Table 5-1 Sampling Program Summary for Milltown – Ford Avenue Redevelopment Area, NJ.

Path	Objective(s)	Investigation activities	COCs	Initial Category of Analysis	Delineation Criteria	Decision Statements
Transformer Pads (9 pads: PAD 1 – 9)						
1	Evaluate if PCBs presently exist in soils adjacent to, and/or beneath the transformer pads at 9 locations.	**1**. Evaluate condition and slope of each pad to determine where to bias the locations for sample collection. **2**. Look for downgradient locations, staining, cracks in the pads or other evidence of impacts from past releases. **3**. Select 4 – 6 locations to undergo initial sampling at each pad based on visual inspection and historical information: if concrete pad is still present, collect soil core beneath concrete pad from at least 1 location (save the concrete core for future potential analysis). **4**. Collect shallow soil cores within top 2 feet of soil columns: Collect 1 soil sample per each location with a 6-inch interval that will be biased to visually stained soils or taken from the most surficial portion of the sampled zone.	PCBs	Start with **2** (SW-846 GC/ECD Method 8082-modified) and then **3** (if PCBs are found; SW-846 GC/MS Method 8270C-modified or RaPID Assay test kits)	0.49 mg/Kg	• Perform Category 2 analysis on the initial set of shallow soil samples. • If the initial results from Category 2 analysis are below the criteria, then no further on-site delineation activities will be conducted at that area. Instead, a limited number of the initial samples will be re-analyzed in accordance with NJ-certified Category 1 procedures to obtain collaborative data. • If concentrations exceed the criteria at any given area, then conduct step-out sampling for horizontal delineation by choosing one of Category 3 methods, depending on the extent of PCBs distribution over the site. • Once horizontal delineation activities have been completed, advance a deep soil boring at the location displaying the highest PCB concentration and then continue vertical delineation until concentrations are below criteria. • Depending on depth of vertical migration and the findings from the Site-wide lithology investigation, advance a deep soil boring (through the artificial fill to native material) and sample soil intervals throughout the artificial fill and uppermost portion of native material.

Table 5-1 (Continued)

Path	Objective(s)	Investigation activities	COCs	Initial Category of Analysis	Delineation Criteria	Decision Statements
Site-Wide Artificial Fill, Geology, and Groundwater Conditions (40 locations for soil and groundwater borings: S/GW 11 – 50)						
1	**Conductivity probe survey**: Map Site-wide stratigraphy in real time in order to fill in data gaps with results of conductivity probe survey: clay layer(s), clay thickness, top of bedrock, and locations where clay layer(s) maybe absent as well as sands, silts, and other deposits. Define the artificial fill distribution to site boundaries by integrating information from the probe activities and soil boring results with other data provided by CSM	Perform approximately 60 – 70 probes across the site for about 1 week: **1.** Test approximately 1/3 of the probes at the locations where soil borings are planned or the lithology is known based on previous soil borings. **2.** Use the rest of the probes (2/3) in locations where no soil borings are planned throughout the site to fill in data gaps **3.** Test at least 5 probes through the clay layer(s) to the underlying bedrock to evaluate thickness of clay.	NA	Conductivity Probe	Not available	• If an interpretation of the probe results appears to identify a similar lithologic profile to that based on actual soil borings data, then use conductivity probe to define stratigraphy at locations where no soil borings are planned on Site-wide basis. • If artificial fill material can be distinguished from native material with the use of the conductivity probe, then use conductivity data to help determine the required depths and sampling intervals within the soil borings.
2	**Soil boring program**: Determine if there has been any downward migration of fill COCs in native material beneath the artificial fill. Delineate the distribution of fill COCs above UUSCC (at surface and depth) to support redevelopment cost evaluation.	Conduct approximately 40 soil borings (8 – 10 borings per day) and then collect at least 4 samples per each boring from native material under the artificial fill: 1 sample from the native material beneath the artificial fill, 1 shallow soil sample within 2', and 2 additional samples from the artificial fill at the discretion of the field geologist. Approximately 50-75% of soil samples will be analyzed by the on-site laboratory each day. The remainder (25-50%) will be archived for future analysis. Scan all soil cores with an OVM and a handheld XRF. Start with Category 3 analysis for PAHs and then approximately 25% of the samples per day will be analyzed by Category 2 for PAHs and screened by Category 3 for TPH.	PAHs	**3** (siteLAB UVF)	UUSCC	• If the conductivity probe is unable to differentiate between native soils and artificial fill, then the depths and sampling intervals within borings will be based exclusively on field geologist interpretation of native material. All soil borings should be terminated in native geologic material. • If field observations within artificial fill indicate any evidence such as elevated PID readings, staining or conductivity anomalies, etc., then the sample selection will be biased towards location where field observation indicate appropriate zones. • If field observations indicate a strong likelihood that potential of COCs in artificial fill may migrate vertically into underlying native materials, then identify the sample for analysis. If not, archive sample for future analysis. *: Analysis for confirmation samples (not primary COCs). **: TPH screening by Category 3 will be conducted along with approximately 25% of soil samples per day that will be analyzed by Category 2 for PAHs. TPH is also not primary COCs for the Site-wide soil boring program.
			Metals	**3** and/or **2** (Spectrce 6000 XRF)	UUSCC	
			VOCs*	**1** (SW-846 GC/MS Method 8260B)	UUSCC	
			TPH**	**3** (SW-846 GC/MS Method 8270C-modified)	10,000 mg/Kg	

