REPORT

Ottawa River Sediment Remediation Priorities Project Report

Toledo Metropolitan Area Council of Governments
Toledo, OH

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Hull & associates, inc.

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BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

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Acronyms

BBL	Blasland, Bouck & Lee, Inc.
CFD	Cumulative Frequency Distribution
COPCs	Chemicals of Potential Concern
CSM	Conceptual Site Model
CSO	Combined Sewer Overflow
Hull	Hull & Associates, Inc.
FS	Feasibility Study
GIS	Geographical Information System
GLLA	Great Lakes Legacy Act
GLNPO	Great Lakes National Program Office
OC	Organic Carbon
OEPA	Ohio Environmental Protection Agency
MNR	Monitored Natural Recovery
MPA	Mass Per Unit Area
NRC	National Research Council
RAOs	Remedial Action Objectives
RM	River Mile
RTA	Remediation Target Area
SADZ	Stickney Avenue Depositional Zone
SEL	Severe Effect Level
SLRA	Screening-Level Risk Assessment
SWA	Surface-Area Weighted Average
SQG	Sediment Quality Guideline
TMACOG	Toledo Metropolitan Area Council of Governments
TOC	Total Organic Carbon
TSCA	Toxic Substances Control Act
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
QAPP	Quality Assurance Project Plan

1. Introduction

The Ottawa River, a tributary to Lake Erie, drains the urbanized watershed of the greater Toledo area that is situated in Lucas County in Northwest Ohio (Figure 1.1). Historically, the river has experienced agricultural, urban, and industrial impacts from which its sediments contain certain chemicals of concern. The Toledo Metropolitan Area Council of Governments (TMACOG) contracted Hull & Associates, Inc. (Hull) and Blasland, Bouck, and Lee, Inc. (BBL) – as a subcontractor to Hull – to identify sediment remediation priorities for the Ottawa River in Lucas County, Ohio. This Ottawa River Sediment Remediation Priorities Project (Project) is funded by the U.S. Environmental Protection Agency, Great Lakes National Program Office (GLNPO). This Project builds on results of previous studies of chemical distributions in the Ottawa River, as well as results of screening-level human health and ecological risk assessments (SLRAs) that identified areas of potential concern along the Lower Ottawa River (Intertox, 2001; Parametrix, 2001). The purpose of this Project was to identify and prioritize areas for sediment remediation in the Lower Ottawa River, defined as extending approximately 8.8 miles upstream from the river's confluence with Maumee Bay, as well as to identify appropriate remediation approaches and preliminary (Feasibility Study[FS]-level) remediation cost estimates for those areas.

Initial project tasks as reported in this document included an assessment of existing data, identification of data needs, preliminary identification of sediment remediation target areas, and development of a sediment sampling plan to fill data gaps. A technical memorandum presenting an analysis of historical sediment data for the Ottawa River was provided to TMACOG during preparation of the sediment sampling plan to fill data gaps for the Project (BBL, 2003). This sampling plan was subsequently incorporated into the Ottawa River Sediment Remediation Priorities Sediment Survey Quality Assurance Project Plan (QAPP) that was prepared by Hull, BBL, Belmont Laboratories in Englewood, Ohio (Belmont Laboratory), and the Ohio Environmental Protection Agency (OEPA), and submitted to GLNPO (OEPA, 2003).

The sediment sampling program, hereafter referred to as the Sampling Program, was conducted in October 2003 by OEPA field staff, and included the collection of sediment cores and grab samples from 51 locations and resulted in a total of 274 samples from four reaches of the Lower Ottawa River (Figure 1.2). These reach boundaries were established for the SLRAs and are utilized in this report for presentation of the Sampling Program data. The sediment samples were described in field logs and photographed before sectioning for chemical analyses, which included polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), total lead (also referred to herein as lead), total organic carbon (TOC), moisture, and grain size distribution. Seven different PCB Aroclors and 16 targeted PAH

compounds were analyzed by Belmont Laboratory.. PCBs, PAHs, and lead were identified as Chemicals of Potential Concern (COPCs), based on conclusions of the human health and ecological SLRAs which indicated that these constituents posed potential environmental risks.

On April 29, 2004, initial Sampling Program findings relevant to this Project were presented to the Project Management Team (a panel assembled by TMACOG to review findings of this Project). These findings had previously served as the basis for the Great Lakes Legacy Act (GLLA) funding proposal prepared and submitted to GLNPO by TMACOG in March 2004 (Appendix A). The GLLA funding opportunity did not come to fruition until after this current Project was initiated. To respond to the opportunity, Hull and BBL interrupted project activities to facilitate preparation of the funding proposal. On September 9, 2004 a proposal review meeting was held at the GLNPO offices in Chicago, Illinois, and attended by representatives of TMACOG and others. At this meeting, it was learned that the March 2004 funding request was not likely to be awarded. GLNPO suggested a pre-remediation study be conducted to support identification of a larger project, and subsequent submittal of a funding request for that larger project. In response, Hull and BBL subsequently revised this Project report based on GLNPO's suggestions, specifically, by developing a preliminary basis for a larger project that included the smaller project for which funding was originally requested. The potential effectiveness of this project in reducing exposure concentrations of PCBs and other COPCs was assessed, and general pre-remediation study needs were identified.

1.1 General Project Approach to Identifying Remediation Priorities

Conclusions of the human health and ecological SLRAs (Parametrix, 2001; Intertox, 2001) pointed to the need for remediation to address potential risks posed by the presence of COPCs in sediments of the Lower Ottawa River (Limno-Tech, Inc. [LTI], 2001). The identification of target areas for potential remediation in the current Project did not follow a "classic" risk-assessment methodology, but instead assumed that risk is proportional to exposure, or to potential exposure concentrations of COPCs. Given this assumption, concentrations of the target analytes in sediment provide, more or less, a surrogate for assessing potential human and ecological risks, and were the basis for identifying and ranking areas for potential remediation.

The SLRAs, due to their conservative, screening-level nature, do not provide a basis for computing the required degree of remediation to meet risk-based "targets", and establishing quantitative, risk-based Remedial Action Objectives (RAOs) was beyond the scope of the Project. Screening-level risk

assessments generally identify potential risks associated with contaminant exposure levels; not necessarily actual risks. In other words, the tendency is to err on the side of including constituents that may warrant further analysis, so that constituents or areas are not prematurely dropped from further analysis. For this reason, it is generally inappropriate to use SLRAs to establish remedial action objectives, because it could lead to unnecessary remediation, i.e. remediation could be indicated for areas that do not actually present unacceptable risks. However, the SLRAs are useful in *prioritizing* remediation areas, which was the objective of the Ecological SLRA (Parametrix, 2001).

Therefore, the subject of this report is to prioritize sediment areas for potential remediation based on relative COPC concentrations throughout the Site, and also based on other factors, including locations of apparent COPC source areas and COPC transport considerations. In this manner, COPC concentrations serve as the primary surrogate for potential exposure and risks to human and ecological receptors.

This project did not evaluate *if* remediation of Lower Ottawa River sediments is appropriate, but instead focused on identifying *where* remediation efforts would be most beneficial in reducing chemical exposure concentrations, and consequently, potential risks. The effectiveness of the proposed remediation in reducing site-wide risks, primarily through reduction of fish tissue PCB body burdens (the primary route of potential human exposure to COPCs is fish consumption) was also not assessed as part of the Project. Available site-specific fish tissue data were determined to be inadequate to evaluate expected reductions in fish tissue body burdens as a result of remediation; however, as discussed in Sections 4 and 6, the data support assessment of the spatial distribution of bio-available PCB concentrations in the sediments, and permit an estimate of the degree to which remediation may reduce bio-available PCB concentrations in the sediments.

Based on the SLRAs, the primary potential "risk driver" for human health and ecological receptors at the Site are PCBs (LTI, 2001); however, the ecological SLRA also identified lead and PAHs as other COPCs. Since a spatial correlation was noted in Total PCB, lead, and Total PAH concentrations, remediation targeted at Total PCBs will likely also address a large fraction of the sediments with elevated lead and Total PAH concentrations as well. While this report identifies the top three ranked areas for sediment remediation based on concentrations of all three chemicals, it contemplates remediation focused primarily on Total PCBs in sediments.

1.2 Report Purpose

The purpose of this report is to present the data collected through the Sampling Program, and to present Project findings regarding priority target areas for remediation, recommended remediation approaches, and preliminary remediation cost estimates. This Project report provides the following:

- Documentation of the sediment data obtained through the Sampling Program;
- Synthesis of the Sampling Program and historical data with the goal of prioritizing those areas that merit focused consideration for sediment remediation;
- A Conceptual Site Model (CSM) focusing on hydraulics, sedimentation, chemical fate, transport, and distribution;
- Identification and ranking of priority areas for potential remediation;
- Assessment of remediation alternatives for the top three priority areas for potential remediation;
- Preliminary remediation cost estimates for the top three priority areas; and
- Recommendations for pre-remediation data collection to support more detailed remediation planning and cost estimating.

1.3 Report Organization

The remainder of this report is organized as follows:

- Section 2: October 2003 Sediment Sampling Program – provides a summary of the Sampling Program;
- Section 3: Sampling Results – describes the laboratory analyses of sediment samples collected in 2003, presents the analytical results in tabular form, and presents graphical displays of spatial variations in the data, including the historical (pre-2003) data;
- Section 4: Conceptual Site Model – presents a summary interpretation of hydraulics, sedimentation, chemical distributions, and chemical exposure;

- Section 5: Preliminary Sediment Remediation Target Areas – describes the top three priority areas for remediation;
- Section 6: Evaluation of Remediation Alternatives – presents an evaluation of potential remediation alternatives;
- Section 7: Preliminary Remediation Cost Estimates – presents preliminary remediation cost estimates and a discussion of key factors affecting uncertainty in the cost estimates;
- Section 8: Summary and Recommendations; and
- Section 9: References.

2. October 2003 Sediment Sampling Program

2.1 Goals and Objectives

The primary goal of the Sampling Program was to better define the extent of previously identified sediment "hot spots" in areas of potential concern in the Lower Ottawa River (TMACOG, 2003). The SLRA concluded that the primary driver of human and ecological risks was the bioaccumulation of PCBs from sediment through the food chain, but also identified potential human health and ecological risks associated with exposure to lead- and PAH-containing sediments (LTI, 2001). The three sediment sampling objectives that were ultimately included in the QAPP were derived from those conclusions, as well as from interpretations of previously collected data, and are listed below. Table 2.1 summarizes these objectives (Table 1.1 from the QAPP).

Objective A:

> *Further characterize the horizontal and vertical distributions of PCBs, PAHs, and lead in sediments in the areas of concern that were identified on the basis of SLRAs in order to define potential target areas for remediation in the Lower Ottawa River.*

Objective B:

> *Determine the surface sediment grain size, TOC content, percent moisture, and visual texture characteristics at sediment sample locations in the target areas established in Table 2.1 in order to compute bio-available sediment concentrations for comparison to thresholds provided in the SLRAs. The grain size data will also be used to evaluate sediment stability under high-flow conditions as one metric in the evaluation of potential sediment remediation target areas.*

Objective C:

> *Determine the sediment thickness, general stratigraphy, and visual texture characteristics of any noticeable layers of the sediment bed, as well as water depths at sediment sample core locations in the target areas established in Table 2.1 in order to estimate sediment inventories, and sediment properties for screening of potential remediation approaches for areas that may be prioritized for remediation based on the sampling results.*

Table 2.1 summarizes the identified data needs and the Sampling Program objectives for each of the four river reaches (or segments) of the study area, as defined in the ecological SLRA (LTI, 2001). The boundaries of each reach are shown on Figure 1.2, and the locations where sediment samples were collected are shown on detailed figures specific to each reach included herein in Appendix D. The River Mile (RM) boundaries for Reaches 1 through 4 are presented below.

Reach	Downstream boundary (RM)	Upstream boundary (RM)	Approximate Length (Miles)
1	0 (Maumee Bay)	3.2 (just downstream of Suder Road)	3.2
2	3.2	4.9 (Stickney Avenue)	1.7
3	4.9	6.5 (just upstream of Lagrange Road)	1.6
4	6.5	8.8 (Auburn Road)	2.3

2.2 Summary of the Sediment Sampling Program

As indicated in Section 1, the Sampling Program was designed by BBL and Hull in conjunction with the OEPA and was implemented by OEPA field staff during the period of October 21 through October 29, 2003. Sampling activities took place on the Lower Ottawa River from approximately RM 0.0 at Maumee Bay, upstream to RM 8.5, near Auburn Road. Sediment core samples were obtained from 51 locations, as shown on the figures presented in Appendix D. The number of samples collected per Reach is summarized below.

Reach	Sediment Cores Collected
1	6
2	22
3	14
4	9
Total	51

The sampling locations shown on the figures presented in Appendix D differed slightly from proposed locations due to field variables. Actual field sampling coordinates were recorded using a Trimble Global Positioning System (GPS), Model TSC1, and are presented in Table 2.2, along with surface water depth, sediment probing depth, and core length, recorded at the time of sampling at each location. Core recovery, calculated as probing depth divided by core length, averaged 94.7%, with a minimum of 41.7%.

The OEPA collected sediment core samples using a pontoon-boat-mounted Rossfelder P-3 Vibracore unit, and hand-pushed coring equipment where water depths prevented sampling boat access. Cores were collected using 4-inch diameter, clear Lexan core tube liners. At each of the field sampling locations,

OEPA field staff measured apparent soft sediment thickness using a 16-foot long, 3/8-inch diameter, steel probing rod that was manually inserted into the sediments to refusal, or to a depth equivalent to the length of the sediment probing rod. In some cases, the full depth of surface water and sediment exceeded that which the 16-foot rod was able to probe. Field probing depths provide an approximation of the total depth of soft, presumably water-deposited sediments present. Probing depths are more accurate in shallower sediment deposits where refusal is more definite and probing depth is not limited by the length of the rod.

At four of the 51 planned core sampling locations (Locations SB03-15, SB03-21, SB03-27, and SB03-50 [see QAPP for specific locations]), samples could not be obtained because sediments were too coarse, and no recoverable sediment was present. At four other locations, insufficient sediment was present to collect a sediment core, so surficial grab samples were collected instead. At three of these locations, SB03-49, SB03-51, and SB03-52, grab samples were collected. At a third location, SB03-48, the top 6 inches of a 13-inch sediment core contained mostly leaves and sticks, so the rest of the core was composited to create a sediment sample that could be considered equivalent to a surface sediment sample (i.e., representative of the 0 to 6-inch depth interval).

Sediment cores were processed at an on-shore core processing location. From the 51 sample locations, a total of 274 individual core sub-samples (from specific depth intervals below the sediment surface) were split and submitted for physical and chemical analysis of selected constituents (see Section 2.2.1 for more detail). Prior to sectioning the sediment cores to prepare samples for laboratory analysis, the cores were split in half, length-wise, and their exposed faces were used to record sediment core stratigraphy. Stratigraphy was visually described on field logs (included in Appendix B) and the split core faces were photographed (included in a CD-ROM in Appendix C).

The OEPA provided samples to Belmont Laboratory for PCB, PAH, lead, and TOC analysis. The Hull Laboratory received split samples of selected core sections for grain size distribution and moisture content analyses.

2.2.1 Chemical and Physical Analyses

Sediment samples were analyzed according to the list of analytes and analytical methods outlined in Table 2.3, although not all samples were analyzed for all chemicals (e.g., some were analyzed for grain size). The total number of analyses for the list of target analytes is summarized below.

Compound	Count
PCBs	274
PAHs	269
Lead	269
TOC	269
Grain Size	71 (surface samples only)
Moisture Content	274

More sediment samples than originally intended in the QAPP were analyzed for PAH and TOC. While the QAPP indicated that TOC analyses were only to be performed on surface samples, and lead and PAH analyses were planned for a smaller subset of the total samples in preparation of Chain-of-Custody forms in the field, additional analysis indicators were requested for PAHs, lead, and TOC. This resulted in more analytical data being available for these parameters than originally planned.

During core sectioning and processing of samples for shipping to the laboratory, several cores were visually observed to contain highly organic sediments, at depths below the planned core sectioning depth identified in the QAPP. These cores were sectioned to obtain samples from depth intervals over the full extent of the core, beyond the planned sampling depth. These additional samples were held for potential subsequent analysis, in the event the original, planned samples contained elevated levels of the target compounds in the bottom-most sample. GLNPO personnel were contacted by BBL to request approval to have Belmont Laboratory hold the samples for further PCB analysis, pending analytical results. Based on GLNPO's concurrence, Belmont Laboratory held these samples at 4 degrees Celsius for approximately 100 days (exact hold times varied based on collection date and analysis date).

