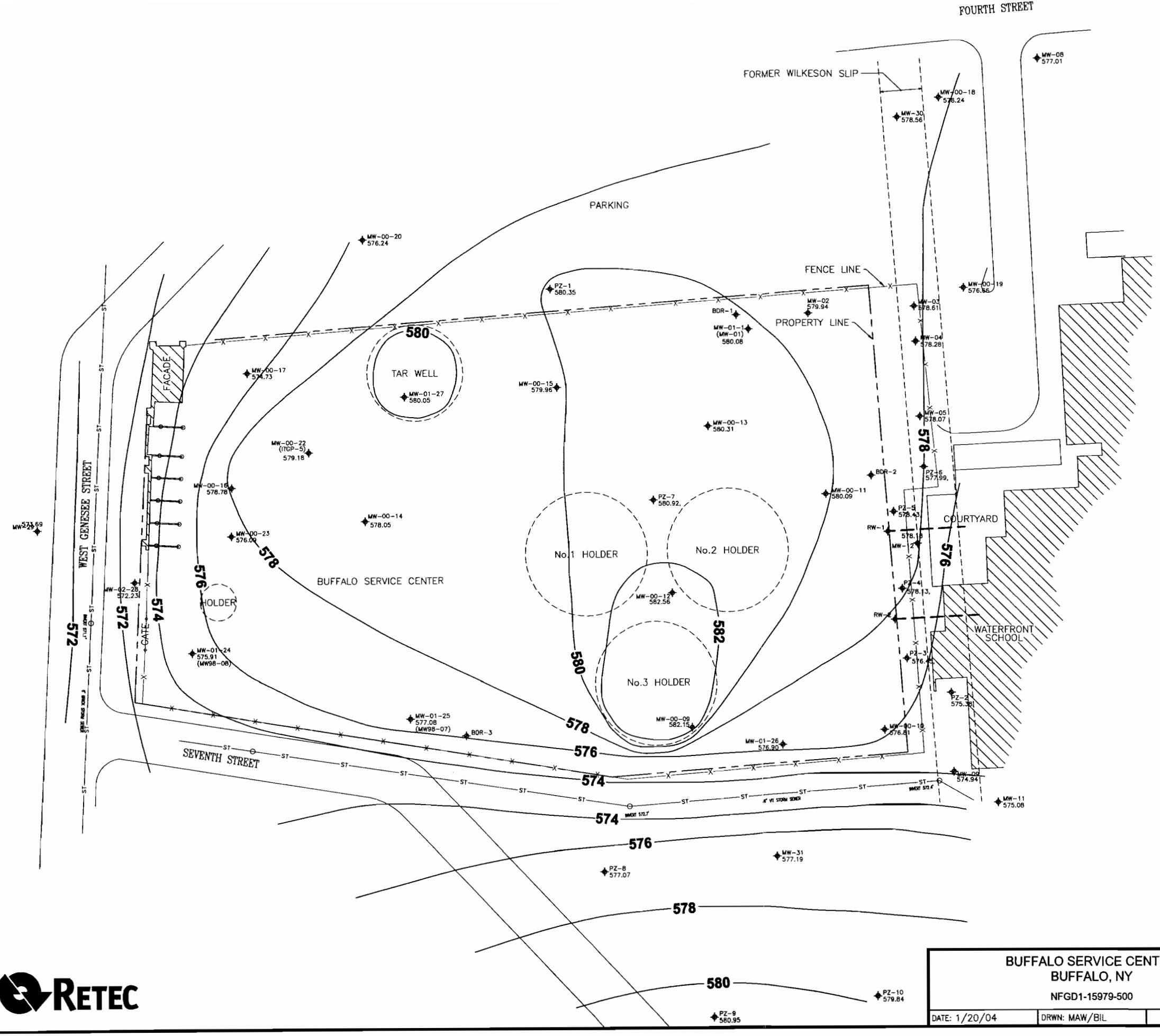
GROUNDWATER SAMPLING RESULTS
MW-09 AREA INVESTIGATION

WATERFRONT SCHOOL PROPERTY
BUFFALO, NEW YORK

PREPARED FOR
QLT BUFFALO LLC
BUFFALO, NEW YORK

Drawn By: RAZ 052208
Checked:
Approved:
DWG Name: 080190-B08

Attachment A



NOTES:

1) FIGURE BASED ON INVESTIGATION RESULTS REPORT BY IT CORP., JANUARY 2002, PRE-DESIGN INVESTIGATION FIELDWORK BY RETEC 2003, AND SURVEYS BY NIAGARA BOUNDARY L.S.P.C., AUGUST 2002 AND AUGUST 2003.

2) ELEVATION OF PZ-8, PZ-9 AND PZ-10 MEASURED DECEMBER 30TH AND ADJUSTED TO ACCOUNT FOR 0.60' RISE IN ELEVATION SINCE NOVEMBER, AS MEASURED AT MW-31.

3) BEDROCK GROUNDWATER ELEVATIONS (MEASURED AT BDR-1, BDR-2 AND BDR-3) ARE NOT INCLUDED.

LEGEND

- MONITORING WELL OR TEMPORARY PIEZOMETER
- ANGLED BORING AND RECOVERY WELL
- FENCE
- NFG PROPERTY LINE
- SUBSURFACE FEATURE
- ST STORM SEWER

40 0 80

1"=80'

RETEC

BUFFALO SERVICE CENTER BUFFALO, NY NFGD1-15979-500			GROUNDWATER ELEVATION NOVEMBER 2003
DATE: 1/20/04	DRWN: MAW/BIL		FIGURE 10

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Attachment B

Standard Operating Procedure – 1

Note Taking and Log Book Entries

Materials:

Permanently bound log book (no spiral-bound log books)
Black or blue ballpoint pen (waterproof ink)

Procedure:

1. Use black or blue ballpoint pen with waterproof ink. Felt-tip pens should not be used.

2. Reserve the inside front cover for business cards from key personnel who visit the site (including the person in charge of the log book).

3. On the first page of the log book, place a return for reward notice, WSP Engineering's phone number, and the project manager's name.

4. Enter the following on the second page of the log book: project name, project number, project manager's name, onsite contacts, onsite telephone number and address, telephone numbers for all key personnel, and emergency fire and medical telephone numbers.

5. Number each page, initial each page, and put the date at the top of each page. Start a new page for each day. At the end of a day, summarize the day's activities, sign the page, and put a slash through the rest of the blank lines. Start the next day on a new page.

6. Enter the time (in military time, e.g., 0830) in the left column of each page when an entry is recorded in the field notebook.

7. If a mistake is made in an entry, cross out the mistake with one line and initial the end of the line.

8. At all times, maintain the chain of custody on the field log book.

Content:

1. Be sure that log book entries are LEGIBLE and contain accurate and inclusive documentation of project field activities.

2. Provide sufficient detail to enable others to reconstruct the activities observed.

3. Thoroughly describe all field activities while onsite. Be objective, factual, and thorough. Language should be free of personal feelings or other terminology that might prove inappropriate.

4. Describe problems, delays, and any unusual occurrences such as wrong equipment or breakdowns along with the resolutions and recommendations that resulted.

5. Fully document any deviations from or changes in the work plan.

6. Describe the weather and changes in the weather, particularly during sampling events.

7. Sketch a map of the facility or areas onsite where activities are occurring, especially the location of sampling points.

