November 20, 2019

Ms. Cathy Amoroso
National Priorities List Coordinator
U.S. Environmental Protection Agency (EPA), Region 4
61 Forsyth Street, SW, 11th Floor
Atlanta, Georgia 30303

Approved, 11/21/2019
EPA DAO

CATHY AMOROSO Digitally signed by CATHY AMOROSO Date: 2019.11.21 17:58:02 -05'00'

Subject: **Quality Assurance Project Plan Addendum**
Patterson Street Solvent Plume
Greensboro, Guilford County, North Carolina
Contract Number (No.) EP-S4-14-03
TDD No. TT-05-041

Dear Ms. Amoroso:

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) is submitting this addendum to the final quality assurance project plan (QAPP), dated June 21, 2019, for supplemental site inspection (SI) sampling at the Patterson Street Solvent Plume (PSP) site in Greensboro, Guilford County, North Carolina. This addendum includes two enclosures. Enclosure 1 contains a figure. Enclosure 2 contains tables.

SITE BACKGROUND

The PSP site is defined as a contaminated groundwater plume with no definitive source, located in a residential area south of an industrial corridor. The site encompasses about 349.1 acres of land surrounding the intersection of Patterson Street and South Holden Road in Greensboro, Guilford County, North Carolina. Several industrial facilities are within the Patterson Street industrial corridor, including major suppliers of blended bulk chemicals to furniture, textile, and other manufacturing businesses. Releases to the environment of chlorinated volatile organic compounds (CVOC) are known or suspected to have occurred at four North Carolina Department of Environmental Quality (NCDEQ) Inactive Hazardous Site Branch (IHSB) sites and three Resource Conservation and Recovery Act (RCRA) sites along the Patterson Street industrial corridor. The study area neighborhood for the SI is bordered by Immanuel Road to the north, Belmar Street to the east, North Hayden Street to the south, and South Holden Road to the west (see Figure 1 in Appendix A). For additional site background information, see the final QAPP, dated June 21, 2019.

SI ACTIVITIES

The week of September 9, 2019, Tetra Tech, along with EPA and North Carolina Department of Environmental Quality (NCDEQ) personnel, conducted an SI, which included the collection of groundwater, surface water, ambient air, and soil gas samples, in the study area neighborhood. EPA hypothesizes that the contaminated groundwater plume beneath the study area neighborhood is discharging to unnamed tributaries that flow through the neighborhood, which, in turn, is volatilizing into the ambient air. Samples were analyzed for CVOCs, including 1,1-dichloroethene (DCE), cis-1,2-DCE, tetrachloroethene (PCE), trans-1,2-DCE, trichloroethene (TCE), and vinyl chloride.

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Groundwater samples contained 1,1-DCE up to 220 micrograms per liter (µg/L), cis-1,2-DCE up to 140 µg/L, PCE up to 460 µg/L, and TCE up to 640 µg/L. All surface water samples contained 1,1-DCE (up to 40 µg/L), cis-1,2-DCE (up to 20 µg/L), PCE (up to 88 µg/L), and TCE (up to 33 µg/L). Surface water samples also contained vinyl chloride up to 1.3 µg/L. Soil gas samples contained 1,1-DCE up to 700 micrograms per cubic meter (µg/m^3), cis-1,2-DCE up to 740 µg/m^3, PCE up to 3,600 µg/m^3, trans-1,2-DCE up to 11 µg/m^3, TCE up to 3,300 µg/m^3, and vinyl chloride up to 35 µg/m^3. All ambient air samples contained PCE (up to 6.6 µg/m^3) and TCE (up to 3.3 µg/m^3). Ambient air samples also contained 1,1-DCE up to 3.7 µg/m^3, cis-1,2-DCE up to 2.1 µg/m^3, and vinyl chloride at 0.16 µg/m^3.

The same CVOCs were detected in groundwater, surface water, soil gas, and ambient air, suggesting the EPA's hypothesis is correct. Surface soil samples were also collected to rule out overland flow as a source for surface water contamination. Because no CVOCs were detected in surface soil samples, surface water is not receiving contamination via overland flow.

