SOIL DELINEATION
SAMPLING & ANALYSIS PLAN

BENNETT'S DUMP SITE
BLOOMINGTON, INDIANA

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February 15, 1999
PSARA PN 30006.69
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Soil Delineation Sampling and Analysis Plan
Bennett's Dump Site
February 15, 1999
1.0 **INTRODUCTION**

This Sampling and Analysis Plan (SAP) has been prepared to address sampling objectives associated with delineating the lateral and vertical extent of the PCB contamination at the Bennett’s Dump site in Bloomington, Indiana. Prior sampling has been conducted at the site by USEPA and by Westinghouse. The data generated by this sampling effort will be used in conjunction with the results of previous investigations to define the excavation limits in the final Remedial Work Plan for the removal activities at the Bennett’s site.

This Plan is supported by and intended to be used in conjunction with the Quality Assurance Project Plan, March 15, 1995 (QAPjP) for the Bloomington Sites, Volume I. Revision 2 of the QAPjP, dated August 22, 1997, has been submitted to the U.S. Environmental Protection Agency (USEPA) and the Indiana Department of Environmental Management (IDEM) for review and approval. Where appropriate, procedures included in this revised version have been referenced in this SAP. All of the work described in this SAP will be conducted in accordance with the applicable provisions of the QAPjP.
2.0 BACKGROUND

2.1 SITE DESCRIPTION

Bennett’s Dump is located approximately 2.5 miles northwest of Bloomington, Indiana, in the SE 1/4 of Section 19 and in the NE 1/4 of Section 30, T9N, R1W. Figure 1 shows the general location of the site. The site consists of 2 areas. The main area is approximately 3 acres in size and is bordered by the quarry access road to the east and south and by Stout Creek to the west. The second area, comprising approximately 0.5 acres, is located approximately 200 feet east of the main area across the quarry access road. Both areas are secured at the perimeter by an 8-ft-high chain link fence with barbed wire around the top.

The abandoned Monon Railroad track is located between the main site and Stout Creek. The former rail line is generally overgrown with low brush and trees. The main site is covered by a clay cap believed to be approximately 16 to 22 inches thick. CBS maintains the cap, as well as the security fences. There is a large pile of old quarry rock located along the eastern edge of the site. Large quarry blocks are also present on the cap in two places to serve as cable anchors for quarry operations just west of the site. Within the perimeter of the main area are some large trees, particularly along the north and east ends of the main site. Limited site clearing was performed in the wooded areas in December 1998 to facilitate a geophysics investigation.

The smaller satellite area is approximately 230 feet by 160 feet and is located some 50 feet south of a deep quarry excavation. The area is characterized by large piles of old quarry rubble and some large trees. Two large pieces of rusted quarry equipment are present in the northern and southern portions of the site.

2.2 SITE HISTORY

The site is located within a former limestone quarrying area previously known as Bennett’s Quarry. The quarry produced a finished building stone whose source was the Salem Limestone. The quarry was privately owned and operated by Mr. Edward Bennett until it was sold to Star Stone Company in 1987. In the 1960’s, a portion of the quarry was reportedly used as a landfill for industrial wastes.

In May, 1983, USEPA and the Indiana State Board of Health conducted an inspection of the Bennett’s Dump site in response to a request by the Monroe County Board of Health. Capacitors containing PCBs were identified at the site that had originated from the Westinghouse plant in Bloomington. This inspection included the collection of nine soil, sediment, and water samples. The results showed that PCB contamination was present and a Removal Action at the Site was initiated by USEPA in June, 1983.
The 1983 Removal Action consisted of the following activities:

