# APPENDIX E

# SOIL SAMPLING METHODOLOGY AND PROCEDURES

## 1.1 ANALYTICAL PARAMETERS SELECTED AND RATIONALE

Soil samples collected during assessments were analyzed for Resource Conservation and Recovery Act (RCRA) Metals (US EPA SW-846, Method 6010B), Copper (US-EPA, Method 7470/6010B), Volatile Organic Compounds (VOCs) (US EPA SW-846, Method 8260B), Semi-Volatile Organic Compounds (SVOCs) (US-EPA SW-846, Method 8270D), Polycyclic aromatic Hydrocarbons (PAHs) (US-EPA SW-846, Method 8270), Benzene, Toluene, Ethylbenzene, and Xylenes (BTEX) (US-EPA SW-846, Method 8260B), Diesel-Gasoline Range Organics (DRO/GRO) (US-EPA SW-846, Method 8015). These parameters were selected based on potential sources or applications that may have resulted in a release of a regulated substance within each area.

## 1.2 SAMPLING AND ANALYSIS PROCEDURES

### 1.2.1 Sampling Equipment and Collection Techniques

The soil samples were obtained by using a stainless steel hand auger, stainless steel spoons, and direct-push sampler or split-spoon sampler during installation of soil borings or monitoring wells. Surface samples were collected utilizing individual, decontaminated stainless steel spoons (one designated, pre-cleaned spoon for each sample). A stainless steel hand auger was utilized in the collection of subsurface soil samples to a depth of approximately seven feet. Prior to the collection of each sample at the predetermined sampling depth, the hand auger was decontaminated via Liquinox® detergent and de-ionized water to avoid cross contamination from upper surface soils. Subsurface samples beyond seven feet in depth were generally collected via direct push technology (DPT) at various intervals. DPT sampling equipment was decontaminated prior to advancement at each sample location. Soil samples collected from monitoring well borings for lithologic evaluation were collected from sleeves inside sonic drill casing.

### 1.2.2 Soil Sample Handling and Preservation Techniques

Powder-free nitrile gloves were worn during sampling activities. The soil samples were collected from the sampling device(s) and placed in laboratory-supplied containers. The samples were individually placed and packed in a cooler and preserved with ice. Samples were shipped 1-2 days after collection and scheduled for next day delivery at Analytical Environmental Services (AES) or Pace Analytical in Atlanta Georgia.

### 1.2.3 Equipment Decontamination Procedures

Equipment, including sampling devices, which came in contact with potentially contaminated materials, soil, or water was decontaminated prior to each use on this project. Decontamination consisted of a phosphate-free laboratory detergent wash, de-ionized rinsate and potable water rinse. Drilling rigs were decontaminated prior to beginning work at the property, and down-hole rods and samplers were decontaminated between borings. Equipment was inspected before use to determine if fluids oils, lubricants, hydraulic fluids, etc.) were leaking. Powder-free nitrile gloves were used during the decontamination procedures.

### 1.2.4 Chain-of-Custody Procedures

Sample custody was initiated at the time of sample collection by placing the labeled sample into an iced cooler in the possession of the sampling technician. A line item on the chain-of-custody record was filled out and initialed by the sampling technician. The chain-of-custody record was used to track custody of samples during transport and shipping. Upon completion of appropriate line items, or upon sample pick-up, the sampling technician signed, dated, and listed the time and confirmed the completeness of descriptive information contained on the form. The chain-of-custody form accompanied the samples. Each individual who subsequently assumed responsibility for the samples signed the chain-of-custody record. The chain-of-custody record terminated upon laboratory receipt of samples. All entries were recorded in ink. Each sample had a corresponding entry on a chain-of-custody record. Chain-of-custody documentation is provided with the laboratory reports in a separate Appendix.

### 1.2.5 Laboratory Analytical Procedures

#### Standard Analytical Methods

The soil samples were analyzed for RCRA Metals using US EPA SW-846 test Method 6010B, Copper using US EPA SW-846 test Method 7470/6010B, VOCs and BTEX using US EPA SW-846 test Method 8260B, SVOCs and PAHs using US EPA SW-846 test Method 8270D, and DRO/GRO using US-EPA SW-846 test Method 8015.

#### Quality Assurance/Quality Control Procedures

Blind duplicates and equipment rinsate samples were collected by Resolute and analyzed by the selected laboratory as part of the Quality Assurance program for the soil sampling activities. The quality assurance sample results were within limits and data quality objectives for the samples were met. Laboratory data for these samples are included in laboratory reports in a separate Appendix.