SUPPLEMENTAL SI ACTIVITIES

Based on the results of the SI, EPA has determined that supplemental surface water, ambient air, indoor air, and crawlspace air sampling is necessary. Supplemental SI sampling is scheduled for December 3 and 4, 2019. NCDEQ will assist by gaining access to target properties and clearing residences of household chemicals that may interfere with indoor air sampling results. Target properties include those near detections of CVOCs in the most recent sampling event. The same sampling sequence from the previous sampling event will be followed. See Figure 1 in Enclosure 1 for proposed sampling locations.

Surface Water Samples

- Because the stream in the PSP study area neighborhood originates in the study area, a background sample upstream of the site could not be collected. Therefore, surface water samples will be collected from two locations along a similar stream in Greensboro, North Carolina to establish background for the surface water samples collected within the PSP study area.
- Surface water sampling will be conducted in accordance with the EPA Region 4 Laboratory Services and Applied Sciences Division (LSASD) Field Branches Quality System and Technical Procedures (FBQSTP) for *Surface Water Sampling* (SESDPROC-201-R4), December 2016.
- Surface water samples will be analyzed for CVOCs by EPA Method 8260C.

Ambient Air, Indoor Air, and Crawlspace Samples

- Ambient air samples will be collected over a 24-hour period from four locations in the PSP study area neighborhood using 6-Liter Summa canisters.
- Indoor air and crawlspace (if present) samples will be collected over a 24-hour period from six residences using 6-Liter Summa canisters.
- Ambient air, indoor air, and crawlspace sampling will be conducted in accordance with the EPA Region 4 LSASD FBQSTP for *Ambient Air Sampling* (SESDPROC-303-R5), March 2016.
- Ambient air, indoor air, and crawlspace samples will be analyzed for CVOCs by EPA Compendium Method TO-15.

All surface water, indoor air, ambient air, and crawlspace samples will be analyzed for 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, PCE, TCE, and vinyl chloride by the EPA Region 4 LSASD laboratory. Analytical results for initial acceptance will be assessed during validation performed by EPA Region 4 LSASD, Office of Quality Assurance that evaluates the usability of the data. Any rejected data and the reasons for rejection will be summarized in the narrative summary of the analytical data packages. In addition, Tetra Tech will review quality control (QC) samples against field samples to determine if additional qualifications are warranted.

Data validation of the surface water, indoor air, ambient air, and crawlspace samples will be conducted in accordance with the EPA Region 4 Analytical Services Branch (ASB) Laboratory Operations and Quality Assurance Manual (LOQAM); EPA Method 8260C, Volatile Organic Compounds by Gas Chromatography-Mass Spectrometry (GC/MS), August 2006; EPA Method TO-15, Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by GC/MS, January 1999; and the EPA Region 4 Data Validation Standard Operating Procedures for Organic Analysis, February 2016.

If you have any questions or need additional copies of this QAPP addendum, please contact me at 678-775-3101.

