BROWNFIELDS QUALITY ASSURANCE PROJECT PLAN (QAPP) FOR THE FORMER PORTLAND CHEMICAL FACILITY 680 NEWFIELD STREET MIDDLETOWN, CONNECTICUT

HRP # MID6003.P3 TASK 01

PREPARED FOR: **CITY OF MIDDLETOWN**
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ISSUED ON: September 1, 2004

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1. Title and Approval

BROWNFIELDS QUALITY ASSURANCE PROJECT PLAN (QAPP) FOR THE FORMER PORTLAND CHEMICAL FACILITY, 680 NEWFIELD STREET, MIDDLETOWN, CONNECTICUT
Document Title

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1 September 2004
Day/Month/Year

Project Manager: _____
Signature

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U.S. EPA Project Manager Approval: _____
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U.S. EPA QA Officer Approval: _____
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_____
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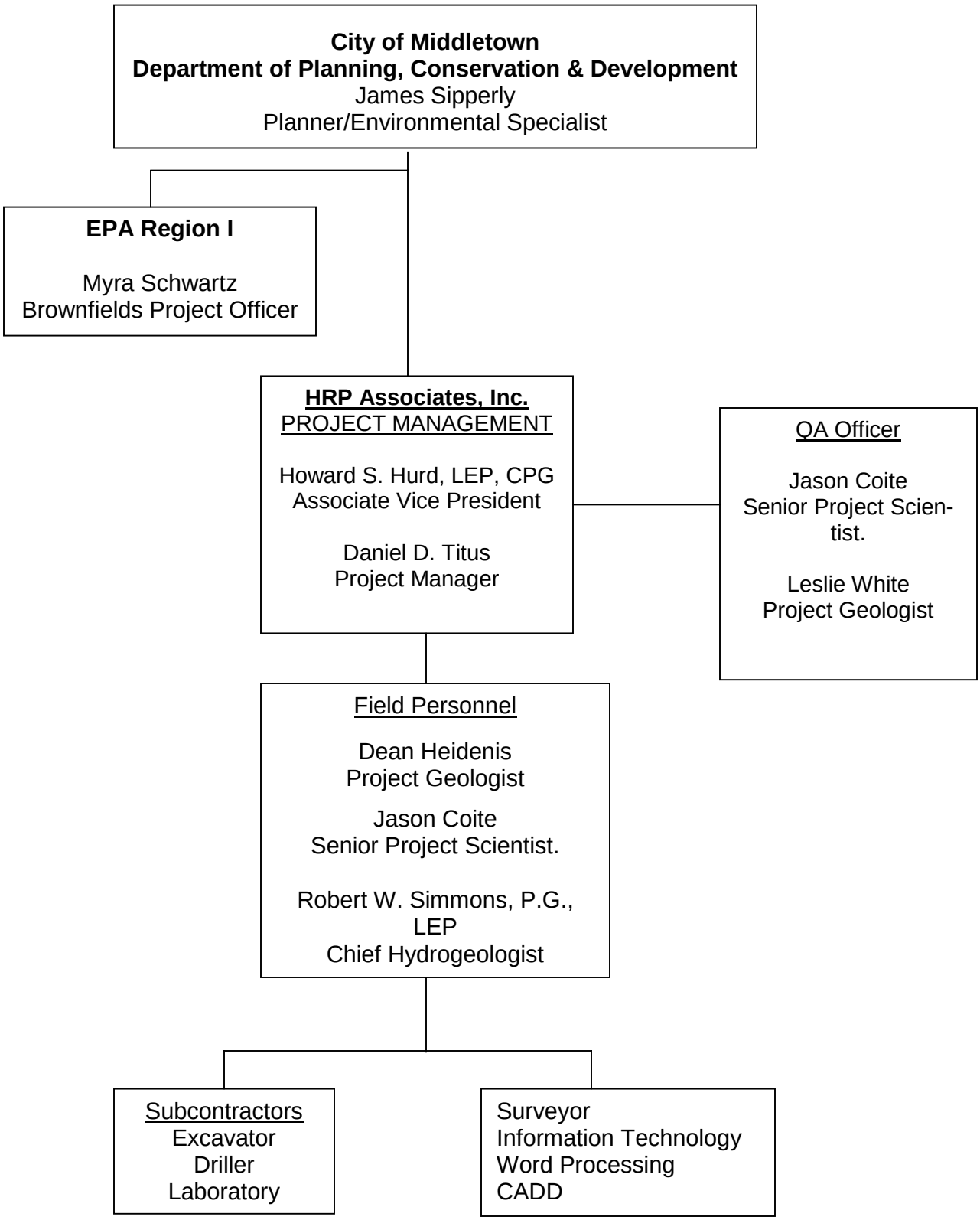
2. Project Organization and Responsibility



3. Problem Definition

The approximately 3.1 acre subject site (the Site) consists of the rear lot of the former Portland Chemical Works facility. The Site had been developed and maintained by former chemical distribution operations, including the Portland Chemical Works, from 1962 to 1992. The Site had been developed with above ground storage tank farm that was connected via aboveground piping to a loading rack along the railroad spur and a drum filling building on the southeast side of the Site. Other smaller shed buildings were located on the east side of the Site. The tank farm, loading rack, storage sheds, and drum filling building have been demolished. A railroad spur, railcar loading ramp, and chain link fence are the only remaining developed features on the site. The remainder of the site currently consists of low-lying marshy areas.

The Site is bounded on the north by Primary Steel, on the south by Town & Country Toyota Dealership, on the east by Patriot Truck Equipment and Jukonski Truck Sales, and on the west by Primary Steel's railroad spur. Site is accessible to Newfield Street via Jukonski Mitsubishi Truck Sales.

Previous site investigations identified limited soil contamination. In January 2001, a remediation program consisting excavation designed to address the soil contamination unearthed previously unidentified drums containing wastes. CT DEP was notified and required an emergency response to remove and properly characterize and dispose the drums and wastes.

Due to the historical management of hazardous waste, the site appears to meets the definition of "Establishment" pursuant to the Connecticut Transfer Act (Connecticut General Statutes Section 22a-134 et seq.). Nevertheless, the site was voluntary entered into the CT DEP Remediation Program pursuant to Sec. 22a-133x of the Connecticut General Statutes (CGS). as such the site will be investigated and remediated in accordance with standard regulations of the Connecticut Remediation Standard Regulations (RSRs).

Based upon the findings of the most recent Phase I Environmental Site Assessment (ESA) of the property (dated October 2001) and Brownfields Targeted Site Assessment completed by TetraTech NUS, Inc. (dated September 2002), the following potential release areas (PRAs) and release areas confirmed by prior testing (RA) have been identified:

TABLE 1: SUMMARY OF IDENTIFIED POTENTIAL RELEASE AREAS AND RELEASE AREAS CONFIRMED BY TESTING AND/OR DIRECT OBSERVATIONS

Former Portland Chemical Facility

680 Newfield Street, Middletown, CT

See Figure 2

PRA # or RA#	Name	Previous Analytical Results				Potential or Known Contaminants of Concern	Comments
		Wastes		Soil	Groundwater	Other		
RA-1	Drum and Debris Burial	Leachate/liquid Cr = 47,300 mg/L Cu = 64,200 mg/L Ni = 2,440 mg/L Hg = 0. 040 mg/L Pb = 6 mg/L Zn = 68 mg/L pH < 2	Solid Cr = 95,500 mg/kg Cr TCLP = 4,370 mg/L Cu = 50,000 mg/kg Cu TCLP = 1340 mg/L VOCs = BDL ETPH = BDL pH = 3.3	No previous sampling identified.	1,1-DCA = 80 ug/L cis-1,2-DCE = 62 ug/L VC = 58 ug/L ETPH = 0.80 mg/L Ni = 12.1 ug/L Ti = 17.2 ug/L	No previous sampling identified.	Site List	Buried debris and fiber drums containing various chemical wastes were identified during the excavation activities in January 2001. The drums and debris were located in an area approximately 5-feet wide by 50-feet long extending to the north-northeast of the former drum filling building.
RA-2	Former Drum Filling Building	No previous sampling identified.		No previous sampling identified.	No previous sampling identified.	Former concrete slab: Cu = 59.9 mg/kg Cu TCLP = 0.02 mg/L Cr = 12 mg/kg Pb = 12.6 mg/kg VOCs = BDL ETPH = BDL	VOCs, TPH	The former drum-filling building constructed in circa 1960 was used to fill 55-gallon drums with the materials from the tank farm. Drum storage was reported to have been located in and adjacent to this building. A floor drain in this building was also indicated to have been connected to the adjacent chemical manhole.
RA- 3	Former Chemical Manhole	No previous sampling identified.		Cr = 382 mg/kg Cr SPLP = BDL Cr^{6+} = 10 mg/kg Cu = 164 mg/kg Cu SPLP = 0.01 mg/L TPH = 530 mg/kg	Bromomethane = 160 1,1-DCA = 35 ppb 1,2-DCA = 8.1 ppb PCE = 37 ppb TCE = 61 ppb cis-1,2-DCE = 140 ppb VC = 74 ppb	No previous sampling identified.	Site List	The chemical manhole received waste chemicals and spills from the floor drain in the drum-filling building.
RA-4	Leaching Field	No previous sampling identified.		No previous sampling identified.	No previous sampling identified.	No previous sampling identified.	Site List	The chemical manhole discharged to a nearby leaching field. Note that the leaching field is located entirely within the area of potential waste burial.
RA-5	Former Loading Rack & Piping	No previous sampling identified.		PCE= 120,000 ug/kg TCE = 9100 ug/kg cis-1,2-DCE = 45000 ug/kg 1,1-DEC = 150 ug/kg VC= 1700 ug/kg xylenes = 324,000 ppb TPH = 10,000 ppm	No previous sampling identified.	No previous sampling identified.	Site List	The former loading rack was used to unload bulk-chemicals from railroad tank-cars to the tank farm. Surficial staining identified in Hazardous Waste Notice of Violation filed in 1991.
PRA-6	Drum Storage Area	No previous sampling identified.		No previous sampling identified.	No previous sampling identified.	No previous sampling identified.	Site List	Exterior drum storage is identified from circa 1965 to circa 1980 on the northeast portion of the Site.
PRA- 7	Former Drum Storage Sheds	No previous sampling identified.		No previous sampling identified.	No previous sampling identified.	No previous sampling identified.	Site List	Drums were stored in and around the small shed formerly located at the western terminus of the railroad spur.
PRA-8	Former Tank Farm	No previous sampling identified.		TPH = 1700 mg/kg PCE = 64 ug/kg	No previous sampling identified.	No previous sampling identified.	Site List	The above-ground tank farm consisted of ten (10) 10,000-gallon tanks.