After the analysis of all samples originally submitted was complete, results for the cores that had deeper samples were then reviewed. Based on PCB concentrations observed in the bottom-most sample from several such cores, the following samples were subsequently analyzed for PCBs to provide additional information on the vertical extent of elevated PCB concentrations at these particular core locations:

Core Location #	Depth Interval (inches)
37	36 to 48
37	48 to 62
42	36 to 52
53A	36 to 48
53A	48 to 56

3. Sampling Results

This section discusses the results of the Sampling Program. Field data and laboratory analytical results are provided in a series of tables. Field data and analytical results are statistically summarized by reach, and the observed horizontal and vertical distributions of the data are presented graphically and discussed. These data, when evaluated together with historical information, support the CSM presented in Section 4.

A number of the figures presented in this section show concentrations of chemicals as a function of RM while others show chemical concentration depth profiles. These figures include pre-2003 data from the Ottawa River Database (LTI, 2001) and allow for a more complete assessment of the distributions of chemicals along the Ottawa River. The pre-2003 and the current Sampling Program data, however, were not collected with consistent vertical core sectioning schemes. The pre-2003 data also used thicker core sections (e.g., in many cases the "surface sediment" samples included sediments from the 0 to 24-inch interval), whereas the Sampling Program cores were all sectioned with a surface sample from the 0 to 6-inch interval. This difference (i.e., different definition of surface sediments among sampling events) must be considered when viewing the figures, especially the distribution of chemicals in the "surface" sediment, which is generally considered the bio-available zone. As such, the pre-2003 data do not provide as reliable information on bio-available concentrations of chemicals as do the more recent Sampling Program data, and, due to the potential incorporation of older, deeper, and more contaminated sediments beneath the surface layer, may, in fact, over-estimate surface-sediment exposure (Parametrix, 2001).

Note that all statistical results for the Sampling Program data presented in this and later sections were computed by assigning one-half of the detection limit concentrations for non-detect results. Using one-half the detection limit was selected as a convenient treatment for non-detect values, and is also consistent with treatment of non-detect values in the SLRAs (Parametrix, 2001; Intertox, 2001). Considering that the evaluation of potential remediation target areas in this report focused on the highest constituent concentrations, which are orders of magnitude greater than detection limits, the treatment of non-detect values is not consequential to the identification of remediation priorities in this report.

3.1 Chemical Analytical Data

Surface and subsurface samples were analyzed for PCBs, PAHs, lead, and TOC concentrations. Percent moisture was also determined (as part of standard laboratory procedure) to express these results on a dry weight basis – e.g., milligram per kilogram (mg/kg) dry sediment, or parts-per-million (ppm). The units "ppm" are typically used for presenting sediment concentration data in this report. Analytical results are presented in Tables 3.1 through 3.6, 3.8, and 3.9:

- Table 3.1 shows analytical results for individual PCB Aroclors and for Total PCBs;
- Table 3.2 shows analytical results for individual and Total PAHs;
- Table 3.3 shows analytical results for lead;
- Table 3.4 provides a summary of Total PCBs, Total PAHs, and lead results for each sample;
- Table 3.5 provides a statistical summary of the Total PCBs, Total PAHs, and lead data for each of the four reaches defined in Table 2.1; and
- Table 3.6 provides a statistical summary of the Total PCBs, Total PAHs, and lead data in the 0 to 6-inch depth interval for each of the four reaches defined in Table 2.1; and
- Tables 3.8 and 3.9 provide analytical results for TOC and a statistical summary of TOC and grain-size data, respectively.

3.1.1 PCBs

PCB detections ranged from 59% to 63% of the samples collected in each reach. Total PCB analysis identified Aroclors 1242 and 1254 as the primary Aroclors present in river sediment, with Aroclor 1242 appearing in most samples where PCBs were detected. The maximum Total PCB concentrations by reach are reflective of the general distribution of PCBs:

Reach 3 > Reach 2 > Reach 4 > Reach 1

Table 3.6 presents Total PCB statistics for the 0 to 6-inch depth interval (also referred to herein as the surface sediment). Maximum concentrations of Total PCBs in surface sediment by reach reflect this same distribution, confirming the SLRAs indications that Reach 3 has the highest PCB concentrations and therefore would be a primary area of concern. The distribution of reach-average PCB concentrations in

the surface sediments for the 2003 data show a similar pattern, with Reach 3 (37.8 ppm) much higher than Reach 2 (1.43 ppm), although the average in Reach 4 (0.42 ppm) is slightly lower than that of Reach 1 (1.49 ppm).

Figure 3.1 shows the distribution of Total PCB concentrations measured in the Sampling Program by RM along with the pre-2003 data. The more recent data show a pattern consistent with the pre-2003 data, with relatively elevated concentrations in Reach 3 and in the upstream portion of Reach 2. Figure 3.2 shows these data in more detail, by reach (presented from upriver to downriver). Appendix E contains figures showing the Total PCB concentrations measured at each sampling location in sub-tables specific to each core sample location.

Reach 4

In general, PCB concentrations in Reach 4 are low relative to those in Reach 3. The maximum Total PCB concentration in Reach 4 (from all depth intervals) is 2.8 ppm (core SB03-47, within the 12 to 24-inch depth interval). In several samples, PCBs were at non-detectable levels below the top one foot of sediment. Generally, sediment-sampling locations in Reach 4 contained very little soft sediment. Depth-discrete PCB data for sediment cores collected from Reach 4 as part of the Sampling Program, including data for cores SB03-46 and SB03-47, are summarized in Table 3.1.

Reach 3

The maximum Total PCB concentration from the Sampling Program samples was 1,142 ppm, obtained from the 12 to 24-inch depth interval of core SB03-53A, collected at RM 5.9. This core also contained 385.5 ppm Total PCBs in the 0 to 6-inch interval. Core location SB03-54A, which is near core SB03-53A, contained 0.15 ppm in the 0 to 6-inch interval, and even lower (non-detectable) concentrations of PCBs in deeper materials, which core section photographs (Appendix C) indicate to be native clay material. The core locations SB03-53A and SB03-54A are on the south bank of the river, on the outside of the river bend downstream of Fraleigh Creek (see Appendix D, Reach 3 sample location map). Several other high PCB concentrations were observed in surface sediments from Reach 3 samples. The next three highest Total PCB concentrations in the 0 to 6-inch depth interval were observed (from upstream to downstream) in samples SB03-41 (44.2 ppm), SB03-37 (42.7 ppm), and SB03-32 (44.3 ppm). The average Total PCB concentration in Reach 3 is 43.0 ppm. The average surface sediment Total PCB concentration in Reach 3 is 37.8 ppm.

Reach 2

In Reach 2, the maximum (91 ppm) and average (4.0 ppm) Total PCB concentrations in the sediment are approximately an order-of-magnitude lower than the maximum and average Total PCB concentrations in Reach 3. That is, the five highest Total PCB concentrations in the surface sediments in Reach 3 are 7.2, 42.7, 44.2, 44.3, and 385.5 ppm, whereas in Reach 2, the five highest Total PCB concentrations in the surface sediments are 2.1, 3.1, 3.2, 4.5, and 5.4 ppm.

Average surface sediment concentrations in Reach 2 (1.43 ppm) are approximately a factor of 25 lower than average surface sediment concentrations in Reach 3 (37.8 ppm). PCB concentrations in Reach 2 also appear to be somewhat less spatially variable than in Reach 3, as indicated by the standard deviation of 10% versus 15%, respectively.

In the area stretching from Stickney Avenue (RM 4.9) downstream to the CSX Railroad bridge (RM 4.2) (Appendix D, Reach 2 sample location map), from where core samples SB03-17 through SB03-31 were collected, sediment cores were generally several feet or greater in length, with detectable levels of PCBs typically observed throughout the top several feet or more of sediment in this area. Evaluation of the vertical distribution of PCB concentrations in Reach 2 shows that, at locations where PCBs were detected throughout the top layers of sediment, there is a clear trend of increasing concentrations to an in-core maximum several feet below the sediment surface. This trend typically reflects relatively long-term burial of historically high concentrations of PCBs by cleaner, more recent sediment layers. This portion of the river is referred to herein as the Stickney Avenue Depositional Zone (SADZ).

Sediment core samples SB03-7 through SB03-16 contained much lower soft sediment thicknesses than found in samples from the SADZ, located upstream of these cores. In cores collected from Reach 2 downstream of the SADZ, PCB concentrations average 0.69 ppm, versus 5.1 ppm in samples from cores collected in the SADZ. The magnitudes and vertical distributions of sediment PCB concentrations in Reach 2 show a marked difference between cores collected in the SADZ and cores collected in the downstream portion of Reach 2.

Reach 1

Six sediment cores were collected in Reach 1. PCB concentrations in these cores range from non-detectable concentrations (in 15 of 24 samples) up to 1.9 ppm. The average PCB concentration in Reach 1 is 0.67 ppm; however, given the relatively high percentage of non-detect results for samples in this

Reach (37%), this probably over-estimates the average PCB concentration in this reach. In general, PCB concentrations are very low in Reach 1 relative to concentrations in Reaches 2 and 3.

All six of the sediment cores collected from Reach 1 were 2-foot cores. In all but one of these cores, the maximum PCB concentration occurred in the top 6 inches of sediment. The bottom-most depth interval from these six cores ranged from non-detect (in 4 cores) up to 0.87 ppm.

Sediment Core PCB Concentration Depth Profiles

Figures 3.3 through 3.6 show the Total PCB concentration depth profiles for Reaches 1 through 4, respectively. In these figures, cores with similar profiles and concentration ranges are generally grouped together for plotting purposes.

In Reach 1, Total PCB concentrations, although relatively quite low, were generally highest near the surface and decreased with depth (Figure 3.3).

In Reach 2, sediment core PCB profiles were markedly different between the SADZ (Figure 3.4b) and the downstream portion of Reach 2 (Figure 3.4a). In the SADZ portion of this reach (where cores SB03-17 through SB03-31 were collected), most of the cores show deeply buried historical maximum PCB concentrations (Figure 3.4b). Two locations in the SADZ (SB03-22 and SB03-26) contain the highest PCB concentrations in the surface samples, and are both located on the outside of river bends in this reach, where "classical" river morphology would typically show deeper surface-water depths and relatively lower sediment deposition, or potential erosion; these core profiles may reflect partial erosion of previously deposited sediments. In contrast, in the downstream portion of Reach 2 (where core samples SB03-7 through SB03-16 were collected), downriver of the SADZ, the maximum PCB concentration in each core, although relatively low, is generally found at the surface, and decreases with depth (Figure 3.4a).

In Reach 3, sediment PCB profiles are much more spatially variable than in Reaches 1 and 2. Several cores in Reach 3 contain maximum PCB concentrations at the surface and declining concentrations with increasing depth, whereas other cores reflect maximum concentrations deeper in the sediments (Figure 3.5). In general, depths of the maximum in-core PCB concentrations in Reach 3 cores are shallower than in Reach 2, and are generally within two feet of the sediment surface.

In Reach 4, PCB concentrations are very low. The maximum Total PCB concentration in two samples (SB03-46 and SB03-47) occurs at the bottom of each core, with both profiles showing increasing Total

PCB concentrations with depth. This suggests that these cores may not have penetrated the full depth of contaminated sediment. However, surface sediment concentrations of PCBs are very low at both of these Reach 4 locations, with core maximums at depth at each location, which reflect less than 4 ppm Total PCBs.

3.1.2 PAHs

The detection frequency of PAHs in sediment samples collected from Reaches 2 through 4 ranged from 61% to 66%, and in Reach 1 the detection frequency was 21% (Table 3.5). The maximum Total PAH concentrations ranged from 7.5 ppm in Reach 1 to 86 ppm in Reach 3. Average Total PAH concentrations in each reach ranged from 0.98 ppm in Reach 1 to 7.1 ppm in Reach 3. The maximum and average Total PAH concentrations by reach show the same relative trend as those displayed for maximum and average Total PCB concentrations:

Reach 3 > Reach 2 > Reach 4 > Reach 1

The average surface sediment Total PAH concentrations also show the same spatial pattern. The maximum surface sediment (0 to 6-inch interval) Total PAH concentration of 29.6 ppm occurs in Core SB03-53A, which is also the same core sample that contains the maximum Total PCB concentration observed in the Sampling Program data (Section 3.1.1). Benzo(b) fluoranthene, Chrysene, Fluoranthene, and Pyrene were the most frequently detected PAH compounds in most of the samples.

The spatial distribution of Total PAHs in sediments of the Lower Ottawa River is shown on Figure 3.7, a plot that contains the pre-2003 data along with the Sampling Program data. Figure 3.8 shows these data in more detail by reach. Total PAH concentrations were generally very low in Reaches 1 and 4; however, relatively elevated concentrations occur in the downstream portion of Reach 3, and in the upstream portion of Reach 2 (in the SADZ).

Total PAH concentrations were highest in samples from Reach 3. In Reaches 1, 2, and 4, Total PAH concentrations were generally much lower. Therefore, a discussion of the higher Total PAH concentrations in Reach 3 is provided below, followed by a summary of Total PAH levels in Reaches 1, 2, and 4.

Reach 3

The maximum Total PAH concentration observed in the Sampling Program data, 86.1 ppm, occurs in Reach 3 within the 24 to 36-inch interval of Core SB03-33, which is the bottom-most sample interval from this core. The SB03-33 core location is at RM 5.52 on the north shore of the river, adjacent to the Dura Avenue Landfill. The three overlying, depth-discrete samples from this core, occurring between 0 and 24 inches, contain Total PAH concentrations of 11.3 to 18.6 ppm. The maximum concentrations of the four most frequently detected PAH compounds – Benzo(b) fluoranthene, Chrysene, Fluoranthene, and Pyrene, (7.1, 9.6, 17.0, and 16.0 ppm, respectively) – all occurred in sample SB03-33.

Reaches 1, 2, and 4

Total PAH concentrations in samples from Reaches 1 and 4 are quite low, with reach-wide averages of 0.98 ppm and 3.08 ppm, respectively. Although PAH concentrations in Reach 2 are higher, and in the SADZ are at similar levels as observed in most sampling locations of Reach 3, the highest PAH concentrations tend to be in the deeper sediment core intervals.

Sediment Core Total PAH Concentration Depth Profiles

Figures 3.9 through 3.12 show the Total PAH concentration depth profiles for the Sampling Program samples. As with PCB data, sediment cores with similar profiles and Total PAH concentration ranges are grouped for plotting purposes. Similar to depth profiles for Total PCBs in Reach 1, Total PAH concentrations in Reach 1 are low, showing the highest values at the surface, and decreasing with depth (Figure 3.9). In the downstream portion of Reach 2 (Figure 3.10a), Total PAH concentrations are generally low and are not highly variable with depth. In the SADZ, Total PAH concentrations are also relatively low, but display a "multi-peaked" character, with maximum concentration peaks noted at depth in most cores, but also localized "peak" concentrations in depth intervals near the sediment surface. In some cases, this observation suggests relatively recent source activity (Figure 3.10b). In Reach 3, Total PAH concentration depth profiles are highly variable, as are those for Total PCBs. Several cores show relatively elevated concentrations below the sediment surface, while other cores contain relatively elevated levels near the surface. As mentioned previously, core sample SB03-33, located adjacent to the Dura Avenue Landfill, contains the maximum observed Total PAH concentration (86 ppm) at the bottom of the core (Figure 3.11).

3.1.3 Lead

Lead was detected in all sediment samples collected and the average lead concentration in each reach ranged from 95 ppm in Reach 1 to 158.6 ppm in Reach 2. The maximum lead concentrations for all samples reflect the same spatial trend as do maximums for Total PCBs and Total PAHs (Table 3.5):

Reach 3 > Reach 2 > Reach 4 > Reach 1

Figure 3.13 shows the spatial distribution of lead concentrations in sediment along the Lower Ottawa River, combining both the pre-2003 and the Sampling Program data. Figure 3.14 shows these data in more detail by reach. The more recent data reflect spatial patterns similar to the pre-2003 data. Further, there is a clear trend of increasing lead concentrations moving downstream through Reach 4 to maximum levels in Reach 3 and the SADZ, followed by a steady declining trend in lead concentrations towards the river mouth.