# GROUNDWATER SAMPLING METHODOLOGY AND PROCEDURES

## 1.1 ANALYTICAL PARAMETERS SELECTED AND RATIONALE

Prior to sampling, Resolute developed and purged each of the newly installed and existing monitoring wells. For the permanent monitoring wells, Resolute utilized a multi-gauge meter during purging/sampling activities in order to record pH, specific conductance, turbidity, dissolved oxygen, oxygen reduction potential and temperature with a frequency of at least one reading per well volume for permanent wells. Contrary to the method of sampling permanent wells, no parameters were collected during sampling through a temporary installation such as a retractable DPT screen.

Groundwater samples collected during the assessments conducted by Resolute were analyzed for RCRA Metals (US EPA SW-846, Method 6010B), Copper (US-EPA, Method 7470/6010B), VOCs (US EPA SW-846, Method 8260B), SVOCs (US-EPA SW-846, Method 8270D), PAHs (US-EPA SW-846, Method 8270), BTEX (US-EPA SW-846, Method 8260B), DRO/GRO (US-EPA SW-846, Method 8015), and Radium (US-EPA SW-846, Method 9315 and 9320). These parameters were selected based on known or suspected historical site uses and previous sampling results indicating a release to groundwater for these regulated constituents.

## 1.2 SAMPLING AND ANALYSIS PROCEDURES

### 1.2.1 Well Evacuation Procedures

After installation, each permanent well was developed to establish a hydraulic connection between the well and the aquifer and to remove sediment that may have collected in the well and sand pack during installation. Prior to sampling, Resolute developed, purged and sampled each of the newly installed and existing permanent monitoring wells utilizing low-flow techniques. Resolute utilized a multi-gauge meter during purging/sampling activities in order to record pH, specific conductance, turbidity, dissolved oxygen, oxygen reduction potential and temperature with a frequency of at least one reading per well volume. Each well was considered developed after three wells volumes had been collected and when their respective parameters stabilized. However, due to the nature of metals in water, samples were not collected until the turbidity levels were below 5 NTUs (where attainable). A summary of the gallons removed and the parameters reported during development of the monitoring wells is included in groundwater sampling sheets included in a separate Appendix. Downhole pumps used in development were cleaned with a liquinox/distilled water solution and rinsed with distilled water before and after placement in each well.

### 1.2.2 Groundwater Sampling, Handling, and Preservation

Where temporary groundwater monitoring wells were installed, Resolute purged the groundwater from the retractable screen on the DPT, or temporary PVC micro-well, in an attempt to lower the turbidity and to remove the volume of water in the area directly impacted by the installation procedure. For the metals analyses, groundwater samples from temporary wells were field-filtered with a 0.45-micron in-line filter. Groundwater samples were collected and submitted for laboratory analysis based on the areas and locations identified near the well.

Permanent monitoring wells were sampled in accordance with the USEPA Region IV Science and Ecosystem Support Division’s Operating Procedure for Groundwater Sampling. Wells were purged utilizing a peristaltic pump or dedicated submersible pump for the permanent monitoring wells. Monitoring wells were purged at the lowest achievable flow rate possible, but at least 100 ml/min. Wells were purged until stabilization was achieved. If turbidity was not <5 NTUs, additional well volumes were purged and reasonable attempts were made to achieve a turbidity value of <5 NTUs. If five well volumes were purged, or purging had continued for three hours, and sampling criteria were not met, a decision was made as to whether to sample or to continue purging. If the turbidity was close to <5 NTUs, purging was continued, but if it did not appear that <5 NTUs would be achieved in a reasonable amount of time, then a groundwater sample was collected.

The samples were collected and placed in laboratory-supplied containers, stored on ice, and transported to either TestAmerica Laboratories located in Savannah, Georgia, Analytical Environmental Services (AES) located in Atlanta, Georgia, or Pace Analytical located in Atlanta Georgia, under standard chain-of-custody procedures.

### 1.2.3 Equipment Decontamination Procedures

Equipment, including sampling devices, which came in contact with potentially contaminated materials, soil, or water was decontaminated prior to each use on this project. Decontamination consisted of a phosphate-free laboratory detergent wash and de-ionized water rinse.

### 1.2.4 Chain-of-Custody Procedures

Sample custody was initiated at the time of sample collection by placing the labeled sample into an iced cooler in the possession of the sampling technician. A line item on the chain-of-custody record was filled out and initialed by the sampling technician. The chain-of-custody record was used to track custody of samples during transport and shipping. Upon completion of appropriate line items, or upon sample pick-up, the sampling technician signed, dated, and listed the time and confirmed the completeness of descriptive information contained on the form. The chain-of-custody form accompanied the samples. Each individual who subsequently assumed responsibility for the samples signed the chain-of-custody record. The chain-of-custody record terminated upon laboratory receipt of samples. All entries were recorded in ink. Each sample had a corresponding entry on a chain-of-custody record. Chain-of-custody documentation is provided with the laboratory reports in a separate Appendix.

