3 SITE CHARACTERIZATION ACTIVITIES

Data needs to characterize the River OU and evaluate potential human health and ecological risks were identified through a site-specific conceptual site model (CSM). The pre-RI CSM is provided in the Baseline Risk Assessment (BLRA, Appendix D) and Figure 5 of the RI/FS Work Plan (NRT, December 2008). The pre-RI CSM was developed to reflect NRT's existing knowledge of the Site and conditions observed in the December 2007 site visit (summarized in Appendix C of the RI/FS Work Plan). A site reconnaissance was performed in August 2008 to confirm the site conditions and refine the CSM. The August 2008 site reconnaissance is discussed in the BLRA in Appendix D.

The COPCs for each media evaluated in the RI (Section 3.9 of the RI/FS Work Plan) are summarized in the following table:

Media	COPCs
Sediment	Petroleum volatile organic compounds (PVOCs), PAHs, phenols, PCBs[1], and inorganics[1] (aluminum, antimony, arsenic, barium, cadmium, chromium, copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc)
Surface Water	PVOCs, PAHs, phenols, PCBs, and inorganics (aluminum, antimony, arsenic, barium, cadmium, chromium, copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc)
Boat Island Soil	PVOCs, PAHs, phenols, PCBs, and inorganics (aluminum, antimony, arsenic, barium, cadmium, chromium, copper, cyanide, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, zinc)

Note: [1] Select sediment samples were analyzed for PCBs and inorganics to characterize the distribution adjacent to the former MGP facility.

Field activities were performed in accordance with the RI/FS Work Plan – Revision 0 and the response to USEPA comments (April 9, 2008) with oversight from USEPA's subcontractor. In addition, the field activities were performed in substantial accordance with the Multi-Site Field Sampling Plan (FSP) – Revision 4 (September 2008), the Multi-Site Quality Assurance Project Plan (QAPP) – Revision 2 (September 2008), and the Multi-Site Health and Safety Plan (HASP) – Revision 2 (August 2007). Modifications to the Multi-Site documents were discussed in Appendix D of the RI/FS Work Plan (NRT, December 2008).

RI activities are summarized in the following sections with the methodologies, sampling locations and analytical parameters.

3.1 Site Surveying and Base Map

WPSC personnel established benchmarks and re-surveyed Upland OU monitoring wells to confirm site features are accurate on the existing base maps. The survey was performed in the Sheboygan County Coordinate system (feet) and North American Vertical Datum of 1988 (NAVD88, feet). The survey ensured the geophysical survey and sampling locations were referenced to the same horizontal and vertical datum and that the sampling locations were properly converted to the USEPA required Universal Transverse Mercator (UTM) projection, North American Datum 1983 (NAD83). Within this Report all elevations are reported in NAVD88 unless otherwise indicated. The UTM coordinates of the sampling locations will be provided to the USEPA GEOS Data Coordinator.

3.2 Bathymetric, Side Scan, and Sub-Bottom Surveys

Enviroscan, Inc. (Enviroscan) performed a river bathymetric survey and side scan sonar survey on June 10-11, 2008 (refer to Enviroscan's Report in Appendix E for a description of methods and results). By chance and not by design, the surveys were performed at a time of high water flow and fast river currents due to heavy rains between June 5-8, 2008 (see Section 2.4 and Appendix C). The surveys were completed over a distance of approximately 2,900 lineal feet in the vicinity of the former MGP. The northern-most survey boundary is approximately 1,100 feet upstream of the former MGP facility northern boundary (which is near the north side of the Boathouse building). From the northern property line of the former MGP to the center of the Pennsylvania Avenue bridge is a distance of about 1,000 feet. The

southern-most survey boundary is approximately 800 feet downstream of the center of the Pennsylvania Avenue Bridge. Based on a river width of approximately 300 feet, this equates to a survey area of about 20 acres.