The maximum concentration of lead observed for the project, 680 ppm, was noted in Reach 3 in Core SB03-53A, within in the 0 to 6-inch interval (the same core containing the maximum observed PCB concentration). Several other locations in Reach 3 contain lead concentrations in surface sediments exceeding several hundred ppm. Similarly high lead concentrations occur in the SADZ portion of Reach 2, although the highest concentrations occur in samples from greater depth intervals than in the Reach 3 samples. Downstream of the SADZ, lead concentrations decrease markedly and decline steadily towards the river mouth.

Sediment Core Lead Concentration Depth Profiles

Figures 3.15 through 3.18 show the lead concentration depth profiles for the Sampling Program samples. Again, sediment cores displaying similar concentration profiles and ranges are grouped for plotting purposes. In Reach 1, lead concentrations are relatively low and exhibit little variation with depth, or decrease with depth (Figure 3.15). In the downstream portion of Reach 2, lead concentrations are low and display no consistent pattern with depth (Figure 3.16a). In the SADZ, lead concentrations in a large number of the cores show increasing concentrations with depth to deeply buried sediments likely associated with historical discharges, although a few cores located towards the outside portions of river bends reflect highest concentrations near the sediment surface (Figure 3.16b). In Reach 3, the depth profiles for lead are variable, and thus generally similar to those for Total PCB and Total PAH profiles for this same reach (Figure 3.17). The lead concentration depth profile for Core SB03-53A, which contains the maximum lead and Total PCB concentrations observed in the Sampling Program dataset, shows the

highest lead concentration at the surface and a generally declining trend with increasing depth, whereas the PCB profile showed increasing concentrations with depth. This could suggest that historical peak loading of lead and PCBs for this same core occurred during different periods.

3.2 Grain Size and TOC

Grain size distributions were determined for the surface sediment samples collected at all sampling locations, as well as for selected subsurface samples for a limited number of core sample locations. Grain size analytical results are presented in Appendix F. TOC concentrations were measured for all but five samples. Grain size data are presented in Table 3.7. TOC data are presented in Table 3.8. A statistical summary of these data by reach is provided in Table 3.9.

Most of the samples consisted of medium- to fine-grained sand, or silt and clay. Some samples contained coarse to fine gravel, with the majority of these samples located in upriver areas (in Reaches 3 and 4).

The grain size distributions portray a trend of fining of the sediments in a downstream direction, as indicated by the average percent total fines (silts and clays) which varies from 82% in Reach 1 to 26% in Reach 4. The percent total fines show the following spatial trend:

Reach 1 > Reach 2 > Reach 3 > Reach 4

The highest TOC concentrations observed in the Sampling Program data was 8.4% in a sample from Reach 1. The section-average TOC concentrations ranged from 3.2% in Reach 1 to 1.2% in Reach 4. TOC concentrations in sediment generally reflect the same variation by section, as do the percent total fines:

Reach 1 > Reach 2 > Reach 3 > Reach 4

The variation in grain size and TOC content by river mile in the Sampling Program dataset is shown on Figure 3.19. Panel A of this figure illustrates the trend of fining of the sediments moving downstream towards the river mouth. While Reach 4 sediments generally contained between 10% and 40% total fines, Reach 1 sediments are generally greater than 90% fines, with the exception of samples collected near bridges (where constricted flow causes locally higher velocities, resulting in coarser sediment deposits). Panel D of this figure shows a similar pattern in TOC distributions, with higher TOC content in the lower reaches of the river; however, the highest TOC content occurs in the SADZ in Reach 2 rather than Reach

1. This may be reflective of the relatively high "trapping" of watershed sediments in this area due to deposition before they are transported to downstream areas.

3.3 Water Depth and Sediment Thickness Data

Water depth, probing rod depth, and sediment core penetration depths were recorded at most core sample locations. These data were recorded to determine the depth of water, total thickness of soft, presumably water-deposited sediment in the river, and to assess core recovery as a function of sediment depth. The data are shown in Table 2.2, with a statistical summary presented in Table 3.10.

Sediment core samples were taken at locations with water depths ranging from 0.5 to 9 feet. The core sample collected in the deepest water occurred in Reach 3, in 9 feet of water, while the shallowest sample was collected in Reach 2, in 0.5 feet of water. On average, water depths encountered during the sampling program varied as follows:

Reach 4 > Reach 3 > Reach 2 > Reach 1

This trend reflects a general narrowing and deepening of the channel moving upstream towards Reach 4 from the relatively flat topography near Maumee Bay. As described in Section 2.2, a probing rod was inserted into the sediment to refusal using reasonable human force to determine soft sediment depth (thickness). The maximum depth of probing rod penetration ranged from approximately 12 feet in Reaches 1 and 2 and to a maximum of approximately 6 feet in Reach 4. Average thickness of soft sediment followed this trend:

Reach 2 > Reach 1 > Reach 3 > Reach 4

Except for Reach 2 containing thicker deposits of sediments than Reach 1, the above trend in sediment thickness is opposite to the trend in average water depths as a function of distance upstream. This inverse relationship is intuitively correct in that the deeper, narrow channel in Reach 4 is not (or is less) conducive to deposition, whereas the broader, shallower channels of Reaches 1 and 2 are more conducive to deposition. The thickest sediment deposits are observed in Reach 2, in particular in the SADZ. This area appears to be the first major depositional zone downstream of Reach 3.

3.4 Core Depth and Percent Recovery

The average depth of core penetration beneath the sediment surface for cores collected during the Sampling Program ranged from 3.8 feet in Reach 4 to 8 feet in Reach 1 (Table 3.10). Core recovery represents the amount of sediment that was retrieved with each core sample, and is expressed as a percent of the total sediment probing depth. Average core recovery for the Project ranged from 85% in Reach 1 to 98% in Reach 4.

4. Conceptual Site Model

This section presents a preliminary CSM for the Lower Ottawa River that addresses river hydraulics, chemical and sediment transport, chemical distributions, and chemical exposure concentrations, to provide a basis for evaluating the potential effectiveness of various remediation approaches in controlling chemical migration and reducing potential environmental risks. U.S. Environmental Protection Agency (USEPA) guidance – Data Quality Objectives Process for Superfund (USEPA, 2000) – identifies CSM development as an early, important activity in sampling plan design, and advocates that a CSM should be initiated at the start of a project and carefully maintained and updated throughout the life of site activities. The USEPA Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites (USEPA, 2002) also calls for use of the CSM as a guide for site investigations and decision-making, and notes that the CSM should be updated periodically when new information becomes available. The Sediment Sampling Planning Memorandum (BBL, 2003) presented an interpretation of existing data for the Lower Ottawa River that, together with information from the human health and ecological SLRAs (which included a CSM for ecological exposure pathways) formed the basis for a sampling plan design.

For sediment sites, the USEPA indicates that a CSM should identify all known and suspected sources of COPCs, the types of chemicals and affected media, existing and potential exposure pathways, the known or potential human and ecological receptors that may be threatened, and should also consider the implications of sediment stability to current and future availability of chemicals (USEPA, 2002). While development of a comprehensive and final CSM is beyond the scope of this project, the available information presented herein (compiled to develop a preliminary CSM) is used to prioritize areas for potential remediation, and focuses on hydraulics, chemical and sediment transport, chemical distributions, and chemical exposure concentrations.

4.1 River Hydraulics

An understanding of river hydraulics is important in evaluating sediment remediation target areas and remediation alternatives for several reasons. First, river hydraulics drive sediment transport and mobilization, including transport of chemicals in the sediment bed to downstream areas. Second, river flow patterns determine sedimentation patterns, and knowledge of flow patterns assists in interpreting site information and in identifying and delineating the spatial distribution of depositional and non-depositional areas. Finally, river hydraulic forces must be accounted for in remediation design, both as a

potential mechanism for redistribution of resuspended materials (e.g., as may occur during dredging activities) as well as for potential physical impacts on remediation systems (e.g., impacts to turbidity controls, stability of cap materials, etc.).

Existing information on river morphology, river-bottom elevations, and flow conditions, show that the downriver morphology of the Lower Ottawa River changes considerably from the head of Reach 4 (at RM 8.8) to the river mouth (at RM 0.0). Information from the Combined Sewer Overflow Study (CSO study) prepared for the City of Toledo (Toledo CSO Team, 1997) was summarized by LTI (Larson, 2000) and included results of one-dimensional (1-D) hydrodynamic modeling conducted using a DYNHYD5 model used in the CSO study. This information, together with field information (water depths) collected through the Sampling Program, implies that, over the lower 8.8 miles of the Ottawa River, the relatively steep, narrow, and deep river channel in Reach 4 widens and slows gradually through Reach 3, and then becomes much wider, shallower, and slower in Reach 2. In Reach 1, water depths are shallowest and highly subject to wind-driven waves, currents induced by Lake Erie seiches, and turbulence from recreational boat traffic (which is most abundant in this reach). Flows are unidirectional in Reach 4 (Larson, 2000). The influence of seiches, during which river flow may be periodically and temporarily "reversed," extends through the upstream portion of Reach 3 (Larson, 2000). In downstream areas (downstream of RM 2.5 [Larson, 2000]), the river becomes more estuarine in nature and the magnitudes of flows (although not necessarily flow velocities) and frequency of flow reversals increase.

The shoreline of the Lower Ottawa River is highly modified relative to former natural conditions. Numerous road and railway bridge crossings span the river and extensive sections of the shoreline, in Reach 3 in particular, have been armored with riprap and/or sheet-pile. Localized areas of the river have also been dredged and channelized, such as the upstream portion of Reach 3 and the lower portion of Reach 4, in conjunction with road construction and bridge improvements. Several of the bridge crossings contain bridge spans that are submerged during flood flows, creating upstream backwater effects and pressure flow situations under the bridges (FEMA, 2000). Multiple storm sewers and CSOs also discharge to the river. All of these factors contribute to the altered, less natural hydraulic status of the river. Nevertheless, evidence of "classical" river and estuarine hydraulics is present in the field data and Site observations – which indicate preferential depositional zones in expected areas, based on flow velocity patterns as affected by channel morphology. Additionally, the sediment core data indicate that sediment accumulation rates in the lower portions of Reach 2 and in Reach 1 are low relative to those in the SADZ. This is not unexpected given the wide, shallow characteristics of these lower river areas, which are more subject to wind-wave action, seiche-driven currents, and other factors that minimize net

deposition and promote long-term "washout" of suspended sediments to Maumee Bay. During low-water conditions caused by seiches, large areas of exposed mudflats or areas of only a few inches of water depth are visible in Reaches 1 and 2.

The variation in hydraulic characteristics in the Lower Ottawa River has important consequences to chemical transport. Chemicals entering the river in Reaches 3 or 4 (either from external sources or from the sediment bed) would be predominantly transported downstream. Chemicals entering the river in Reach 1 or Reach 2 are subject to at least short-term upstream transport due to seiches, in addition to potential redistribution due to resuspension by wind waves, seiches, and biological activity (wildlife and fish foraging, fish spawning, etc.) as well as human impacts (boat propeller scour, etc.).

In the lower portions of Reach 2 and in Reach 1, the frequency of flow reversals, the shallow water depths, and long wind-fetches, together with recreational boat traffic, create conditions that promote sediment and chemical resuspension, redistribution, and gradual long-term washout of sediments and associated chemicals to Maumee Bay.

Available recent bathymetric data for the Ottawa River is very limited; however, based on water depths measured during Sampling Program activities together with river reach area estimates determined from available Geographic Information System (GIS) maps, the approximate average channel dimensions for reaches of the river can be estimated and are shown below. Whereas reach-average water depths range from 1.4 to 2.9 feet, water depths exceeding 10 feet occur between most bridge abutments at bridge crossings due to localized scour caused by constricted flow.

Reach	Average Water Depth (ft)	Average Channel Width (ft)	Length (Miles)	Area (acres)
1	1.4	1078	3.2	418
2	1.6	610	1.7	12.6
3	2.6	127	1.6	25
4	2.9	76	2.3	21

4.1.1 Flow Velocity and Shear-Stress Calculations

Flood events and large seiche events can combine to cause water-level fluctuations in the Lower Ottawa River of several feet or more in relatively short timeframes (scale of hours). These events impart shear stresses on bottom sediments that may cause erosion of the sediment bed in some areas. Seiche events can also cause high flow velocities that may affect remediation activities. The high flow velocities should

be accounted for in remediation design, and/or evaluation of sediment stability in areas where Monitored Natural Recovery (MNR) is evaluated as a remediation approach.

Information on Ottawa River flow conditions is available from the 1-D DYNHYD model (Toledo CSO Team, 1997), and from the Flood Insurance Study for Lucas County, Ohio (FIS) dated October 6, 2000 (FEMA, 2000). Water surface elevations and velocities for various flood events computed using the U.S. Army Corps of Engineers (USACE) HEC-2, one-dimensional, step-backwater computer program are reported in the FIS. The FIS modeling results provide an estimation of expected flow velocities for flood conditions. The expected flow velocities and water depths for the 100-year flood event indicate main channel water depths in the SADZ are in the range of 13 to 14 feet, and in Reach 3 main channel water depths are in the range of 16 to 20 feet. In the SADZ, the depth-averaged velocity in the main channel was estimated to be 2.0 fps (from the available computer floodway velocities in the vicinity of this area). In Reach 3, the depth-averaged velocity in the main channel was estimated to range from 2.1 to 3.4 fps, from the available computed floodway velocities in the vicinity of this area.

4.2 Sediment Transport and Sedimentation

In Section 3 of this report, the spatial distributions of different sediment types in the Lower Ottawa River were presented as indicated by sediment probing depths, sediment core lengths, grain size data, and TOC data. This information, together with an understanding of the channel morphology (width, depth, sinuosity, bank characteristics, etc.) and river flow rates supports description of a conceptual model of sediment transport in the Lower Ottawa River. Additionally, the observed depositional profiles of Total PCBs, Total PAHs, and lead provide additional insights into long-term sedimentation patterns in the river system.

Reach 4

Given the relatively high river gradient in Reach 4, the relatively narrow and deep channel, non-reversing flow conditions, and the limited amount of fine sediments and organic carbon occurring in this reach (Figure 3-19), this reach is generally considered to be non-depositional. The sediment chemical profiles from this reach (Figures 3.6, 3.12, and 3.18) indicate low chemical concentrations, negligible sediment deposition, and frequent occurrence of the core-maximum concentrations in the 0 to 6-inch sediment depth interval. The majority of chemicals entering this portion of the river would likely be transported downstream. Chemicals deposited to the sediment surface are likely relatively transient, and periodically remobilized by flood flows and moved toward downstream depositional areas.

Reach 3

In Reach 3, the river channel is highly modified, with the majority of both shorelines having been riprapped or otherwise altered in conjunction with activities at the various landfills bordering this section of the river. The channel meanders in Reach 3, creating variable sedimentation across the river width, with some areas accumulating sediment as indicated by sediment core data, and other areas being either relatively non-depositional, or periodically disturbed (by hydrodynamic or other forces). This results in a high degree of spatial variability in chemical concentrations as well as chemical concentration depth profiles in this reach (see Figures 3.5, 3.11, and 3.17). Sediment cores reflecting deeper (buried) maximum concentrations of chemicals in Reach 3 generally occur in areas that would be expected to be less energetic based on channel morphology (such as on the inside of a river bend, or downstream of some sort of shoreline protrusion). One location inconsistent with this generalization is SB03-53A, which is a sediment core located on the outside of a river bend in Reach 3, near the former Unnamed Tributary, which contains chemical profiles indicative of historical deposition. This area was previously disturbed during placement of an AquaBlok™ cap (placed in 1999 as part of the AquaBlok sediment capping demonstration project), as well as placement of steel sheet-piling at the mouth of the former Unnamed Tributary (BBL, 2000), which may have changed local river hydraulics. Based on field observations made in Spring 2002 (Hull, 2002) and again in Summer 2004, during benthic macroinvertebrate sampling activities (unpublished information), AquaBlok capping material was observed to occur within portions of the field-study area, thus indicating that the demonstration cap could potentially be serving as an interim sediment barrier within portions of Reach 3. Additionally, a couple inches of AquaBlok were observed to occur at the surface of core sample location SB03-53A during the October 2003 sampling effort (OEPA field sampling log for core location SB03-53A, contained in Appendix B of this report). A field evaluation of the extent to which the demonstration cap occurs spatially within this portion of Reach 3, and within this core sampling location in particular, is recommended.