8. During sampling activities, record all information pertaining to the sampling event. Include descriptive locations and diagrams of the sample locations, time, sample media, analysis, sampling procedure, equipment used, sizes and types of containers, preservation and any resulting reactions, sampling identification (especially for duplicate samples), shipping procedures (record airbill numbers), and addresses.

9. Note decontamination or disposal procedures for all equipment, samples, and protective clothing and how effectively each is performed.

10. If possible, photograph all sample locations and areas of interest. Maintain a photographic log in the field log book and include:

    Date, time, photographer, name of site, general direction faced, description of the subject taken, and sequential number of the photograph and the roll number.

11. Record the names and affiliations of key personnel onsite each day.

12. List all field equipment used and record field measurements, including distances, monitoring and testing instrument readings (e.g., photoionization detector (PID), organic vapor analyzer (OVA), pH, conductivity, model numbers, etc.), and calibration activities.

13. Record proposed work schedules and changes in current schedules in the log book.

14. Describe site security measures.

15. Include drum inventory for all investigation-derived waste (IDW) materials generated during site activities. Provide information on how IDW material was labeled.

Standard Operating Procedure - 2

Sample Container, Preservatives, & Holding Times

Scope:

This operating procedure describes the ways and means of selecting the appropriate sampling containers for environmental sampling.

Application:

The purpose of this procedure is to assure that sample volumes and preservatives are sufficient for analytical services required under EPA-approved protocols.

Materials:

Sample containers
Sample container labels
Indelible (waterproof) markers or pens
Clear tape

Procedures:

1. Refer to Table 1 for minimum sample volume and glassware types required for sampling a particular matrix and compound class.

2. Select the appropriate glassware (i.e., bottles or jars) from those provided by the analytical laboratory. Verify that the analytical laboratory has provided the correct number of sample containers and the correct preservatives for the project per the sampling plan requirements.

3. The analytical laboratory should always provide extra sample containers for all analytical parameters in case of breakage or other problems encountered in the field. This is particularly true for VOC sample containers (i.e., 40-ml vials).

4. Report any discrepancies or non-receipt of specific types of sample containers to the Quality Assurance Officer immediately. Arrangements should be made with the laboratory to immediately ship the missing or additional sampling containers to the project site.

5. Apply WSP Engineering sample labels to the sample containers.

6. Information on the sample labels should contain the following data:

    Site/Project name
    Project/Task number
    Unique sample identification number
    Sample date
    Time of sample collection (military system, e.g., 0000 to 2400 hours)
    Analytical parameters
    Preservative
    Sampling personnel

7. Once sample containers are properly labeled, the sample labels should be wrapped with clear tape to prevent deterioration of sample label.

8. Proceed with the sample collection per the sampling plan requirements.

9. Collected samples should be immediately placed in an iced cooler to maintain as close as possible a 4°C atmosphere for shipment to the analytical laboratory. Follow sample shipping procedures detailed in Sample Shipping Standard Operating Procedures.

10. Recommended order of sample collection:

In-situ measurements (e.g., temperature, pH, specific conductance)
Volatile organic analytes (VOA)
Purgeable organic carbon (POC)
Purgeable organic halogens (POX)
Total organic halogens (TOX)
Total organic carbon (TOC)
Extractable organics
Total petroleum hydrocarbons (TPH)
Total metals
Dissolved metals
Microbiologicals
Phenols
Cyanide
Sulfate and chloride
Turbidity
Nitrate and ammonia
Radionuclides

Table 1 – Sample Containers, Preservatives, and Holding Times

Analytical Parameter	Matrix	Sampling Container Size and Type	Preservatives	Maximum Holding Time
Metals, except mercury and hexavalent chromium	Solid	8-oz. glass jar	Cool to 4o C	180 days
Mercury	Solid	8-oz. glass jar	Cool to 4o C	28 days
Hexavalent chromium	Solid	8-oz. glass jar	Cool to 4o C	24 hours
Metals, except mercury and hexavalent chromium	Aqueous	500-ml plastic container with Teflon-lined plastic cap	HNO3, pH<2 Cool to 4o C	180 days
Mercury	Aqueous	500-ml plastic container with Teflon-lined plastic cap	HNO3, pH<2 Cool to 4o C	28 days
Hexavalent chromium	Aqueous	500-ml plastic container with Teflon-lined plastic cap	Cool to 4o C	24 hours
Volatile organics	Solid	4-oz. glass jar with Teflon-lined cap	Cool to 4o C	14 days
Volatile organics	Aqueous	Three 40-ml glass vials with Teflon-lined caps	HCl, pH<2 Cool to 4o C	14 days

Analytical Parameter	**Matrix**	**Sampling Container Size and Type**	**Preservatives**	**Maximum Holding Time**
Semivolatile organics	Solid	8-oz. amber glass jar with Teflon-lined cap	Cool to 4o C	14 days to extraction 40 days from extraction to analysis
Semivolatile organics	Aqueous	Two 1,000-ml amber glass jars with Teflon-lined caps	Cool to 4o C	7 days to extraction 40 days from extraction to analysis
Cyanide	Solid	8-oz. glass jar	Cool to 4o C	14 days
Cyanide	Aqueous	One 500-ml plastic container	NaOH, pH>12, Cool to 4o C	14 days
TCLP Volatiles	Solid	8-oz. glass jar with Teflon-lined cap	Cool to 4o C	14 days to TCLP extraction 14 days from extraction to analysis
TCLP Semivolatile Organics	Solid	8-oz. glass jar	Cool to 4o C	14 days for TCLP extraction 7 days for preparative extraction 40 days from extraction to analysis
TCLP Metals, except Mercury	Solid	8-oz. glass jar	Cool to 4o C	180 days for TCLP extraction 180 days from preparative extraction to analysis

Analytical Parameter	**Matrix**	**Sampling Container Size and Type**	**Preservatives**	**Maximum Holding Time**
TCLP Mercury	Solid	8-oz. glass jar	Cool to 4o C	28 days for TCLP extraction 28 days from preparative extraction to analysis
Total Petroleum Hydrocarbons	Solid	4-oz. glass jar with Teflon-lined cap	Cool to 4o C	14 days for extraction 40 days for analysis
Total Petroleum Hydrocarbons (EPA Method 418.1)	Aqueous	1-liter amber glass jar	Cool to 4o C	14 days for extraction 40 days for analysis
Total Petroleum Hydrocarbons (EPA Method 8015 GRO)	Aqueous	2 40-ml glass vials	Cool to 4o C	14 days for extraction 40 days for analysis
Total Petroleum Hydrocarbons (EPA Method 8015 DRO)	Aqueous	2 40-ml glass vials	Cool to 4o C	14 days for extraction 40 days for analysis

Standard Operating Procedure - 3

Groundwater Sampling

Materials:

Bound sampling notebook
Groundwater monitoring data log forms
Well key
Adjustable wrench or manhole wrench
Plastic sheeting
Photoionization detector (PID)
Flashlight or mirror
Electronic water level indicator or interface probe
Bailer (bottom loading)
Pump (for purging)
Nylon or polyethylene rope
Temperature, pH, and conductivity meters
Other field meters, as appropriate (i.e., turbidity meter, DO meter, etc.)
Sample bottles, labels, indelible markers, and clear tape
Peristaltic pump
0.45-micron filter
Teflon tubing
Polyethylene tubing
Pocket knife or scissors
Saranex or Tyvek suit (if required by Health & Safety Plan)
Nitrile gloves
Vinyl gloves

Note: To sample using a low flow submersible pump, see SOP-3b.