- A total of 252 capacitors which were visible on the ground surface were removed and disposed along with approximately 12 cubic yards of soil.
- A delineation sampling effort was conducted, including 63 soil borings and the collection of soil samples at various depths across the site. This sampling effort is discussed in Section 3.1 of this Plan.
- Aerial photographs were taken and used to define the limits of the site.
- A geophysical survey was conducted to identify electromagnetic anomalies that could be associated with concentrations of buried metal.
- Seven test trenches and test pits were installed in areas determined by the geophysical studies to contain concentrations of buried metal. Six of these trenches identified capacitors buried to a maximum depth of 3 to 5 feet.
- A clay cap was placed over a portion of the site. The cap was constructed of clay from a nearby borrow area on the Bennett’s property, and was measured at 16 to 22 inches thick. Additional clay was used to fill existing depressions at the site and improve drainage.
- A 6-inch topsoil layer was placed over the cap and seeded.
- A 6-foot high perimeter security fence was constructed, including 3 strands of barbed wire across the top.

A second interim cleanup action was performed by Westinghouse in late 1987 and early 1988. This project included the extension of the clay cap at the perimeter of the main site, posting warning signs, and the removal of sediment from approximately 1600 feet of Stout’s Creek.

CBS has been performing maintenance at the Bennett’s Dump site since 1985. Activities have included periodic site inspections, mowing and care for the clay cap, fence maintenance, and periodic groundwater sampling.

In December 1998, prior to mobilization for sampling or geophysics, the site was cleared of undergrowth and small trees to facilitate the investigation and future remedial activities. The larger trees, particularly on the north end of the site, were left in place. Some of these trees predate the dumping operations, and it may be possible to complete the remediation without disturbing them. Limited clearing was also performed outside the fence to the east and northwest of the site due to the need for geophysics in these locations. The smaller satellite area was also partially cleared for geophysics.

Concurrent with the site clearing, a 50-ft by 50-ft grid system was established across the fenced area. This grid system has been laid out to correspond as closely as possible with the grids used during the 1983 sampling effort. The grid area encompasses the entire site within the fence line, including all of the known “buried metal” areas. In addition, grids were established south of the
fence and east across the railroad tracks. Control points were installed along the perimeter of the area and at 100-ft intervals to mark the north-south and east-west coordinate lines of the new grid system. These control points are identified with wooden stakes and are flagged. Coordinates are written in indelible ink on wooden slats inserted next to the stakes. This system will be used as the basis for identifying sample locations and excavation areas throughout the project.
3.0 PREVIOUS SITE INVESTIGATIONS

Various investigations have been conducted at and in the vicinity of the Bennett’s Dump site since 1983. These include soil, sediment, surface water and groundwater sampling efforts, soil borings, at least 2 geophysical surveys, aerial photography interpretation, soil borings and bedrock coring, monitoring well installation, water level monitoring, surveying, and hydraulic conductivity testing. This section addressed three of those prior investigations that have generated data that will be useful in determining the probable limits of excavation, and involve samples collected at known and repeatable locations. All of the available, relevant data and information will be used in the development of excavation limits to be presented in the final work plan for the Bennett’s site.

3.1 SAMPLING PERFORMED DURING USEPA REMOVAL ACTION, JUNE, 1983.

The USEPA conducted an investigation and subsequent removal action at the Bennett’s site between May and July, 1983. This project included at least 3 soil investigations and a geophysical survey.

The first sampling effort included the collection of nine soil, pond sediment, creek sediment and surface water samples. The soil and pond sediment samples were collected immediately adjacent to visible capacitors. Prior to the 1983 removal action, a shallow pond existed in the central portion of the site. The creek sediment and surface water samples were collected from Stout’s Creek. Sediment was removed from the creek during the 1987 interim cleanup action.

The second investigation is documented in a report entitled “On Site Coordinator’s Report, Immediate Removal Project 68-95-0076, Bennett’s Quarry, Bloomington, Indiana,” June, 1993. According to this report, the investigation included the installation of 63 soil borings and the analysis of 166 samples for polychlorinated biphenyls (PCBs). This sampling was performed using a 50-ft by 50-ft grid system. Figure 2 presents the PCB soil analytical results from that effort, overlaid on a current site map. Borings were installed to a maximum depth of 6.5 ft, although many of the borings encountered bedrock before reaching that depth. Samples were typically collected for analysis in 6-inch depth intervals at 0 to 6-inches, 2.0 to 2.5 feet, and 5.0 to 5.5 feet.