Sediment grain size data and TOC content is also highly variable in Reach 3, but is consistent with the overall trend of increasingly finer sediments and higher TOC content moving downstream toward Reach 2. In general, sediment properties and chemical distribution data indicate that Reach 3 is a transitional zone, with areas of limited deposition, but also evidence of periodic reworking of the sediments in this reach; the sediment bed in Reach 3 is likely subject to periodic remobilization during periodic high-flow events.

SADZ Portion of Reach 2

Relative to upstream areas, a marked transition in sediment transport and sedimentation patterns occurs in Reach 2, associated with changes in the channel bottom slope, width, and depth. As indicated in the previous section, the SADZ is a wide, relatively shallow and slower-moving section of the river, located just downstream of the boundary between Reach 3 and Reach 2 (Figure 4.1). The SADZ contains two channel bends associated with an "S-type" meander. Sediment grain size data indicate that this area contains a large percentage of fines, and TOC values are highest in this area (Figure 3.19). Some sediment core profiles show deeply buried (likely associated with historic discharges) maximum concentrations of Total PCBs, Total PAHs, and in most cases, lead, as discussed in Section 3. However, review of the vertical distribution of Total PAHs in some of the SADZ cores suggest more recent inputs from upstream sources, as indicated by Figure 3.10b.

The SADZ apparently retains a relatively large percentage of the contaminated sediments transported to this reach from upstream areas. This is implied not only by the chemical concentration depth profiles, but also by the high percentage of fine sediments and the highest TOC content in the system occurring in this reach. Some sediment cores in this reach do not show chemical concentration depth profiles consistent with long-term deposition (i.e., based on "classical" river morphology, would not be conducive to sediment accumulation); these include areas on the outside of river-bend channels. Typically, in such river channels, an erosional area (or non-depositional area) is evident in the river bottom, along the outside bed of channel meanders.

Downstream Portion of Reach 2 and Reach 1

Sediment cores located downriver of the SADZ, in the shallower, downstream portions of Reach 2, and in Reach 1, indicate relatively low rates of sediment accumulation. This is supported by shallower probing depths and core lengths, as well as chemical profiles. This may be the result of the sediment being apparently "trapped" in the upstream portion of Reach 2, or because these particular downstream areas are subject to relatively greater mixing/resuspension and scour. A variety of processes (sediment resuspension by wind and river waves, localized resuspension by boat props, large "flushing" volumes introduced by seiche events, storm flow, etc.) may collectively contribute to the dispersion of sediment in these areas. Recreational boat impacts on the sediment in Reach 1 are also possible due to the shallow water depths; however, the most important processes driving sediment and chemical transport are probably the natural geochemical and biological processes that occur in the shallow areas in the lower reaches.

Sediment grain size distribution data (contained in Appendix F) show that nearly 100% of surface sediments in Reach 1 are finer than a #200 sieve (i.e., occur in the clay and fine-silt-sized range). By comparison, most grain-size results for sediments in the SADZ show only 30% to 60% of sediments finer than a #200 sieve. Very fine sediments in Reach 1 and in the lower portions of Reach 2 are likely a result of relatively coarser sediments being deposited in upstream areas such as the SADZ. The very fine particles have low settling rates and are able to be transported further downstream and either deposited in the lower reaches or out to Maumee Bay. The very fine surface sediments also appear to contain less organic carbon than sediments in upstream areas, such as in the SADZ. The larger silts and organic materials appear to settle out upstream. One reason for the relatively low organic carbon content in the lower reaches may be relatively more intensive "weathering" and diagenesis of organic material due to frequent cycling between the sediments and the water column and relatively low long-term deposition rates. Further study may be warranted to better understand the geochemical processes affecting sediments and sedimentation in lower reaches of the river.

4.3 Chemical Distributions

Chemical distributions are an important aspect of the CSM, especially as related to bio-available chemical concentrations in surface sediments. Section 3 presented a detailed discussion of the data collected and analyzed during the Sampling Program. This section summarizes significant information on chemical distributions, and evaluates spatial distributions of relatively bio-available chemical concentrations and apparent chemical co-locations in sediments.

4.3.1 PCBs

As discussed in Section 1.1, potential human health and ecological risks evaluated in the SLRAs concluded that risks associated with exposure to and bio-accumulation of PCBs from the Ottawa River was a primary "risk driver." Given that PCBs were identified as the main COPC in the human health SLRA, an adequate understanding of PCB distributions in sediments of the Lower Ottawa River is necessary in order to evaluate remediation alternatives intended to reduce potential human and ecological risks, primarily associated with fish consumption.

The following summary points can be made concerning Total PCB distributions in sediments of the Lower Ottawa River as indicated by the results of the Sampling Program:

- PCB distributions in the Lower Ottawa River generally reflect potential historical source areas in Reach 3 and in Reach 4.

- Total PCB concentrations in Reach 4 are relatively low – averaging 0.43 ppm in all of the samples, and 0.42 ppm in surface-sediment samples – with the highest concentrations noted in a sample collected just upstream of Reach 3 (2.3 ppm).

- Relatively high surface-sediment concentrations of Total PCBs occur in Reach 3, with the five highest Total PCB concentrations in surface sediments ranging between 7.2 and 385 ppm.

- The average surface-sediment PCB concentration in Reach 3 is 38 ppm.

- Sediment PCB concentrations are highly spatially variable in Reach 3, reflecting, among other factors, variation in sediment accumulation as a function of variable channel morphology and source areas.

- High concentrations of Total PCBs, up to 91 ppm, also occur in SADZ sediments in Reach 2, but tend to be deeply buried by cleaner sediments; the surface-sediment average and maximum Total PCB concentrations in Reach 2 are 1.4 ppm and 5.4 ppm, respectively.

- In the downstream portion of Reach 2, and in Reach 1, Total PCB concentrations are relatively low, and not highly spatially variable, with the depth of detectable contamination relatively shallow when compared to that occurring in the upstream areas of Reach 2.

4.3.2 Lead

The ecological SLRA identified lead as another COPC. The following summary points can be made concerning lead distributions in the Lower Ottawa River:

- Lead concentrations in most sediment samples exceed Sediment Quality Guidelines (SQGs) in Reaches 1 through 4 used in the ecological SLRA (Parametrix, 2001).

- The highest lead concentrations occur in Reaches 2 and 3, with maximum concentrations of 470 ppm and 680 ppm in these reaches, respectively.

- The maximum Project-wide lead concentration, 680 ppm, occurs in Reach 3, within the same sediment core (Core SB03-53A) containing the maximum Total PCB concentration (1,140 ppm), as well as the maximum surface sediment Total PAH concentration (30 ppm).

- A number of the highest observed lead concentrations for the Project, at concentrations of several hundreds of ppm, occur in surface sediment (the 0 to 6-inch interval) of Reach 3.

- The highest observed lead concentration in the SADZ, 300 ppm, occurs with other similarly high lead concentrations in sediment cores, in depth intervals several feet below the sediment surface.

- Lead concentration depth profiles in sediment cores of Reach 2 reflect deeply buried historical maximum lead concentrations, with a trend of declining trends upwards toward the sediment surface.

- Near the river mouth, lead concentrations decline to relatively low levels, marginally exceeding the SQGs.

4.3.3 PAHs

The ecological SLRA concluded that the nature and extent of potential risks associated with exposure to sediment-borne PAHs were uncertain (LTI, 2001). However, due to uncertainty in data available at the time of the SLRAs, it too was considered a COPC.

The following summary observations can be made concerning PAH distributions in the Lower Ottawa River:

- Total PAH concentrations in Reach 4 are relatively low, with average and maximum values of 3.1 ppm and 18 ppm, respectively.

- The highest Total PAH concentrations are observed in Reach 3 (up to 86 ppm) and in the SADZ (up to 32 ppm), and tend to be co-located in samples containing relatively high concentrations of Total PCBs and lead.

- Average surface-sediment (i.e., 0 to 6-inch depth interval) Total PAH concentrations in Reach 3 and the SADZ are 9.5 and 5.0 ppm, respectively.

- In the SADZ, Total PAH concentration depth profiles have a "multi-peaked" character, with greater depth intervals containing historically high levels of Total PAHs. Relatively high Total PAH concentrations are also observed in near-surface depth intervals in some cores.

- Observed Total PAH concentrations are lowest in Reach 1, with average and maximum values of 0.98 ppm and 7.5 ppm, respectively.

4.4 "Bio-available" PCB Concentrations

The spatial distribution of bio-available Total PCB concentrations in sediments depends on, among other factors, the degree of PCB sorption to the organic fraction of sediment particles. A simple way to evaluate the distribution of bio-available PCBs is to express the surface sediment Total PCB concentrations in terms of dry-weight organic carbon (OC), as an "OC-normalized" concentration. Elevated concentrations of Total PCBs on a dry-weight of sediment, or "ppm," basis may not pose greater risks than lower levels of Total PCBs if higher concentrations of organic carbon are also present in sediment, which adsorb PCBs and make them less bio-available.

PCB body burdens in fish and other biota have been shown to be better correlated to OC-normalized Total PCB concentrations in surface sediment than to Total PCB concentrations expressed on a dry weight basis (ppm). Therefore, the spatial variation in OC-normalized Total PCB concentrations in the sediment provides an indication of the spatial variation in bio-available PCB concentrations.

Total PCB concentrations in surface sediments (the 0 to 6-inch depth interval) were OC-normalized and plotted versus River Mile to assess the spatial distribution of potentially bio-available PCBs (Figure 4.2). The spatial trend in OC-normalized Total PCB concentrations show that the highest values occur in Reach 3 and in the SADZ. Several locations in Reach 3 contain OC-normalized Total PCB concentrations higher than in downstream areas and in Reach 4 by an order-of-magnitude or more. An important observation is that OC-normalized Total PCB concentrations downstream of Reach 3 are relatively uniform (compared to the Total PCB concentration trends expressed as dry weight [ppm], shown in Figure 3.1). This indicates that bio-available concentrations of PCB in the sediment, which usually drive fish tissue body burdens, are fairly uniformly distributed in the downstream areas. These observations have implications to the potential effectiveness of sediment management actions in causing reductions in fish tissue PCB levels. The Reach 3 OC-normalized Total PCB values indicate that remediation actions in this reach may have a disproportionately large impact on fish tissue PCB levels, compared to potential remediation in downstream areas.

The geometric mean (geomean) and maximum and minimum Total PCB-OC normalized concentrations in the surface sediments in each reach, (distinguishing between the SADZ and downstream areas in Reach 2), are presented below.

Organic Carbon -Normalized Total PCB Concentrations (mg/kg OC)*			
Reach (from mouth moving upriver)	**Geomean**	**Maximum**	**Minimum**
Reach 1	65	90.5	28
Reach 2 – downstream of SADZ	27	225	0.85
Reach 2 – SADZ	30	474	0.44
Reach 3	95	11,400	0.44
Reach 4	18	135	1.25
*duplication samples not included in statistics			

In accumulating PCBs within their tissue, fish integrate exposure concentrations over broad areas due to their seasonal and foraging movements in the river; therefore, to estimate sediment Total PCB concentrations that affect fish tissue PCB levels by bioaccumulation through the food chain, an estimate is needed of the average exposure concentrations over a fish's habitat. Due to the skewed distribution of the OC-normalized Total PCB data (evident from Figure 4.2), use of the arithmetic average surface sediment OC-normalized concentration may over-estimate actual exposure concentrations relevant to PCB bio-accumulation in fish tissue. Therefore, the geomean of the data is used to provide a more accurate representation of differences in average exposure concentrations among the areas indicated in the table above, in lieu of spatially-averaged exposure concentrations that could potentially be developed using a geo-statistical approach (although data may not support this in most areas of the Site).

The distribution of average OC-normalized Total PCB concentrations in surface sediment is skewed by the relatively high (11,400 mg/kgOC) surface sediment concentration in Reach 3. The geomean OC-normalized Total PCB concentrations further illustrate that OC-normalized PCB levels are highest in Reach 3. It is noteworthy that the geomean of OC-normalized Total PCB concentrations in Reach 1 is higher than in Reaches 2 and 4. This is apparently due to the low concentrations of organic carbon in Reach 1 sediments. Whether or not the PCBs in Reach 1 are actually more bio-available, or pose more risk than in than in Reach 2 (where OC concentrations are greater) may merit further study.

In any event, the surface-sediment, OC-normalized Total PCB concentrations point to Reach 3 as a priority area for potential remediation. On a relative basis, Reach 3 presents the highest concentration of bio-available PCBs based on the OC-normalized Total PCB concentrations. Whether or not sediment remediation will promote significant reductions in fish tissue PCB concentrations within a reasonable

time frame has not been evaluated in this project. Very limited data are available to assess the degree to which downstream transport of PCBs from Reach 3 may be affecting exposure concentrations in downstream areas; however, remediation of Reach 3 sources would reduce potential transport and may facilitate recovery in downstream areas. Further assessment of chemical transport, involving a mass-balance evaluation of the degree to which control of upstream sources will accelerate recovery of exposure concentrations (i.e., speed up the rate at which surface sediment PCB levels decline over time), would be helpful.

This information suggests that active sediment remediation (e.g., dredging or capping) in areas other than in Reach 3 may require addressing relatively large areas of the river to achieve the same proportionate reductions in exposure to bio-available concentrations of Total PCBs. This is due to the larger sediment surface areas and the fact that bio-available PCB levels (i.e., the geomean of OC-normalized Total PCB concentrations in surface sediments) in Reaches 1 and 2 are a factor of 1.4 to 3.5 lower than in Reach 3. In other words, sediment remediation of these downstream areas could have a lower "bang-for-the-buck" than remediation of Reach 3.

4.5 Chemical Co-location

The degree to which Total PCBs, Total PAHs, and lead are co-located was evaluated through the use of correlation plots. The maximum concentrations of lead and Total PAHs were plotted against Total PCBs, assigning one-half the detection limit for non-detect results (Figure 4.3). Panel A of Figure 4.3 shows the lead vs. Total PCB correlation for all of the samples, with symbol color denoting reach location. Panel B of Figure 4.3 shows the lead vs. Total PCB correlation for samples from the SADZ and from Reach 3. Panels C and D show the correlations for Total PAH vs. Total PCB for all samples from all reaches, and then only those from the SADZ and Reach 3, respectively.

The correlation plots show that most sediment cores containing lead concentrations greater than 100 ppm (which is used here as an arbitrary strata for discussion purposes) are coincident with cores containing sediment Total PCB concentrations greater than 1 ppm (also used here for discussion purposes, Figure 4.3, panel A); relatively few samples with lead in excess of 100 ppm occur at locations with Total PCBs less than 1 ppm. The locations in Reach 3 and in the SADZ with sediment lead concentrations greater than 100 ppm that are not co-located with Total PCB concentrations greater than 1 ppm are labeled with the sample ID in Figure 4.3, panel B.

Very few samples contain Total PAH concentrations greater than 10 ppm (which is used here as an arbitrary strata for discussion purposes) that are not coincident with Total PCB concentrations greater than 1 ppm (Figure 4.3, panel C). To reiterate, the arbitrary strata of 1, 10, and 100 ppm used in this analysis are for discussion purposes only.

The observed correlation of lead and Total PAH with Total PCB indicates that remediation focused on Total PCBs should also address most of the elevated concentrations of lead and Total PAHs. Total PCBs thus appear to be a reasonable surrogate for sediment contamination in general at this site. Final delineation of target remediation areas based on pre-remediation sediment sampling activities should review individual sampling locations from the Project within the targeted reaches to assess if additional remediation to address elevated lead and/or Total PAH concentrations may be warranted. For example, there may be a basis to extend the spatial extent of remediation based on Total PCB concentrations to address adjacent areas that may contain higher levels of lead and/or PAHs.

The observation that some areas contain elevated lead and Total PAH concentrations, but not elevated concentrations of Total PCBs, indicates possible differences in locations and timing of historical sources. Lead and Total PAH contributions from urban runoff, landfills, and industrial areas may have contributed to differences in spatial distribution relative to Total PCB distributions. Additionally, sources of lead and Total PAHs are likely still present (e.g., from CSOs or urban run-off) whereas industrial uses of PCBs largely ended decades ago, and any continuing sources are anticipated to be lower than for Total PAHs or lead.