### 1.2.5 Laboratory Analytical Techniques

#### Analytical Procedures

The groundwater samples were analyzed for RCRA Metals (US EPA SW-846, Method 6010B), Copper (US-EPA, Method 7470/6010B), VOCs (US EPA SW-846, Method 8260B), SVOCs (US-EPA SW-846, Method 8270D), PAHs (US-EPA SW-846, Method 8270), BTEX (US-EPA SW-846, Method 8260B), DRO/GRO (US-EPA SW-846, Method 8015), and Radium (US-EPA SW-846, Method 9315 and 9320).

#### Quality Assurance/Quality Control Procedures

Blind duplicates and equipment rinsate samples were collected by Resolute and analyzed by the selected laboratory as part of the Quality Assurance program for the groundwater sampling activities. The results of the quality assurance samples were within limits, and the data quality objectives for the laboratories samples were met. Laboratory data for these samples are included in laboratory reports in a separate Appendix.

## EXCAVATION SAMPLING METHODLOGY AND PROCEDURES

The following steps will be implemented:

*Former Above Ground Storage Tank (AST) Area*

- Shallow soil, bottom ash and petroleum-impacted soil in this area are approximately 0.5’ to 1.6’ thick and underlain by bottom ash fill to depths of 6’ to 8’ below ground surface (bgs). The soil and ash will be excavated until visibly removed to less than 6” thickness or until the elevation of groundwater is reached. Groundwater elevation will be as measured in a nearby groundwater monitoring well or groundwater is observed in the excavation.
- If the soil and ash are visibly removed above the elevation of groundwater, the bottom of the excavated area will be sampled on a 30’ x 30’ grid.
- For portions of the excavation that extend to groundwater, bottom confirmation samples will <u>not</u> be collected.
- If sidewalls are present in the excavation, excavation confirmation samples will be collected every 30 linear feet of sidewall.
- One grab sample will be collected from each 30’ x 30’ grid node.
- The samples will be submitted to Analytical Environmental Services laboratory in Atlanta, Georgia and analyzed for arsenic, barium, and beryllium by USEPA Method 6020 and Total Petroleum Hydrocarbon – Diesel Range Organics (TPH-DRO) by USEPA Method 8270C.
- If a grid node concentration exceeds the following:
    - 41 milligrams per kilogram (mg/kg) arsenic,
    - 500 mg/kg barium,
    - 3 mg/kg beryllium, and/or
    - 100 parts per million (ppm) TPH-DRO,

  A 15’ x 15’ square assigned to the failing sample will be excavated one additional foot bgs and resampled, if the extended excavation is above groundwater elevation. If the extended excavation is to groundwater, confirmation samples will not be collected.

*Northern Ash Pond Berm (KMW-06)*

- The arsenic-impacted ash fill is present in the berm in the immediate vicinity of groundwater monitoring well KMW-06.
- This ash fill will be excavated based on visual observation.
- After the ash is visually removed to less than 6” in thickness, one confirmation sample will be collected on the eastern side of well KMW-06 and one on the western side of well KMW-06.
- The samples will be submitted to Analytical Environmental Services laboratory in Atlanta, Georgia and analyzed for arsenic by USEPA Method 6020.
- If an excavation confirmation sample concentration exceeds 41 milligrams per kilogram (mg/kg) arsenic, the excavated area will be extended by one additional foot in the direction of the detected concentration and resampled.

*Southern Ash Pond Area and Eastern Ash Pond Area*

- Fill soil approximately 1.0’ to 1.5’ is underlain by remains of the former ash pond to depths ranging from 1.5’ to 8.0’ bgs. This ash fill will be excavated to less than 6” in thickness based on visual observation.
- These areas include the area south of the former ash pond, immediately west of the AST area, and the area due east of the former ash pond, north of the AST area
- If the soil and ash are visibly removed above the elevation of groundwater, the bottom of the excavated area will be sampled on a 30’ x 30’ grid.