Sincerely,

Quinn Kelley
Tetra Tech START IV Project Manager

Andrew F. Johnson
Tetra Tech START IV Program Manager

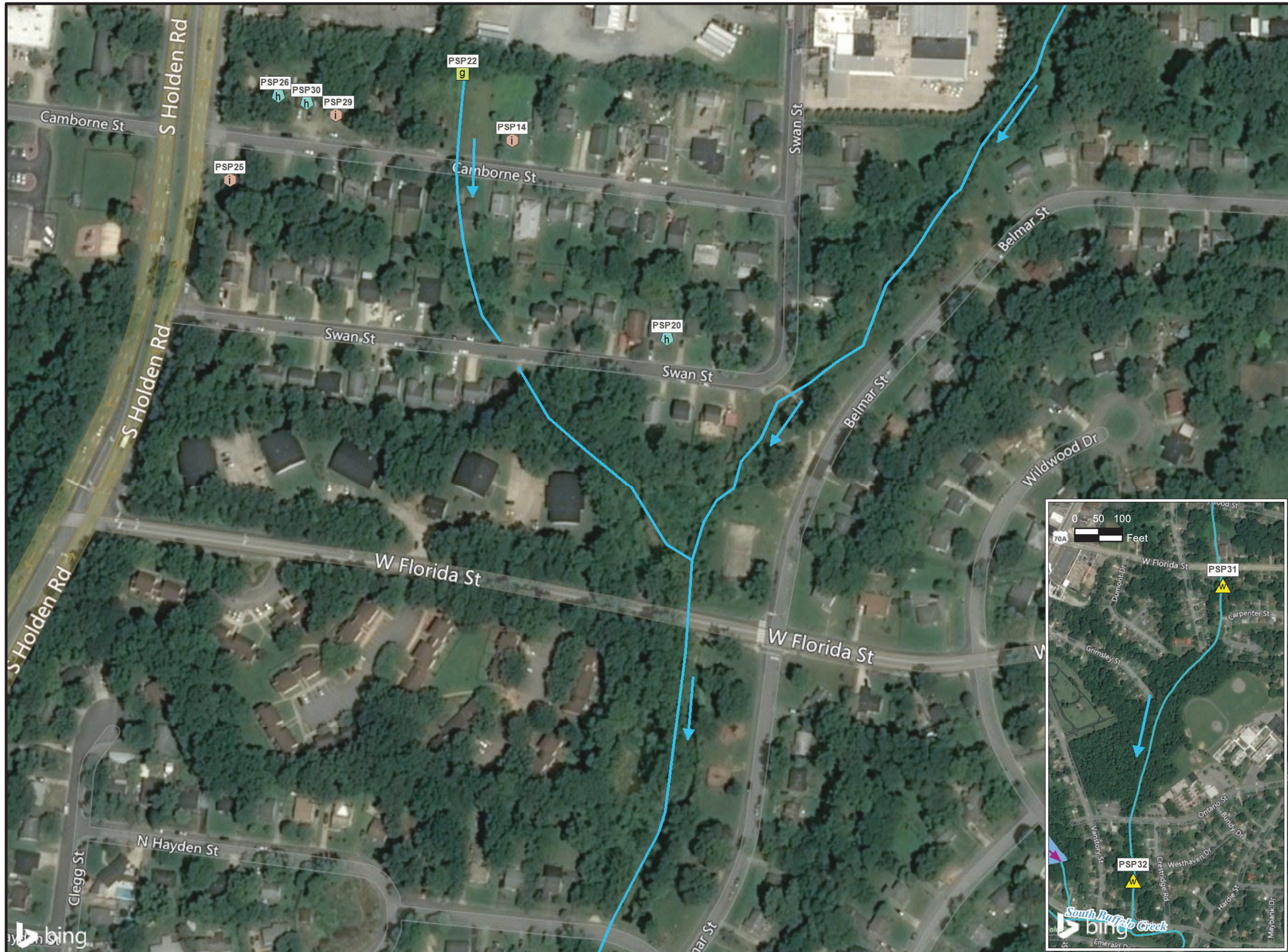
Enclosures (2)

cc: Katrina Jones, EPA Project Officer
Angel Reed, Tetra Tech START IV Document Control Coordinator

ENCLOSURE 1

FIGURE

(One Page)



Legend

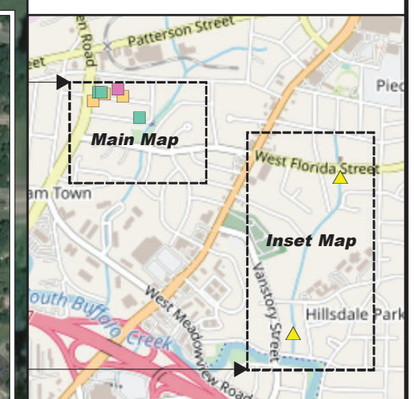
- Ambient Air Sample
- Indoor Air and Crawlspace Samples
- Ambient Air, Indoor Air, and Crawlspace Samples
- Surface Water Samples
- Unnamed Tributary
- Direction of Flow

N
W E
S

0 100 200
Feet

Notes:
PSP - Patterspon Street Solvent Plume Site

Map Source:
Bing Maps Aerial Imagery, 2015.



United States
Environmental Protection Agency
Region 4

FIGURE 1
Proposed Supplemental
Sampling Locations

TDD Name: Patterson Street Solvent Plume Site
TDD No.: TT-05-041
City: Greensboro
County: Guilford
State: North Carolina

TETRA TECH

Date: 11/20/2019
Analyst: dale.vonbusch

File: C:\TT-05-041_Patterson_St\mxd\proposed_supplemental_sampling_locations.mxd

ENCLOSURE 2

TABLES

(Five Pages)