Figure 3 shows a two-dimensional interpretation of these data. Because the lateral sampling interval was typically 50 ft, each location was interpreted as representing the center of a 50-ft by 50-ft grid. Grids represented by a boring where the PCB concentration equaled or exceeded 50 ppm in one or more samples are shaded red. Grids wherein all of the samples from a given boring exhibited PCB concentrations below 50 ppm are shaded blue. Where locations are closer than 50 ft, the area represented by each sample stops midway between the samples.

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The third investigation involved the installation of seven test trenches and test pits. These were installed in locations identified by geophysics as containing concentration of buried metal. Six of the seven trenches identified buried capacitors. The maximum depth of the capacitors is 3 feet below grade in five of the trenches. Capacitors were found to a depth of 5 feet below grade in the sixth location. The seventh trench, located at the northern end of the site, encountered metal building debris but did not find capacitors or capacitor parts.

As described above, a geophysical investigation was also conducted at this time. Based on the map of electromagnetic anomalies included in the OSC report, all of the buried metal areas identified by that effort are encompassed by this sampling program.

3.2 1984 SOIL BORINGS

In May, 1984, CBS contracted Blasland and Bouck to install soil borings at the Bennett’s Dump site. This work was performed primarily to profile the soil stratigraphy at the site and to identify depth to bedrock.

3.3 1998 GEOPHYSICAL SURVEY

In December, 1998, CBS contracted with PSARA Technologies and geophysical survey specialist, Geosphere Inc., to perform a geophysical survey on December 14-18, 1998. This investigation was performed to verify previous data, to address areas not included in previous geophysics, and to identify subsurface contours. The survey consisted of a combination of electromagnetic (EM) and magnetometer techniques, as well as a seismic refraction investigation. The EM survey was accomplished using an EM31 instrument by collecting readings along north-south lines across the site with 5-ft spacing between lines. Readings were taken at 2.5-ft intervals along each line. A fluxgate magnetometer was used to collect magnetic data along the same north-south gridlines. The magnetic survey focused primarily on target areas identified during the EM31 survey. The seismic refraction data was acquired along four lines selected from preliminary contour maps of the EM/magnetometer results. The location of these four lines is presented in Figure 4.

The seismic refraction study conducted at the Bennett’s Dump site revealed the presence of two soil lithologic units in the overburden above the limestone bedrock beneath the site. The clay cap, which is known to have been placed over the majority of the site, is not identifiable as a distinct layer based on the results of the seismic study. The uppermost layer, therefore, includes the clay cap and an intermediate layer. The intermediate layer is consistent with a loosely compacted clayey soil and/or fill, and ranges in thickness from approximately 2 ft to a maximum of about 12 ft. The clay/intermediate layer is present at all seismic stations.

Beneath the intermediate layer, an underlying clay layer was also discovered within the soil horizon. Seismic velocities of the underlying layer are higher than the clay cap/intermediate layer and are consistent with heterogeneous clay units with trash and debris intermixed. The
The underlying layer thickness varies from 0 ft (i.e., not present) to a maximum of nearly 15 ft. A contour map showing the elevation of the top of the underlying clay layer is provided in Figure 4. This figure has been prepared based on the limited data available. A revised figure will be prepared based on the soil borings generated during this proposed sampling effort.

The soil at the site is underlain by limestone bedrock. The surface of the limestone is highly irregular with two depressions in the bedrock surface: a linear depression at the southern end of the site, and a broad circular depression in the north-central portion of the site. The steep walls and apparent benching in the depression walls indicates that these depressions may be cultural in origin and likely the result of small-scale quarrying operations. The seismic data, along with previously developed boring data, was used to construct a contour map of the bedrock surface, which is provided in Figure 5. This figure has been prepared based on the limited data available. A revised figure will be prepared based on the soil borings generated during this proposed sampling effort.