4.6 PCB Mass Distributions

As presented in Section 4.5, Total PCB concentrations may serve as a surrogate for ranking the extent of sediment contamination, particularly in Reaches 2 and 3. To provide an indication of how the sediment chemical inventory is distributed in the Lower Ottawa River, Total PCB mass inventories at each of the core sampling locations were computed. This is not to suggest that sediment remediation focused at higher mass will provide commensurate reduction in exposure, but rather provides another metric to use in understanding the distribution of PCBs. This was accomplished by first expressing the Total PCB concentration expressed as bulk concentration (grams of Total PCB per cubic meter of wet sediment – g/m^3) and then multiplying this value by the length of the core sample section (i.e., the depth interval). To convert the dry-weight Total PCB concentration (mg PCB/kg dry weight, or ppm) to the bulk concentration, the percent moisture result for each sample was used along with an assumed particle

density of 2.65 grams per cubic centimeter (g/cm^3), which is based on the results from the grain size analyses. The bulk Total PCB concentration in each core section (g/m^3) was then multiplied by the depth interval represented by the section (in meters), to obtain the mass-per-unit-area (MPA) for the sample in units of grams per square meter of sediment surface (g/m^2). The MPA for each sample in each core was then summed to obtain the MPA at each core sample location. Results are presented in Table 4.1 and the table footnotes provide additional details on the MPA calculation. A statistical summary of the MPA results in each reach is presented in Table 4.2.

The maximum Total PCB MPA in each reach varied from 0.37 g/m^2 in Reach 1 to 471 g/m^2 at location SB03-53A in Reach 3. The average Total PCB MPA varied from 0.28 g/m^2 in Reach 1 to 39.4 g/m^2 in Reach 3. The distribution of Total PCB MPA values is highly skewed as shown by the cumulative frequency distribution (CFD) in Figure 4.4. A total of 19 of the 51 locations (37%) have a Total PCB MPA greater than 1 g/m^2 (which is used here as an arbitrary strata for discussion purposes), and all but two of these were in Reaches 2 and 3; two of the values are from samples in Reach 4 and none were from Reach 1. Ten of the 51 locations (20%) contain PCB MPA greater than 10 g/m^2 (which is used here as an arbitrary strata for discussion purposes), with six of these are in the SADZ, and four in Reach 3 (Figure 4.5). The spatial distribution of MPA values shown in Figure 4.5 reflects a pattern consistent with the distribution of PCB concentrations.

As an indicator of the depth of contamination, the maximum depth of Total PCB concentrations exceeding 1 ppm (selected for data analysis purposes only) at each sampling location was computed (note that not all core samples contained Total PCB concentrations greater than 1 ppm). A total PCB concentration of 1 ppm is not suggested as an appropriate clean-up target here – rather it is simply used as a cut-off for estimating sediment thicknesses that potentially may be targeted for remediation. Figure 4.6 shows the spatial distribution of the depth of sediment containing Total PCB concentrations greater than 1 ppm. In Reach 3, the maximum depth of Total PCB > 1ppm is generally between 2 and 5 feet. In Reach 2, Total PCB concentrations > 1 ppm are found up to 8 feet below the sediment surface.

5. Preliminary Sediment Target Areas

5.1 Approach to Identifying and Prioritizing Preliminary Sediment Remediation Target Areas

Of the sediment data sets currently available, the October 2003 Sampling Program data set collected as part of the Project provides the most complete "picture" of Total PCB, lead, and Total PAH distributions in the Lower Ottawa River. In this section, target sediment areas considered for remediation are identified using the Sampling Program data, and then prioritized using a series of considerations, or factors, identified for this purpose.

As discussed in Section 1.1, conclusions of the human health and ecological SLRAs (Parametrix, 2001; Intertox, 2001) pointed to the need for further remediation to address sediment contaminants (LTI, 2001), and the approach to identification and ranking of sediment target areas assumed risk reduction would be proportional to exposure reduction (i.e., reduction in sediment exposure concentrations). To re-iterate, this project did not evaluate *if* remediation of Ottawa River hot spots is appropriate, but instead focused on identifying *where* remediation efforts would be most beneficial in reducing chemical exposure concentrations, and consequently, potential risks. Also, as discussed in Section 3.1 and in more detail in Section 4.5, elevated concentrations of Total PCBs, lead and Total PAHs are co-located in many instances. This indicates that remediation focused on Total PCB will also address most areas of potential concern based on lead and Total PAH concentrations; however, other areas potentially warranting remediation may remain, and pre-remediation sampling could be conducted to evaluate this further.

As identified in the proposed Project approach (Hull et al, 2003), the objectives of the current Project were to identify the top two or three priority areas for sediment remediation. The approach for identification and prioritization of such candidate target areas considered various technical and economic factors, including the following:

- The relative concentrations of Total PCBs, lead, and Total PAHs in the sediment, with emphasis on apparent PCB hot spots;
- The relative concentrations of Total PCBs, lead, and Total PAHs in surface sediments (where COPCs are potentially bio-available), focusing on Total PCBs and also lead to some degree;
- OC-normalized Total PCB concentrations;

- PCB mass distributions in the sediment;
- The extent of co-location of relatively high concentrations of these chemicals;
- Depth of PCBs in sediments, especially depth at which relatively high levels are observed;
- Relative sediment stability, which considers the potential for sediments to remain in-place under variable flow conditions, versus acting as continuing sources that could pose future risks in the event of remobilization;
- Potential for sediments with high COPC concentrations to serve as sources to downstream areas;
- Potential for recontamination;
- Natural recovery potential in net depositional areas, as indicated by sediment chemistry profiles;
- Potential for habitat disruption or impairment as a result of implementing a particular remedial approach;
- Project funding mechanisms (a determining factor in identifying the Priority 1 project);

Section 5.2 provides a summary of the top 3 priority areas identified for potential remediation based on the above considerations. The remainder of Section 5 summarizes how these considerations, or factors, were used in identifying the priority areas. Based on the data distributions presented in Section 3, and the CSM presented in Section 4, Reach 3 and the SADZ in the upstream portion of Reach 2 appear to merit the greatest focus for potential remediation. In Reach 4, the downstream portion of Reach 2, and in Reach 1, COPC concentrations in sediments are generally much lower and depths of soft sediment are generally much shallower. Therefore, these areas are not recommended as primary areas for remediation.

5.2 Priority Area Identification

A November 7, 2001 presentation by OEPA to the Ottawa River Remediation Team identified the following hot spots in the Ottawa River, as identified in the SLRAs:

- Within Reach 2: the Stickney Avenue Depositional Zone (SADZ)
- Within Reach 3: Fraleigh Creek (formerly Unnamed Tributary)

- Within Reach 3: Near Sibley Creek (RM 5.5)

- Within Reach 4: Near Central Avenue Crossing (RM 8.3)

The Sampling Program data confirm the presence of hot spots, or, Remediation Target Areas (RTAs), in Reach 2, and particularly in Reach 3, given the occurrence of relatively high concentrations of Total PCBs, lead, and Total PAHs in the bio-available zone (as indicated by samples from the top 6 inches of sediment), as well as chemicals occurring deeper in the sediments. As indicated in Sections 3 and 4, there is frequent co-location of elevated concentrations of all three of these chemicals in cores collected from Reach 3. In a number of cases, elevated concentrations may be due mainly to historic source proximity (e.g., prior industrial /landfill discharges), whereas in other instances, RTAs may be primarily the result of significant chemical/sediment interaction (sorption) and deposition of sediment-borne chemicals transported from upstream (such as in depositional areas in relatively low flow velocity areas).

The Sampling Program data do not appear to support prioritizing areas in Reach 4 for remediation because concentrations of the targeted chemicals are relatively low in this Reach, and because sediment deposits are of relatively limited thickness. The limited sampling in this area may not have detected some existing areas with elevated CPOC concentrations; however, Reach 4 is relatively energetic compared to Reaches 1 through 3, and bottom sediments are mainly of coarse materials (sands and gravels), with relatively little fine sediment overtop. These conditions do not favor accumulation of sediment/COPCs. Sediments in Reach 4 are likely subject to periodic remobilization and downstream transport, and this process may have reduced exposure concentrations in this reach between 1998 and 2003. That is, Total PCB concentrations of up to 10 ppm observed in this area based on the 1998 data set were not noted within the same area during the Sampling Program, with the highest surface sediment PCB concentration recently observed in Reach 4 being 2.3 ppm (in October of 2003).

Based on the Sampling Program data, the other three RTAs described by in the SLRAs (listed above) are confirmed as apparent RTAs by the October 2003 data. These RTAs are contained within the three priority areas identified for potential remediation. These priority areas are listed below and shown in Figure 5.1.

- Priority Area 1: Would comprise three RTAs in the upper portion of the Lagrange Reach (Upper Lagrange Reach RTAs);

- Priority Area 2: As described below, would comprise five RTAs in the Lagrange Reach, (including the three RTAs in Priority Area 1 and two additional RTAs in the lower part of Lagrange Reach); and

- Priority Area 3: Would comprise impacted sediments within the Stickney Avenue Depositional Zone (SADZ)

As discussed in Sections 3 and 4, three specific sampling locations within the upper portion of the Lagrange Reach represent apparent RTAs, and the conditions in these areas make them priority candidates for potential remediation. Midway through the Project, these three areas were identified as priority RTAs for potential remediation in support of a funding request through the USEPA GLLA program. Project efforts were temporarily re-directed toward supporting the GLLA funding proposal (contained in Appendix A), which was submitted in March 2003. In a GLLA proposal review meeting held in Chicago, Illinois on September 9, 2004, GLNPO suggested that adequate pre-remediation data be collected to define a larger project in the Lagrange Reach that encompasses the Priority Area 1 RTAs, and other areas targeted for remediation. As a result of the September 9 meeting, there is assumed to be a small likelihood that remediation of Priority Area 1 (which included 3 RTAs in the upper Lagrange Reach) would be implemented as a stand-alone project, but instead would merit consideration as a component of a larger project. For that reason, Priority Area 1 is included in the larger Priority Area 2, and references hereafter to Priority 2 will imply the consideration of both the former Priority Area and Priority Area 2. Priority Area 3, the SADZ, is the lowest priority because surface sediment CPOC concentrations are relatively low in this area compared to Priority Area 2; and also because it is downstream of Priority Area 2 and potentially subject to recontamination due to potential releases of COPCs from the sediments related to remediation activities upstream in Priority Area 2, and perhaps also other factors.

Priority Areas 2 and 3 are discussed further in the following subsections.

5.2.1 Priority Area 2: Lagrange Reach

As described in the previous section, Priority Area 2 includes the three RTAs in Priority Area 1 as well as two other RTAs in the downstream portion of the Lagrange Reach. These five RTAs were identified as areas containing relatively high CPOC concentrations based on the spatial distributions of CPOC concentrations presented in Sections 3 and 4, and also based on the statistical distributions of Total PCB concentrations, as indicated by cumulative frequency distributions (CFDs) contained in Figure 5.2.

Panels A and D of Figure 5.2 show the CFDs for the location-maximum (i.e., the maximum concentration value in a core, or the grab sample concentration where grab samples were collected instead of cores) Total PCB concentrations for all of the available (2003 and pre-2003) data in all four reaches, and in Reach 3 only, respectively. Panels B and C of Figure 5.2 show the CFDs for the surface sediment Total PCB concentrations in all four reaches, and only Reach 3, respectively. These CFDs indicate an approximate "knee," or breakpoint, in the distribution curves occurring at approximately 5 ppm. There are a relatively small number of locations with Total PCB concentrations greater than 5 ppm; however, these locations include Total PCB concentrations as high as 1,142 ppm. With respect to the apparent breakpoint of 5 ppm for Project sediment data, it is relevant to note that MacDonald et al. (2000) recognize one particular Sediment Quality Guideline (SQG) - a Severe Effect Level (SEL) for Total PCB concentrations in freshwater ecosystem sediments - of 5.3 ppm (dry weight), thus lending an additional degree of justification for recognizing the 5-ppm value for the current Project.

Detectable concentrations of Total PCBs were observed at most sample locations from Reach 3. There are five areas in Reach 3 that contain core samples with Total PCBs in sediments in excess of 5 ppm. Based on the observed breakpoint shown in Figure 5.2, and the observation that all samples with Total PCBs exceeding 5 ppm occurred in these five areas, these five discrete areas have been collectively defined as Priority Area 2. As discussed in Section 6, based on available data, remediation of these areas could reduce average PCB concentrations in the surface sediments by approximately 80 percent or more.

These five RTAs of Priority Area 2 were approximately delineated for purposes of evaluating remediation alternatives and developing preliminary cost estimates through roughly estimating the approximate width and length of sediment areas potentially requiring remediation. Approximate dimensions are presented in Section 6. It must be emphasized that the RTA dimensions and boundaries are not reliably established – they are simply rectangles drawn to encompass samples with Total PCB concentrations above 5 ppm. Pre-remediation sampling is necessary to determine RTA dimensions. The RTAs are shown in Figure 5.3

5.2.2 Priority Area 3: Stickney Avenue Depositional Zone, SADZ

The third priority area for sediment remediation is the SADZ. As discussed in Sections 3 and 4, available data show that this area, located at the upstream end of Reach 2, is highly depositional, with total sediment thicknesses of more than 10 feet, and chemical profiles showing deeply buried, historical peak concentrations of COPCs. This is the first major depositional zone downstream of the historic landfill section of the river, and it has apparently provided an effective sediment and chemical "trap," because contaminant depth profiles in this area are distinctly different from those observed in downstream

portions of Reach 2. This area of Reach 2 is of potential concern due to the occurrence of elevated CPOC concentrations in the sediment bed. Given that the COPC concentration depth profiles in this area reflect long-term deposition and imply relatively high sediment stability, some assessment of the future stability of sediments in this area is warranted. Remobilization of sediments in and from this area, while not necessarily resulting in increased risks, may be of potential concern. The hydraulic and sediment transport characteristics of the SADZ make this area potentially suitable for a natural recovery remedy, or perhaps sediment capping, if natural recovery by sedimentation does not continue.

5.3 Priority Area Ranking

The assessment of the Sampling Program data in Section 3 and the analysis of these data in developing the Conceptual Site Model, as discussed in Section 4, lead to the identification of the top three priority areas for potential remediation listed in Section 5.2. The overall selection and ranking of the priority areas relied on the various considerations, or factors, listed in Section 5.1. The following table presents a summary of the some of the key information that provided a basis for ranking the priority areas; however, the primary basis for ranking these areas is based on the relative concentrations of COPCs and the location of each area moving from upstream to downstream. Sequencing of remediation from upstream to downstream is prudent in a river system like the Lower Ottawa River to minimize potential recontamination due to releases that may occur during remediation of upstream areas.

Information for Ranking Target Areas

Criteria (determined from October 2003 Sampling Program Data)	**Priority Area 1: Upper Lagrange Reach RTAs** (3 most upstream areas, A, B, and C)	**Priority Area 2: Lagrange Reach RTAs** (all 5 areas, A, B, C, D, and E)	**Priority Area 3: SADZ**
Average COPC concentrations in the surface bio-available sediment, ppm	Total PCBs: 158 Total PAHs: 17.2 Lead: 380	Total PCBs: 75 Total PAHs: 15.5 Lead: 298	Total PCBs: 1.3 Total PAHs: 5.5 Lead: 177
Average COPC concentrations in the sediments, all depth intervals, ppm	Total PCBs: 161 Total PAHs: 8.8 Lead: 212	Total PCBs: 82.4 Total PAHs: 14.3 Lead: 244	Total PCBs: 5.6 Total PAHs: 2.9 Lead: 160

Criteria (determined from October 2003 Sampling Program Data)	**Priority Area 1: Upper Lagrange Reach RTAs** (3 most upstream areas, A, B, and C)	**Priority Area 2: Lagrange Reach RTAs** (all 5 areas, A, B, C, D, and E)	**Priority Area 3: SADZ**
PCB mass distributions in the sediment – average MPA[1] in cores with PCB >10 ppm	Average: 172 g PCB/m^2 Max: 471 g PCB/m^2	Average: 78.7 g PCB/m^2 Max: 470.6 g PCB/m^2	Average: 17 g PCB/m^2 Max: 32 g PCB/m^2
Relative sediment stability	Reach unfavorable to long-term deposition, RTAs in main channel or near outside bank of river bends – geomorphically unstable	Reach unfavorable to long-term deposition in most areas, limited sedimentation in near-shore and low-velocity areas, potentially subject to remobilization by high flows	Sediment core depth profiles of Total PCBs, Total PAHs, and lead indicate relative long-term stability. Maximum contaminant concentrations are relatively deep in the sediments. Highly depositional area.
Potential for sediments to serve as a continuing source to downstream areas	High – elevated contaminant concentrations at the sediment surface in potential erosion areas (note that AquaBlok capping material occurs within the vicinity of RTA B; clarification of the spatial distribution of capping material in this area is recommended)	High – elevated contaminant concentrations at the sediment surface in potential erosion areas	Moderate – Data indicate this area to apparently be an efficient sediment "trap," retaining suspended material from upstream
Potential for recontamination	Relatively low compared to existing contaminant levels – several potential point/non-point sources believed to have been eliminated or substantially reduced.	Moderate – potential for recontamination from upstream RTAs in Reach 3 (Priority Area 1), or from residual sources potentially associated with landfills or CSOs.	Relatively high – until upstream sediments are remediated in the Lagrange Reach, the SADZ will continue to accumulate contaminated sediment from upstream, although likely not at levels comparable to historical levels
Potential for natural recovery	Relatively low – limited deposition, relatively high potential for sediment scour	Relatively low – limited deposition in most areas, relatively high potential for sediment scour	Relatively high – more likely to accelerate if Area 1 sediments are remediated – historic high rates of sedimentation

[1] The MPA calculation is described in Section 4.6

Criteria (determined from October 2003 Sampling Program Data)	**Priority Area 1: Upper Lagrange Reach RTAs** (3 most upstream areas, A, B, and C)	**Priority Area 2: Lagrange Reach RTAs** (all 5 areas, A, B, C, D, and E)	**Priority Area 3: SADZ**
Physical accessibility	Assume reasonable access available at former staging area near former Unnamed Tributary	Assume reasonable access available from south bank just upstream of Stickney Avenue and near Fraleigh Creek	Access may be available but significant staging area clearing, access road clearing/ improvement and site preparation may be required
Potential Funding Mechanisms	GLLA funding opportunity in March 2004	Possible GLLA funding for fiscal year 2004/05	Planned for 2004-06, with intent to pursue GLLA funding in a future year.