Table 5-1 (Continued)

Path	Objective(s)	Investigation activities	COCs	Initial Category of Analysis	Delineation Criteria	Decision Statements
Site-Wide Artificial Fill, Geology, and Groundwater Conditions (continued)						
3	**Shallow groundwater evaluation**: Evaluate the nature and extent of the shallow groundwater system in conjunction with the Site-wide soil-boring program.	Conduct approximately 40 borings for the Site-wide shallow groundwater sampling. All groundwater samples will be analyzed by Category 2 for VOCs once a week. A limited number of groundwater samples which do not indicate the presence of VOCs will be analyzed by Category 1.	VOCs	**2** (USEPA SW-846 GC/MS Method 8260B-modified)	GWQS	If field observations indicate an absence of soil moisture in a given soil boring location, then that boring will be abandoned at the completion of soil sampling activities, and no attempt will be made to collect groundwater there. If field observations indicate soils are moist or wet, then place a temporary PVC well in the borehole and wait for 48 hours to determine if groundwater grab sample can be obtained. If field observations indicate the presence of saturated zone with potential for good yields, then collect a depth-discrete groundwater grab sample from a temporary point advanced adjacent to the soil boring location. *: A small portion of groundwater samples will be tested by Category 1 analysis (field filtered): off-site analysis.
			Metals*	**1** (NJDEP Certified laboratory)	GWQS	

Table 5-1 (Continued)

Path	Objective(s)	Investigation activities	COCs	Initial Category of Analysis	Delineation Criteria	Decision Statements
Site-Wide Storm Water Drainage System (Total 16 locations: SED 1 - 2 and SED 5 - 18)						
1	**Out-fall delineation sampling**: Delineate the extent of the sediment impacts at 2 drainage system discharge points (SED 1 & 2).	Begin drainage channel sampling from a sample point in the center of the drainage channel: conduct sampling along transects that cross the thin discharge channel as well as along the length of the channel from the initial discharge point to the pond edge. Conduct initial analysis of soil collected from the 6-inch interval of the soil column.	PAHs	**2** (SW-846 GC/MS Method 8270C-modified)	UUSCC or Sediment guideline	For horizontal delineation, if concentrations exceed criteria, then proceed to outermost edge of the channel and take samples. Repeat at up to 3 locations along the channel between the out-fall pipe and edge of the pond. For vertical delineation, if concentrations exceed criteria, then test next 6-inch interval. Repeat until all COC values are below criteria.
			Metals	**2** (Spectrce 6000 XRF)		
			PCBs	**3** (SW-846 GC/MS Method 8270C-modified or RaPID Assay test kits)		
			TPH	**3** (SW-846 GC/MS Method 8270C-modified)	10,000 mg/Kg	
2	**Pond edge sampling (SED 7 & 8)**: Identify that Mill pond is affected from the 2 upland AOCs: adjacent/downstream of Coal Storage Area/100,000 Gallon AST area and Chlorobenzene Groundwater Plume.	Initially, collect 3 samples at pond edge adjacent/downstream of the 2 impacted areas.	PAHs	**2** (SW-846 GC/MS Method 8270C-modified)	UUSCC or Sediment guideline	If samples indicate presence of contaminants associated with the two impacted areas, then delineate along the pond edge. Choose step-out distances based on proximity to other samples and suspected lateral dimensions of the upland impacts.
			Metals	**2** (Spectrce 6000 XRF)		
			TPH	**3** (SW-846 GC/MS Method 8270C-modified)	10,000 mg/Kg	
3	**Drainage system components sampling**: Evaluate the Site-wide drainage system that can be an important pathway for potential contaminants to reach pond ecosystem.	Select a group of catch basins, trench drains, sumps, pits and manholes/junction boxes for sediment sampling. Bias select group of borings from the Site-wide investigation to a drainage system component to obtain soil samples (and groundwater samples where available) to a pit or junction box. Take soil samples adjacent to 2 additional outfalls (SED-15 & 17).	PAHs	**2** (SW-846 GC/MS Method 8270C-modified)	UUSCC or Sediment guideline	
			Metals	**2** (Spectrce 6000 XRF)		
			PCBs	**3** (SW-846 GC/MS Method 8270C-modified or RaPID Assay test kits)	0.49 mg/Kg for soil or Sediment guideline	