Procedure:

1. Verify locations of wells, media to be sampled, and parameters to be analyzed for as specified in the sampling plan.

2. Prepare field log book with description of site, weather, participants, and other relevant observations, including all sampling data necessary to complete the groundwater monitoring data log (Refer to SOP-1). Inspect the well for soundness of protective casing and surface ground seal.

3. With the field personnel in Level C personal protective equipment, unless historical data warrants downgrading to Level D protective equipment, survey around the base of the well and wellhead with a PID; remove well cap, place probe of PID in wellhead, and record PID response in field book. Survey breathing zone to ensure that the level of personal protection is appropriate. Note observations on the groundwater monitoring data log.

4. Check for floating product layer (LNAPLs) and sinking free product layer (DNAPLs). Measure thickness with an oil/water interface probe in accordance with EPA or state guidance documents or requirements. (If NAPL sampling is required, see the sampling procedures in SOP-3a).

5. Measure the casing inside diameter (CID) and record in inches. From the top of the casing, measure the depth (in feet) to water (DTW) with an electronic water level indicator and record in the field log book. Static water level measurements must be recorded from the surveyor's mark at the top of the casing, if present. If no mark is present, mark a location with a metal file or indelible marker on the casing for future reference. Measure and record the total depth (in feet) (TD) of the well.

6. Monitoring wells should be sampled by starting with the upgradient (or clean wells) and proceeding downgradient (in the order from most to least contaminated wells) for the remaining monitoring wells.

7. Calculate the length of the water column in the well casing:

   length = (TD - DTW)

   Calculate the volume of water in gallons in one well casing:

   For a 2-inch well: or $vol=0.041\ d^2h$

   vol = [(TD - DTW) * 0.16] where: h = TD-DTW

   For a 4-inch well: d = diameter of well

   vol = [(TD - DTW) * 0.65]

   For a 6-inch well:

   vol = [(TD - DTW) * 1.47]

   or calculate the volume using the formula:

   $vol = (TD - DTW)(CID)^2(0.041)$ CID=casing inside diameter in inches

8. Remove a minimum of three well volumes before sampling. To determine the number of gallons required to purge the well, multiply the number of gallons in one well volume (calculations above) by three. Record the minimum purge volume in the field log book. Record water color, suspended particulates, discoloration of casing, casing diameter and material, any unusual occurrences during sampling, and any pertinent weather details in the field log book.

9. Place plastic sheeting around the well before beginning purging process. Once plastic is around well, the purging process may begin. Do not allow the bailer rope to come into contact with the ground surface (i.e., keep the rope on the plastic). Keep the plastic as clean as possible.

10. Carefully lower the bailer attached to bailer cord into the well and allow the bottom to sink 1 foot below the water surface to capture surficial water only. Remove bailer and inspect it for LNAPL. If any are found, or if sampling plan requires, secure samples of the LNAPL in accordance with SOP-3a for analysis if sufficient volume is present. Place collected samples on ice. DO NOT PURGE OR SAMPLE GROUNDWATER IN WELL CONTAINING LNAPL.

11. During the purging process, geochemical measurements (e.g., pH, conductivity, turbidity, and temperature) should be collected a minimum of four times (i.e., before purging and after the removal of each well volume). Record these data in the field log book.

12. Continue bailing at a uniform rate. Each time, empty the bailer into a calibrated container for measurement. Dispose of the contents in an appropriate container for later disposal in compliance with federal and state laws.

13. A decontaminated submersible pump may be used in place of a bailer to purge wells when the diameter of the well is large or the purge volume is large. Refer to SOP-16 for submersible pump decontamination procedures.

14. If well is bailed dry before removing three well volumes, allow well to recharge and proceed to sample. Wells shall not be bailed dry if doing so will cause recharge water to enter the well in a cascading fashion but instead will be bailed at a rate which will minimize the agitation of recharged water. If full recovery exceeds 2 hours, sample as soon as sufficient volume is available within 3 hours of purging.

15. After the minimum purge volume has been removed, review the geochemical measurements to ensure that readings have stabilized. Readings should be within 10% of the previous reading. If the geochemical measurements have not stabilized, continue to purge the well until the monitoring parameters do not vary more than 10 percent between two successive well volumes removed.

16. Affix a sample label to each sample container and complete all required information (sample no., date, time, sampler's initials, analysis, preservatives). Place clear tape over the label. Record sample number, well number, date, time, and the sampler's initials in the field book.

17. Collect the groundwater samples after purging is complete. While collecting samples, lower the bailer slowly to avoid agitating the water. Sample first for VOCs, taking care to remove all air bubbles from the vial and minimize agitation. Collect remaining organic samples then inorganic samples.

    The recommended order of sample collection is as follows:

    In field measurements (e.g., temperature, pH, specific conductance, turbidity, dissolved oxygen)
    Volatile organic compounds (VOCs)
    Purgeable organic carbon (POC)
    Purgeable organic halogens (POX)
    Total organic halons (TOX)
    Total organic carbon (TOC)
    Extractable organics
    Total metals
    Dissolved metals
    Phenols
    Cyanide
    Sulfate and chloride
    Turbidity
    Nitrate and ammonia
    Radionuclides

18. Thoroughly decontaminate all equipment used before proceeding to the next well. Discard used bailer cord, plastic sheeting, towels, gloves, etc., in a plastic bag.

19. Complete chain-of-custody forms with appropriate sampling information.

20. Complete both front and back of the groundwater monitoring data log (attachment) for each monitoring well or sampling point upon return from the field, using data from the field log book.

Filtering of Metal Samples:

1. Assemble peristaltic pump per operating manual instructions, which accompany pump.

2. At the pump intake, attach polyethylene tubing to the tubing at the head of the peristaltic pump. The polyethylene tubing should be long enough to extend to the bottom of the bailer. At the pump discharge end, attach a clean 0.45-micron filter (or appropriate sized filter) to the Teflon tubing.

3. Turn on the pump and draw the water from the bailer, through the pump and filter, and into the sample container.

4. Disassemble the pump head and discard the polyethylene and Teflon tubing and filter in a plastic bag.

Attachment 1 – Groundwater Monitoring Data Log
Found on next page

Groundwater Monitoring Data Log

Well No./Designation _____ Date: _____

Site Data

Site Name: _____ WSP Engineering Sampling Team _____

Site Address: _____ WSP Engineering Project No.: _____

Weather Conditions: _____

Well Description

Well Location: _____

Well Security: _____

Casing Material: Inner _____ Outer _____

Organic Vapors (PID, OVA, TIP): Wellhead _____ ppm

Breathing Zone _____ ppm

Nonaqueous Phase (thickness): _____

Reference Point (e.g., top of PVC casing): _____

Purge Data

Purge Method: _____

(Note: Allow water level to equilibrate after removing well cap)