6. Evaluation of Remediation Alternatives

6.1 Introduction

This section presents an evaluation of potential remediation approaches for the Priority Areas identified in Section 5. The remediation approach for Priority Area 1 was developed and presented in the GLLA funding proposal (Appendix A). In the GLLA proposal review meeting held in Chicago, Illinois on September 9, 2004, GLNPO suggested that adequate pre-remediation data be collected to define a larger project in the Lagrange Reach that encompasses the Priority Area 1 RTAs, and perhaps also other areas targeted for remediation. As a result of the September 9 meeting, the data and initial scope and rationale were reassessed, and a broadened remedial approach developed (which includes the 3 RTAs in the Lagrange Reach, referred to thus far as Priority Area 1). As noted earlier in this report, remediation of Priority Area 1 is included in Priority Area 2, thus references to Priority 2 imply the consideration of both the former Priority Area 1 and Priority Area 2.

The evaluation of management options for impacted sediment sites generally requires definition of a) the goals and objectives of management actions, and b) a valid conceptual model of the sediment system to be managed (NRC, 2000). As discussed in Section 4, a CSM has been developed that considers hydraulics, sediment transport, and chemical sources, transport and distributions. An ecological CSM is provided in the ecological SLRA (Parametrix, 2001). Together these CSMs identify receptors; COPCs; areas where potential risks may result from contaminated sediments; areas with the highest CPOC exposure levels; potential CPOC source areas; and information on CPOC and sediment transport that are relevant to evaluation of remediation alternatives. Specific goals and objectives for managing sediments in the Ottawa River were not explicitly stated prior to this Project; nor were specific risk-based remediation goals established through the human health and ecological SLRAs. Therefore, general goals and objectives of remediation of the Priority Areas are stated here. These general goals and objectives focus on reduction of bio-available levels of chemicals in surface sediments (and thereby also potential risk from these sediments), as well as reduction of the potential for chemical transport from more highly contaminated areas to relatively less contaminated areas downstream where more diluted COPC levels may still be concentrated in food-chain receptors through bio-accumulation.

Specifically, the general goals for the remediation of Priority Area 2 (the Lagrange Reach) are to:

- Reduce potential risks associated with exposure to COPCs in the surface sediment layer in the area of identified RTAs.
- Reduce the potential for downstream transport of COPCs from areas with relatively high concentrations to areas with lower concentrations.

The general goals for remediation of Priority Area 3 (the SADZ) are to:

- Reduce the potential risks associated with exposure to COPCs in the surface sediment layer in the area of identified RTAs.
- Provide an acceptable level of confidence that relatively high concentrations of COPCs that occur below the surface sediments (and are not bio-available) will remain stable and buried beneath the bio-available layer.

6.2 Remediation Alternatives

The evaluation of remediation approaches for Priority Areas 2 and 3 intended to meet the above goals considers the implementability, effectiveness, and cost of potential alternatives, as well as other factors, as discussed in this section. The National Research Council (NRC) identifies the following regulatory and nonregulatory approaches to reducing and managing risks posed by contaminated sediments (NRC, 2000).

Socioeconomic options	Institutional controls Offsets
Source control	
Natural attenuation and recovery	Biodegradation Sedimentation
In situ treatment	Enhanced natural attenuation Capping
Multicomponent removal and in situ treatment	Dredging technologies Pretreatment technologies Ex situ treatment, storage, and disposal technologies Technologies for management of residual contaminants

Socioeconomic options to managing risks at the Ottawa River already exist in the form of published fish consumption advisories and advisories against wading or swimming in the Ottawa River. These

advisories can be found on the following web page: http://www.epa.state.oh.us/dsw/fishadvisory/. Signs advising against recreational contact with the Ottawa River are also posted. While such advisories can be effective in minimizing human health risks, they have little impact on ecological risks, and do not facilitate near-term restoration of the beneficial recreational uses of the Ottawa River (except as afforded by natural attenuation and recovery processes during the time the advisories are in place). Source-control actions have also been implemented; however, no assessment has been made of potential benefits of additional source-control measures toward improving conditions in the Ottawa River relative to those we see today. A summary of major source control activities that have been completed on the Ottawa River is included in the GLLA proposal contained in Appendix A.

The remedial alternatives which are most widely utilized to mitigate sediments containing COPCs are monitored natural recovery, sediment capping (various methods), and sediment dredging or excavation (using various technologies for removal, dewatering and dredged material management). For purposes of evaluating remediation alternatives for Priority Areas 2 and 3, the following general approaches were considered, both alone, and in combination with one another:

- Monitored Natural Recovery (MNR);
- Sediment capping; and
- Sediment removal by wet dredging or dry excavation.

6.3 Priority Area Characteristics and Sediment Area and Volumes

To support the evaluation of alternatives, it was necessary to first develop a preliminary estimate of the area of the river bottom and the volume of sediments in the priority areas that may potentially warrant remediation. This was accomplished by developing approximate estimates of the spatial extent of sediments with potentially elevated concentrations of COPCs around sediment core locations with elevated COPC concentrations, and estimating the average sediment thickness in these areas. The sediment area and thickness estimates were then used to compute an in-place sediment volume estimate for the priority areas.

6.3.1 Priority Area 2

In Priority Area 2, a total of five apparent RTAs were identified. As presented in Section 5, the distribution of Total PCBs exhibits an apparent breakpoint at approximately 5 ppm. There are a relatively

small number of locations with Total PCB concentrations greater than 5 ppm; however these locations include Total PCB concentrations as high as 1,142 ppm (see Figure 5.2). The five apparent RTAs identified in Reach 3 include the only samples (from the Sampling Program) with Total PCBs in excess of 5 ppm. The following table summarizes the general estimated dimensions of each of these five RTAs, including the estimated sediment surface area and volume of sediment at each RTA that may potentially require management. Pre-remediation sampling is necessary to refine these estimates.

Remediation Target Area	Estimated Width (ft)	Estimated Length (ft)	Estimated Sediment Thickness (ft)	Estimated Area of Potential Remediation (acres)	Estimated Sediment Volume (cy)	TSCA[1]-level PCBs? (yes/no)
A. Lagrange Road Area	50	1200	2.5	1.38	5,600	No
B. Former Unnamed Tributary Area	50	100	2.5	0.11	500	Yes
C. Railroad Trestle Area	50	150	2.5	0.17	700	Yes
D. Sibley Creek Area	50	150	2.0	0.17	600	No
E. Lower Lagrange Area	50	1300	2.5	1.49	6,000	No
			Totals	3.3	13,400	-

Note: TSCA – Toxic Substance Control Act.

Sediment thicknesses in each area were estimated based on sediment core depths and depth of contamination, but also information from Site reconnaissance, which suggests sediment thicknesses in near-shore deposits decrease toward the center channel. While contaminated sediment depths of 4 feet or more were observed at locations SB03-53A (RTA B) and SB03-37 (RTA C), the averaged depth of sediment over the respective estimated areas comprising these RTAs is likely less, and was assumed to be 2.5 feet. The average depth of contaminated sediment in the area of RTAs A and E was estimated based on available data for these areas to be approximately 2.5 feet. In the area of RTA D, approximately 2 feet of sediment was obtained in the core sample from this area and the average depth of sediment in this area was assumed to be 2 feet. In each case, the width of the area of sediments potentially requiring remediation was assumed to be 50 feet, or approximately 40% of the river width in these areas. The data currently available do not appear to support a more refined estimate; however, Site reconnaissance suggests that soft, presumably water-deposited sediment deposits were generally limited to a fraction of the river's width in Reach 3 due to the meander of the channel. Possible exceptions may be in the areas of RTAs A and E, where the channel has a straighter orientation; however, additional data are needed to refine these estimates.

The total, in-place volume of sediment in the five above-described RTAs is preliminarily estimated to be 13,400 cy. Sediments in the area of RTAs B and C contain Total PCB concentrations in excess of the

TSCA Total PCBs criterion of 50 ppm. In the event that dredging with landfill disposal is implemented, it is assumed that material from these areas would be hauled to a landfill approved to accept TSCA-level waste. The total in-place volume of sediments in RTAs B and C is estimated to be approximately 1,200 cy.

6.3.2 Priority Area 3

In the SADZ, the area and volume of sediments potentially requiring remediation were similarly estimated. The approximate length and width of this area was determined from available GIS maps. The depth of sediment potentially requiring management in this area was estimated based on the average depth of sediment with Total PCB concentrations in excess of 1 ppm. This concentration was used to evaluate the depth of potentially contaminated sediment, as it has some precedent as a remediation target, although it is not suggested that this is an appropriate target for this project or for this particular area. During field reconnaissance, sediment deposits in the upstream and downstream portions of this reach just upstream and downstream of the bridge crossings were observed to be relatively thin, and contained mainly coarse-grained sediments. Based on this observation, it was assumed that 80% of the total area would be potentially subject to remediation, and that 20% of the area contained relatively coarse-grained sediment, which would be expected to have fairly low levels of CPOCs. From these assumptions, the following area and volume of sediment potentially requiring remediation in the SADZ is estimated as follows:

Priority Area	Average Width (ft)	Length (miles)	Average Sediment depth with >1ppm PCB (ft)	Area (acres)	Estimated Percent of Area of Potential Remediation	Estimated Contaminated Sediment Volume (cy)
3. SADZ	220	0.7	5.5	18.4	80%	130,000

This preliminary estimate indicates that SADZ contains approximately 18.4 acres and approximately 130,000 cy of sediment potentially requiring remediation.

6.3.3 Anticipated Effectiveness of RTA Dredging in Reducing Risks

Sediment removal was proposed for selected RTAs in the Lagrange Reach in the GLLA funding proposal (Appendix A). Sediment removal by dredging was proposed based on considerations of the hydraulic characteristics and locations of these RTAs, primarily RTAs B and C identified in the table in Section 6.3.

These areas are located near-shore, in relatively shallow water, and in a relatively energetic portion of the Lower Ottawa River, particularly RTA B, located near the former Unnamed Tributary. This location is on the outside of a river bend and, based on classic river geomorphology, is potentially subject to erosion due to meander potential of the stream channel. Contaminated sediments in these areas may extend to the waterline, and be present in very shallow near-shore areas. Due the shallow water depths and locations of RTAs B and C, conditions in these two areas do not favor simple (e.g. basic monolayer design) capping, or natural recovery via sedimentation. At the time of sampling, the water depth at core location SB03-53A in RTA B was 1.1 ft and at core location SB03-37 in RTA C, observed water depth was 1.9 ft (see Table 2.2). Depending on Site hydraulics and localized erosional stresses, and absent first removing some of the sediment volume, such relatively shallow water depths may be insufficient to support construction of a subaqueous sediment cap in these areas that would provide a chemical and physical barrier sufficient to mitigate human and ecological exposure. Additionally, considering the characteristics of the channel in these areas as well as maximum surface sediment Total PCB concentrations (385 ppm in the 0 to 6-inch interval), it is unlikely that natural recovery could provide reliable risk reduction in these areas. Based on these considerations, sediment removal was proposed at these RTA locations in the GLLA funding proposal; such an approach is retained herein as the most appropriate remediation alternative for these two RTAs.

For the same reasons as described above for RTAs B and C, dredging appears to be the most favorable remediation approach for RTA D near Sibley Creek. At the time of sampling at core location SB03-35, the water depth was 1.1 ft in this RTA. This RTA is also near-shore (and is assumed to extend to the water line) and located on the outside of a river bend.

Hydraulic and sedimentation characteristics throughout the remainder of the Lagrange Reach and within the downstream portion of Reach 4, including near RTAs A and E, also do not favor natural recovery by sedimentation. As discussed in Section 4, sedimentation patterns in this part of the river are highly variable due to flow patterns and the proximity to historical sources. The highly modified channel conditions and relatively high flow velocities in these areas do not provide conditions conducive to long-term deposition. While water depths at RTAs B, C, and D do not support capping of these areas, capping may be viable for RTAs A and E, considering that water depths in RTAs A and E are slightly deeper, based on recorded water depths at the time of sampling. Water depths at the time of sampling at core locations SB03-41 and SB03-42 in RTA A were 2.7 ft and 2.3 ft, respectively, and in RTA E, water depths at core locations SB03-32 and SB03-33 were 4.5 ft and 1.8 ft, respectively. Additional pre-remediation data including channel bathymetry and estimates of flood-flow scour potential, is required to

fully evaluate the potential effectiveness of sediment capping versus dredging in these areas; however, current information favors dredging of these areas. Specifically, the hydraulic conditions and water depths in these areas would likely require sediment cap armoring to avoid erosion, and water depths may not be sufficient to support construction of a multi-layered, subaqueous cap over these areas. Consideration would also need to be given to changes in flood stage and surface-water flow velocities caused by cap placement, which, for areas the size of RTAs A and E, may be significant. For these technical reasons, coupled with the assumed removal thickness (i.e., no real economic benefit to a partial remove/cap alternative, given that the removal depth in these areas is assumed to be 2.5 ft), sediment removal at all RTAs in the Lagrange Reach currently appears to be an appropriate remediation approach. This should be revisited once any additional pre-remediation characterization sampling data are available.

As discussed in Section 6.1, an appropriate framework for calculating expected risk reduction associated with sediment remediation is not currently available for the Ottawa River; this Project assessed remediation priorities for the Ottawa River based on relative concentrations of COPCs (also see Section 1.1). Several observations can be made, however, concerning the anticipated effectiveness of dredging Priority Area 2 RTAs in reducing both potential human health and potential ecological risks. These risks are derived from direct toxicity of COPCs in the sediment to organisms living in or feeding in the sediment, and from consumption of fish containing elevated tissue concentrations of bio-accumulated Total PCBs. In Section 4, presentation of COPC distributions in the Lower Ottawa River shows that Reach 3 contains the highest surface-sediment exposure concentrations of Total PCBs, lead, and Total PAHs (the three COPCs identified by the human health and ecological SLRAs). These are primarily associated with Priority Area 2 RTAs. Section 4.4 discusses the distribution of OC-normalized Total PCBs, which also indicates that Reach 3 contains much higher bio-available Total PCB concentrations (i.e., based on OC-normalized Total PCB concentrations in the 0 to 6-inch sediment depth interval) than does any other area of the Lower Ottawa River.

Dredging would reduce bio-available levels of Total PCBs and other potentially harmful chemicals in sediments in the RTAs and consequently would reduce potential ecological and human health risks associated with these areas. As an indication of the level of anticipated exposure reduction in Reach 3 (exposure drives risk), the percent reduction in the surface area-weighted-average (SWA) Total PCB and OC-normalized Total PCB concentrations in the surface sediment layer (i.e., the 0 to 6-inch depth interval) of Reach 3 was estimated. The SWA is the sum of the product of the Total PCBs concentration and percent total area for each RTA. The SWA for the five RTAs in Reach 3 was computed as follows:

$$SWA = \frac{PCB \cdot Area_A + PCB \cdot Area_B + PCB \cdot Area_C + PCB \cdot Area_D + PCB \cdot Area_E}{Area_A + Area_B + Area_C + Area_D + Area_E}$$

The Total PCB concentrations of samples from the October 2003 Sampling Program were used in this calculation. The results of this calculation are presented below.