TABLE 1: SUMMARY OF IDENTIFIED POTENTIAL RELEASE AREAS AND RELEASE AREAS CONFIRMED BY TESTING AND/OR DIRECT OBSERVATIONS

Former Portland Chemical Facility

680 Newfield Street, Middletown, CT

See Figure 2

PRA # or RA#	Name	Previous Analytical Results				Potential or Known Contaminants of Concern	Comments
		Wastes	Soil	Groundwater	Other		
PRA-9	Loading Ramp	No previous sampling identified.	No previous sampling identified.	No previous sampling identified.	No previous sampling identified.	Site List	The loading ramp was presumably used to load materials onto railroad cars.
PRA-10	Railroad Spur	No previous sampling identified.	No previous sampling identified.	No previous sampling identified.	No previous sampling identified.	Site List plus Herbacides	The railroad spur was formerly used by tank-cars containing various bulk-chemicals. Also, railroad ties were typically treated with chlorinated-organic creosotes. Railroad right-of-ways were typically treated with herbicides.
PRA-11	Unnamed Stream and Outfall Culvert	No previous sampling identified.	Sediment: benzo(a)anth. = 8000 ug/kg benzo(a)pyrene = 5600 ug/kg benzo(b)fluor. = 7000 ug/kg benzo(k)fluro = 2400 ug/kg chrysene = 8400 ug/kg indeno(1,2,3-cd) = 2100 ug/kg 4,4-DDE = 23 ug/kg 4,4-DDD = 11 ug/kg 4,4-DDT = 6.4 ug/kg Aroclor 1254 = 1100 ug/kg ETPH = 580 mg/kg	No previous sampling identified.	Outfall WaterDischarge: Cu = 20 ug/L VC = 6 ug/L cis-1,2-DCE = 35 ug/L PCE = 2 ug/L TCE = 1 ug/L TPH = 0.5 mg/L	Site List	The culvert outfall discharges run-off from Newfield Street and drainage features on the adjacent property to the east.
PRA-12	Artificial Fill Area	No previous sampling identified.	benzo(a)anthr. = 3800 ug/kg benzo(a)pyrene = 3900 ug/kg benzo(b)fluor. = 3700 ug/kg benzo(k)fluro. = 3700 ug/kg chrysene = 4800 ug/kg indeno(1,2,3-cd) = 2600 ug/kg Cr = 12 mg/kg Pb = 236 mg/kg V = 28.1 mg/kg TPH = 410 mg/kg 4-4 DDT = 40 ug/kg 4,4-DDD = 6.1 ug/kg chlordane = 19.3 ug/kg	No previous sampling identified.		Site List	The northwest portion of the Site consists of fill material deposited under a Army Corps of Engineers permit. Also, six to nine fiber and steel drums containing non-hazardous substances (disodium phosphate) were removed from this area.

NOTES:
PRA = Potential Release Area
RA = Release Area (confirmed by testing or documented observation)
Site List = Contaminant of Concern List, which assumes potential for all Anticipated Contaminants to be present with the exception of herbicides. Herbicides are suspected only in the vicinity of the railroad spur (PRA-12).
Contaminates of Concern = VOCs, PAHs, PCBs, Pesticides, TPH, 10 Select Metals (Ba, Ti, Cr-T, Cr^{6+}, Cu, Pb, Hg, Ni, V, & Zn)

4. Project Description

This project is designed as a Phase III: Degree & Extent investigation of portions of the property for anticipated contaminants based upon the findings of the HRP Phase I ESA completed in May 2001. Note that no site activity has occurred since completion of the Phase I ESA.

The purpose of the work described by this QAPP is to assess the quality of environmental media (soil and groundwater) at the subject site based upon the specific findings of the Phase I ESA. The activities to be performed are detailed in the Scopes of Work pertaining to the following tasks:

Task 1: Utility markout;
Task 2: The installation of test pits with a backhoe, soil borings with a Geoprobe, and laboratory analysis of soils;
Task 3: The installation of temporary monitoring well points with a Geoprobe; and laboratory analysis of groundwater:
Task 4: Hand collection and laboratory analysis of surface water; and
Task 5: Hand collection and laboratory analysis sediment samples.

The details of each of the above mentioned tasks are discussed below.

Task 1.0 – Utility Markout

All proposed subsurface investigation locations will be field marked with white painted stakes, since there are no paved areas of the site where white paint alone is appropriate. For test pit locations, the markout stake will be located at the proposed northwest corner of each test pit. HRP will contact “Call Before You Dig” for utility clearances, as required by law. HRP will also review each location as possible with available site contacts to clear on-site utilities.

Task 2.0 – Test Pits, Soil Borings, and Laboratory Analysis of Soils

HRP will retain an excavation subcontractor to provide a backhoe and associated man-power to install seventy-five (75) test pits across the subject site. Test pit locations are shown on the attached Figure. These test pits will be used to observe the subsurface materials for waste deposits, evidence of fill, lithology, and possible evidence of contamination. The soils encountered will be logged by a HRP geologist, will be examined for visual and olfactory evidence of contamination, and will be screened for VOCs using a Photoionization Detector (PID). The soil samples will be preserved as necessary and stored on ice until delivery to a state certified laboratory for analysis.

HRP will utilize a Geoprobe style push-technology drill rig to install twelve (12) test borings, six (6) of which will be converted to temporary groundwater monitoring well points, to depths as deep as the local water table (anticipated to range from 1-8 feet below grade, based on

previous investigations) in areas identified in the October 2001 Phase I ESA as having the potential to be impacted (see Figure 2). Samples will be retrieved continuously with a 4-foot MacroCore sampler and examined for visual and olfactory evidence of contamination, as well as screened for VOCs using a PID. A detailed drill log will be maintained for each boring.

Based on physical inspection and field screening results, soil samples (See Section 5) will be collected and submitted for laboratory analysis by one or more of the following methods:

- Volatile Organic Compounds (VOCs) by collection method U.S. EPA Method 5035A and 8260B (120 samples),
- Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. EPA Method 8270C – modified (120 samples),
- pH by U.S. EPA Method 9045C (120 samples)
- 9 Site-Specific Constituent of Concern Metals (barium, thallium, chromium [total], copper, lead, mercury, nickel, vanadium, and zinc) by mass analysis U.S. EPA Method 3050B, 6010B, and 7471) (120 samples),
- Hexavalent Chromium by U.S EPA Method 7196A (120 samples),
- Total Petroleum Hydrocarbons (TPH) by Connecticut Extractable Total Petroleum Hydrocarbons (ETPH) (80 samples),
- Polychlorinated Biphenyls (PCBs) by U.S. EPA Method 8082 (50 samples),
- Pesticides by U.S. EPA Method 8081 (46 samples),
- Herbicides by U.S. EPA Method 8151A (4 samples),

Mass analysis metal detections will compared to 20-times the Connecticut Remediation Standard Regulation (RSR) Pollution Mobility Criteria (PMC) for each metal to identify any *potential* exceedences of the PMC. Up to 80 samples with mass analysis metal concentrations detected above the respective values are resubmitted to the laboratory for analysis via the Synthetic Precipitate Leachate Procedure (SPLP), the results of which are compared *directly* to the PMC. .

Of the 83 samples selected for SPLP extraction based on the mass analysis results for metals, up to 65 extractions will be analyzed for PAHs; up to 25 extractions will be analyzed for PCBs; up to 20 extractions will be analyzed for Pesticides; and up 5 samples will be analyzed for Herbicides. Selection for PAH and PCB/Pesticide analysis of the SPLP extraction will be based on the total concentrations detected in soil samples.

- Synthetic Precipitation Leaching Procedure (SPLP) extraction by U.S. EPA Method 1312 (83 samples), followed by
    - Site-Specific Constituent of Concern Metals (barium, thallium, chromium [total], chromium [hexavalent], copper, lead, mercury, nickel, vanadium,

and zinc) by analysis (U.S. EPA Method 1312, 6010B, and 7471) (up to 360 metals)

- PAHs by U.S. EPA Method 8270C-modified (65 samples)
- Hexavalent Chromium by U.S EPA Method 7196A
- PCBs by U.S. EPA Method 8082 (25 samples)
- Pesticides by U.S. EPA Method 8081 (20 samples)
- Herbicides by U.S. EPA Method 8151A (5 samples).

Task 3.0 – Groundwater Sampling

Test Pit Groundwater Grab Samples

Based on the previous investigations, the deepest groundwater elevation was observed at a 10.34-feet below grade. As such, groundwater is expected to be encountered during the excavation of test pits (see Task 2.0). Groundwater "grab" samples will be collected from ten (10) of the seventy-five (75) test pits. The rationales for collection of groundwater grab sampling at select test pit locations are listed in Section 5 below. Dedicated disposable tubing will be slowly lowered into the test pit until the tube end is submerged in the groundwater that has accumulated at the bottom of the test pit. A peristaltic pump will be used to pump groundwater sample via the tubing. Unfiltered groundwater will be collected in two 40-mL vials and preserved in accordance with HRP SOPs (Appendix D) until submitted to the laboratory for analysis. Groundwater collected for all other analysis (see below) will be field filtered with a disposal, dedicated groundwater sediment filter.

Test Boring Temporary Groundwater Sampling Points

Six (6) of the twelve (12) test borings (see Task 2.0) will be completed as temporary groundwater sampling points constructed of 1-inch diameter PVC using 10 foot screened (0.010 slot) sections coupled to solid riser to the surface. The screen will be set such that 7 to 8 feet will penetrate the water table, thus allowing for detection or accumulation of free-phased petroleum product if present. The locations of the proposed temporary well points are shown on Figure 2. The rationales for installation of the temporary well points and collection of groundwater sampling are listed in Section 5 below.