Anomalies found in the conductivity, in-phase metal, and magnetic data collected during this investigation indicate that some type of refuse was used as fill to bring the bedrock depressions back to grade. Based on the large metallic responses in the magnetic and EM-31 in-phase results, this refuse has a metallic component. Smaller, singular metallic anomalies scattered through the southern portion of the site likely represent less organized dumping operations. A site map showing the major anomaly locations is presented in Figure 6.
4.0 Sample Locations and Sampling Procedures

This section describes the procedures for locating and collecting the various types of samples required for this project.

The sample locations described in this section have been established to delineate the lateral and vertical extent of soils that contain PCBs in excess of 50 ppm at the Bennett’s Dump site. The sampling program described herein was developed following a review of existing soil sampling data, as well as soil borings and geophysical data. The proposed sampling encompasses the entire areas of anomaly identified during the 1983 geophysics survey, as well as the areas of identified contamination as shown in the USEPA OSC report. The locations of all seven 1983 test trenches are also encompassed by this sampling program. Further, CBS intends to sample to depths greater than those described in any of the 1983 investigations, except where auger refusal prevents further sampling.

Existing boring logs from prior investigations were used in conjunction with the 1998 geophysics (discussed below) to establish a preliminary estimate of the fill thickness and to prepare a preliminary bedrock contour map.

4.1 Soil Sampling

Figure 7 shows the 50-ft by 50-ft grid system overlaying the site. The layout of this grid system closely matches that used by USEPA in the 1983 investigation. Grid sampling will extend to the south and to the west, outside of the fence as necessary, to evaluate the grids directly adjacent to the hot grids identified during the USEPA study. Samples will be collected from each of these grids for the purpose of determining whether these grids require excavation.

Samples will be collected from the center of each grid at 1-foot depth increments starting at the ground surface. Continuous sampling will be performed through the cap and the intermediate layer, and will extend to either a minimum of 2 feet into the underlying clay layer or to bedrock. The thickness of the cap will be measured and recorded, and samples which contain only clay cap material will not be analyzed.

Samples will be submitted to the laboratory for PCB analysis as described in Section 5.0 of the SAP. One duplicate sample of each grid sample will be retained for archive. All samples will be collected in accordance with Field Sampling Procedure FP-16, which is included in Volume I, Appendix B, of the QAP/P.
4.2 ADDITIONAL SAMPLING LOCATIONS

If the laboratory results from any sample interval within a given grid show PCB concentrations equal to or greater than 50 ppm, any adjacent grids that have not been sampled or that are not already a part of the excavation area will be sampled in the manner described in this section. This additional sampling is intended to establish both the lateral and initial vertical limits of excavation. An initial excavation map will be developed in the work plan based on the results of this investigation and consistent with the previously existing data. This plan will be submitted with the final work plan and will establish the grids to be excavated and the initial excavation depth intervals. Final verification of these grids will be conducted using the post-excavation verification strategy, which will be described a Remediation Sampling Plan to be prepared and submitted with the final Work Plan.

Based upon the results of the sampling described above, CBS may elect to install additional soil borings during this effort to more precisely delineate specific areas or to further investigate the electromagnetic anomalies.

4.3 EQUIPMENT DECONTAMINATION

Soil sampling equipment (e.g., split spoons, augers, shovels, trowels, and mixing bowls) will be cleaned prior to collecting each sample to prevent cross contamination. All equipment will be decontaminated using the following five-step procedure as described in Field Sampling Procedure FP-2 in Volume I, Appendix B, of the QAPjP:

1) Scrub and wash with laboratory-grade detergent.
2) Rinse with tap water.
3) Rinse with deionized water.
4) Rinse with pesticide-grade methanol (wash bottle).
5) Rinse with deionized water.