Remediation Target Area	Surface Sediment Total PCB (ppm)	Surface Sediment Total PCB (mg/kg OC)	Area (acres)	SWA Total PCB (ppm)	SWA Total PCB (mg/kg OC)
A. Lagrange Road Area	22.9	961	1.4	36.6	1535
B. Former Unnamed Tributary Area	385	11,300	0.11		
C. Railroad Trestle Area	42.7	2,850	0.17		
D. Sibley Creek Area	1.5	117	0.17		
E. Lower Lagrange Area	25.8	1,320	1.5		

The anticipated reduction in the surface-sediment SWA Total PCB and OC-normalized Total PCB concentrations in Reach 3 due to RTA remediation can be estimated by first computing the SWA for the whole reach (using the SWA for the RTAs [shown above] plus the average concentration of samples outside the RTAs), and then computing the SWA for the reach assuming a post-remediation concentration in the RTAs. The calculation of the SWA for Reach 3 before dredging is presented in the table below.

Reach 3 Area	SWA Surface Sediment Total PCB (ppm)	SWA Surface Sediment Total PCB (mg/kg OC)	Estimated Area (acres)	SWA Total PCB (ppm)	SWA Total PCB (mg/kg OC)
RTAs	36.6	1535	3.3	6.1	270
Remainder of reach	0.34	28.2	21		

To estimate Total PCB concentrations and OC-normalized Total PCB concentrations in Reach 3 surface sediments after remediation of the RTAs, a 90% reduction of these concentrations in the RTAs was assumed. Experience at numerous sites has shown a wide range of dredging effectiveness in reducing surface-sediment exposure levels. In cases where buried chemical concentrations are much higher than surface-sediment concentrations, dredging may actually result in higher exposure concentrations at the

surface; however, a reduction of 90% is an acceptable assumption for this calculation. To the extent post-dredging concentrations remain at unacceptable levels, placement of a layer of clean materials such as sand, gravel, or other capping materials can reduce residual exposure and risks following dredging. Nevertheless, assuming dredging achieves a 90% reduction in surface sediment concentration, Total PCB and OC-normalized Total PCB concentrations in the RTAs yield the following results:

Reach 3 Area	SWA Surface Sediment Total PCB (ppm)	SWA Surface Sediment Total PCB (mg/kg OC)	Area (acres)	SWA Total PCB (ppm)	SWA Total PCB (mg/kg OC)
RTAs	3.7	153	3.3	0.87	48
Remainder of reach	0.34	28.2	21		

The above calculations indicate that the SWA Total PCB and SWA OC-normalized Total PCB concentrations in the surface sediments in Reach 3 may be reduced by approximately 86% and 82%, respectively. Results indicate that the SWA Total PCB concentration in Reach 3 before RTA remediation, estimated at 6.1 ppm, may be reduced to approximately 0.87 ppm. Results indicate that the OC-normalized Total PCB concentration in Reach 3, estimated to be 270 mg/Kg OC, would be reduced to approximately 48 mg/kg OC.

These calculations suggest that RTA remediation in Reach 3 would significantly reduce area-wide surface-sediment exposure concentrations for PCBs as well as other COPCs in these areas.

While dredging adversely affects the benthic community in the short term (it is largely removed), the reduced exposure concentrations of COPCs is expected to result in lower potential area-wide toxicity. Reduction in overall risks to both human health and ecological receptors may be realized through remediation of the RTAs.

Remediation of RTAs will also mitigate the potential for continuing downstream transport of COPCs from these areas. Sediment containing elevated levels of COPCs will be removed from the system and will no longer pose a threat of continuing contamination or re-contamination to downstream sediment areas (or even to localized, upstream areas, as may be the case during reversing surface-water flows due to seiches).

The long-term effectiveness of sediment remediation in this portion of Reach 3 in significantly and permanently reducing risks depends on whether adjacent sources up-river have been adequately controlled. In addition to further sampling to delineate target areas, some assessment of whether or not there are continuing sources of contamination to this reach of the river should be conducted to evaluate the potential for re-contamination, if sediment remediation is conducted in this area.

6.4 Evaluation of Remediation Approaches for the SADZ

As discussed in Section 4, hydraulic and sedimentation characteristics of the SADZ, at the upper end of Reach 2, have historically favored long-term accumulation of fine-grained sediments. The concentration depth profiles of COPCs in this reach reflect classical trends for highly depositional environments, with deeply buried historical maximum COPC concentrations in sediments overlain by successively lower COPC concentrations moving up toward the sediment surface. Elevated concentrations of COPCs occur relatively deep in the sediments in this area, greater than 3 feet in many locations. Based on these factors, a MNR remedy and/or sediment capping may be suitable for the SADZ, if sediment stability is determined inadequate to reliably contain the more elevated, buried COPCs in the future. Further assessment of the stability of the sediment bed in this area is needed to evaluate the potential for these sediments to be remobilized and moved to downstream areas. However, by virtue of the depositional profiles developing and persisting over decades, the sediments in this area of the river appear to have a high degree of inherent stability – which is why they are still present in this area. Additional pre-remediation/pre-design sampling and characterization would clarify contaminant occurrences and distributions in the SADZ, including sampling and characterization within the "backwater" wetland area, located directly downriver of Stickney Avenue, on the south side of the river.

The SADZ contains a potentially large volume of contaminated sediment, estimated at 130,000 cy, based on the average sediment thickness in this area (see Section 6.3). This estimated volume appears to make dredging as the sole remediation approach for this area very expensive. The reported unit cost for removal/disposal of sediments/soils in the Unnamed Tributary in 1998 was on the order of $500/cy (The Toledo Blade, 1998). Nationally, completed environmental dredging projects have shown unit costs, including sediment removal and dredged material management (which while they are highly dependent on site-specific factors) to generally range upwards of $200/cy, with average costs closer to $400/cy. Assuming a potential unit cost range of $200/cy to $500/cy for the dredging of sediments in the SADZ yields a total cost range of from 26 million to 65 million dollars. Given this cost range, and considering

that MNR or sediment capping of this area are potentially viable, a more refined estimate for dredging alone does not appear to be justified.

MNR would appear to be the favored remediation approach for the SADZ considering that surface-sediment concentrations of COPCs in the areas sampled are relatively low and that the COPC concentration depth profiles reflect trends consistent with long-term stability. Selection of MNR as a remediation approach for the SADZ depends on whether or not sediment remobilization could occur such that unacceptable risks would result. In the event that remediation activities occur in Reach 3, it is recommended that any active remediation of the SADZ be deferred until the upriver work is completed, to avoid recontamination of the SADZ due to potential migration from sediments, in the event that dredging is selected as a remedy for Reach 3.

To the extent that MNR may not be a reliable remedy in all areas of this reach, sediment capping may be appropriate. If water depths are prohibitively shallow, some minimal sediment dredging followed by cap placement may be considered, to ensure that water depths are not significantly compromised.

It is premature to select a remediation approach for the SADZ until Reach 3 remediation is completed, and until additional assessment of sediment stability is completed and additional channel bathymetry information is obtained. Either MNR or sediment capping (possibly linked with limited sediment removal) may effectively achieve remediation goals for the SADZ, as presented in Section 6.1.

7. Preliminary Remediation Cost Estimates

7.1 Introduction

As discussed in Section 5, the highest remediation priorities are the RTAs in the Lagrange Reach. Priority Area 1, which was defined for the GLLA funding proposal (contained in Appendix A), included a subset of these RTAs. Priority Area 2 was expanded to include Priority Area 1, following feedback from GLNPO during the September 9, 2004 proposal review meeting in Chicago, Illinois. This was decided in order to support a larger project in the Lagrange Reach (See Section 6.1 for further information). Therefore, Priority Area 2 includes the three Priority Area 1 RTAs in addition to two other RTAs in the Lagrange Reach (RTAs A through E). Based on a host of factors considered (see Section 6.4), sediment removal is currently considered the most appropriate remediation approach for these RTAs. The general assessment of remediation effectiveness presented in Section 6.3 supports sediment removal as an appropriate remediation approach for these areas. A specific remediation approach and associated preliminary Feasibility Study (FS)-level cost estimate for sediment removal in Priority Area 2 is presented in this section.

Priority Area 3 is the SADZ. To reiterate from Section 6.5: selection of a remediation approach for this area of the river is considered premature until remediation activities in Priority Area 2 are completed, and until further information is available concerning sediment stability and bathymetry in the SADZ; clarifying information related to contaminant levels and distribution in the nearby backwater wetland area are also needed prior to approach selection. FS-level cost estimates for sediment capping were considered to be of minimal value at this point until further information is available to evaluate whether or not capping is appropriate, feasible, and necessary. Capping-based remedial costs will depend on many factors, including: whether or not any sediment dredging is needed to provide adequate depth for cap placement; the area to potentially be capped; the type of capping material used; and the overall cap design, including potential cap armoring requirements to resist periodic high-flow velocities.

In potential support of MNR for the SADZ, data collection activities to document "baseline" exposure concentrations in fish tissue, or to establish a baseline for monitoring future trends in COPC bio-availability in this reach, could be implemented at any time. Costs for monitoring in support of MNR are not addressed in this report, although recommendations and considerations for such a monitoring program are presented in Section 8.

The remainder of this section describes a conceptual remediation plan and a preliminary FS-level cost estimate for RTA removal in Priority Area 2. The conceptual remediation plan involves a combination of water- and shore-based dredging projects with gravity dewatering, basic stabilization, and land filling of dredged material.

7.2 Conceptual Remediation Plan

The remediation approach for the Priority Area 2 RTAs is identified at a conceptual level, in the spirit of typical FS remediation plans. This section describes the remediation concept based on selection of a reasonable approach from prior project experience and various assumptions. For purposes of this cost estimate, sediment removal is assumed for all RTAs. As discussed in Section 6.4, some areas of the Lagrange Reach may be hydraulically suitable for capping and, due to the potentially lower cost of capping approaches (where significant sediment removal prior to cap placement is not an issue), further consideration should be given to capping specific areas of the Lagrange Reach, once additional pre-remediation data are obtained.

As stated above, the remedial method is conceptually identified as mechanical dredging of sediments constituting the five RTAs identified in Priority Area 2. Based on available and adequate access and other factors, it is anticipated that this method will consist generally of a combination of water- and shore-based dredging assemblies and transport of removed sediments via barge and haul trailer to land-based material handling/staging areas, followed by dewatering, stabilization, and ultimately land filling of dredged materials. Potential staging areas are near Fraleigh Creek and near the south river shore near Stickney Avenue. Water-based activities are dependent on suitable river conditions (i.e., sufficient water depth to allow dredging and transport vessels), and may require revision if future bathymetry or other data warrant. Access from shore is relatively limited due to occurrence of wetlands, bridge structures, and the relatively high and steep riprapped banks along most of the river shoreline adjacent to the three landfills. Access from shore may be feasible for remediation of RTA B (near the Unnamed Tributary), and potentially RTA C (just downstream of the railroad trestle), although the steep, rip-rapped bank in this area presently appears to favor a water-based removal, with dredged material transport to a staging area near the former Unnamed Tributary. For purposes of this FS-level cost estimate, some combination of water- and shore-based excavation of RTAs is considered.

It is assumed that sediment removal would be conducted with a barge-mounted or shore-based crane, equipped with a watertight clamshell bucket. For in-water work, the crane would load a transport barge, which would transport the sediments to one of the two potential staging areas. During excavation,

transport of resuspended sediments from the excavation areas would be controlled through the use of silt curtains placed in the river, fastened to the shoreline at the upstream and downstream limits of the excavation area, and weighted to lie on the river bottom. Further, real-time monitoring of turbidity would be conducted to identify unacceptable transport of sediments from the excavation area, in which case, appropriate adjustments to the operations would be made to reduce potential impacts to areas outside the excavation limits.

Dredged materials would be handled at either of two land-based staging areas, as referenced above. For in-water work, the transport barges would be mechanically unloaded at the staging areas and sediments would be placed in bermed dewatering pads fitted with an impermeable liner. Both residual fluids in barges and dewatered liquids on the dewatering pads would be collected and treated at an on-site water treatment plant. It is assumed that the plant would consist generally of particulate filters and carbon vessels, and that treated water would be discharged under an appropriate permit to the local sewer system. This approach to water management was employed during remediation of the former Unnamed Tributary (BBL, 2000).

Once sediments have been gravity dewatered to the extent practicable, the sediments would be stabilized with lime or a similar agent as needed for transport to appropriate disposal facilities. Periodic samples (appropriate frequency to be determined as part of remedial-design activities) would be collected from dredged materials prepared for transport to verify their waste characteristics prior to shipment. It is anticipated that materials would be transported via truck carrier to the appropriate facility, depending on whether COPC concentrations exceed TSCA levels or not. As discussed in Section 6.3, it is currently assumed that a total of 1,200 cy of sediment to be removed from RTAs B and C would contain Total PCB concentrations in excess of the TSCA limit of 50 ppm.

Post-removal sediment sampling is assumed in each of the RTAs to evaluate post-dredging residual concentrations and post-removal bathymetry. Where required, to either minimize potential stability concerns with bank or channel areas adjacent to dredged areas, or to address unacceptable post-dredging residual concentrations of Total PCBs, excavated areas could be backfilled with either some combination of a gravel/sand mix plus a thin-layer, clay based capping component (like AquaBlok™), or exclusively with a gravel/sand mix. In addition to the above factors, the type of backfill material(s) used will also depend on, among other factors, the specific river location and desired performance attributes. For example, the gravel/sand backfill mix would be appropriately sized and graded to minimize scour/resuspension of underlying sediments, provide appropriate stability of the streambed (particularly stream banks), and improve substrate habitat; an additional, basal AquaBlok component could also

provide many of these same qualities, as well as a low-permeability barrier if needed (to minimize advective or diffusive flux of any residual sediment-borne contaminants). The preliminary cost estimate presented herein generally assumes the use of either of the backfill/capping approaches generally described above.

7.3 Cost Estimate Description

Table 7-1 provides a conceptual (i.e. preliminary or FS-level) cost estimate for the removal-based remedy generally described above. The cost estimate is based on currently available information and various assumptions, described below and on the table. It is important to understand that the remedial methodology described above and the cost estimate thereof is heavily dependent on the collection of additional site data for contaminants, bathymetry and sediment geotechnical properties, among others. An over-riding source of uncertainty in the cost estimate is the actual area and volume of sediments to be removed, which will require delineation through pre-remediation sampling. As such, the accuracy of the estimate is considered no better than +50%/-30%, which is typical for cost estimates based on a relatively limited site data.

To estimate the costs of the conceptual removal-based remedy, the costs are calculated based largely on the volume of removed sediments. For example, and as described in detail on the estimate, the amount of water to be treated is based on an estimated 40 gallons of water produced per cubic yard of sediment removed. The estimate was prepared in this fashion, as the volume of target sediments will be based on pre-remediation sampling, as well as regulatory/agency input, and is subject to significant revision. Certain costs have been excluded, given the preliminary nature of the project. The major exclusions are:

- Long-term operation, maintenance and monitoring costs;
- Permitting, access, legal and agency oversight costs; and
- Specific restoration requirements (i.e., recreating stream or land forms)

Given the uncertainties associated with the project scope, and to provide for a preliminary "upper limit" for such a project, a 25% contingency may also be applied to the cost estimate in order to provide a cost range.

Although there are certain limitations on estimating the project costs, as well as assessing the feasibility of remedial methodologies, the description provided above and the accompanying cost estimate are useful for preliminary scoping of a remedial action for the Priority Area 2, based on current information.

The resulting preliminary range of costs for implementing a removal-based remedy for RTAs in Priority Area 2 is between approximately 5.13 million dollars (minus contingency) and approximately 6.42 million dollars (including contingency). This cost range can be refined after collection and evaluation of clarifying pre-remediation/pre-design data and information.