Groundwater Sample/Survey Existing Monitoring Wells

The six (6) existing groundwater monitoring wells will be purged of six well volumes prior to being sampled. The groundwater samples will be collected in accordance with the U.S. Environmental Protection Agency (Region 1) "Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells", Revision 2, dated July 1996 and the Connecticut Department of Environmental Protection "Draft Site Characterization Guidance Document", dated June 12, 2000.

Given the shallow groundwater table reported during previous, on-site investigations, a variable speed peristaltic pump will be used to purge and sample each existing well listed in the Section 5 below. Prior to sampling, each well will be measured for depth to water below the top of the PVC well casing using a decontaminated electronic water level indicator. The depth to water measurements will be used along with well construction details to determine the middle of the water column within the well. The bladder pump, or the small diameter tubing of the peristaltic pump, will be slowly lowered into the well to the approximate middle of the water column. If the water surface within the well is determined to be above the screen section, the tubing intake will be positioned at the center of the wetted well screen.

Groundwater will be pumped at such a rate as to minimize the stress on the well and limit mixing of the water column. Depth to water measurements will be recorded in 3 to 5-minute intervals to determine the ideal pumping rate to maintain drawdown at or less than 0.3 feet. Should the water level within the well not stabilize during pumping (at the minimum pumping rate of the sampling equipment), the well will be pumped down to a level above the tubing intake, allowed to recharge, and a sample will be collected at that time.

Water quality indicator parameters (pH, temperature, redox potential, conductivity, dissolved oxygen, turbidity) will be measured using an in-line flow through cell to continuously measure the above parameters. Measurements will be recorded at a maximum interval of 3 to 5-minutes to identify when stabilization of the parameters is established. Once each of the indicator field parameters have stabilized, the groundwater samples will be collected prior to the flow through cell.

All groundwater samples will be preserved as necessary and stored on ice until delivery to a state certified laboratory for analysis. Each groundwater sample will be analyzed for the following:

- VOCs plus methyl-tert-butyl-ether (MTBE) by U.S. EPA Method 8260B (23 samples),
- PAHs by U.S. EPA Method 8270C-modified (23 samples),
- 10 Site-Specific Constituent of Concern Metals (barium, thallium, chromium [total], chromium [hexavalent], copper, lead, mercury, nickel, vanadium, and zinc) by mass analysis U.S. EPA Method 6010B, 7196A and 7470) (23 samples),
- TPH by CT ETPH (23 samples)

HRP will survey the relative elevations of the each well and temporary sampling point so that the direction of groundwater flow can be evaluated and mapped.

Task 3.0 – Sediment Sampling

Four sediment samples will be collected from the unnamed, onsite stream and two of the identified on-site tributaries to the stream. The purposes of sediment sampling and analyses are to confirm previous testing results and determine the effects of nearby contamination sources.

Sediment samples (See Section 5) will be collected and submitted for laboratory analysis by one or more of the following methods:

- Volatile Organic Compounds (VOCs) by collection method U.S. EPA Method 5035A and 8260B (4 samples),
- Polynuclear Aromatic Hydrocarbons (PAHs) by U.S. EPA Method 8270C – modified (4 samples),
- pH by U.S. EPA Method 9045C (4 samples)
- 10 Site-Specific Constituent of Concern Metals (barium, thallium, chromium [total], chromium [hexavalent], copper, lead, mercury, nickel, vanadium, and zinc) by mass analysis U.S. EPA Method 3050B, 6010B, 7196A and 7471) (4samples),
- Total Petroleum Hydrocarbons (TPH) by Connecticut Extractable Total Petroleum Hydrocarbons (ETPH) (4 samples),
- Polychlorinated Biphenyls (PCBs) by U.S. EPA Method 8082 (4 samples),
- Pesticides by U.S. EPA Method 8081 (4 samples),
- Synthetic Precipitation Leaching Procedure (SPLP) extraction by U.S. EPA Method 1312 (2 samples), followed by
    - Site-Specific Constituent of Concern Metals (barium, thallium, chromium [total], chromium [hexavalent], copper, lead, mercury, nickel, vanadium, and zinc) by mass analysis U.S. EPA Method 3050B, 6010B, 7196A and 7471) (up to 10 metals, total, in 2 extractions)
    - PAHs by U.S. EPA Method 8270C-modified (2 samples)
    - PCBs by U.S. EPA Method 8082 (2 samples)
    - Pesticides by U.S. EPA Method 8081 (2 samples)

Task 4.0 – Surface Water Sampling

Four surface water samples will be collected from the unnamed, onsite stream and two of the identified on-site tributaries to the stream. The purposes of surface water sampling and analyses are to confirm previous testing results and determine the effects of nearby contamination sources on the water body.

All surface water samples will be preserved as necessary and stored on ice until delivery to a state certified laboratory for analysis. Each groundwater sample will be analyzed for the following:

- VOCs plus methyl-tert-butyl-ether (MTBE) by U.S. EPA Method 8260B (4 samples),
- PAHs by U.S. EPA Method 8270C-modified (4 samples),
- 10 Site-Specific Constituent of Concern Metals (barium, thallium, chromium [total], chromium [hexavalent], copper, lead, mercury, nickel, vanadium, and zinc) by mass analysis U.S. EPA Method 6010B, 7196A and 7470) (4 samples),
- TPH by CT ETPH (4 samples)

4a. Project Timeline

Activities (list products)	Dates	
	Activity Start	Activity End
Utility Markout	Upon QAPP approval	Five working days after QAPP approval
Sediment Sampling	Upon QAPP approval	One working day after activity start date
Surface Water Sampling	Upon QAPP approval	One working day after activity start date
Installation of Test Pits	Immediately subsequent to utility markout	Five working days after activity start date
Installation of Soil Borings and Temporary Groundwater Monitoring Points	Immediately subsequent to utility markout	One working day after activity start date
Groundwater Sampling from Existing Monitoring Wells	Concurrent with Test Boring Installations	One working day after activity start date

5. Sampling Design

Laboratory analysis will be consistent with previously identified chemicals and those suspected to be present. All sampling locations were designed based on the previous environmental site investigations, including the HRP Phase I assessment (October 2001) and the TetraTechNUS Brownfields Site Assessment investigation (September 2002), as well as existing site conditions.

Data collection will consist of:

- Soil sampling from test pit and drilling operations
- Groundwater from temporary well point installations and existing monitoring wells;
- Sediment from wetlands and the unnamed watercourse via hand methodologies; and
- Surface water from the unnamed watercourses via hand methodology.

HRP will implement the scope of work as detailed in this QAPP. No deletions or modifications of sampling parameters are anticipated. However, if deletions or modifications are warranted by field conditions (i.e. insufficient sample, or re-appropriating the number of soil sampler in a given test pit due to the presence of waste materials), HRP will request and obtain approval prior to proceeding with these modifications. (i.e. From the field during the site investigation, HRP will contact Myra Schwatz and/or Dick Siscanau of EPA Region 1.)

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
RA-1 Drum and Debris Burial	TP-1		TP-1	A	x	x	x	x	x	x		x
	TP-2		TP-2	A	x	x	x	x				x
	TP-3		TP-3	A, H	x	x	x	x				x
	TP-4		TP-4	A, H	x	x	x	x	x	x		x
	TP-5		TP-5	A, H	x	x	x	x				x
	TP-6		TP-6	A, H	x	x	x	x				x
	TP-7		TP-7	A	x	x	x	x	x	x		x
	TP-8		TP-8	A	x	x	x	x				x
	TP-9		TP-9	A	x	x	x	x				x
	TP-10		TP-10A	A, B	x	x	x	x	x	x		x
			TP-10B		x	x	x	x				
	TP-11		TP-11A	A, B	x	x	x	x	x	x		x
			TP-11B		x	x	x	x				
	TP-12		TP-12A	A, B, H	x	x	x	x	x	x		x
			TP-12B		x	x	x	x				
	TP-13		TP-13A	A, B, H	x	x	x	x	x	x		x
			TP-13B		x	x	x	x				
	TP-14		TP-14A	A, B, F, H	x	x	x	x	x	x		x
			TP-14B		x	x	x	x				
	TP-15		TP-15A	A, B, H	x	x	x	x	x	x		x
			TP-15B		x	x	x	x				

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
RA-1 Drum and Debris Burial (continued)	TP-16		TP-16A	A, B, D, H	x	x	x	x	x	x		x
			TP-16B		x	x	x	x				
	TP-17		TP-17A	A, B, H	x	x	x	x	x	x		x
			TP-17B		x	x	x	x				
	TP-18		TP-18A	A, B, D	x	x	x	x	x	x		x
			TP-18B		x	x	x	x				
	TP-19		TP-19A	A, B	x	x	x	x	x	x		x
			TP-19B		x	x	x	x				
	TP-20		TP-20A	A, B	x	x	x	x	x	x		x
			TP-20B		x	x	x	x				
	TP-21		TP-21	A	x	x	x	x				x
	TP-22		TP-22	A	x	x	x	x	x	x		x
	TP-23		TP-23A	A, B	x	x	x	x	x	x		x
			TP-23B		x	x	x	x				
	TP-24		TP-24A	A, B	x	x	x	x	x	x		x
			TP-24B		x	x	x	x				
	TP-25		TP-25A	A, B, F, H	x	x	x	x	x	x		x
			TP-25B		x	x	x	x				
	TP-26		TP-26A	A, B, F, H	x	x	x	x	x	x		x
			TP-26B		x	x	x	x				
	TP-27		TP-27	A, B, F, H	x	x	x	x				x
	TP-28		TP-28	A, F, H	x	x	x	x				x
	TP-29		TP-29A	A, B	x	x	x	x	x	x		x
			TP-29B		x	x	x	x				