The bathymetric survey provided hydrographic maps with 1-foot elevation contours (Figures 1A and 1B in Appendix E), documenting river bottom relief at the time of the survey. The side scan survey provided maps showing irregular images on the river bottom, interpreted by Enviroscan to be miscellaneous debris, rocks, and possible vertical piling (Figures 2A and 2B in Appendix E), which may affect remedial activities to be considered in the Feasibility Study.

Enviroscan also performed a sub-bottom survey of the project area in an attempt to differentiate suspected upper soft sediment from underlying consolidated parent soils. As noted in the Enviroscan report, however, the survey was unable to distinguish stratigraphic layers below the river bottom. Suspected principle causes for this inability include the potential presence of gas within the sediment, and/or a lack of clear distinction in the consistency (grain size, relative density) and thickness of the upper sediment layer. The latter suspected cause was somewhat validated by the observation of coarse-grained sediments during poling and vibrocore sampling; gas bubbles emitting from the sediment were not readily evident during the field RI.

Because the sub-bottom survey did not provide the intended results, NRT prepared a map of thicknesses (Figure 5) penetrated by the vibrocore device, which can be used as an indicator of the thickness of upper soft/loose sediments.

3.3 Sediment and Substrate Poling

Sediment poling was completed on July 9, 2008 for the purpose of spot checking river bathymetry/water depths and soft sediment thickness in the project area.

Sediment poling locations were established along initial transects in the same area of coverage as the June 10-11, 2008 surveys by Enviroscan. NRT's differential GPS (DGPS) was used to obtain the coordinates of each poling location. A 2-inch diameter aluminum pole with a 3-inch by 6-inch plate attached to the bottom was used to measure the water/top of sediment depth. Initially the plate and aluminum pole were manually pushed into the sediment, and then the plate was removed and only the aluminum pole without

the plate was pushed. Penetrated thicknesses ranged from 0 to 3 inches and did not vary appreciably with and without the plate. Sand was generally observed on the tip of the aluminum pole and on the plate, which apparently resisted penetration and resulted in similar measurements with and without the plate. As a result, a field decision was made to cease poling without the plate, and the remainder of the field measurements focused on checking river bathymetry with the plate attached to the aluminum pole. Poling measurements are summarized in Table 1. A spot check comparison of sediment elevations between the July 9, 2008 poling data and June 10-11, 2008 bathymetry indicated reasonable correlation, as expected because of the QA/QC activities by Enviroscan during their surveys, which included their own poling to verify the accuracy of their equipment. The spot-check differences were approximately less than 6 inches, which is half the contour interval.

Sediment poling data (Table 1) was used in the BLRA to indicate the depth a person may sink into sediment while wading in the water. The relative soft/loose sediment thicknesses were assessed through the penetration depth of the vibrocore (Figure 5) for use in the FS.

3.4 River Sediment and Parent Material Sampling

River sediment and parent material samples were collected from July 21 through August 5, 2008 (Sheet 1). River sediment and parent material samples were collected to evaluate the following:

- Ambient sediment conditions and potential off-site sources of contaminants;
- The vertical and horizontal contaminant distribution within river sediments through chemical analysis of sediment samples;
- Sediment toxicity and bioavailability of COPCs;
- Calculate a site-specific risk value based on results of ecological risk and human health risk assessments;
- Identify zones of risk based on sediment concentration and the nature of soft sediments and consolidated parent materials that exceed the calculated site-specific risk values;
- The characteristics (e.g., mobility, etc.) of coal tar, if any, within sediment;
- Sediment stability using mostly empirical methods; and
- Inform the FS with respect to geotechnical and waste disposal characterization.

3.4.1 Sampling Locations

Previous sampling locations from the 1995/1996 investigation were used to assist in focusing initial transect and boring locations. As discussed in Section 1.3.4.1, the 1995/1996 investigation was performed to identify the preliminary nature and extent of MGP residuals. Initial transects included the following soft sediment cores based on previous site characterization:

- Two transects located upstream of the site in "ambient" conditions (T1 and T2).
- Three transects located in the upstream portion of MGP-affected sediment area (T3, T4, and T5).
- Four transects locate in the central portion of MGP-affected sediment area (T6, T7, T8, and T9).
- Two transects in the downstream portion of MGP-affected sediment area (T10 and T11).
- Two transects that were anticipated to be the downstream limit of sampling, returning to "ambient" conditions (T12 and T13).