Total Well Depth (TD): _____ ft Depth to Water (DTW): _____

Casing Inner Diameter (CID): _____ inches

To calculate well volume: Well Vol.(gal)=$(CID)^2(0.04)(TD-DTW)$

Well Volume: _____ gal x 3=Purge Volume _____ gal

Purge Time: Begin _____ End _____

Data: Temp _____ pH _____ Spec. Cond._____Turb. _____Other _____

Volume 1: Temp _____ pH _____ Spec. Cond._____Turb. _____Other _____

Volume 2: Temp _____ pH _____ Spec. Cond._____Turb. _____Other _____

Volume 3: Temp _____ pH _____ Spec. Cond._____Turb. _____Other _____

Volume 4: Temp _____ pH _____ Spec. Cond._____Turb. _____Other _____

Volume 5: Temp _____ pH _____ Spec. Cond._____Turb. _____Other _____

Volume Purged: _____ Purged Dry: Yes No

Disposal Method for Purgewater: _____

Water Description

Odor: Prepurge _____ Postpurge _____

Color: Prepurge _____ Postpurge _____

Sampling Data

Sampling Method: _____

Sampling Time: Begin _____ End _____

Analytical Parameters (circle appropriate parameters):

VOCs BNA BNE Total (Unfiltered) Metals

Dissolved (Filtered) Metals TPH PCB Cyanide

Other: _____

_____

Comments: _____

_____

_____

Standard Operating Procedure - 17

Decontamination of Water Level Indicators

Materials:

Field logbook
Personal protective equipment (PPE)
Non-phosphate detergent (e.g., Liquinox or Alconox)
Deionized water
Isopropanol
Two buckets
Spray bottles
Paper towels

Note: To limit the potential for cross-contamination between wells, wells should be gauged in the order of increasing constituent concentrations whenever possible.

Decontamination Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. If the groundwater is grossly contaminated (i.e., LNAPL or DNAPL is present), the tape should be pulled out of the well, NOT reeled up, and placed directly into a bucket of nonphosphate detergent and tap water. The tape and probe should be scrubbed with a brush to remove visible contamination. The tape and probe should then be rinsed in a second bucket of tap water before proceeding with Step 3. If persistent stains or oily films remain, apply isopropanol to a paper towel and wipe the tape and probe until clean.

3. Thoroughly wet a paper towel with deionized water from a spray bottle. Fold the paper towel over the tape and wipe it as the tape is reeled up.

4. The water level probe should also be sprayed with deionized water and wiped dry with a clean paper towel.

5. Place water level indicator in the clean carrying case or in a clean plastic bag to prevent contamination during transportation.

6. Properly manage all PPE, used paper towels, and decontamination rinsates in accordance with state and federal requirements (See SOP 26).

Standard Operating Procedure - 18

Decontamination of Interface Probe

Materials:

Field logbook
Personal protective equipment (PPE)
Nonphosphate detergent (e.g., Liquinox or Alconox)
Deionized water
Isopropanol
Two buckets
Spray bottles
Paper towels

Decontamination Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. If the groundwater is grossly contaminated (i.e., LNAPL or DNAPL is present), the tape should be pulled out of the well, NOT reeled up, and placed directly into a bucket of nonphosphate detergent and tap water. The tape and probe should be scrubbed with a brush to remove visible contamination. The tape and probe should then be rinsed in a bucket of tap water before proceeding with Step 3. If persistent stains or oily films remain, apply isopropanol to a paper towel and wipe the tape and probe until clean.

3. Thoroughly wet a paper towel with deionized water from a spray bottle. Fold the paper towel over the tape and wipe it as the tape is reeled up.

4. The interface probe should be sprayed with deionized water and wiped dry with a clean paper towel.

5. Place the interface probe in the clean carrying case or in a clean plastic bag to prevent contamination during transportation.

6. Properly manage all PPE, used paper towels, and decontamination rinsates in accordance with state and federal requirements (See SOP 26).

Standard Operating Procedure - 19

Decontamination of Sampling Equipment

Materials:

Field logbook
Personal protective equipment (PPE)
Deionized water
10% nitric acid solution
Nylon brushes
Containers (e.g., garbage cans, buckets, plastic tubs)
Nonphosphate detergent (e.g., Liquinox or Alconox)
Isopropanol
Aluminum foil
Polyethylene sheeting
Plastic garbage bags
Paper towels
Spray bottles
Duct tape

Note: All sampling equipment must be decontaminated before shipment to the office.

Decontamination Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. Prepare a decontamination area by spreading polyethylene sheeting on a firm, flat surface (if possible). Create a berm around the decontamination area to contain inadvertent spillage. A berm can be created by rolling under the edges of the polysheeting or by draping the plastic over a wooden frame, etc.

3. Prepare a solution of nonphosphate detergent and tap water in a container.

4. Wipe sampling equipment with paper towels to remove residual soil or gross contamination. Heavy oils or grease may be removed with paper towels soaked with isopropanol.

5. Disassemble sampling equipment (e.g., split-spoon samplers and bailers). Wash equipment thoroughly in a nonphosphate detergent and hot tap water (if available) solution. Teflon bailers must be disassembled and the inside washed with a long-handled bottle brush or short-handled brush pulled through the bailer with rope.

6. Rinse the equipment with hot tap water (if available).

7. If the equipment will be used to collect samples for metals analysis, follow the tap water rinse with a 10% nitric acid solution rinse. Carbon steel equipment (e.g., bucket augers, split-spoons) should be rinsed with 1% nitric acid solution to reduce the potential for oxidizing the metal surfaces. Collect the nitric acid rinse in a separate bucket for proper disposal. Rinse the equipment with tap water.

8. Thoroughly rinse the equipment with deionized water.

9. Spray the equipment with isopropanol and allow to completely air dry. The solvent rinse must be collected in a separate bucket. Isopropanol is the recommended solvent for organic contaminants because it is readily available and is not a Department of Transportation hazardous material. However, other solvents (e.g., acetone, hexane, methanol) may be more effective in removing certain contaminants, such as oils or PCBs. Please note that many state programs and USEPA regions specify the solvents to be used for equipment decontamination.

10. Rinse the equipment with deionized water using at least five times the volume of solvent used in the previous step.

11. After the equipment has been allowed to completely air dry, each piece must be individually wrapped with aluminum foil (shiny side out), and then wrapped in plastic.

    Note: Decontamination solvents may introduce contaminants to environmental samples. It is very important to ensure that the equipment has completely dried before use or storage.

12. After the final decontamination event on a project, label each piece of equipment with the date of decontamination, the initials of decontamination personnel, and the type of decontamination solutions used.

13. Note any discrepancies from standard decontamination procedures in the field logbook.

14. Field decontamination presents unique problems in disposal of decontamination solutions. The spent wash water and rinse water can potentially be placed in the facility's waste water treatment system. However, field personnel should obtain approval from facility personnel and from the local POTW. If no wastewater treatment system is present onsite, or if approval cannot be obtained from the facility and local POTW, the wash water should be containerized for offsite disposal in accordance with state and federal requirements. The volume of spent solvent generated during field decontamination should be minimal. Solvents should be collected in separate buckets and allowed to evaporate. See SOP 26 for information on managing investigation-derived wastes.

15. Paper towels soaked with solvent should be allowed to air dry and be disposed of with the general trash. Under no circumstances should any decontamination solution be disposed of on soil surfaces.