Soil Analyses
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Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
RA-1 Drum and Debris Burial (continued)	TP-30		TP-30	A, H	x	x	x	x				x
	TP-31		TP-31A	A, B, H	x	x	x	x	x	x		x
			TP-31B		x	x	x	x				
	TP-32		TP-32	A	x	x	x	x				x
	TP-33		TP-33	A	x	x	x	x				x
	TP-34		TP-34	A	x	x	x	x				x
	TP-35		TP-35A	A, B	x	x	x	x	x	x		x
			TP-35B		x	x	x	x				
	TP-36		TP-36	A	x	x	x	x				x
	TP-37		TP-37	A	x	x	x	x				x
	TP-38		TP-38	A, D	x	x	x	x	x	x		x
	TP-39		TP-39	A	x	x	x	x				x
	TP-40		TP-40	A	x	x	x	x				x
	TP-41		TP-41	A	x	x	x	x	x	x		x
	TP-42		TP-42	A	x	x	x	x				x
	TP-43		TP-43	A	x	x	x	x				x
	TP-44		TP-44	A	x	x	x	x	x	x		x
	TP-45		TP-45	A	x	x	x	x				x
	TP-46		TP-46	A	x	x	x	x				x
	TP-47		TP-47A	A, B	x	x	x	x	x	x		x
			TP-47B		x	x	x	x				

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
RA-1 Drum and Debris Burial (continued)	TP-48		TP-48A	A, B	x	x	x	x	x			x
			TP-48B		x	x	x	x				
	TP-49		TP-49	A	x	x	x	x				x
	TP-50		TP-50A	A, B	x	x	x	x	x	x		x
			TP-50B		x	x	x	x				
	TP-51		TP-51A	A, B	x	x	x	x	x			x
			TP-51B		x	x	x	x				
	TP-52		TP-52A	A, B	x	x	x	x	x	x		x
			TP-52B		x	x	x	x				
	TP-53		TP-53A	A, B	x	x	x	x	x			x
			TP-53B		x	x	x	x				
	TP-54		TP-54A	A, B	x	x	x	x	x	x		x
			TP-54B		x	x	x	x				
	TP-55		TP-55A	A, B	x	x	x	x	x			x
			TP-55B		x	x	x	x				
	TP-56		TB-56A	A, B	x	x	x	x	x	x		x
			TP-56B		x	x	x	x				
	TP-57		TP-57A	A, B	x	x	x	x	x			x
			TP-57B		x	x	x	x				
	TP-58		TP-58A	A, B	x	x	x	x	x	x		x
			TP-58B		x	x	x	x				
	TP-59		TP-59A	A, B	x	x	x	x	x			x
			TP-59B		x	x	x	x				

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
RA-1 Drum and Debris Burial (continued)	TP-60		TP-60A	A, B	x	x	x	x	x	x		x
			TP-60B		x	x	x	x				
	TP-61		TP-61A	A, B	x	x	x	x	x			x
			TP-61B		x	x	x	x				
RA-2 Former Drum Filling Building	TP-67		TP-67	C	x	x	x	x	x	x		x
	TP-68		TP-68		x	x	x	x	x	x		x
RA-3 Former Chemical Manhole	TP-64		TP-64	D, E	x	x	x	x	x	x		x
	TP-65		TP-65	D, E	x	x	x	x	x	x		x
	TP-66		TP-66	D, E	x	x	x	x	x	x		x
RA-4 Leaching Field	TP-14		TP-14A	A, B, F, H	x	x	x	x	x	x		x
			TP-14B		x	x	x	x				
	TP-21		TP-21	A, F, H	x	x	x	x				
	TP-25		TP-25A	A, B, F, H	x	x	x	x	x	x		x
			TP-25B		x	x	x	x				
	TP-26		TP-26A	A, B, F, H	x	x	x	x	x	x		x
			TP-26B		x	x	x	x				
	TP-27		TP-27A	A, F, H	x	x	x	x				x
	TP-28		TP-28	A, F, H	x	x	x	x				
	TP-32		TP-32	A, F, H	x	x	x	x				
	TP-33		TP-33	A, F, H	x	x	x	x				
	TP-38		TP-38	A, F, H	x	x	x	x	x	x		x

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
RA-5 Former Loading Rack	TP-71		TP-71	B, D, G	x x	x x	x x	x x	x	x		x
	TP-72		TP-72	D, G	x	x	x	x	x	x		x
		TB-7	TB-7	D, G,	x	x	x				x	x
		TB-8	TB-8	D, G	x	x	x					x
		TB-9	TB-9	D, G	x	x	x					x
PRA-6 Drum Storage Area	TP-3		TP-3	A, H	x	x	x	x				x
	TP-4		TP-4	A, H	x	x	x	x	x	x		x
	TP-5		TP-5	A, H	x	x	x	x				x
	TP-6		TP-6	A, H	x	x	x	x				x
	TP-12		TP-12A TP-12B	A, B, H	x x	x x	x x	x x	x	x		x
	TP-13		TP-13A TP-13B	A, B, H	x x	x x	x x	x x	x	x		x
	TP-14		TP-14A TP-14B	A, B, F, H	x x	x x	x x	x x	x	x		x
	TP-15		TP-15A TP-15B	A, B, H	x x	x x	x x	x x	x	x		x
	TP-25		TP-25A TP-25B	A, B, F, H	x x	x x	x x	x x	x	x		x
	TP-26		TP-26A TP-26B	A, B, F, H	x x	x x	x x	x x	x	x		x
	TP-27		TP-27	A, B, F, H	x	x	x	x				x
	TP-28		TP-28	A, F, H	x	x	x	x				x

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
PRA-6 Drum Storage Area (continued)	TP-30		TP-30	A, H	x	x	x	x				x
	TP-31		TP-31A TP-31B	A, B, H	x x	x x	x x	x x	x	x		x
PRA- 7 Former Drum Storage Sheds	TP-69			H	x	x	x	x	x	x		x
	TP-70			H	x	x	x	x	x	x		x
PRA-8 Former Tank Farm	TP-73			D, I	x	x	x	x	x	x		x
	TP-74			I	x	x	x	x				
	TP-75			I	x	x	x	x				
		TB-1	TB-1	I								
		TB-2	TB-2	I								
PRA-9 Loading Ramp		TB-3	TB-3	J	x	x	x		x	x	x	x
		TB-4	TB-4	J	x	x	x		x			x
		TB-5	TB-5	J, K								x
		TB-6	TB-6	J	x	x	x					x
PRA-10 Railroad Spur		TB-3	TB-3	K	x	x	x				x	x
		TB-7	TB-7	K	x	x	x				x	x
		TB-10	TB-10	K	x	x	x				x	x
		TB-11	TB-11	K	x	x	x				x	x

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]
PRA-12 Artificial Fill Area	TP-62		TP-62	D, L	x	x	x	x		x		
	TP-63		TP-63	D, L	x	x	x	x		x		
		TB-12	TB-12	D, L	x	x	x			x		

1 Specific soil sample depth horizons to be analyzed from this testing location will be chosen based upon field screening and physical evidence of potential contamination

2 Sampling Rationale:

A – Area beneath which wastes were potentially buried in addition to that already identified.
B – Area in which ground penetrating radar and/or magnetometer survey detected a subsurface anomaly.
C – Location of floor drain in the former drum filling building.
D – Contamination previously detected in soil and/or groundwater.
E – "Chemical Manhole" received wastes from drum filling building floor drain. Contamination previously detected in soil and groundwater.
F- The vicinity around the "Chemical Manhole" had been identified as a leaching field for the chemical manhole discharge.
G - Loading rack used to fill the former above ground tank farm with chemicals from rail cars. CT DEP inspection document spills in this area.
H – Historical drum storage in this area.
I – Tank farm consisted of ten 10,000-above ground storage tanks.
J – Loading ramp used to load/unload chemical containers to/from rail cars. Likely location for spills during transfers.
K – Railroad spur.
L - Fill material deposited under an Army Corps of Engineers permit. Six to nine discarded fiber and steel drums containing disodium phosphate were removed from this area.

Soil Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Test Pits	Soil Borings	Soil Samples1	Sampling Rational[2]	VOCs[3]	PAHs3	Metals – Mass Analysis [3,4]	pH [3]	PCBs [3, 5]	Pesticides [3, 5]	Herbicides[3]	TPH[3]

3 Analytical Methodologies
VOCs = Volatile Organic Compounds by U.S. EPA Method 8260B
COC Metals are Ba, Ti, Cr-T, Cr^{6+}, Cu, Pb, Hg, Ni, V, & Zn by mass analysis (U.S. EPA Methods 3050B, 6010B, 7196, and 7471)*
pH by U.S. EPA Method 9045C (120 samples)
PAHs = Polynuclear Aromatic Hydrocarbons by U.S. EPA Method 8270C – modified*
TPH = Total Petroleum Hydrocarbons by ETPH
PCBs = Polychlorinated Biphenyls by U.S. EPA Method 8082*
Pesticides = EPA Method 8081*
Herbicides = EPA Method 8151A

4 Mass analysis metal detections will compared to 20-times the Connecticut Remediation Standard Regulation (RSR) Pollution Mobility Criteria (PMC) for each metal to determine *potential* exceedences of the PMC. Up to 83 samples with concentrations detected above the respective values are resubmitted to the laboratory for analysis via the Synthetic Precipitate Leachate Procedure (SPLP, EPA Method 1312) which are compared *directly* to the PMC.

5 Of the 83 samples selected for SPLP extraction based on the mass analysis results for metals, up to 65 extractions will be analyzed for PAHs, and up to 25 extractions will be analyzed for PCBs and Pesticides. Selection for PAH and PCB/Pesticide SPLP extraction analysis will be based on the total concentrations detected in soil samples.