The two upstream ambient transects each included three core locations. In addition to these six locations, four more locations were planned to collect the upper (18-inches) of soft sediment, with a goal of ten sampling locations to assess ambient sediment quality. However, eight additional ambient sample locations were attempted because coarse-grained sediment prevented ample sediment recovery in four locations. The four ambient locations with adequate sample recovery included BKG3, BKG6, BKG7, and BKG8 (Sheet 1).

Each other transect initially included three to five sampling locations (labeled with the suffix A, B, C, etc.) designed to refine the extent of affected sediment. These transects were spaced approximately every 150 river-feet apart starting with the upstream edge (T3) and moving downstream toward the downstream edge (T13).

Two sampling locations (B-402 and B-403) were also placed adjacent to the eastern shore of the Sheboygan River to evaluate near-shore sediment quality and characteristics of MGP-residuals in the vicinity of former sampling locations EZ-402 and EZ-403 (Sheet 1). As discussed in the Work Plan (December 2008, NRT), EZ-402 and EZ-403 were collected from the base of the excavations performed during the Upland OU remedial action (see Appendix B).

Environmental Chemistry Consulting Services (ECCS) operated an on site mobile laboratory to provide near real time analytical results for the parent PAHs to support field decisions. For purposes of making field decisions, the upstream ambient sample locations were collected before other samples to evaluate ambient levels of PAH concentrations. Once the data was received from ECCS, it was forwarded to the project risk assessor, Exponent. Exponent calculated an ambient concentration of 14,000 µg/kg (or 14 mg/kg) using the 95th percentile upper tolerance limit (see Appendix D for further details of the calculation). This concentration was used for field decisions on whether additional transects, or core samples on existing transects, were needed to define the extent of MGP residuals as discussed in Appendix E of the RI/FS Work Plan (December 2008, NRT). Only the following 13 parent PAHs were used in computing the 14,000 µg/kg (or 14 mg/kg) field screening value and in assessing the need for other sample locations or transects: acenaphthene, acenphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene. The iterative process led to the addition of the following soft sediment sampling locations/transects:

- Transect T18, located in the upstream portion of the MGP-affected sediments between T3 and T4;
- Sampling location T4D, located in the upstream portion of the MGP-affected sediments;
- Sampling location T8D1, located in the central portion of the MGP-affected sediments;
- Sampling location T9D, located in the central portion of the MGP-affected sediments;
- Transect T17, located downstream of the Pennsylvania Avenue bridge, between T12 and T13 which were previously anticipated to be ambient conditions; and
- Transects T14, T15, and T16, located downstream of T12, T17, and T13, which actually define the downstream extent of the Site and return to ambient concentrations.

Parent material borings were co-located with nine of the soft sediment sampling locations to evaluate the depth of MGP residuals observed during previous sediment investigations or the 2008 soft sediment sampling activities.

The sampling logs are included in Appendix F.

3.4.2 Soft Sediment Sampling Methods

AScI performed vibrocoring from a barge-mounted platform to collect the soft sediment samples as described in Section 4 of the Multi-Site FSP. The vibrocore was also used for the ambient samples. Sampling locations were recorded using a DGPS unit.

Prior to coring, the water depth and presence of soft/loose sediment was measured using the poling techniques described above. Throughout the sediment sampling, the water elevation was recorded to provide a mechanism for converting water depth measurements to elevations of top of sediment. Surface water elevations are summarized on Table 2. The top of sediment elevations for each sampling location is summarized on Table 3, and is included on each respective log. The poled thickness of soft/loose sediment, measured immediately before sampling, guided the anticipated sampling depth and length of vibrocore tube to be used. The corings were advanced to vibrocore refusal. If soft sediment cores failed to recover at least 75% of the depth penetrated in the first attempt, one more attempt was made at the same general location. If a sediment core with at least 75% recovery was still not obtained, up to two more locations were attempted, within about 10 feet of the first attempt. The core with the greatest recovery after three locational attempts was used for analyses, as the 75% criterion was a goal, not a minimum requirement. The field logs document the recovery of each sample retained for analysis. The samples not retained for analysis were not logged and the material was placed with the other investigative wastes.