TABLE 1
PATTERSON STREET SOLVENT PLUME
SUPPLEMENTAL SAMPLING LOCATIONS

Station ID	Sample ID	Sample Type	Analysis	Sample Location	Rationale
Surface Water Samples					
PSP31	PSP31-SW	Grab	CVOCs	About 0.6 mile southeast of the bedrock stream in the PSP study area	Background location for comparison to other samples
PSP32	PSP32-SW	Grab	CVOCs	About 0.75 mile southeast of the bedrock stream in the PSP study area	Background location for comparison to other samples
Ambient Air Sample					
PSP22	PSP22-AA	Grab	CVOCs	Seep that creates the urban ditch located at 2824 Camborne Street	Determine presence or absence of contamination
Ambient Air, Indoor Air, and Crawlspace Samples					
PSP14	PSP14-AA	Grab	CVOCs	2822 Camborne Street	Determine presence or absence of contamination
	PSP14-IA	Grab	CVOCs		
	PSP14-CS	Grab	CVOCs		
PSP25	PSP25-AA	Grab	CVOCs	2841 Camborne Street	Determine presence or absence of contamination
	PSP25-IA	Grab	CVOCs		
	PSP25-CS	Grab	CVOCs		
PSP29	PSP29-AA	Grab	CVOCs	2832 Camborne Street	Determine presence or absence of contamination
	PSP29-IA	Grab	CVOCs		
	PSP29-CS	Grab	CVOCs		
Indoor Air and Crawlspace Samples					
PSP20	PSP36-IA	Grab	CVOCs	1404 Swan Street	Determine presence or absence of contamination
	PSP36-CS	Grab	CVOCs		
PSP26	PSP37-IA	Grab	CVOCs	2836 Camborne Street	Determine presence or absence of contamination
	PSP37-CS	Grab	CVOCs		
PSP30	PSP38-IA	Grab	CVOCs	2834 Camborne Street	Determine presence or absence of contamination
	PSP38-CS	Grab	CVOCs		

Notes:

AA	Ambient air sample
CS	Crwalspace sample
CVOCs	Chlorinated volatile organic compounds (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, PCE, TCE, and vinyl chloride)
DCE	Dichloroethene
IA	Indoor air
ID	Identification
PCE	Tetrachloroethene
PSP	Patterson Street Solvent Plume
SW	Surface water sample
TCE	Tetrachloroethene

TABLE 2
PATTERSON STREET SOLVENT PLUME
QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Sample ID	Sample Type	Analysis	Rationale
PSP-TB-04	Trip Blank (aqueous)	CVOCs	Determine if unknown site conditions or sample handling procedures are influencing analytical results. At least one trip blank will be submitted with each sample shipment for VOC analysis only.
(Original sample ID)-DUP	Field Duplicate	CVOCs	Measure both field and laboratory precision. One duplicate sample will be collected for each 20 samples collected per matrix.

Notes: Also refer to Section 2.5 of this QAPP

##	Number to be determined in the field
AA	Ambient air sample
CVOCs	Chlorinated volatile organic compounds (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, PCE, TCE, and vinyl chloride)
DCE	Dichloroethene
DUP	Field duplicate
EB	Equipment rinsate blank
FB	Field blank
ID	Identification
MS/MSD	Matrix spike/matrix spike duplicate
PCE	Tetrachloroethene
PSP	Patterson Street Solvent Plume
TB	Trip blank
TCE	Trichloroethene
VOC	Volatile organic compound

TABLE 3
PATTERSON STREET SOLVENT PLUME
ANALYTICAL PARAMETERS AND METHODS, REQUIRED SAMPLE CONTAINERS, PRESERVATION METHODS, AND HOLDING TIMES

ANALYTICAL PARAMETER	NOTED ON CHAIN-OF-CUSTODY RECORDS	MATRIX	ANALYTICAL METHOD[1]	NUMBER AND TYPE OF SAMPLE CONTAINER	PRESERVATION METHOD	SAMPLE HOLDING TIME
AQUEOUS[2] SAMPLES						
CVOCs[3]	CVOCs	Surface water and QC sample (trip blank)	EPA Method 8260C	Three 40-mL glass vials with Teflon-lined septum lids	Hydrochloric acid (HCl) to pH <2; cool to 4 °C	14 days
AMBIENT AIR, INDOOR AIR, AND CRAWLSPACE SAMPLES						
CVOCs[3]	CVOCs	Ambient air samples	EPA Method TO-15	6-Liter Summa Canister	None	30 days
		Indoor air samples		6-Liter Summa Canister		
		Crawlspace samples		6-Liter Summa Canister		