- For portions of the excavation that extend to groundwater, bottom confirmation samples will not be collected.
- One grab sample will be collected from each 30' x 30' grid node.
- If sidewalls are present in the excavation, excavation confirmation samples will be collected every 30 linear feet of sidewall.
- The samples will be submitted to Analytical Environmental Services laboratory in Atlanta, Georgia and analyzed for arsenic and barium by USEPA Method 6020.
- If a grid node concentration exceeds the following:
  - 41 mg/kg arsenic, and/or
  - 500 mg/kg barium,

  the 30' x 30' grid square will be excavated one additional foot bgs and resampled, if the extended excavation is above groundwater elevation. If the extended excavation is to groundwater, confirmation samples are not necessary.

*Ash Fill Area Surrounding Construction Debris Landfill*

- Fill soil approximately 1.0' to 1.5' thick is underlain by arsenic-impacted ash fill in the areas surrounding the landfill to depths ranging from 2.5' to 5.5' bgs. This ash fill will be excavated to less than 6" in thickness based on visual observation.
- These areas include the parking lot south, the eastern drainage swale, all road beds adjacent to the landfill and ash that extends underneath the fence on the northern and western sides of the landfill
- If the soil and ash are visibly removed above the elevation of groundwater, the bottom of the excavated area will be sampled on a 30' x 30' grid.
- For portions of the excavation that extend to groundwater, bottom confirmation samples will not be collected.
- One grab sample will be collected from each 30' x 30' grid node.
- Excavation sidewall samples are not anticipated based on the surrounding, sloping topography. If sidewalls are present in the excavation, excavation confirmation samples will be collected every 30 linear feet of sidewall.
- The samples will be submitted to Analytical Environmental Services laboratory in Atlanta, Georgia and analyzed for arsenic and barium by USEPA Method 6020.
- If a grid node concentration exceeds the following:
  - 41 mg/kg arsenic, and/or
  - 500 mg/kg barium,

  the 30' x 30' grid square will be excavated one additional foot bgs and resampled, if the extended excavation is above groundwater elevation. If the extended excavation is to groundwater, confirmation samples are not necessary.

*Sandblasting Area*

- The arsenic-impacted ash fill is present from approximately 0.3' to 1.6' bgs and will be excavated to less than 6" in thickness based on visual observation.
- After the ash is visually removed to less than 6" in thickness, confirmation samples will be collected on a 30' x 30' grid.
- If portions of the excavation extend to groundwater, bottom confirmation samples will not be collected.
- One grab sample will be collected from each 30' x 30' grid node.
- Sidewall excavation confirmation samples will be collected every 30 linear feet of sidewall.
- The samples will be submitted to Analytical Environmental Services laboratory in Atlanta, Georgia and analyzed for antimony, arsenic, nickel, and thallium by USEPA Method 6020.

- If a grid node concentration exceeds the following:
    - 10 mg/kg antimony,
    - 41 mg/kg arsenic,
    - 420 mg/kg nickel, and/or
    - 10 mg/kg thallium,

  the 30' x 30' grid square will be excavated one additional foot bgs and resampled, if the extended excavation is above groundwater elevation. If the extended excavation is to groundwater, confirmation samples will not be collected.

*Roadbed South of Main Kraft Substation*

- The Asphalt road bed and rail ballast south of the main Kraft substation is underlain by ash fill 0.5' to 2.0' bgs. This ash will be excavated to less than 6" in thickness based on visual observation.
- If the soil and ash are visibly removed above the elevation of groundwater, the bottom of the excavated area will be sampled on nodes 30' apart following the shape of the excavation.
- For portions of the excavation that extend to groundwater, bottom confirmation samples will <u>not</u> be collected.
- If sidewalls are present in the excavation, excavation confirmation samples will be collected every 30 linear feet of sidewall.
- The samples will be submitted to Analytical Environmental Services laboratory in Atlanta, Georgia and analyzed for arsenic and barium by USEPA Method 6020.
- If a grid node concentration exceeds the following:
    - 41 mg/kg arsenic, and/or
    - 500 mg/kg barium,

  the 30' x 30' grid square will be excavated one additional foot bgs and resampled, if the extended excavation is above groundwater elevation. If the extended excavation is to groundwater, confirmation samples are not necessary.

*Construction Debris Landfill*

- The construction debris landfill will be excavated based on visual observation.
- If landfill contents other than construction debris are encountered (e.g., ash, PCB-oil containing equipment, etc.), excavation bottom confirmation samples will be collected on a 30' x 30' grid.
- If portions of the excavation extend to groundwater, bottom confirmation samples will <u>not</u> be collected.
- If sidewalls are present in the excavation, excavation confirmation samples will be collected every 30 linear feet of sidewall.
- One grab sample will be collected from each 30' x 30' grid node.
- Confirmation sample analyses, if any, will be based on materials observed during the landfill excavation.