Samples were visually characterized, logged and sub sampled at the Site in the back of a box truck in general accordance with Section 4 of the Multi Site FSP. A photoionization detector (PID) was used to monitor the breathing zone air for worker health and safety purposes, but the PID was not used as a tool to field screen the samples. However, the sample logs contain olfactory observations, including the presence/absence of naphtha odor commonly associated with MGP residuals, or petroleum-like odors (lacking naphtha odor). The sediment core was subdivided into the following intervals:

- 0 to 6 inches (0-0.5 feet) below mudline
- 6 to 18 inches (0.5-1.5 feet) below mudline
- 18 to 30 inches (1.5-2.5 feet) below mudline

- 30 to 42 inches (2.5-3.5 feet) below mudline
- 42 to 54 inches (3.5-4.5 feet) below mudline, etc.

The 0 to 6 inch interval was collected to assess concentrations to which the benthic community is exposed. The core continued to be subdivided in one foot intervals thereafter to the bottom. If the last interval was less than 3 inches in thickness, it was included in the previous interval; if it was greater than 3 inches, it became its own interval. Samples were selected for laboratory analysis based on visual observations and analytical results of nearby intervals or transects to define the extent of affected sediment. This approach is discussed in the RI/FS Work Plan (NRT, December 2008), specifically Section 6.3.5.3 and Appendix E. Samples for analysis of PVOCs were collected immediately, while all other COPCs were collected following sample homogenization in dedicated disposable plastic bags, as described in the RI/FS Work Plan (NRT, December 2008).

3.4.2.1 Core Compaction Correction

Vibrocores that were composed of mostly fine-grained material (50% or more fines based on field visual assessment, with fines being silt and clay particles smaller than a No. 200 sieve) were assumed to be subject to core compaction during collection. Core compaction occurs when fine-grained sediments become "compacted" due to the sidewall friction and vibration as the sediment slides through the collection tube. This phenomenon is less prevalent with coarse-grained sediment (50% or more sand and gravel particles larger than a No. 200 sieve), so coarse-grained samples were not corrected for core compaction.

Correcting fine-grained samples for core compaction was done in the office during review and interpretation of the RI findings. The process "stretched" the field measured sample recovery reported on the logs to full (100%) recovery. This proportionately lengthened each field sample interval (0-0.5, 0.5-1.5, 1.5-2.5 feet, etc.) by dividing the interval depths by the core percent recovery. For example, with a 75% core recovery, the 0.5-1.5 feet field sample interval is stretched to 0.7-2.0 feet (0.5/0.75=0.7 and 1.5/0.75=2.0). In another example with 100% recovery, the fine-grained field sample intervals are unchanged. The core compaction corrections are reflected in the depths and elevations presented in the RI Report data tables, summary figures, and geological cross-sections.

3.4.3 Parent Material Sampling Methods

STS Consultants-AECOM (STS) performed hollow stem auger borings from a barge-mounted platform to collect the parent material as described in Section 4 of the Multi-Site FSP. Sampling locations were recorded with DGPS unit. Using the DGPS unit, the barge re-occupied soft sediment sampling locations selected for parent material analysis. Each boring was blind drilled to the depth of refusal recorded for each vibrocore sample. Once that depth was obtained, the parent material boring was sampled continuously using a split-barrel sampler a minimum of 4 feet beyond the last interval in which MGP-residuals were observed via visual or olfactory evidence.