4.4 QUALITY CONTROL SAMPLES

Two types of quality control (QC) samples will be collected:

- Replicate samples
- Rinseate blanks
Replicate samples will be collected periodically to check the laboratory analyses for consistency. Replicates will be collected during grid sampling events at a frequency of one replicate per 10 samples collected. Replicate samples will be obtained by equally dividing a sufficient amount of the sample aliquot to perform the required analyses. Replicate samples will be transferred to laboratory-cleaned glass jars and submitted for analysis.

Rinseate blanks will be collected to ensure that all sampling equipment is being properly decontaminated between sampling events. Rinseate samples will be collected in the field at a frequency of one per day. Rinseate samples will be collected by pouring deionized water over the decontaminated sampling equipment and collecting it in a 1-liter amber glass sample container. Sampling personnel will not be told which equipment to sample until after decontamination procedures have been completed.

CBS will allow the USEPA or its authorized representative(s) to take split and/or duplicate samples of any samples collected by CBS or its contractors or agents. All QC samples will be handled as described in Volume I of the QAPjP.
5.0 Sample Management

Field personnel are responsible for the identification, preservation, packaging, handling, shipping, and storage of samples obtained in the field such that all samples can be readily identified and will retain, to the extent possible, in situ characteristics to be determined through analysis. All samples collected will be tracked by preparing and using a sample chain-of-custody form as described in Field Sampling Procedure FP-12 in Volume I, Appendix B, of the QAP/jP.

5.1 Sample Identification System

Each sample, including quality control samples, will be identified with a unique sample number. This number will provide easy identification of the sample in field logs, field data sheets, analytical reports, chain-of-custody forms, and project reports. Sample numbers will be assigned in accordance with the procedures in the Bloomington Project Data Management Program.

5.2 Sample Containers, Preservatives, and Holding Times

Upon collection, samples will be transferred directly into the appropriate sample container. Only precleaned sampling containers supplied by the laboratory will be used. All samples will be cooled to 4°C immediately upon collection and maintained at this temperature during sample shipment. Table I summarizes the types of samples to be collected, container types and sizes, preservatives, and sample holding times.

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Analytical Method(^a)</th>
<th>Container Size</th>
<th>Preservative</th>
<th>Holding Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Samples</td>
<td>PCBs by 3550/8082 or 3545/8082</td>
<td>Glass, 4-oz</td>
<td>4°C</td>
<td>14 days to extraction</td>
</tr>
<tr>
<td>Rinseate samples</td>
<td>PCBs by 3510/8082</td>
<td>Glass, 1-liter</td>
<td>4°C</td>
<td>40 days to analysis</td>
</tr>
</tbody>
</table>

5.3 **Sample Labeling**

Samples will be labeled at the time of sample collection by affixing a self-stick label to the sample container. All sample labels will include the following information:

- Project name and number
- Unique sample identification number (see Section 4.1)
- Date and time the sample was collected
- Initials of the sample collector
- Sampling location and sample description

5.4 **Sample Shipping**

All samples collected during this study will be properly labeled and packaged for shipment by overnight courier to the offsite laboratory. Glass containers will be secured in sturdy coolers to prevent breakage during transport. Ice in leak-proof bags will be placed in the coolers to preserve the samples at 4°C. Coolers will be secured with tape and labeled to ensure the samples are not disturbed during transportation. A chain-of-custody seal(s) will be attached so that any attempts at opening or tampering will result in a broken seal.

5.5 **Sample Custody**

Sample chain of custody tracks the life of a sample from collection to analysis. A record of the sample custody will be maintained to establish and document sample possession during collection, shipment, laboratory receipt, and laboratory analysis. This documentation will be evidenced on a chain-of-custody record by the signatures of the individuals collecting, shipping, and receiving each sample. Procedures for sample handling, shipping, and transfer of custody are described in Section 5.0 of Volume I of the QAPP.