Table 5-1 (Continued)

Path	Objective(s)	Investigation activities	COCs	Initial Category of Analysis	Delineation Criteria	Decision Statements
Area South of Powerhouse						
1	Delineate metals and PAH impacts in the area south of the powerhouse building. Evaluate shallow groundwater and soil conditions adjacent to the building.	**1**. Initially start 4 step-out soil sampling radiating outward from S/GW-7 with 2-foot depth interval: collect 2 shallow soil samples per each location at 0-0.5' and 1.5-2' in depth. **2**. Estimate the extent of impacts (boundary) based upon the layout of the area and other physical features and then begin a series of shallow soil sampling along the estimated boundaries. **3**. Once the lateral extent of impacts has been defined, select locations for vertical delineation. **4.** Once the soil impacts have been sufficiently delineated, collect groundwater samples at 3 locations, based on results of soil samples and estimated groundwater flow direction.	PAHs	**2** (SW-846 GC/MS Method 8270C-modified)	UUSCC	• Depending on results, perform judgmental sampling by step-in (below criteria) or step-out (above criteria) soil sampling until lateral extent of shallow soil impacts has been determined, following guidance for decision logic in Chapter 4. • If results of shallow soil sampling started from the estimated boundaries are below criteria, then step-in toward original boring. • Once lateral extent of shallow soil impacts has been defined, select locations where the 1.5-2' sampling interval has indicated the greatest impacts and then conduct vertical delineation at increasingly deeper intervals until concentrations fall below criteria. • If excessive concentrations of lead (near TCLP) are discovered in soil sample, collect shallow groundwater samples near to the sample location for analyzing dissolved metals (off-site analysis), using field filter. Also, collect soil sample for TCLP analysis to support waste disposal evaluation. *: PCOCs for groundwater samples
			Metals (soil)	**3** and/or **2** (Spectrce 6000 XRF)	UUSCC	
			TPH	**3** (SW-846 GC/MS Method 8270C-modified)	10,000 mg/Kg	
			VOCs*	**2** (USEPA SW-846 GC/MS Method 8260B-modified)	GWQS	
2	Determine if petroleum contamination has migrated through the powerhouse floor and is migrating downgradient toward the pond.	Choose 4 locations along the outside edge of Buildings 9 and 10 to collect shallow soil and groundwater samples by biasing sample locations based on inspection of interior.	VOCs	**2** (USEPA SW-846 GC/MS Method 8260B-modified)	UUSCC GWQS	If initial soil and groundwater sampling indicate elevated concentrations of TPH, floating product, and/or dissolved VOCs, then perform additional sampling along, and downgradient of, the building edge to delineate the lateral extent of such impacts.
			TPH	**3** (SW-846 GC/MS Method 8270C-modified)	10,000 mg/Kg for soil samples	

Table 5-1 (Continued)