In boring locations where oil coated or oil wetted sediments were observed in vibrocore samples, the borehole water within the hollow stem auger may have contained emulsified oils. Where present, this oil was in the form of a thin sheen smeared on the outside of the sediment core. Further discussion on the visual observations of MGP residuals is provided in Section 4.3. The sheen was transferred from the inside of the split spoon which had to pass through the oily water on the way down the auger. An attempt was made in the field during sample processing to collect analytical samples from the interior portions of the split-spoon samples, avoiding the sheen; however, it should be noted that the potential remained for cross-contamination between oily water and parent material.

Samples were visually characterized, logged and sub sampled in general accordance with Section 4 of the Multi Site FSP. Parent material samples were sub-divided into 2-foot intervals for analysis. Splitting the parent material samples into intervals less than 2 feet was not possible because the split-spoon sampler provided insufficient sample volume for the various analytical tests. Samples for analysis of PVOCs were collected from the recovered sample without homogenization, while all other COPCs were collected following sample homogenization in dedicated disposable plastic bags, as described in the RI/FS Work Plan (NRT, December 2008).

3.4.4 Sediment Sample Analysis

Analytical laboratory reports are included in Appendix G. Selected samples were submitted to the on-site mobile analytical laboratory (ECCS) for PAHs (16 total). PVOCs and phenols were sent to ECCS's fixed based laboratory. Each sample was also sent to a fixed based analytical laboratory (Test America) for analysis of total organic carbon. The top of each core (0-6 inches) was sent to Test America for black

carbon and to another fixed based analytical laboratory (Meta) for parent and alkylated PAHs (total of 34). Additional samples below the surface were selected and submitted for testing of black carbon and 34 PAHs with a goal to test approximately 20% of all samples for these parameters.

One core from each transect was submitted to a fixed based analytical laboratory (Pace) for PCBs. Between one and two cores from each transect were also sent to Pace for inorganic compounds (aluminum, antimony, arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc).

For QA/QC purposes, a blind duplicate sample and a matrix spike/matrix spike duplicate (MS/MSD) sample were also submitted to each laboratory at a rate of approximately one in 20 samples.

Excess sample from each interval was labeled and placed in a refrigerated truck for potential use in whole sediment toxicity testing, geotechnical testing, waste profiling, or later disposed as investigative-derived waste (Section 3.7).

Initial PAH sample results (total concentration of 13 parent PAHs out of 16PAHs analyzed by ECCS, as discussed in Section 3.4.1) were used, with an average TOC concentration (from previous investigations) representative of the grain-size observed (i.e., coarse grained versus fine grained), to assist in identifying samples to represent a range of predicted toxicity using USEPA's equilibrium partitioning sediment benchmark (ESB) approach, as discussed in Appendix D-1 of the RI/FS Work Plan (NRT, December 2008). The samples selected for toxicity testing were not limited to the near-surface biologically active zone in an effort to evaluate risk correlations to different ranges of PAH concentrations, regardless of depth. Toxicity testing sample selection is further discussed in the BLRA (Appendix D).

Sample intervals selected for toxicity testing were sent to a Coastal Bioanalysts, Inc. for grain size analysis and to perform a modified version of the procedures described by EPA/600/R-99/064 *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with Freshwater Invertebrates*, Second Edition, Method 100.4. The test endpoints were a 28-day survival and growth (weight and length) test using Hyalella azteca (amphipod) to evaluate the toxicity of whole sediments (rather than the 48-day test with survival, growth, and reproduction endpoints). The toxicity testing report is provided in the BLRA (Appendix D).

In addition to the COPCs, a portion of the sediment sample was also submitted to Meta for parent and alkylated PAHs (total of 34), and to Test America for total sulfides, cyanide, and ammonia to evaluate potential confounding effects.

Seventeen sample intervals were selected for geotechnical testing (Appendix H) to support the Feasibility Study, from sample locations T10AP, T10CP, T8C, TB402, T7B, T2B, T12D, T12B, T3A, T4C, T8D1, T1A, T16A, and T8E. The geotechnical parameters were tested by CGC, Inc. and included:

- Atterberg limits;
- Grain size (sieve and hydrometer);
- Specific gravity;
- Organic content by loss on ignition; and
- Moisture content.