Groundwater Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Groundwater Grab Samples	Temporary Well Points	Existing Monitoring Wells	Sampling Rational[1]	VOCs[2]	PAHs[2]	Metals[2]	TPH[2]
RA-1 Drum and Debris Burial (continued)	TPW-16			A, B	x	x	x	x
	TPW-17			A, B	x	x	x	x
			MW-1	A, B, D	x	x	x	x
			MW-3	A	x	x	x	x
			MW-5	A, D	x	x	x	x
			RIZ-7	A	x	x	x	x
RA-2 Former Drum Filling Building	TPW-67			C	x	x	x	x
			RIZ-4	C	x	x	x	x
RA-3 Former Chemical Manhole	TPW-64			E	x	x	x	x
	TPW-65			E	x	x	x	x
			RIZ-4	E	x	x	x	x
RA-4 Leaching Field	TPW-33			A, B, F, H	x	x	x	x
	TPW-38			A, F, H	x	x	x	x
RA-5 Former Loading Rack	TPW-12			B, G	x	x	x	x
		TBW-8		G	x	x	x	x
		TBW-9		G	x	x	x	x
			MW-203	D, G	x	x	x	x
PRA- 7 Former Drum Storage Sheds	TPW-69			H	x	x	x	x
	TPW-70			H	x	x	x	x
PRA-8 Former Tank Farm		TBW-1		I	x	x	x	x
		TBW-2		I	x	x	x	x
PRA-9 Loading Ramp		TBW-5		J	x	x	x	x
PRA-10 Railroad Spur		TBW-10		K	x	x	x	x

Groundwater Analyses

Former Portland Chemical Facility

680 Newfield Street (rear), Middletown, CT

1 Sampling Rationale:

A – Area beneath which wastes were potentially buried in addition to that already identified.

B – Area in which ground penetrating radar and/or magnetometer survey detected a subsurface anomaly.

C – Location of floor drain in the former drum filling building.

D – Contamination previously detected in soil and/or groundwater.

E – "Chemical Manhole" received wastes from drum filling building floor drain. Contamination previously detected in soil and groundwater.

F- The vicinity around the "Chemical Manhole", in particular, the area to the north of the manhole, is a suspected leaching field for the chemical manhole discharge.

G - Loading rack used to fill the former above ground tank farm with chemicals from rail cars. CT DEP inspection document spills in this area.

H – Historical drum storage in this area.

I – Tank farm consisted of ten 10,000-above ground storage tanks.

J – Loading ramp used to load/unload chemical containers to/from rail cars. Likely location for spills during transfers.

K – Railroad spur.

L - Fill material deposited under an Army Corps of Engineers permit. Six to nine discarded fiber and steel drums containing disodium phosphate were removed from this area.

2 Analytical Methodologies:

COC Metals are Ba, Ti, Cr-T, Cr^{6+}, Cu, Pb, Hg, Ni, V, & Zn by mass analysis (U.S. EPA Methods 3050B, 6010B, 7196, and 7471)

VOCs = Volatile Organic Compounds by U.S. EPA Method 8260B

PAHs = Polynuclear Aromatic Hydrocarbons by U.S. EPA Method 8270C – modified

TPH = Total Petroleum Hydrocarbons by CT ETPH

Sediment Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Sediment Samples	Sampling Rational[1]	VOCs[2]	PAHs[2]	Metals – Mass Analysis [2]	pH[2]	PCBs[2]	Pesticides[2]	TPH[2]	SPLP[2]			
										Metals	PAHs	PCBs	Pest.
PRA-11 Unnamed Stream and Outfall Culvert	SED-1	A, B	x	x	x	x	x	x	x	x	x	x	x
	SED-2	A, B	x	x	x	x	x	x	x	x	x	x	x
	SED-3	C	x	x	x	x	x	x	x				
	SED-4	C	x	x	x	x	x	x	x				

1 Sampling Rationale:
A – Unnamed stream includes run-off from Newfield Street and adjacent industrial property.
B – Contamination previously detected in sediment water samples.
C – Unnamed tributary receives drainage from former tank farm area.

2 Analytical Methodologies
VOCs = Volatile Organic Compounds by U.S. EPA Method 8260B
COC Metals are Ba, Ti, Cr-T, Cr^{6+}, Cu, Pb, Hg, Ni, V, & Zn by mass analysis (U.S. EPA Methods 3050B, 6010B, 7196, and 7471)
pH by U.S. EPA Method 9045C (120 samples)
PAHs = Polynuclear Aromatic Hydrocarbons by U.S. EPA Method 8270C – modified
TPH = Total Petroleum Hydrocarbons by ETPH
PCBs = Polychlorinated Biphenyls by U.S. EPA Method 8082
Pesticides = EPA Method 8081
Herbicides = EPA Method 8151A
SPLP = Synthetic Precipitate Leaching Procedure (EPA Method

TABLE 5: Surface Water Analyses
Former Portland Chemical Facility
680 Newfield Street (rear), Middletown, CT

Area	Groundwater Grab Samples Temporary Well Points Existing Monitoring Wells	Sampling Rational[1]	VOCs[2]	PAHs[2]	Metals[2]	TPH[2]
PRA-11 Unnamed Stream and Outfall Culvert	SW-1	A, B	x	x	x	x
	SW-2	A, B	x	x	x	x
	SW-3	C	x	x	x	x
	SW-4	C	x	x	x	x

[1] Sampling Rationale:

A – Unnamed stream includes run-off from Newfield Street, adjacent industrial property, and on-site tributaries.
B – Contamination previously detected in surface water samples.
C – Unnamed tributary receives drainage from former tank farm area.

[2] Analytical Methodologies:
COC Metals are Ba, Ti, Cr-T, Cr^{6+}, Cu, Pb, Hg, Ni, V, & Zn by mass analysis
(U.S. EPA Methods 3050B, 6010B, 7196, and 7471)
VOCs = Volatile Organic Compounds by U.S. EPA Method 8260B
PAHs = Polynuclear Aromatic Hydrocarbons by U.S. EPA Method 8270C – modified
TPH = Total Petroleum Hydrocarbons by CT ETPH

6. Sampling and Analytical Methods Requirements

Task 2.0

Parameter	Matrix	Number of Samples (including field QC)	Analytical Method	Sampling SOP	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/analysis)
VOCs	Soil	117 6 duplicate 6 trip blank 6 equipment blank	EPA 8260B/ 5035A preservation	Appendix D	(2) 40 ml VOA vials	MeOH (to be frozen by lab) Cool to 4 °C	14 days
TPH	Soil	35 2 duplicate 2 equipment blank	ETPH	Appendix D	4 oz. glass jar	Cool to 4 ºC	14 days
10 COC Metals*	Soil	117 6 duplicate 6 equipment blank	EPA 3050B/ EPA 6010B/ EPA 7471 EPA 7196 SM 3500 Cr D	Appendix D	8 oz. glass jar	Cool to 4 ºC	6 months/ 28 days for Hg
PAHs	Soil	117 6 duplicate 6 equipment blank	EPA 8270C modified	Appendix D	4 oz. glass jar	Cool to 4 ºC	14 days/ 40 days
PCBs	Soil	50 2 duplicate 6 equipment blank	EPA 8082	Appendix D	4 oz. glass jar	Cool to 4 ºC	7 days until extraction/ 40 days after extraction
Pesticides	Soil	45 2 duplicate 6 equipment blank	EPA 8081	Appendix D	8 oz. glass jar	Cool to 4 ºC	14 days/40 days after extraction
Herbicides	Soil	5 1 duplicate 1 equipment blank	EPA 8151A	Appendix D	4 or 8 oz glass jar	Cool to 4 ºC	14 days/40 days after extraction

*10 COC Metals - Barium, Thallium, Total Chromium, Hexavalent Chromium, Copper, Lead, Mercury, Nickel, Vanadium, Zinc

Parameter	Matrix	Number of Samples (including field QC)	Analytical Method	Sampling SOP	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/analysis)
SPLP	Soil	83 4 duplicates	EPA 1312	Appendix D	8 oz. glass jar	Cool to 4 °C	6 months/ 28 days for Hg
10 COC Metals	SPLP Soil Extraction	360 metals*	EPA 3050B/ EPA 6010B/ EPA 7471 EPA 7196 SM 3500 Cr D	Appendix D	8 oz. glass jar	Cool to 4 ºC	6 months/ 28 days for Hg
PAHs	SPLP Soil Extraction	69 3 duplicates	EPA 8270C modified	Appendix D	4 oz. glass jar	Cool to 4 ºC	14 days/ 40 days
PCBs	SPLP Soil Extraction	29 2 duplicates	EPA 8082	Appendix D	4 oz. glass jar	Cool to 4 ºC	7 days until extraction/ 40 days after extraction
Pesticides	SPLP Soil Extraction	25 1 duplicate	EPA 8081	Appendix D	8 oz. glass jar	Cool to 4 ºC	14 days/40 after extraction
Herbicides	SPLP Soil Extraction	4 1 duplicate	EPA 8151A	Appendix D	4 or 8 oz glass jar	Cool to 4 ºC	14 days/40 after extraction

Task 3.0

Parameter	Matrix	Number of Samples (including field QC)	Analytical Method	Sampling SOP	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/analysis)
VOCs	Groundwater	23 1 duplicate 2 trip blank 2 equipment blank	EPA 8260B	Appendix D	(2) 40 ml VOA vials	Cool to 4 ºC, HCl, pH<2	14 days

* Mass analysis metal detections will be compared to 20-times the Connecticut Remediation Standard Regulation (RSR) Pollution Mobility Criteria (PMC) for each metal. This is a conservative interpretation to determine if there are any *potential* exceedences of the PMC. Concentrations detected above the respective values are resubmitted to the laboratory for analysis via the Synthetic Precipitate Leachate Procedure (SPLP), the results of which are compared *directly* to the PMC.