5.6 **Field Sampling Log Book**

A field sampling log book, as described in Field Sampling Procedure FP-1, will be initiated at the start of the first onsite sampling activity and maintained to record sampling activities throughout this remediation project. The field sampling log book is a controlled document that becomes part of the permanent site file. The log book will consist of a bound notebook with consecutively numbered pages that cannot be removed. All data entries will be recorded using a non-erasable ink pen.
The following items will be included in the daily entries in the field sample log book:

- Date of activities
- Arrival and departure of sampling personnel and observers
- Field sample activities
- Individual sample description (color, consistency, odor, etc.)
- Sample pick-up, including chain-of-custody form number, carrier, date and time
- Unusual events during sampling
- Health and safety issues related to sampling
- Weather conditions

Section 5.1.2 and Field Sampling Procedure FP-1 of Volume I of the QAPjP discuss field log book recordkeeping.
6.0 LABORATORY ANALYSIS

Heritage Laboratories in Indianapolis, Indiana, has been selected as the analytical laboratory for this project. Samples will be submitted to Heritage for analysis via hand delivery or overnight courier. The laboratory will transmit analytical results via facsimile within 48 hours of receipt, and original reports will be forwarded in the mail.

Two types of samples will be collected as part of this project. These include soil samples and rinseate samples. All of these samples will be analyzed for PCBs in accordance with EPA Method 8082 (SW-846) as presented in Table 1 of this SAP. Heritage Laboratories' Standard Operating Procedures for performing these analyses are included in Volume I, Appendix A, Laboratory Procedures, of the QAPjP. To reduce analytical costs, however, a screening analytical approach will be used. This approach is identical to Method 8082 but involves less stringent internal quality control requirements. The screening approach is expected to yield more accurate results that could be achieved using an immunoassay technique. In addition, any sample exhibiting a PCB result in excess of 500 ppm will not be re-diluted and re-analyzed. The result will be reported by the laboratory as “>500 mg/kg”. Except as described above, all laboratory analyses will be conducted using Level II Data Quality Objectives.
Figure 2. 1983 USEPA Sample Results
Bennett's Dump Site
Bloomington, Indiana
Notes:
1. For the purpose of estimating the areal extent of PCB's above 50 ppm, each sample represents the center of a 50-ft by 50-ft area.
2. Where samples are closer together than 50 feet, the area represented by each sample stops midway between the samples.

LEGEND
- Sample Location - PCB concentration < 50 ppm in all samples at all depths
- Sample Location - PCB Concentration >50 ppm in at least 1 depth interval
- Area interpreted as PCB-impacted based on USEPA data (See Notes)
- Area interpreted as not PCB-impacted based on USEPA data (See Notes)

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Figure 3. Interpretation of PCB-Impacted Areas Based on 1983 USEPA Data Bennett's Dump Site Bloomington, Indiana

Drawn By: SAS Date: 1/8/99 Scale: As Shown
Figure 5: Bedrock Contour Map
Bennett's Dump
Bloomington, Indiana

Base Map Source: Bennett and Spra Engineering, P.C. 1998
Geophysical data from Geosphere Inc. 1999

Drawn By: SAH
Date: 2/17/99
Scale: 1" = 100'
Figure 6. Generalized Electromagnetic Anomaly Map
December 14 through 18, 1998
Bennett's Dump
Bloomington, Indiana

Drawn By: SAH
Date: 2/17/99
Scale: 1"=100'

Bennet's Dump
LEGEND

- Proposed Soil Boring Location
- Area interpreted as PCB-impacted based on USEPA data (See Notes)
- Area interpreted as not PCB-impacted based on USEPA data (See Notes)

Figure 7.
Proposed Delineation Soil Borings
Bennett's Dump Site
Bloomington, Indiana

Drawn By: SAS
Date: 1/8/99
Scale: As Shown