Standard Operating Procedure – 20

Sample Shipping Procedures

Materials:

Suitable shipping container (e.g., plastic cooler or lab supplied styrofoam cooler)
Chain-of-custody forms
Custody seals
WSP Engineering mailing labels
Strapping, clear packing, or duct tape
Ziploc® plastic bags
Knife or scissors
Permanent marker
Latex or nitrile gloves
Large plastic garbage bag
Wet ice
Bubble wrap or other packing material
Universal sorbent materials
Sample container custody seals (if required)
Federal Express form (with WSP Engineering account number)
Vermiculite (or commercially available cat litter)

Procedures:

For shipping purposes, samples are segregated into two classes; environmental samples and restricted articles (i.e., hazardous materials). Environmental samples can also be categorized based on expected or historical analyte levels (i.e., low or high). An environmental sample is one that is not defined as a hazardous material by the Department of Transportation (DOT, 49 CFR Part 171.8). The DOT 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. Any material of a suspected hazardous nature, previously characterized as hazardous, or known to be hazardous is considered a restricted article.

In general, the two major concerns in shipping samples are protecting the samples from incidental breakage during shipment and complying with applicable DOT and courier requirements for restricted article shipments.

Protecting the samples from incidental breakage can be achieved using "common sense." All samples should be packed in a manner that will not allow them to freely move about in the cooler or shipping container. Glass surfaces should not be allowed to contact each other. When possible, repack the samples in the same materials that they were originally received in from the laboratory. Each container should be cushioned with plastic bubble wrap, styrofoam, or other nonreactive cushioning material. Shipping hazardous materials should conform to the packaging, marking, labeling, and shipping instructions identified in 49 CFR Parts 172 & 173.

Environmental samples shall be packed for shipment using the following procedures:

1. Line the shipping container with a large, heavy-duty plastic garbage bag. Place universal sorbent materials (e.g., sorbent pads) between the cooler and the heavy-duty plastic bag. The amount of sorbent material should be sufficient to absorb the volume of wet ice and aqueous samples. If using a plastic cooler, securely tape the drain plug closed on the outside of the cooler.

2. Place 2-4 inches of bubble wrap or other packing material inside the heavy-duty plastic bag in the bottom of the cooler.

3. The sample packer should wear latex or nitrile gloves when handling the samples during the packing process.

4. Place the bottles in the cooler with sufficient space to allow for the addition of more bubble wrap or other packing material between the bottles. Large or heavy sample containers should be placed on the bottom of the cooler with lighter samples (i.e., VOAs) placed on top to eliminate breakage.

5. Place the "wet ice" inside two sealed heavy-duty zipper-style plastic bags and package the bags of ice on top of or between the samples. Pack enough ice in the cooler to chill the samples during transit. If the cooler is shipped on a Friday or Saturday for Monday delivery, double the amount of ice placed in the cooler (Monday delivery should be used only as a last resort). Fill all remaining space with bubble wrap or other packing material. Securely close and seal with tape the top of the heavy-duty plastic bag.

6. Place chain-of-custody form (and, if applicable, CLP traffic reports) into a Ziploc® plastic bag and affix to the cooler's inside lid, then close the cooler. Securely fasten the top of the cooler shut with tape. Place two signed and dated chain-of-custody seals on the top and sides of the cooler so that the cooler cannot be opened without breaking the seals.

7. Once cooler is sealed, shake test the cooler to make sure that there are no loose sample containers in the cooler. If loose samples are detected, open the cooler and repack the samples.

8. Using clear tape, affix a mailing label with WSP Engineering’s return address to the top of the cooler.

9. Ship samples via priority overnight express to the contracted analytical laboratory for next morning delivery. If applicable, check the appropriate box on the airbill for Saturday delivery.

10. Declare value of samples on the shipping form for insurance purposes. The declared value should reflect the cost to recollect the samples.

11. Record the tracking numbers from the Federal Express forms in the field notebook and on the chain of custody form. Also, retain the customer's copy of the Federal Express airbill.

Hazardous materials should be packed according to the above procedures with the following additions:

1. Place samples in individual Ziploc® plastic bags and secure with a plastic tie or tape.

2. Place samples in paint cans in a manner which would prevent bottle breakage (i.e., do not place glass against glass).

3. Place vermiculite or other absorbent packing material in the paint can around the samples. The amount of packing material used should be sufficient to absorb the entire contents of the sample if the container is broken during shipment.

4. Secure a lid to the paint can with can clips and label the outside of the can with sample numbers and quantity. Mark the paint can with "This End Up" and arrow labels that indicate the proper upward position of the paint can.

5. Package the paint cans in DOT-authorized boxes or coolers, with appropriate DOT shipping labels and markings on two adjacent sides of the box or cooler.

6. Ship the restricted articles via overnight courier following the courier's documentation requirements. A special airbill must be completed for each shipment. Retain a copy of the airbill for WSP Engineering records and tracking purposes, if necessary.

Standard Operating Procedure – 21

Field Quality Assurance/Quality Control Samples

Materials:

Field logbook
Personal protective equipment (PPE)
Sample containers
Sample labels
Clear tape
Laboratory analyte free water
Clean or dedicated sampling equipment

Procedure:

1. Use appropriate PPE as specified in the site-specific health and safety plan.

2. Select the appropriate glassware for the field Quality Assurance/Quality Control (QA/QC) samples. Refer to the WSP Engineering Standard Operating Procedure for Sample Container, Preservatives, and Holding Times to determine the appropriate bottles to use.

3. Field QA/QC samples include the following:

   trip blanks
   duplicate samples
   equipment blanks

4. Trip blanks should be provided by the analytical laboratory for all projects where samples are being collected for analysis of volatile organic compounds (VOCs). Trip blanks should accompany the sample bottles from the analytical laboratory to the site, accompany the sample containers at all times during the sampling event, and return to the laboratory with the sample containers. One trip blank should be submitted to the analytical laboratory with each shipment containing samples for VOC analysis. The trip blank should be analyzed only for VOCs.

5. One duplicate sample should be collected for every 20 samples of each matrix (e.g., soil and groundwater) collected during each sampling event. Duplicate samples of soil and other solid matrices should be collected by dividing the sample material in half and alternately filling the two sample bottle sets. Duplicate samples of groundwater and other aqueous matrices should be collected by alternately filling the two sample bottle sets from the same sampling vessel (e.g., bailer). The appropriate SOP should be followed for the collection of each sample type (soil, groundwater, sediment, sludge). Duplicate samples should be analyzed for all the analytes that are being analyzed for during the sampling event.

6. One equipment blank should be collected in the field at a rate of one per type of equipment per decontamination event not to exceed one per day. If dedicated sampling equipment is used, the equipment blanks should be prepared in the field before sampling begins. If field decontamination of sampling equipment is required, the equipment blanks should be prepared after the equipment has been used and field-decontaminated at least once. Equipment blanks should be prepared by filling or rinsing the precleaned equipment with analyte-free water and

collecting the rinsate in the appropriate sample containers. The samples should be labeled, preserved, and filtered (if required) in the same manner as the environmental samples. Equipment blanks should be analyzed for all the analytes for which the environmental samples are being analyzed. Decontamination of the equipment following equipment blank procurement is not required.

7. All QA/QC samples should be submitted to the analytical laboratory with unique sample numbers. Therefore, the QA/QC samples should be labeled as separate environmental samples following the same numbering scheme used during that particular sampling event. However, the QA/QC samples should be clearly identified on WSP Engineering's copy of the chain-of-custody form and in the field logbook.