Parameter	Matrix	Number of Samples (including field QC)	Analytical Method	Sampling SOP	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/analysis)
TPH	Groundwater	23 2 equipment blank 1 duplicate	CT ETPH	Appendix D	1,000 ml amber glass	Cool to 4 ºC	14 days
PAHs	Groundwater	23 2 equipment blank 1 duplicate	EPA 8270C modified	Appendix D	2 x 1L Amber glass	Cool to 4ºC	7 days/ 40 days after extraction
COC Metals (except hex. chromium)	Groundwater	4	Filtered EPA 200.7/ EPA 200.9/ EPA 245.1/ SM3113B	Appendix D	500 ml plastic jar	Cool to 4 °C HNO_3 to pH<2	6 months/ 28 days for Hg
Hex. Chromium	Groundwater	4	SM 3500 Cr D	Appendix D	500 ml plastic jar	Cool to 4 °C	24 hours

Task 4.0

Parameter	Matrix	Number of Samples (including field QC)	Analytical Method	Sampling SOP	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/analysis)
VOCs	Sediment	4 1 trip blank	EPA 8260B/ 5035A preservation	Appendix D	(2) 40 ml VOA vials	MeOH (to be frozen by lab) Cool to 4 °C	14 days
PAHs	Sediment	4	EPA 8270C modified	Appendix D	4 oz. glass jar	Cool to 4 ºC	14 days/ 40 days
10 COC Metals	Sediment	4	EPA 3050B/ EPA 6010B/ EPA 7471 EPA 7196	Appendix D	8 oz. glass jar	Cool to 4 ºC	6 months/ 28 days for Hg
TPH	Sediment	4	ETPH	Appendix D	4 oz. glass jar	Cool to 4 ºC	14 days
PCBs	Sediment		EPA 8082	Appendix D	4 oz. glass jar	Cool to 4 ºC	7 days until extraction/ 40 days after extraction

Parameter	Matrix	Number of Samples (including field QC)	Analytical Method	Sampling SOP	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/analysis)
Pesticides	Sediment	4	EPA 8081	Appendix D	8 oz. amber glass jar	Cool to 4 ºC	14 days/ 40 days
SPLP Extractions	Sediment	2	EPA 1312	Appendix D	4 oz. glass jar	Cool to 4 ºC	6 months/ 28 days for Hg
10 COC Metals	SPLP Extractions	2	EPA 3050B/ EPA 6010B/ EPA 7471 EPA 7196	Appendix D	8 oz. glass jar	Cool to 4 ºC	6 months/ 28 days for Hg
PCBs	SPLP Extractions	2	EPA 8082	Appendix D	4 oz. glass jar	Cool to 4 ºC	7 days until extraction/ 40 days after extraction
Pesticides	SPLP Extractions	2	EPA 8081	Appendix D	8 oz. amber glass jar	Cool to 4 ºC	14 days/ 40 days

Task 5.0

Parameter	Matrix	Number of Samples (including field QC)	Analytical Method	Sampling SOP	Containers (Number, size and type)	Preservation Requirements (temperature, light, chemical)	Maximum Holding Time (preparation/analysis)
VOCs plus MTBE	Surface Water	4 1 trip blank	EPA 8260B	Appendix D	(2) 40 ml VOA vials	Cool to 4 ºC, HCl, pH<2	14 days
TPH	Surface Water	4	CT ETPH	Appendix D	1,000 ml amber glass	Cool to 4 ºC	14 days
PAHs	Surface Water	4	EPA 8270C modified	Appendix D	2 x 1L amber glass	Cool to 4oC	7 days/ 40 days after extraction
COC Metals (except hex. chromium)	Surface Water	4	Filtered EPA 200.7/ EPA 200.9/ EPA 245.1/ SM3113B	Appendix D	500 ml plastic jar	Cool to 4 °C HNO_3 to pH<2	6 months/ 28 days for Hg
Hex. Chromium	Surface Water	4	SM 3500 Cr D	Appendix D	500 ml plastic jar	Cool to 4 °C	24 hours

7. Method and SOP Reference Tables

Analytical Method Reference: Include document title, method name/number, revision number, date	Project Analytical SOPs: Included in Appendix A, B, and C: Include document title, date, revision number, and originator's name
1a. U.S. EPA – "Methods for Evaluating Solid Waste, Physical/Chemical Methods", 3rd Edition, U.S. EPA, November 1986, (SW846).	1b. Con-Test Statement of Qualifications, 2002
2a. U.S. EPA – "Methods for Chemical Analysis of Water and Wastes", U.S. EPA 600\4-79-020, Revised 1983.	2b. Con-Test Quality Assurance Manual, Revision Number 2, 2000
3a. U.S. EPA – Method 8260B. "Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)", SW846, Rev. 2, December 1996	3b. "Volatile Organic Compounds by GC/MS (EPA 8260)", Con-Test Laboratory, Inc., Rev. 1, May 1997
4a. U.S. EPA – Method 5035A. "Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples", SW846, Rev. 1, July 2002	4b. U.S. EPA – Method 5035A. "Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples", SW846, Rev. 1, July 2002
5a. U.S. EPA – Method 3050B. "Acid Digestion of Sediments, Sludges, and Soils", SW846, Rev. 2, December 1996	5b. U.S. EPA – Method 3050B. "Acid Digestion of Sediments, Sludges, and Soils", SW846, Rev. 2, December 1996
6a. U.S. EPA – Method 6010B. "Inductively Coupled Plasma-Atomic Emission Spectrometry", SW-846, Rev. 2, US EPA, December 1996	6b. "ICP - Inductively Coupled Plasma Emission Spectroscopy, 200.7, 6010, Potables, Non-potables, and Solids", Con-Test Laboratory, Inc., Rev. 2, July 16, 2003
7a. U.S. EPA – Method 7471A. "Mercury in Solid and Semisolid Waste (Manual Cold-Vapor Technique)", SW-846, Rev. 1, September 1994	7b. "Mercury (Cold Vapor Technique)", Con-Test Laboratory, Inc., Rev. 2, December 6, 2002
8a. U.S. EPA – Method 1312. "Synthetic Precipitation Leaching Procedure", SW-846, Rev. 0, July 1992	8b. U.S. EPA – Method 1312. "Synthetic Precipitation Leaching Procedure", SW-846, Rev. 0, July 1992

Analytical Method Reference: Include document title, method name/number, revision number, date	Project Analytical SOPs: Included in Appendix A, B, and C: Include document title, date, revision number, and originator's name
9a. U.S. EPA – Method 8082. "Polychlorinated Biphenyls (PCBs) by Gas Chromatography", SW846, Rev. 1, December 1996	9b. "Polychlorinated Biphenyls (PCBs) by Gas Chromatography, Method EPA 8082", Con-Test Laboratory, Inc., Rev. 0, May 5, 2003
10a. Connecticut DEP – Method CT-ETPH. "Analysis of Extractible Total Petroleum Hydrocarbons (ETPH) using Methylene Chloride Gas Chromatograph/Flame Ionization Detection", Approved 1999	10b. "CT ETPH: Analysis of Extractible Total Petroleum Hydrocarbons (ETPH) using Methylene Chloride; GC/FID, Method CT ETPH", Con-Test Laboratory, Inc., Rev. 0, July 15, 2003
11a. U.S. EPA – Method 8081A. "Organochlorine Pesticides by Gas Chromatography", SW846, Rev. 1, December 1996	11b. U.S. EPA – Method 8081A. "Organochlorine Pesticides by Gas Chromatography", SW846, Rev. 1, December 1996
12a. U.S. EPA – Method 200.7. Metals and trace Elements by ICP/Atomic Emission Spectrometry, Rev. 4.4, "Methods for the Determination of Metals in Environmental Samples Supplement 1", EPA/600/R-94/111, May 1994	12b. "Analysis of Metals in Non-Potable Water by Inductively Coupled Plasma: Atomic Emission", Con-Test Laboratory, Inc., Rev. 2, October 1997
13a. U.S. EPA – Method 245.1. Mercury by Cold Vapor AA Spectrometry – Manual, Rev. 3.0, "Methods for the Determination of Metals in Environmental Samples Supplement 1", EPA/600/R-94/111, May 1994	13b. "Mercury (Cold Vapor Technique)", Con-Test Laboratory, Inc., Rev. 2, December 6, 2002
14a. PAHs (vs. SVOCs?) Method 8270, SW846 Rev3, 1996 "Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry	14b. "Analytical Analysis of Semivolatile Organics (PAH's) Rev.2, Sept 9, 2001
15a. EPA method 9045C "Soil & waste pH" SW826, Rev.3, Jan 1995	15b. No. 64 "pH" Rev. No.2, August 11, 2003
16a. SM18 3500 CR D-modified Chromium colorimetric method	16b. "Hexavalent Chromium" No. 70, Rev 2, August 20, 2003

Analytical Method Reference: **Include document title, method name/number, revision number, date**	**Project Analytical SOPs:** **Included in Appendix A, B, and C: Include document title, date, revision number, and originator's name**
17a. US EPA - Method 8151A. Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzylation Derivatization. SW846, Rev. 1, December 1996	17b. Phoenix Laboratory No. 627.8151 "Chlorinated Herbicides by GC Using Methylation Derivatization" Rev. 2 , April 3, 2002

Project Sampling SOPs* **(Included in Appendix D: Includes document title, date, revision number, and originator's name)**
1. Standard Operating Procedures (SOPs) For Environmental Investigations, HRP Associates, Inc.

* Project Sampling SOPs include sample collection, sampling preservation, equipment decontamination, preventive maintenance, etc.

8. Preventive Maintenance – Field Equipment

Instrument	Activity	Frequency	SOP Ref.
Photoionization Detector	Check Battery Check Filter	Daily	Appendix D
Peristaltic Pump*	Charge Battery**	Between Each Rental	N/A

* Rental Equipment
** Activity preformed by the rental vendor

N/A = Not Applicable

9. Calibration and Corrective Action – Field Equipment

Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref.
Photoionization Detector	Calibration	Daily	N/A	Recalibrate	Appendix D
Peristaltic Pump*	N/A	N/A	N/A	N/A	N/A

* Rental Equipment
N/A = Not Applicable

10. Preventive Maintenance – Laboratory Equipment

Con-Test Analytical Laboratory

Instrument	Activity	Frequency	SOP Ref. *
VOC – GC/MS	Check gas	Daily	Appendix B
	System bake	Daily	Appendix B
	Replace septa	As needed	Appendix B
	Change/Replace Liner	As needed	Appendix B
	Change column	As needed	Appendix B
	Change Ferrules	As needed	Appendix B
	Replace trap	As needed	Appendix B
	Change Vacuum pump oil	2x year	Appendix B
SVOC – GC/MS	Check gas	Daily	Appendix B
	Clean/replace liner	As needed	Appendix B
	Replace column	As needed	Appendix B
	Change ferrules	As needed	Appendix B
	Change Vacuum pump oil	2x year	Appendix B
	Check/change pump tubing	Daily	Appendix B
	Change capillary tubing	As needed	Appendix B
	Clean Nebulizer	Monthly (as needed)	Appendix B
	Clean spray change	Monthly (as needed)	Appendix B
	Clean torch	As needed	Appendix B
ICP	Check/ Change Pump Tubing	Daily	Appendix B
	Change capillary tubing	As needed	Appendix B
	Rinse (between samples)	Per sample	Appendix B
	Clean torch	As needed	Appendix B
	Clean spray chamber	As needed	Appendix B
	Clean nebulizer	As needed	Appendix B