Path	Objective(s)	Investigation activities	COCs	Initial Category of Analysis	Delineation Criteria	Decision Statements
Coal Storage Area/100,000 Gallon AST Area						
1	Evaluate potential effectiveness of the concrete containment wall to act as a barrier to horizontal migration of soil and groundwater quality impacts. Identify the presence of a potential clay layer and determine potential presence of a vertical contaminant migration pathway within the containment wall area.	**1**. Excavate test pits along the inside edge of the wall to determine the depth of the wall foundation. **2**. Select several sampling points for soil boring along the outside of the wall and then collect samples at various depths below the foundation depth. **3**. Excavate test pits and/or advance soil borings along the inside of the wall.	PAHs	**2** (SW-846 GC/MS Method 8270C-modified)	UUSCC	• If soil in the inside test pits appears impacts, then collect samples at various depths to undergo chemical analysis. • If results from the outside soil samples indicate impacts, then delineate along the outside edge of the wall.
			Metals	**3** and/or **2** (Spectrce 6000 XRF)	UUSCC	
			TPH	**3** (SW-846 GC/MS Method 8270C-modified)	10,000 mg/Kg	
2	Evaluate the presence of free product and/or dissolved VOCs movements beyond the containment wall.	Collect groundwater grab samples between the wall and the pond.	VOCs	**2** (USEPA SW-846 GC/MS Method 8260B-modified)	GWQS	If results from the outside groundwater samples indicate impacts, then select additional groundwater grab sampling location downgradient of the wall toward the pond and repeat sampling until adequate delineation between the wall and the pond is achieved.
Area East of Building 60A (around S/GW-5)						
1	Delineate soil quality impacts vertically and laterally: more precisely defined vertical and lateral delineation.	**1**. Advance a soil boring near by the original S/GW-5. **2**. For vertical delineation, scan the soil cores by a hand-held XRF and then submit samples from above and below the maximum measured depth of such impacts for on-site analysis. **3**. Once the vertical extent of such impacts has been defined, conduct lateral delineation in a step-out fashion or by using the boundary estimate approach: extend soil borings to the depth identified from the vertical profiling. **4**. Throughout the lateral delineation sampling effort, conduct additional vertical profiling to verify the vertical extent of soil quality impacts.	PAHs	**2** (SW-846 GC/MS Method 8270C-modified)	UUSCC	If concentrations in vertical delineation are above criteria, continue to analyze deeper intervals from the initial boring until the maximum vertical extent of soil quality impacts has been established. Depending on site conditions, reviews of historical operations and decisions of the Field Team Leader, perform either of lateral delineation approaches as follows: • If no obvious horizontal extent of impacts exist, choose step-out sampling locations. ➔ If concentrations exceed criteria, continue step-outs until boundary has been established. • If there is a good indication of an operational or physical condition that could be considered a boundary, move initial lateral delineation sampling locations to the estimated boundary location. ➔ If concentrations are below criteria, conduct step-in samplings toward the S/GW-5 location to more precisely define the lateral extent of soil quality impacts.
			Metals	**3** and/or **2** (Spectrce 6000 XRF)	UUSCC	
			TPH	**3** (SW-846 GC/MS Method 8270C-modified)	10,000 mg/Kg	

Table 5-1 (Continued)

Path	Objective(s)	Investigation activities	COCs	Initial Category of Analysis	Delineation Criteria	Decision Statements
Site-Wide Debris Piles						
1	Identify any content that could be a source of contamination to environment.	Cull through debris piles recording contents.	UK	**4**	NA	Depending results, create decision rules around sampling.
Area-Specific Groundwater Delineation: (Chlorobenzene Plume; around S/GW-9)						
1	Delineate the on-site extent of the subject chlorobenzene plume. Determine if it originates from an on-site source.	**1**. Collect a series of groundwater samples from locations situated immediately southeast of Building 3 (along arch). **2**. Conduct lateral groundwater grab sampling (step-out) on either side of S/GW-9 to delineate the edges of plume. **3**. Collect a series of groundwater grab samples at the downgradient of S/GW-9, near the pond edge. **4**. Collect a limited number of soil samples in the vicinity of any suspected on-site source area, which may be identified.	VOCs	**2** (USEPA SW-846 GC/MS Method 8260B-modified)	GWQS	If results from the initial upgradient arch suggest that a potential source is present in a given upgradient direction, then continue sampling in that upgradient direction until a source area is located or the upgradient property boundary is encountered. On the eastern side of S/GW-9, step-out to the property boundary. If results are below criteria, then step in half way between the property boundary and the location S/GW-9. Extend delineation activities towards the pond in downgradient direction. Determine if downgradient extent of plume extends past downgradient property boundary. Collect limited number of soil samples at any potentially identified on-site source areas as well as groundwater grab samples at edge of plume defined to be within Site boundaries to undergo Category 1 collaborative analysis. At the conclusion of all area-specific groundwater delineation activities, identify potential areas where the installation of deep groundwater wells may be warranted. Any such deep groundwater characterization which may be deemed necessary will be conducted subsequent to the subject Stage 2-SI/RI program.

UUSCC: New Jersey Unrestricted Use Soil Cleanup Criteria
GWQS: New Jersey Groundwater Quality Standards.
NA: not available, UK: unknown