Standard Operating Procedure – 23

Underground Utility Locating

Application:

The purpose of this procedure is to ensure that all required and appropriate procedures are followed to locate and mark subsurface utilities (e.g., electrical lines, natural gas lines, communication lines) before initiating any intrusive field activities (e.g., drilling, test pits, trenching). Compliance with this procedure is mandatory before intrusive work can be conducted on a WSP Engineering project. This procedure is intended to allow the work to proceed safely and will minimize the potential for damaging underground utilities. Intrusive work includes all activities that require WSP Engineering's employees or their subcontractors to penetrate the ground surface. Examples of intrusive work include, but are not limited to probing, drilling, injection, test pit excavations, trenching, and remedial excavations.

Materials:

Record of the communication utility locating form (Attachment 1)
Field logbook
Wooden stakes
Spray paint
Flagging tape
As-built drawings for sub grade utilities (if available)
Hand auger or post-hole digger
Hand-held magnetometer or cable locator (optional, if and only if private utility locator has cleared the area and personnel have been properly trained in the use of the equipment)

Procedure:

Pre-site Mobilization

1. Gather the necessary information to complete the record of communication utility locating form (Attachment 1).

2. Contact the state utility locating service (e.g., One-Call, Miss-Dig). It is imperative to contact the locating service with sufficient lead-time to allow all utility providers to visit the site location. In each case, the state utility locating service will provide the caller with a legal dig date. Under no circumstances will intrusive work begin before the legal dig date provided by the call center. The telephone numbers for the locating service in selected states are listed in Table 1. However, the telephone number is typically listed in the area Yellow Pages. Provide the utility locating service with any information they request concerning the site and work activity in order to locate utilities at the site. Several states, including California, require that the proposed drilling locations be marked with white spray paint before contacting the locating services. The following information provided by the locating service should be documented in a record of communication utility locating form (Attachment 1): utility providers that will be contacted, and a utility clearance ticket number. The ticket number will be used by the various utility companies to reference the clearance request and to contact the caller with clearance verifications (see note below).

Note 1: Generally, the public utility companies will mark underground lines up to the private property boundary. However, you should request that the utility companies mark their utilities in the work areas on the site. If the utility companies will not provide that service, a private utility locating service **MUST** be contracted.

Note 2: Some utilities (e.g., sewer, water, cable TV) may not be included by the State locating service. The State locating service will provide you with a list of utilities that will be notified based on the information provided regarding the sites location. Compare this list with utilities generally expected at all sites (e.g., sewer, water, gas, communication, electric). If any expected utilities are absent from the contact list, you **MUST** contact the utilities directly for clearance before the start of intrusive activities. Record all contacts on the utility locating record of communication form.

3. Identify a site contact familiar with the utilities on the property (e.g., plant manager, facility engineer, maintenance supervisor), and provide this individual with a site plan showing the proposed locations of all soil borings, monitoring wells, test pits, and other areas where intrusive activities will be conducted. Ask the site contact for all drawings concerning underground utilities in the proposed work areas.

4. No intrusive work should be done before the legal dig date provided by the State utility locating service. No intrusive activities should be conducted along or near public right-of-ways until all utilities have been marked and visually verified in the area of investigation. In addition, **NO** field activities shall be conducted on private property unless the State locating service or a private utility locating service has confirmed the presence or clearance of onsite utilities.

Site Mobilization

1. Locate all proposed drilling and trenching locations, both onsite and offsite, with spray paint, stakes, or other appropriate markers.

2. Verify that **ALL** utility companies listed by the municipal locating service, and any contacted directly by WSP Engineering, have either marked the underground lines in the specified work areas or have responded with "no conflict." Document on the utility record of communication form as each utility mark is visually confirmed.

   Note: When receiving verbal clearances by telephone from utility companies, or their subcontractors, it is imperative that you verify which utilities are being cleared, particularly when dealing with subcontractors that may be marking more than one utility.

3. Review all available as-built utility diagrams and plans with the site contact to identify potential areas where underground lines may be present. The review should confirm the locations marked by the locating services and identify utilities that may have been omitted by the locating services. If the as-built drawings do not confirm utilities marked by the locating services, follow instructions in Section 6. If possible, obtain a copy(s) of the utility plans for future reference in the field.

   Conduct a site walk with the site contact. During the site walk, attempt to obtain a general knowledge of the types of utilities present in the work areas. Furthermore, survey your surroundings to identify features that require electricity (e.g., parking lot lights, pad-mounted

transformers) or suggest the presence of underground utilities, such as linear depressions in the ground. Check these items against the utility locating record of communication form checklist. For example, check to see whether major electrical lines are aboveground, or locate underground sewer lines by using the locations of manholes and storm water grates. Keep in mind that many sewer lines can be offset from catch basins.

4. A minimum of 4 feet clearance should exist between utilities and proposed drilling locations, and a minimum of 6 feet between utilities and proposed trenching locations. A minimum distance of 15 feet should be maintained by heavy equipment (e.g., excavator buckets, drill rig towers and rods) from overhead power lines. A safe distance of 25 feet should be maintained from high tension overhead power lines. In the event that work must be conducted within 25 feet of high tension wires, the lines should be wrapped and insulated by the local utilities. If a utility conflict is identified, adjust the proposed location(s) using the criteria given above. These minimum distances should be increased whenever possible to offer additional assurance that utilities will not be encountered.

5. A private utility locating service **MUST** be used for work on private property in cases where the public utility locating service does not mark utilities on the subject property. It is **NOT ACCEPTABLE** to rely on as-built drawings or verbal utility clearances. A private locator may not be necessary in rare instances; however, these cases must be discussed with the project manager **AND** a partner or executive partner of WSP Engineering before work may proceed.

   A listing of several private subsurface utility locating firms is provided in Table 2. In addition, a hand-held magnetometer or magnetic-cable locating device can be used to augment, but not replace, clearance for each work area. Use of this equipment is restricted to employees with proper training on the use of hand-held utility locating equipment. Proper training is defined as having working knowledge of the manufacturer's operating procedures, and the completion of at least one successful location under the supervision of a qualified person.

6. In some cases, state and private locating services may not be able to identify all utilities. In areas where uncertainty still exists concerning the presence of underground utilities after clearance by state and private locating services, a hand auger or post-hole digger can be used to probe the shallow subsurface before using any heavy equipment (drill rig, backhoe). The probe hole should be advanced a minimum of 4 feet below ground surface at each proposed drilling or excavation location. A sufficient number of probe holes should be completed so that the area is cleared for the proposed intrusive activity. For drilling, a minimum of three holes installed in a triangular pattern should be advanced at each location. The use of hand digging methods in **NO WAY** replaces the need State and private utility locating services. Hand digging techniques should only be employed if uncertainty regarding the location of underground lines still exists after clearances by the State locating service and a private locating service.

7. Discuss the site conditions with the subcontractor and recommend that care be used at the start of the intrusive activities. Field personnel should always consider the presence of unidentified utilities at each work area. In addition, field personnel have the authority and responsibility to postpone intrusive activities if insufficient information, as stipulated in this SOP, is available, or if onsite reconnaissance identifies inconsistencies in the findings of utility locators. In these instances, field personnel should contact the project manager or a member of the health and safety committee, and an executive partner or partner of WSP Engineering before proceeding with the proposed work. The first priority on every project is to ensure that the work is conducted safely.