Ten samples (nine of the seventeen geotechnical samples and a composite of auger slurry generated by parent material sampling) were submitted for analysis pursuant to WDNR Chapter 347 "Sediment Sampling and Analysis, Monitoring Protocol and Disposal Criteria for Dredging Projects" (NR 347). Pace analyzed the samples for: pesticides (chlordane, DDT, and DDD &DDE); inorganic compounds (arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium and zinc); oil & grease; nitrate & nitrite; ammonia; total Kjeldahl nitrogen; total phosphorous; and total organic carbon.

The hollow stem auger slurry (water and sediment generated during parent material sampling) was contained in two drums on-site. A sample of the solids from each drum was collected and composited together for waste characterization. A composite sample was also prepared for waste characterization of excess sediment by combining sample intervals T8A (18-30), T8C (6-18), TB402 (66-78), T7B (30-42), T8C (30-42), and TB402 (18-30). These sediment samples are representative of the affected sediment. Pace analyzed the composite samples using Protocol B to identify disposal options.

3.5 Surface and Subsurface Soil Sampling

Surface soil samples from the 0 to 2 foot depth interval were collected on Boat Island on August 6, 2008 to assess soil quality. Discrete surface soil samples were collected from four locations (SS1 through SS4) as shown on Sheet 1. Analytical laboratory reports are provided in Appendix G.

Surface soil samples were collected using a hand auger as described in Section 4 of the Multi-Site FSP (September 2008). Soil sample locations were recorded using a DGPS unit as described in Section 7 of the Multi-Site FSP (September 2008). One discrete sample of surface soil (0 to 2 feet) was collected from each location and submitted to Pace for analysis of PVOCs, PAHs (16), phenols, PCBs, cyanide, and inorganic compounds (aluminum, antimony, arsenic, barium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc).

Subsurface soil borings were advanced at locations SS3 and SS4 because nearby sediment cores T8C and T9B adjacent to Boat Island indicated the presence of staining at depth. However, subsurface soils at these locations did not show any visual or olfactory evidence of coal tar or staining, and therefore no subsurface samples from these two hand auger borings were submitted for analyses. Refer to the boring logs in Appendix F.

Following completion, the soil borings were abandoned in accordance with the methods described in Section 4 of the Multi Site FSP (September 2008).

3.6 Surface Water Sampling

Surface water sampling in the Sheboygan River was completed on four transects (T1, T6, T9, and T13) across the river on August 7, 2008 (Sheet 1). Analytical laboratory reports are provided in Appendix G.

The four transects extended perpendicular from the eastern shore to the opposite shore and were established in the following areas:

- Transect T1, located upstream of the former MGP property (ambient sample location);
- Transect T6, located in the approximate center of the former MGP property, near the northern end of Boat Island, where previous investigations reported the presence of MGP-residuals in soft sediment;

- Transect T9, located approximately 200 feet downstream of the former MGP property, near the southern end of Boat Island, where previous investigations reported the presence of MGP-residuals in soft sediment; and
- Transect T13, located approximately 700 feet downstream of the former MGP property and downstream of the Pennsylvania Avenue Bridge.

There were three sub-sampling locations on each transect; generally at one quarter, at one half, and at three quarters of the distance across the river. Each transect sub-sample location was identified by the suffix a, b, or c as samples were collected from the east bank toward the west bank of the river. One discrete sample was collected from each sub-sample location, at depths consistent with velocity measurements (described below) depending on water column depth (Table 5).

Boat Island, located in the center of the Sheboygan River across from the former MGP facility, effectively splits the river into eastern and western river channels (Sheet 1). To evaluate potential water quality differences in the eastern and western portions of the channel, the sub-samples described above were homogenized in the field into the following five composite samples:

- T1, ambient sample, composed of sub-samples (t1a, t1b, and t1c);
- T6, center of former MGP property – eastern channel, composed of sub-samples (t6a and t6b);
- T9, 200 feet downstream of former MGP property – eastern channel, composed of sub-samples (t9a and t9b);
- T6/T9, center and downstream of former MGP property – western channel, composed of sub-samples (t6c and t9c); and
- T13, downstream of Pennsylvania Avenue Bridge, composed of sub-samples (t13a, t13b, and t13c).