Notes:

1 CVOCs using Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.4, October 2016, available at the following web address:
https://www.epa.gov/clp/superfund-clp-analytical-statements-work-sows
EPA Method TO-15 available at the following web address:
https://www.epa.gov/sites/production/files/2015-07/documents/epa-to-15_0.pdf

2 Aqueous samples include surface water and a trip blank.

3 CVOCs include 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, PCE, TCE, and vinyl chloride.

°C Degrees Celsius
< Less than
DCE Dichloroethene
mL Milliliter
PCE Tetrachloroethene
QC Quality control
TCE Trichloroethene

TABLE 4
PATTERSON STREET SOLVENT PLUME
PERFORMANCE OR ACCEPTANCE CRITERIA

ENVIRONMENTAL AND FIELD QUALITY CONTROL SAMPLES	
Analytical Parameter	**Analytical Method**
CVOCs	EPA Method 8260C (SW)
CVOCs	EPA Method TO-15 (AA, IA, CS)

DATA QUALITY MEASUREMENTS	
Accuracy	Refer to EPA Region 4, LSASD FBQSTPs for *Ambient Air Sampling* , SESDPROC-303-R5, March 2016; *Surface Water Sampling,* SESDPROC-201-R4, December 2016; *Global Positioning System* , SESDPROC-110-R4, June 2015; the analytical methods listed above; and the data validation guidance documents discussed in Sections 4.1 and 4.2 of this QAPP.
Precision	Refer to EPA Region 4, LSASD FBQSTPs for Ambient Air Sampling, SESDPROC-303-R5, March 2016; Surface Water Sampling, SESDPROC-201-R4, December 2016; Global Positioning System, SESDPROC-110-R4, June 2015; the analytical methods listed above; and the data validation guidance documents discussed in Sections 4.1 and 4.2 of this QAPP.
Representativeness	Refer to EPA Region 4, LSASD FBQSTPs for Ambient Air Sampling, SESDPROC-303-R5, March 2016; Surface Water Sampling, SESDPROC-201-R4, December 2016; Global Positioning System, SESDPROC-110-R4, June 2015; the analytical methods listed above; and the data validation guidance documents discussed in Sections 4.1 and 4.2 of this QAPP.
Completeness	Based on a review of the available file information, including discussions with the EPA RPM, surface water, ambient air, indoor air, and crawlspace samples are proposed for collection. The EPA project manager is responsible for determining if the field and laboratory data collected during this project achieve the level of completeness required to meet the objectives of the project.
Comparability	Sample and data comparability is expected to be achieved by conducting all field and laboratory work using the same, well-documented, uniform procedures.

Notes:

AA	Ambient air sample
CS	Crawlspace sample
CVOCs	Chlorinated volatile organic compounds (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, PCE, TCE, and vinyl chloride)
EPA	U.S. Environmental Protection Agency
FBQSTP	Field Branches Quality System and Technical Procedures, available at the following web address: https://www.epa.gov/quality/quality-system-and-technical-procedures-lsasd-field-branches
IA	Indoor air sample
LSASD	Laboratory Services and Applied Sciences Division
QAPP	Quality Assurance Project Plan
SW	Surface water sample

TABLE 5
PATTERSON STREET SOLVENT PLUME
EQUIPMENT AND SUPPLIES

FIELD INSTRUMENTS/ EQUIPMENT	SAMPLE CONTAINERS	SAMPLING EQUIPMENT AND SUPPLIES	SAMPLE PROCESSING SUPPLIES	DECONTAMINATION SUPPLIES	MISCELLANEOUS SUPPLIES
Trimble GPS unit	40-mL glass vials with HCl	Nitrile gloves	Resealable plastic bags	Buckets	Digital camera
	6-Liter Summa canisters	Ultra-pure water	Custody seals	Luminox	Permanent markers
			Labels	Brushes	Logbooks
			Laptop	Aluminum foil	Garbage bags
			Printer	Ultra-pure water	First aid kit
			Paper		Eyewash
			FedEx labels		Spray paint
			Duct tape, strapping tape		Pin flags
			Paper towels		
			Coolers		

Notes:

GPS Global positioning system
HCl Hydrochloric acid
mL milliliter