Instrument	Activity	Frequency	SOP Ref. *
ICP (cont.)	20 minute rinse before shut-down	Daily	Appendix B
GC – PCB	Check gas	Daily	Appendix B
	System bake	Daily	Appendix B
	Replace septa	As needed	Appendix B
	Change/Replace Liner	As needed	Appendix B
	Change column	As needed	Appendix B
	Change Ferrules	As needed	Appendix B
Hexavalent chromium	Clean cells	As needed	Appendix B
pH	Rinse Probe	Between samples	Appendix B
Pesticides	Check gas	Daily	Appendix B
	System Bake	Daily	Appendix B
	Replace septa	As needed	Appendix B
	Change/Replace Liner	As needed	Appendix B
	Change column	As needed	Appendix B
Herbicides	Check gas	Daily	Appendix B
	System Bake	Daily	Appendix B
	Replace septa	As needed	Appendix B
	Change/Replace Liner	As needed	Appendix B
	Change column	As needed	Appendix B
	Change Ferrules	As needed	Appendix B

11. Calibration and Corrective Action – Laboratory Equipment

Con-Test Analytical Laboratory

Instrument	Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Ref.
GC/MS		CCV (10%) Every 12 hrs – tuning	± 20% T.V.	Maintenance: recalibrate as necessary	Appendix B
GC		CCV (10%)	±25% TV	Maintenance, recalibrate as necessary	Appendix B
ICP		Initial (daily) CCV (10%)	**Established control limit ± 5% T.V.	Rerun/Maintenance	Appendix B
Herbicides		CCV (10%0	+or- 15% TV	Maintenance, recalibrate as necessary	Phoenix 627, 8151
pH		CCB after every batch	+/- 0.05 units	recalibrate	Appendix B
Hexavalent chromium		CCV 10%	80-120%	Recalibrate	Appendix B
PCBs/Pesticides		CCV 10%	+/- 10% T.V	Maintenance/Recalibrate	Appendix B

12. Sample Handling and Custody Requirements

All samples will be clearly labeled with the company name, job number, date, and sample identification (i.e., location, depth, etc.). Samples will be stored in coolers with ice until transport from the site to the laboratory by field personnel or courier. Holding times for various parameters are specific in the most recent SW-846 promulgated method for the requisite analytical parameter. Questions on holding times will be directed to the analytical laboratory.

All samples will be tracked via a chain of custody (COC). Each individual handling the samples must sign the COC. The original COC will remain with the sample though out the duration of the sampling event and will be kept in the permanent project file. Copies of the COC will be distributed to the working project file, laboratory manager, and the data package.

At the laboratory the samples will be relinquished to the Sample Custodian with the signing of the COC. The samples are visually inspected for damage and label correctness. Each sample is assigned an individual laboratory sample number. Samples are logged into the "B" sample log-in book (the environmental sample log book). The login includes the lab number, client, date, matrix, preservation, parameters, and laboratory batch ID. This information along with the log-in date and time, submitter ID, laboratory due date and priority, date sampled, date received, receiver, and any other appropriate laboratory information is then input into the Laboratory Information Management System (LIMS). A form is generated by LIMS and the original COC is attached. Samples are then transferred to be preserved if necessary and then to refrigerators pending analysis. Analysis is performed by the appropriate analyst or supervisor. After analysis is complete samples are transferred to disposal storage and held for two months in case further testing is required. Samples are appropriately characterized and disposed of in accordance with Federal, State, and Local regulations.

13. Analytical Precession and Accuracy

Analyte	Analytical Method*	Detection Limit (water/ soil) (µg/L)/ (mg/Kg)	Quantitation Limit (water/ soil) (µg/L)/ (mg/Kg)	Precision (water/ soil) %RPD	Accuracy (water/ soil) %R
VOCs*	8260B*	w - 1.00 µg/L* s – 100 µg/kg*	w - 1.00 µg/L* s – 100 µg/kg*	w- <30% s- <50%	70 – 130%
Metals					
Barium	w- EPA 200.7 s - 6010B	w - 0.0020 mg/L s – 0.1 mg/kg	w - 0.0020 mg/L s – 0.1 mg/kg	w- <30% s- <50%	70 – 130%
Chromium	w- EPA 200.7 s - 6010B	w - 0.0070 mg/L s – 0.35 mg/kg	w – 0.0070 mg/L s – 0.35 mg/kg	w- <30% s- <50%	70 – 130%
Hexavalent Chro-mium	w-SM3500 CR s-SM846 7196	w- 0.004 mg/L s- 0.2 mg/kg	w- 0.004 mg/L s- 0.2 mg/kg	w- <30% s- <50%	75-125%
Copper	w- EPA 200.7 s - 6010B	w - 0.010 mg/L s – 0.5 mg/kg	w – 0.010 mg/L s – 0.5 mg/kg	w- <30% s- <50%	70 – 130%
Lead	w- EPA 200.7 s - 6010B	w - 0.05 mg/L s – 1.0 mg/kg	w - 0.05 mg/L s – 1.0 mg/kg	w- <30% s- <50%	70 – 130%
Nickel	w- EPA 200.7 s - 6010B	w - 0.0050 mg/L s – 0.25 mg/kg	w - 0.0050 mg/L s – 0.25 mg/kg	w- <30% s- <50%	70 – 130%
Thallium	w-EPA 200.7 icp w-EPA 200.9 s-SW6010B	w-0.1 mg/L w-0.001 mg/L s-0.5 mg/Kg	w-0.1 mg/L w-0.001 mg/lL s-0.5 mg/Kg	w-<30% w-<20% s-<50%	w-70-130% w-85-115% s-70-130%
Vanadium	w-EPA 200.7 s-SW6010B	w-0.01 mg/L s-0.5 mg/Kg	w-0.01 mg/L s-0.5 mg/Kg	w-<30% s-<50%	w-70-130% s-70-130%
Zinc	w- EPA 200.7 s - 6010B	w - 0.003 mg/L s – 0.5 mg/kg	w – 0.003 mg/L s – 0.5 mg/kg	w- <30% s- <50%	70 – 130%
Mercury	w- 245.1 s- 7471	w-0.00004 mg/L s – 0.001 mg/kg	w –0.00004mg/L s – 0.001 mg/kg	w- <30% s- <50%	70 – 130%
PAHs					
Acenapthene	8270C	w- 10 ug/L s- 0.33 mg/kg	w- 10 ug/L s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Acenapthylene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Anthracene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Benzo(a)anthracene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Benzo(b)fluoranthene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Benzo(k)fluoranthene	8270C	w- 10 ug/l s- 0.33 mg/kg	w – 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%

Analyte	Analytical Method*	Detection Limit (water/ soil) (µg/L)/ (mg/Kg)	Quantitation Limit (water/ soil) (µg/L)/ (mg/Kg)	Precision (water/ soil) %RPD	Accuracy (water/ soil) %R
Benzo(g,h,i)perylene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Benzo(a)pyrene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Chrysene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Di-benz(a,h)anthracene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Fluoranthene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Fluorene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Indeno(1,2,3-cd)pyrene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Napthalene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Phenanthrene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
Pyrene	8270C	w- 10 ug/l s- 0.33 mg/kg	w- 10 ug/l s- 0.33 mg/kg	w- <30% s- <50%	40 -140%
8082 PCBs					
Aroclor 1016	8082	w- 0.05ug/L s- 0.025mg/kg	w- 0.05ug/L s- 0.025mg/kg	w- <30% s- <50%	40 -140%
Aroclor 1221	8082	w- 0.05ug/L s- 0.025mg/kg	w- 0.05ug/L s- 0.025mg/kg	w- <30% s- <50%	40 -140%
Aroclor 1232	8082	w- 0.05ug/L s- 0.025mg/kg	w- 0.05ug/L s- 0.025mg/kg	w- <30% s- <50%	40 -140%
Aroclor 1242	8082	w- 0.05ug/L s- 0.025mg/kg	w- 0.05ug/L s- 0.025mg/kg	w- <30% s- <50%	40 -140%
Aroclor 1248	8082	w- 0.05ug/L s- 0.025mg/kg	w- 0.05ug/L s- 0.025mg/kg	w- <30% s- <50%	40 -140%
Aroclor 1254	8082	w- 0.05ug/L s- 0.025mg/kg	w- 0.05ug/L s- 0.025mg/kg	w- <30% s- <50%	40 -140%
Aroclor 1260	8082	w- 0.05ug/L s- 0.025mg/kg	w- 0.05ug/L s- 0.025mg/kg	w- <30% s- <50%	40 -140%
pH	EPA 150.1 (w) SW846 9045 (s)	0.01 pH units	s- O.01	10%	N/A

Analyte	Analytical Method*	Detection Limit (water/ soil) (µg/L)/ (mg/Kg)	Quantitation Limit (water/ soil) (µg/L)/ (mg/Kg)	Precision (water/ soil) %RPD	Accuracy (water/ soil) %R
8151A herbicides					
2,4 D	8151A	w-0 ug/L s-100 ug/Kg	w-0 ug/L s-100 ug/Kg	w-<30 s-<50%	40-140%
2,4,5-T	8151A	w-0.2 ug/L s-20 ug/Kg	w-0.2 ug/L s-20 ug/Kg	w-<30 s-<50%	40-140%
2,4,5-TP	8151A	w-0.2 ug/L s-20 ug/Kg	w-0.2 ug/L s-20 ug/Kg	w-<30 s-<50%	40-140%
Dinoseb	8151A	w-0.5 ug/L s-10 ug/Kg	w-0.5 ug/L s-10 ug/Kg	w-<30 s-<50%	40-140%
Dicamba	8151A	w-0.5 ug/L s-30 ug/Kg	w-0.5 ug/L s-30 ug/Kg	w-<30 s-<50%	40-140%
Dalapon	8151A	w-5.0 ug/L s-500 ug/Kg	w-5.0 ug/L s-500 ug/Kg	w-<30 s-<50%	40-140%
Dichloroprop	8151A	w-0.5 ug/L s-100 ug/Kg	w-0.5 ug/L s-100 ug/Kg	w-<30 s-<50%	40-140%
2,4 DB	8151A	w-1.0 ug/L s-100 ug/Kg	w-1.0 ug/L s-100 ug/Kg	w-<30 s-<50%	40-140%
Pesticides					
Alpha-BHC	8081	w-<0.20 ug/L s-<0.025 mg/kg	w-<0.20 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Delta-BHC	8081	w-<0.05 ug/L s-<0.025 ug/L	w-<0.05 ug/L s-<0.025 ug/L	w-<30 s-<50%	40-140%
Beta-BHC	8081	w-<0.05 ug/L s-<0.025 ug/L	w-<0.05 ug/L s-<0.025 ug/L	w-<30 s-<50%	40-140%
Gamma-BHC	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Heptachlor	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Aldrin	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Heptachlor epoxide	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Endosulfan I	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
4,4-DDE	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%