Prior to collecting the sub-samples, the total water column depth was measured using an aluminum pole as described in the sediment poling approach (Section 4 of the Multi-Site FSP [September 2008]). A plastic tube Kemmerer sampler was used to collect the discrete surface water samples at depths described below for velocity measurements. This method of collection was selected over the peristaltic pump method (described in the Work Plan) for the ability to rapidly collect samples from a specific elevation within the water column, and ease of compositing samples. One sample volume (Kemmerer volume) was collected from each depth interval for compositing of the sub-samples. A portable meter was used to

measure field characteristics of the sub-samples, including pH, temperature, dissolved oxygen, oxidation/reduction potential, conductivity, and turbidity (Table 5). In addition to the portable meter to evaluate water clarity (turbidity), several attempts were made to use a Secchi disk, however the river current was too strong for the disk to function properly.

River velocity measurements were made using a FP-201 Global Flow Probe, concurrent with the surface water sampling (Table 5). Sampling locations were determined using a DGPS. The river velocity measurements were collected as described in Section 4 of the Multi-Site FSP (September 2008) at each surface water sub-sample location (Sheet 1). A digital velocity meter attached to a ridged steel rod was used to record river velocity from the sampling boat. After the sampling location was poled, the velocity meter was lowered into the water column. For water depths of 2.5 feet or less, a velocity measurement was made at 0.6 times the total water column depth (only occurred at sample location T9F). The velocity measurement at locations where the water column is greater than 2.5 feet was recorded at 0.2 and 0.8 times the total water column depth. At each depth the velocity meter was rotated around until the maximum velocity is recorded on the display. The minimum and maximum velocity at each depth and each location was recorded in a field notebook and the average velocity is summarized on Table 5.

Surface water samples were submitted to Pace Analytical Services, Inc. (Pace) for analysis of PVOCs, PAHs, PCBs, hardness, phenols, aluminum, antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, vanadium, and zinc. Samples were also sent to Test America Laboratories, Inc. (Test America) for analysis of cyanide using the OIA-1677 method for available cyanide. For QA/QC purposes, one blind duplicate and one trip blank were submitted with the surface water samples.

3.7 Deviations from the RI/FS Work Plan

The following activities were performed using an approach or method different from the approach or method described in the RI/FS Work Plan (NRT, December 2008). A brief explanation is also provided.

- **Surface water sample collection:** The RI/FS Work Plan anticipated using a peristaltic pump to collect surface water samples. As discussed in Section 3.6, a Kemmerer sampler was used to collect the discrete surface water samples from specific elevations more efficiently. The sampling was performed in accordance with SOP SAS-09-01 of the Multi-Site FSP which allows for sampling with a Kemmerer. In addition, it was

anticipated the surface water samples would be collected prior to sediment sampling, however the surface water samples were collected after sediment sampling was completed.

- **Secchi disk:** The RI/FS Work Plan anticipated using a Secchi disk to evaluate water clarity. As discussed in Section 3.6, the river current was too strong for the disk to function properly. Turbidity measurements were collected using field equipment, as summarized on Table 5.

- **Parent material sampling intervals:** The RI/FS Work Plan anticipated parent material would be composited into a 0-6 inch sample, with 1 foot intervals thereafter. However, due to poor sample recovery and inadequate sample volume, some parent material cores were composited in 2 foot intervals.

3.8 Disposal of Investigation-Derived Waste

Investigative wastes were containerized during site investigation activities prior to off-site disposal. Sediment slurry and excess sediment wastes generated during the investigation activities were disposed at the Veolia Hickory Meadows Landfill in Hilbert, Wisconsin following receipt of the Protocol B analytical results.