Again, it is the requirement of this SOP to obtain site utility clearances from the State utility locating service. If the State locating service does not provide onsite (i.e., work area) utility clearance, a private locating service must be contracted to clear the work areas before digging, drilling, or probing begins. Although certain instances and site conditions may appear to allow intrusive work without prior clearance, **ALL** deviations from this SOP **MUST** be approved by the project manager and a partner or executive partner **BEFORE** beginning intrusive work.

8. If the scope of the intrusive activity locations changes, the scope of intrusion expands or includes a new onsite or offsite area(s), review the existing information to determine whether the area(s) can be safely cleared of all potential underground utilities. If necessary, contact the state locating service and request another clearance for the new area(s) of investigation and retain a private locator in accordance with Item 5 above. Remember, the new request will provide a new legal dig date before which NO INTRUSVE WORK CAN BEGIN. Additionally, if a clearance ticket will expire while the work is ongoing (typically after 14 days), a new clearance must be requested at before the first ticket expires so that work can continue uninterrupted. Refer to the communication utility locating form for the legal dig date time frame required by the State locating service.

PUBLIC and PRIVATE UTILITY LOCATING FORM

Project:_____ Project Manager:_____

Project Number:_____

Project Start Date:_____ Duration of Project:_____

Project Location (Site Address):_____

Project Site Description (complete the following with all information available *before* calling):

Work Being Done For: (*Company or Individual Name)*: _____

State: _____County:_____ City/Place: _____

Street: _____(*Only one street per ticket)* Zip Code:_____

Nearest Intersecting Street: _____

Lat/Long:_____Parcel/Tax map ID:_____

Description of the area to be marked *(Provide the following: Street working on, which side of street, how far in which direction from nearest intersecting street; etc.)*:

_____

_____

Locations for proposed borings or digging identified with paint and/or stakes? (circle one): YES NO N/A

NOW, MAKE THE CALL:

Call Placed to Phone No.: _____

Date of Call:_____Time of Call:_____a.m. / p.m.

Ticket No. Assigned to Location Request:_____

Assigned Legal Dig Date: ___ / ___ / ___ Assigned Legal Dig Time: ____ AM / PM

The Following Table Must Be Completed Before Work Can Begin:

CALL BACK/FAX BACK INFORMATION RECORD						
	Gas	Communication	Electric	Water	Sewer	Other
Responsible Company (provided by OneCall operator)						
Date Notified						
Time Notified						
Notified By						
Phone Number						
Marks Complete						
No Conflict						
No Facilities						

Calls Made By:_____ Form Completed By:_____

Project Manager Notified of Results (initial if completed):_____

Onsite Underground and Overhead Utility Clearance Checklist

Visual Confirmation of Marked Public Utilities:

Utility Type	Visual Cues	Marks Confirmed (initial)	No Markings Seen (initial)
Water	Blue Markings, fire hydrant, manholes; water meter, sprinkler heads, AST, hose bib		
Gas	Yellow Markings, gas meter, manholes; yellow bollards		
Electric	Red Markings, parking lot lights, overhead lines (telephone poles), underground vaults, manholes; conduit on buildings		
Sewer (sanitary/storm)	White or Blue Markings, underground vaults, manholes, drain grates		
Communication	Red or White Markings, red bollards, telephone poles; manholes; conduit on buildings		

Visual Confirmation of Marked Private Utilities (at onsite drilling/digging locations):

Utility Type	Visual Cues	Marks Confirmed	No Markings Seen (initial)	Not Applicable (initial)
Water	fire hydrant, manholes; water meter, ASTs, interior connections, hose bib, valve box			
Irrigation	sprinkler heads, hose bibs			
Gas	gas meter, manholes; yellow bollards, interior connections, valve box			
Electric	parking lot lights, interior connections, overhead lines, underground vaults, manholes, transformers/switchgear; conduit on buildings			
Sanitary/Storm/ Septic System	underground vaults, manholes, drain grates, leach field, sand mound, no evidence of sanitary sewer (for septic system			
Production Equipment	USTs (fill pipes and vent pipes), ASTs (overhead and underground pipelines), manholes/valve pits; pump islands			
Communication	Red/orange bollards, telephone poles, interior connections; manholes; conduit on buildings			

If any Utilities have "No Marking Seen" checked, private locating must be conducted to clear each drilling/digging area.

Site Visit Made By:_____

Form Completed By:_____

Standard Operating Procedure – 24

Soil Sampling Using GeoProbe® System or Equivalent

Application:

To perform depth-discrete soil sampling with 2-foot or 4-foot long samplers using hydraulically-driven soil sampling equipment (GeoProbe® System or Equivalent).

Materials:

Stainless steel soil sampler (2-foot or 4-foot long)
Clear acetate liners
Tape measure or expandable ruler
Utility knife
Photoionization detector (PID)
Stainless steel spoons
Aluminum tray or stainless steel mixing bowl[a]
Nitrile or latex gloves
Field notebook

Procedure:

1. Calibrate the PID in accordance to the manufacturer's instructions. Decontaminate all down-hole sampling equipment and the utility knife, spoons, and mixing bowl per SOP 19 before initiating any boring activities. Ensure that the location is clear of all underground utilities and pipelines.

2. Attach a decontaminated 2-foot or 4-foot long stainless steel sampler fitted with a new, clear acetate liner and a decontaminated removable cutting shoe to small-diameter rods. Lower the stainless steel sampler to the top of the desired sampling depth.

3. Advance the stainless steel sampler through the desired sample interval. Record in the dedicated field notebook the interval through which the sampler was pushed.

4. After the sampler has reached the desired depth, retrieve the sampler by first removing the rods and then disconnecting the sampler. Remove the cutting shoe and acetate liner containing the soil column from the sampler. Measure the length of the material recovered relative to the interval the sampler was advanced, and record this information in the field notebook.

5. Cut the acetate liner using a utility knife to expose the recovered soil. Quickly scan the recovered soil with the PID and if necessary, immediately collect samples for VOC analysis. If the plan indicates the collection of samples for headspace analysis, collect this sample after obtaining the sample for VOC analysis per SOP 22. Record the PID readings in the field notebook.

6. For VOC samples, transfer soil directly from the acetate liner into the sample containers with a clean, stainless steel spoon. Fill the VOC sample container with a representative sample from the entire length of the recovered sample core, or other designated sample interval[a]. Fill the VOC container completely, leaving no headspace.

7. Describe the recovered soil using the Unified Soil Classification System or standard geological descriptions. Record the sample description in the field notebook.

8. If it is necessary to mix the sample, transfer the soil from the acetate liner to a clean aluminum tray or decontaminated stainless steel mixing bowl with a decontaminated stainless steel spoon[b].

9. Examine contents of the tray/bowl and remove rock fragments and organic debris, such as roots, grass, and woody material, with the stainless steel spoon. Use the same spoon to chop apart clumps of dirt and mix the contents of the tray to a homogeneous particle size and soil texture. Transfer the tray/bowl contents to the appropriate sample containers using the stainless steel spoon.

10. The sample container(s) should be sealed, labeled, and placed in a cooler with ice or freezer packs to maintain 4° Celsius for shipment to the analytical laboratory.

11. Complete the chain-of-custody form with the appropriate sampling information.

a) NJDEP's Field Sampling Procedures Manual requires the collection of soil samples for VOC analysis from the 0.5-foot interval that exhibits the highest reading during the field (PID) screening.

b) U.S. Environmental Protection Agency (EPA) Region 4 requires a glass bowl for homogenizing soil for sample collection.