Analyte	Analytical Method*	Detection Limit (water/ soil) (µg/L)/ (mg/Kg)	Quantitation Limit (water/ soil) (µg/L)/ (mg/Kg)	Precision (water/ soil) %RPD	Accuracy (water/ soil) %R
Dieldrin	8081	w-<0.020 ug/L s-<0.010 mg/kg	w-<0.020 ug/L s-<0.010 mg/kg	w-<30 s-<50%	40-140%
Endrin	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
4,4-DDD	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Endosulfan II	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
4,4-DDT	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Endrin Aldehyde	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Endosulfan sulfate	8081	w-<0.05 ug/L s-<0.025 mg/kg	w-<0.05 ug/L s-<0.025 mg/kg	w-<30 s-<50%	40-140%
Methoxychlor	8081	w-<0.50 s-<0.25 mg/kg	w-<0.50 s-<0.25 mg/kg	w-<30 s-<50%	40-140%
Toxaphene	8081	w-<1.0 ug/L s-<0.50 mg/kg	w-<1.0 ug/L s-<0.50 mg/kg	w-<30 s-<50%	40-140%

* Detection Limits for VOC's is listed as standard limits.
** Accuracy same for water and soil

14. Field Quality Control Requirements

QC Sample	Frequency	Acceptance Criteria	Corrective Action
Duplicate	1 per every 20 samples	Duplicate concentrations are within ±50% of original sample	Rerun sample Flag in data report
Equipment Blank	1 per day	No contaminants are detected	Rerun sample Flag in data report
VOA Trip Blank	1 per cooler/day	No contaminants are detected	Flag in data report

15. Laboratory Quality Control Requirements

Con-Test Analytical Laboratory

QC Sample	Frequency	Acceptance Criteria	Corrective Action
VOA Reagent/Method Blank	Batch	<PQL	Re-run; instrument maintenance
Reagent/Method Blank	Batch	<PQL	Re-run; instrument maintenance
Duplicate	10% or Batch	<50%	Re-run
Matrix Spike	10% or Batch	Con-Test control limit	Re-extract batch
Performance Evaluation (PE) Sample	Batch	Set by specific PE sample	Re-analyze/extract; instrument maintenance
Other Surrogate Spike	Per Sample	Con-Test control limits	Re-extract

16. Data Management and Documentation

Field data will be recorded in a permanently bound waterproof notebook. All notes will include the date, sampling location, weather conditions, any measurements taken, and any problems encountered in the field.

The sampling labels and the chain of custodies will be clearly written and consistent with one another.

Analytical samples are recorded in a permanently bound laboratory notebook, specific for each instrument. A brief narrative is included at the end of each analytical run that includes any problems encountered with the standards, samples, blanks or QC samples. Some of the automated analytical equipment (GCs and GC/MSs) have computer generated analytical runs which automatically flag and note any problems on the computer run. If any corrective action is taken, it will be noted in narrative in the instrument notebook (see the laboratory QAP for more detail). The laboratory SOPs have been included in Appendix A, B and C.

The following deliverables will be provided by the laboratory:

1. Client's Name
2. Project Number
3. Laboratory Sample ID
4. Client Sample ID
5. Collection Date
6. Sample Matrix
7. Analyses
8. Analytical Results/Data Results Sheets
9. Reporting Limits
10. Reporting Units
11. Dilution Factor
12. Date Analyzed
13. Method Blank Results
14. Surrogate Recoveries and Acceptance Limits
15. Matrix Spike/Matrix Spike Duplicate Results and Acceptance Limits
16. Spike/Duplicate Results and Acceptance Limits
17. Laboratory Control Sample Results and Acceptance Limits
18. Project Narrative which contains all observations and deviations

Types of information the laboratory will provide include:

1. Analytical Summary Sheets
2. QC Summary Sheets

The following will be maintained by the laboratory:

- All raw data including chromatograms
- Copies of Instrument Logbooks
- Copies of internal chains of custody.
- PE sample results.
- ICP Serial Dilution Results
- ICP Interference Check Sample Results

All reports are generated in hard-copy form and Con-Test electronic data deliverables will be provided in Excel format.

17. Assessment and Response Actions

The Project QA Officer will coordinate with the field personnel, specifically on issues pertaining to sampling activities and sample handling, so that the activities are consistent with the QAPP.

Refer to Appendix B for the laboratory assessment and response action.

18. Project Reports

The laboratory will provide a copy of the analytical results to HRP Associates, Inc.

Under this task, the subsurface investigation data will be assembled and evaluated with respect to the RSRs and presented in a summary report. The report will include maps showing the location of all sampling points, logs of all test borings, analytical data summary tables, laboratory analytical reports, documentation of data validation, and will present conclusions and recommendations regarding the environmental status of the site and implications with respect to proposed site development.

19. Verification of Sampling Procedures

All sampling procedures will be reviewed with the field personnel. An HRP geologist will perform and oversee all sampling events. All personnel that perform field sampling activities have been trained in the use of the HRP SOPs to be utilized pursuant to this QAPP. Field personnel will be given a copy of this QAPP to read prior to performing any field sampling activity or directed by the project manager as to what sampling procedures are to be employed. The project manager will speak to the field sampling team on a daily basis to verify that the sampling procedures specified in this QAPP are being followed. These managerial controls will verify that the sampling procedures contained in this QAPP are utilized. The project manager will be responsible to verify that the sampling procedures are appropriate to meet the objectives at the proposed investigations.

20. Data Verification and Validation

The laboratory will perform internal validation procedures as per their SOPs.

An HRP QA Manager will perform a Tier II – type validation of the laboratory data deliverables received from the Connecticut Certified Laboratory. The following tasks will be performed and documented in the validation section of the final site activities report. A discussion will also be provided that includes any observations and conclusions about the quality of the data and any limitations on the way it should be used.

A Summary of Technical Usability

- HRP will identify and document the following:
- Laboratory and laboratory project number
- Number of samples and sample field identifications (IDs) submitted to the laboratory by comparing the laboratory narrative to the chain-of-custody
- The laboratory sample IDs
- List parameters analyzed by comparing the laboratory narrative to the chain-of-custody

B Technical Issues Affecting Accuracy

HRP will review, document, and comment on:

- Sampling holding times compared to acceptable holding times
- Laboratory control sample recoveries compared to acceptable laboratory control sample recoveries as established by the method standard operating procedures of the laboratory internal procedures
- Matrix spike recoveries compared to acceptable matrix spike recoveries as established by the method standard operating procedures of the laboratory internal procedures

C Technical Issues Affecting Precision and Representativeness

The relative percent differences (RPD) will be calculated between samples and sample duplicates and between matrix spikes and matrix spikes duplicates. The acceptable RPD for soil is an RPD<50% and the acceptable RPD for water is an RPD<30% (see Section 13).

D Technical Issues Affecting Sensitivity

HRP will review and comment on any contaminants identified the following

- Method blanks
- Equipment blanks

HRP will review the laboratory reported minimum detection limits (MDLs)

E Summary of Completeness, Documentation, and Chain-of-Custody Issues

HRP will review the data deliverables package for the following components:

- Laboratory narrative
- Data result sheets
- Method blank results
- Surrogate recoveries and acceptance limits
- Matrix spike/matrix spike duplicate results and acceptance limits
- Laboratory control sample results and acceptance limits
- Project narrative including all observations and deviations

If any sample or QC issues are documented in the narrative that are not included as part of the data package deliverables, the laboratory will be contacted, copies of relevant information obtained, and a discussion of any limitations on the use of the data will be presented in the validation section of the final reports. If the data deliverables package is incomplete the laboratory will be contacted and requested to provide the missing documentation.

21. Data Usability

Present Field Duplicate Results

All field duplicate results will be presented in tables throughout the corresponding reports.

Representativeness

HRP will review all data and flag any unexpected and/or anomalous results in the corresponding reports.

Comparability

Soil and groundwater results will be compared to the Connecticut Remediation Standard Regulation (RSR) soil and groundwater criteria as follows:

1. Soil
   - Residential Direct Exposure Criteria
   - Industrial/Commercial Direct Exposure Criteria
   - "GB" Area Pollutant Mobility Criteria

2. Groundwater
   - Surface Water Protection Criteria
   - Residential Volatilization Criteria
   - Industrial/Commercial Volatilization Criteria

Sensitivity

HRP will compare all soil and groundwater result detection limits to the RSR's to verify that they are below the standards. If detection limits are found above standard the laboratory will be contacted to rerun the sample at a detection limit below the standard. If it is not possible to achieve detection limits below the RSR criteria the analyte will be flagged in the report.

Usability and Completeness Summary

HRP will discuss the usability of data collected in the corresponding reports and discuss if it could be used for the overall findings. Any data gaps and unusable data will be noted in the subsequent reports. Based upon the results of data validation (See Section 20) at least 90% of the data must be valid for the proper evaluation of the site.

Appendix A

Con-Test Statement of Qualifications

Appendix B

Con-Test Quality Assurance Manual

Appendix C

Con-Test Standard Operating Procedures (SOPs)

Appendix D

HRP Associates, Inc. Standard Operating Procedures (SOPs) for Environmental Investigation