Standard Operating Procedure – 25

Groundwater Sampling Using Geoprobe® System or Equivalent

Application:

To perform groundwater sampling using hydraulically-driven screen point sampling equipment (GeoProbe® System or Equivalent).

Materials:

Stainless steel probe rods with treads sealed with Teflon® tape or O-rings
Stainless steel screen point sampler
Stainless steel mini-bailer
Teflon®-coated stainless steel wire or thin nylon line
Polyethylene tubing (3/8-inch) fitted with a stainless steel check valve
Silicone tubing
0.45-micron filter
Peristaltic pump
Sample bottles, labels, indelible markers, and clear tape
Nitrile or latex gloves

Procedure:

1. Decontaminate all down-hole equipment before conducting sampling activities at each location. Ensure that the sampling location has been cleared of all underground utilities.

2. Drive the stainless steel point sampler into the subsurface material. The design of the sampler should allow the screen to remain retracted within the probe rods until it is driven to the appropriate sampling depth.

3. After reaching the desired depth, pull back on the stainless steel sheath to expose the screen. The point on the probe rods will be displaced and is not recoverable[a].

4. Purging is not required for probes that are sealed and opened at the target depth for sample collection. Exposed probes that are driven through the soil to the desired water sample depth must be purged of a minimum of three probe-rod volumes of water before sampling is conducted.

5. Groundwater samples can be collected using a mini-bailer lowered on Teflon®-coated stainless steel wire or nylon line inside the probe rods. Another method of sample collection involves the use of a clean section of 3/8-inch polyethylene tubing fitted with a stainless steel bottom check valve. The polyethylene tubing is inserted down the probe rods to the desired sampling depth. Oscillate the polyethylene tubing up and down to drive a column of water to the surface. A peristaltic pump may be attached to the sample tubing and used to pump water to the surface. The peristaltic pump should not be used to collect samples for VOC analysis.

6. Immediately collect samples for VOC analysis, if required. Transfer the groundwater directly form the sampling equipment (mini-bailer, polyethylene tubing) to the sample containers. If analyzing for dissolved metals, the sample must be filtered in the field. See note below with regards to field filtering of metal samples.

7. Seal and label each sample container and place in a cooler with ice or freezer packs to maintain 4° Celsius for shipment to the analytical laboratory.

8. Complete the chain-of-custody form with appropriate sampling information.

    a) Where samples are collected from depths greater than 15-20 feet below the water table, a water level indicator may be inserted into the rods before exposing the screen to determine whether water is entering through the rod joints or disposable probe point.

Field Filtering of Metal Samples:

1. Assemble peristaltic pump per operating manual instructions that accompany the pump. Silicone tubing is generally used though the head of the pump.

2. Attach polyethylene tubing to the inflow end of the silicone tubing. The polyethylene tubing should be long enough to extend to the bottom of the screen point. Attach a clean filter to the outflow end of the silicone tubing.

3. Turn on the pump and slowly draw the water from the sampling equipment, through the pump and filter, and into the sample container. If sediment is visible in the sample container, filter break-through has occurred and the sampling and filtering process will need to be repeated.

4. Disassemble the pump head and discard the tubing and filter.

Standard Operating Procedure – 26

Managing Investigation Derived Waste

Application:

The purpose of this SOP is to provide instructions for handling, storing, and sampling Investigation Derived Waste (IDW) pending disposal. *All IDW should be handled as hazardous waste unless information exists which would allow it to be classified as non-hazardous waste.* IDW generated during a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) response action must be managed in compliance with applicable or relevant and appropriate requirements (ARARs) to the extent practicable and with applicable requirements of the CERCLA offsite policy. (EPA Guidance Document OERR Directive 9345.3-02)

IDW includes soil cuttings, development water, purge water, drilling fluids, decontamination fluids, personal protective equipment, and sampling equipment.

Materials:

Non-Hazardous and Hazardous Waste Labels
Investigation Derived Waste Log (Figure 1)
Permanent Ink Marking Pen Paint Stick/Pen
Sampling Equipment (Refer to Sampling SOPs)
Sample Jars
Chain of Custody Forms
Cooler

Procedure:

Hazardous IDW

1. All IDW should be handled as hazardous waste unless information exists which would allow it to classified as non-hazardous waste. New or existing site data (i.e., soil and groundwater results) and generator knowledge can be used to classify the IDW.

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

   - The IDW must be placed in DOT approved containers (55-gallon drum, roll-off container, or temporary storage tank).
   - The containers must remain closed except when adding, sampling, or inspecting the material.
   - All containers must be labeled with the words “Hazardous Waste”.
   - An accumulation start date and the contents of the container must be included on the label.
   - Investigation Derived Waste Logs (Figure 1) must be completed before leaving the site. One copy of the log should be presented to the site contact and the original provided to the project manager. Once the material has been removed from the site, the IDW log should be stamped “Removed” and placed in the project file.

- The IDW containers must be stored in a secure onsite location (facility hazardous waste storage area if one exists).
- Disposal of the IDW must be completed within **90 days** of the date the waste was generated. If the facility is a small quantity generator, 180 days is allowed for shipment of the waste offsite.
- Onsite disposal may be allowed or appropriate under certain conditions. Refer to OERR Directive 9345.3-02 for guidance, especially for CERCLA sites.
- WSP Engineering personnel should notify the site contact that weekly inspections of the IDW must be conducted and documented.
- WSP Engineering personnel should also instruct the site contact that this waste must be included in the facilities annual or biannual reports.

2. If the IDW is presumed to be hazardous and sampling is required to confirm its classification, it should be labeled Hazardous Waste-Pending Analysis. The waste should be sampled before leaving the site (See sampling SOPs). It should be noted that EPA methods 8260 and 8270 may be more cost effective than running the full Toxicity Characteristic Leaching Procedure (TCLP) scan. TSD Facilities will usually specify the required analysis for their waste profiles.

Non-Hazardous IDW

1. If information exists to classify the IDW as non-hazardous waste, the following procedures can be implemented:

Soil Cuttings

- Spread around the borehole or other onsite location with the approval of facility personnel
- Place back in the boring
- Containerize and dispose offsite

Groundwater

- Pour onto ground next to well to allow infiltration
- Containerize and dispose offsite
- Discharge to POTW with approval of facility personnel
- Discharge to onsite wastewater treatment plant with approval of facility personnel

Decontamination Fluids

- Pour onto ground (from containers) to allow infiltration
- Containerize and dispose offsite
- Discharge to POTW with approval of facility personnel
- Discharge to onsite wastewater treatment plant with approval of facility personnel

PPE

- Double bag and deposit in site dumpster
- Containerize and dispose offsite

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

- The non-hazardous IDW must be placed in DOT approved containers (55-gallon drum, roll-off container, or temporary storage tank).
- The containers should remain closed except when adding, sampling, or inspecting the material.
- All containers must be labeled with the words “Non-Hazardous Waste”.
- An accumulation date and the contents of the container should be included on the label.
- Complete the IDW log (Figure 1). One copy of the log should be presented to your site contact and the original should be given to the project manager.
- The IDW containers must be stored in a secure onsite location.
- Arrangements for disposal *should* be completed within 90 days of the accumulation start date.

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

Personnel/Contact: _____ Project No.: _____

Telephone: _____