It must be emphasized that pre-remediation data are needed to refine the estimated sediment area, potential sediment dredging volumes, and the actual remediation approach for each RTA. As previously discussed, sediment capping may be appropriate to address potential risks at several of the RTAs, pending further information on conditions in each area to be remediated. This remediation concept and associated cost estimate is a reasonable approach, but all aspects of the conceptual approach and cost estimate must be reviewed with the benefit of additional information prior to selecting the final approach, and prior to making final cost estimates for project funding and contracting. To the extent that funding resources are inadequate to address all of the RTAs, it is recommended that the basis for RTA delineation be optimized to achieve the largest reduction in exposure concentration for the available budget.

8. Summary and Recommendations

8.1 Project Purpose and Summary of Activities

As stated in Section 1.1, the purpose of this Project was to identify and prioritize areas for sediment remediation in the Lower Ottawa River (the first 8.8 miles moving upstream from Maumee Bay), as well as to identify appropriate remediation approaches and a preliminary (FS-level) cost estimate to address those areas. This was accomplished, as presented in this report, through conducting the following activities:

- Evaluation of historical data and assessment of data needs;
- Collection of additional sediment data through the Sampling Program implemented in October 2003;
- Assessment of the magnitudes and spatial distributions of COPCs in river sediments;
- Development of a Conceptual Site Model (CSM) that considers sedimentation and chemical sources, fate, transport, and distributions;
- Identification of the top three priority areas for potential sediment remediation, based on relative concentrations of COPCs;
- Evaluation of potential remediation alternatives for the top three priority areas (Priority Area 1 was identified to support a GLLA funding proposal and was subsequently accommodated within a larger area, Priority Area 2);
- Development of a preliminary, FS-level cost estimate for addressing targeted sediments in Priority Area 2; and
- Development of recommendations for proceeding toward remediation (presented in this section).

8.2 Summary Findings and Conclusions

Summary findings and conclusions of the Project are presented below. The Sections of the report presenting more detail are referenced appropriately for each issue. The findings are presented beneath the following topic headings: Priority Areas and Remediation Alternatives.

8.2.1 Priority Areas

Analysis of COPC distributions in sediments as well as hydraulic and sediment transport characteristics, as described in the CSM (Section 4), provided the primary basis for identification of priority areas for potential remediation. As discussed in Section 1, the approach to identifying priority areas for potential remediation considered relative differences in exposure concentrations, as opposed to identifying which areas may contribute most to potential risks. As such, the Project did not identify if remediation is warranted, but rather if it were conducted, where the largest cost/benefit would be realized, in terms of reducing potential risks (i.e., where would remediation dollars achieve the greatest "bang for the buck.") Based on the above approach, and in answer to one of the Project proposal's key questions: "...what parts of the river should be top priority for remediation...?" (Hull et al. 2003), the Project identified the following three priority areas:

- Priority Area 1 – three RTAs in the Lagrange Reach (Reach 3), for which remediation funding through the GLLA was requested in a March 2004 proposal to GLNPO.

- Priority Area 2 – this area encompasses five RTAs, including the three from Priority Area 1 in the Lagrange Reach, which was identified following the GLLA proposal review meeting held in Chicago, Illinois on September 9, 2004, in which GLNPO suggested that a larger area be defined in the Lagrange Reach for potential funding, as opposed to the smaller Priority Area 1 which was initially defined based on assumed funding limitations.

- Priority Area 3 – the SADZ located downstream of Stickney Avenue, between the Stickney Avenue bridge and the CSX Railroad bridge.

For purposes of further discussion in this section, Priority Area 2 pertains to Priority Area 1 also (since it includes Priority Area 1) and Priority Area 1 is not further discussed.

Priority Area 2, the RTAs in the Lagrange Reach, contain the highest Total PCB, Total PAH, and total lead concentrations observed in the river system, as well as the highest surface-sediment (i.e., the 0 to 6-inch depth interval) concentrations of these chemicals. These RTAs also contain the highest MPA of

Total PCBs, and the highest OC-normalized Total PCB concentrations as well. The SWA Total PCB and OC-normalized Total PCB concentrations in these RTAs are 100 and 50 times higher, respectively, than these values in the remainder of the Lagrange Reach, as determined from the October 2003 Sampling Program data (see Section 6.3.3). Correlation plots show that elevated Total PCB concentrations are fairly well co-located with elevated concentrations of lead and Total PAHs. Based on the observed statistical distribution of Total PCB and OC-normalized PCB concentrations in this area, and as corroborated to some degree by published guidelines, 5 ppm was selected as the basis for identifying RTAs and approximately delineating their boundaries (see Figure 5.5).

Below 5 ppm, the statistical distribution indicates that there are relatively few locations or opportunities to significantly affect average exposure concentrations. Above 5 ppm, the data are highly skewed toward elevated concentrations of Total PCBs, and the data indicate that targeting a relatively small number of samples will have a disproportionately large impact on reducing exposure and potential risks, compared to targeting other areas. This provides "the criterion" for selecting RTAs. The five Priority Area 2 RTAs include all of the samples in the Lagrange Reach with Total PCB concentrations in excess of 5 ppm.

The SADZ contains relatively low surface-sediment concentrations of COPCs, but concentration depth profiles show relatively high concentrations buried several feet below the sediment surface (Section 3). Data collected to date indicate that this area does not present as high potential human health and ecological risks as Priority Area 2; however, elevated COPC concentrations at depth in these areas represent a potential concern, unless the sediments can be reliably assumed to remain stable. Indications from the concentration depth profiles are that this zone has relatively high inherent stability, and that natural recovery by sedimentation has reduced risks in this area.

The Project proposal posed another key question: "What is the extent (size and location) of each area in the river sediments that should be remediated? What is the depth and volume of sediment involved as appropriate to meet project goals?" (Hull et al. 2003). The area and volume of sediments potentially requiring remediation in each of the five Priority Area 2 RTAs, as well as in the SADZ, was preliminarily estimated, as presented in Section 6.3. The estimated sediment volume associated with Priority Area 2 that may potentially require remediation is 13,400 cy, or over 3.3 acres. The estimated sediment volume in Priority Area 3 (the SADZ) that may potentially require remediation is 130,000 cy, over 18.4 acres. While these estimates are very approximate and uncertain, they are considered adequate for preliminary scoping of potential costs associated with remediation of sediments in these areas. Additional pre-remediation data are needed to more accurately define these areas and to allow for greater accuracy in estimating remediation costs.

In contrast to justification for establishing Priority Areas 2 and 3, the Sampling Program data do not appear to support prioritizing any areas in Reach 4 for sediment remediation because concentrations of the targeted chemicals are relatively low in this Reach, and because sediment deposits are of relatively limited thickness. The limited sampling in this area may not have detected some existing areas with elevated CPOC concentrations; however, Reach 4 is relatively energetic compared to Reaches 1 through 3, and bottom sediments are mainly of coarse materials (sands and gravels), with relatively little fine sediment overtop. One recommendation from the Project (see below), the collection and analysis of suspended and subsequently re-deposited sediments originating from Reach 4, should provide clarification as to whether consideration of Reach 4 as a non-priority area would continue to be justified.

Likewise, information collected during the Project also do not appear to support prioritizing any areas in either the downstream portion of Reach 2 (downstream of the SADZ) or in Reach 1 for sediment remediation, as COPC concentrations in sediments in these areas are also relatively low, and depths of soft sediment in these areas are also relatively shallow.

8.2.2 Remediation Alternatives

The remediation approach conceived for Priority Area 1 is presented in the GLLA funding proposal contained in Appendix A, and included sediment excavation, dewatering, and off-site disposal of 1,200 cy of material. This approach is superseded by the remediation approach described in Section 6 for Priority Area 2, which includes the Priority Area 1 RTAs.

Priority Area 2 (Lagrange Reach RTAs)

The Project proposal posed another key question: "What remediation method would be most effective and feasible for each area? How much would it cost and how can remediation efforts be optimized to get the most "bang for the buck"?" (Hull et al. 2003). The primary remediation alternatives considered were those described in Section 6.2: natural recovery, sediment capping, and sediment dredging. An evaluation of each approach for Priority Areas 2 and 3 are contained in Sections 6.4 and 6.5, respectively.

In Priority Area 2, a conceptual sediment remediation plan is presented involving a water-based dredging project, with passive dewatering, water treatment, and disposal to a sanitary sewer under appropriate permits, and disposal of dredged material at an appropriate landfill (See Section 7.2). Sediment capping is retained as a potentially viable approach for deeper areas, in particular near RTAs A and E; however, based on currently available information, hydraulic and sedimentation characteristics in the remainder of the RTAs do not appear to favor a simple capping approach. There is no indication that natural recovery

would provide significant risk reduction associated with RTAs in this reach in any reasonable time frame. The final selection of a remediation approach for each RTA should be made following pre-remediation sampling, which is necessary to define the spatial extent and volume of potentially contaminated sediments associated with each of the RTAs prior to finalizing and designing a remediation plan. The uncertain spatial extent and volume of the sediments in these areas is the single largest source of uncertainty in the estimated costs.

The preliminary, FS-level range of costs for implementing the conceptual remediation plan described above is between approximately 5.13 million dollars (minus contingency) and approximately 6.42 million dollars (including contingency). This cost range can be refined after collection and evaluation of clarifying pre-remediation/pre-design data and information.

An analysis of the effectiveness of RTA remediation in Priority Area 2 in reducing potential risks was conducted by computing the reduction in the SWA concentration of Total PCB and OC-normalized Total PCB concentrations in the surface sediments of Reach 3 as a result of remediation. RTA dredging was assumed to reduce surface sediment concentrations by 90%. Results indicate that the Total PCB and OC-normalized Total PCB concentrations in the surface sediments of Reach 3 would be reduced by 86% and 82%, respectively. This suggests that remediation of Priority Area 2 RTAs would achieve a relatively large reduction in potential risks associated with exposure to PCBs in this portion of the Ottawa River.

The long-term effectiveness of RTA remediation in Reach 3 depends on the extent to which chemical sources have been controlled. While there is substantial anecdotal evidence that sources from landfills, industrial outfalls, and other sources have been substantially reduced, measurements of COPC transport in the river were not available with which to assess the potential for recontamination of remediated areas. Low-level continuing sources likely exist from dispersed urbanized areas as well as from upstream sediments. Additional data would support evaluation of the potential for RTA recontamination, although the potential for recontamination to levels similar to those presently observed is considered very low.

Priority Area 3 (SADZ)

Conditions in the SADZ favor sedimentation, and thus make this area a potential candidate for a MNR and/or capping remedy, in the event that the sediments were determined to be potentially unstable to the point where unacceptable risks may occur in the future. Additional information and data are needed to evaluate whether or not MNR is a reliable remedy in this area; however, in the event that remediation activities occur in Priority Area 2, it is recommended that any active remediation of the SADZ be deferred until upriver work is completed, and until additional information is available to support a sediment

stability analysis. This would include collection and analysis of additional surface-sediment samples following completion of remediation in Priority Area 2, additional bathymetric data (sufficient to support a two-dimensional modeling analysis of the potential influence of flood flows and large seiches) and perhaps sediment erosion measurements (to enable sediment scour analysis).

Dredging of sediments in the SADZ appears cost prohibitive, potentially in the range of from 26 million to 65 million dollars if the estimated volume of potentially contaminated sediments in this area were to be removed (Section 6.5).

8.2.3 Recommendations

A number of recommendations are offered herein to build on the work conducted for this Project, and to advance toward efficient and cost-effective remediation.

Priority Area 2

The most important recommendation to be offered from the Project is that contaminated sediments occurring in the five RTAs identified to comprise Priority Area 2 should be remediated – that is, such sediments should not be left in place, unaddressed. As discussed herein, and based on current information, remediation for most of the Priority Area 2 RTAs – i.e. RTA B, RTA C, and RTA D - should occur through removal by dredging, whereas remediation of sediments in RTA A and RTA E could occur by dredging, in situ capping, or some combination thereof, as appropriate.

To facilitate and focus remediation of the five RTAs in Priority Area 2, a pre-remediation sediment sampling effort should first be conducted to reduce uncertainty as to the area, size, and volume of the five identified RTAs. Once these data are collected, it is recommended that the conceptual remediation plan then be reviewed and modified as appropriate. To iterate, specific consideration should be given to potentially capping sediments in RTAs A and E, given that capping may provide a technically viable and potentially cheaper alternative than dredging in these areas. It is anticipated that following both a pre-remediation sampling effort and refinement of the conceptual remediation plan, design of the remediation program could then proceed.

Specific recommendations for a pre-remediation sampling effort to support sediment remediation by dredging and/or capping within Priority Area 2 RTA locations include the following:

- Collection of sediment cores to establish vertical and lateral remediation boundaries in the vicinity of each of the Priority Area 2 RTAs. Considering that PCBs are the risk driver, and that Total PCB

concentrations provide a reasonable surrogate for other COPCs (lead and PAHs), an adequate delineation of RTAs for remediation can likely be achieved by analyzing samples for Total PCBs. To the extent that sample analysis for lead and/or PAHs are collected to evaluate the potential merits of adjusting the remediation boundaries to address adjacent areas with elevated concentrations of these COPCs, it is suggested that, for the purposes of cost effectiveness, analysis of only surface samples for these constituents be considered. One exception may be in the vicinity of core sample location SB03-33, located near the Dura Avenue Landfill in RTA E, where the highest observed Total PAH concentration in the October 2003 Sampling Program dataset occurred at the bottom-most depth interval of the core sample from this location.

- Collection of bathymetric survey data (channel cross-section surveys) through Reach 3 and through the SADZ at representative cross-sections at intervals along the length of these areas, with collection of more closely spaced data in the vicinity of each of the five Priority Area 2 RTAs.

- Collection of sediment probing measurements along cross-channel transects near each of the five Priority Area 2 RTAs to define the apparent total thickness of soft, presumably water-deposited sediments to allow for preparation of an isopach map of sediment thickness distributions in each area.

- Evaluation of the extent to which the existing AquaBlok cap in area of RTA B near the former Unnamed Tributary may be providing effective containment and reduction of risks in this area.

With the benefit of additional data collected through the pre-remediation sampling, it is recommended that the conceptual remediation plan outlined in Section 7 be re-evaluated before selecting the final sediment remediation approach. At such time, development of a more accurate remediation cost estimate should be possible, and refinement of the preliminary FS-level cost estimate presented in Section 7 will be required. Costs may change significantly, depending on results of the pre-remediation sampling effort and subsequent data evaluation, as well as a review of the overall remediation approach.

In addition to facilitating and focusing sediment remediation in Priority Area 2 by first clarifying the appropriate spatial extent of remediation of each of the Priority Area 2 RTAs, additional assessment of potential continuing sources is also recommended. In this regard, the following specific suggestions are offered:

- Assess the potential for continuing localized sources of PCBs, PAHs, and/or lead to Reaches 3 and 4 by collecting several rounds of surface water quality data during: a) wet weather runoff events

when external loadings (i.e., sources not related to sediment releases) could potentially be highest and b) typical summer low-flow conditions when potential dissolved-phase releases of contaminants from the sediment bed could also be elevated. Such sampling should include a determination of the particulate-phase concentrations (i.e., contaminants bound to suspended sediments, as included in the TSS fraction) of these chemicals. Alternatively, or in addition, sediment traps may also be deployed in Reaches 3 and 4 to passively collect sediments over a period of several weeks; this approach may be more cost-effective than high-volume, surface-water sampling.

- The potential for dissolved- or colloidal-phase COPCs, which could occur in some local groundwater resources, to act as contaminants to Reach 3 should be further evaluated in the vicinity of the RTAs. This can be accomplished using seepage meters, shallow piezometers, and/or other methods.

Priority Area 3

It is recommended that selection of a remediation approach for the SADZ (Priority Area 3) be deferred until after remediation of Priority Area 2 is completed. However, collection of data necessary to support a more detailed assessment of sediment stability in the SADZ may be conducted in conjunction with pre-remediation sampling for Priority Area 2; specifically, collection of additional bathymetric data in the SADZ suitable to support a two-dimensional hydrodynamic modeling analysis is recommended. This information will facilitate a technical evaluation of whether or not unacceptable risks may result from potential remobilization of elevated concentrations of COPCs buried within the sediments in this area.

Additional sediment characterization data should also be collected for the backwater wetland area located directly downriver of Stickney Avenue, on the south side of the river, given the relative lack of information regarding sediment-quality conditions in this portion of Reach 2. Such a wetland area could effectively serve as an "attractive nuisance" to potential ecological receptors were sediments to be significantly impacted in this area, further justifying collection of additional data for this particular location.

Monitoring Progress

The proposed sediment remediation actions in Priority Area 2 (Reach 3) will contribute to a reduction of risks posed by contaminated sediments. Presently, an adequate data set is not available to reliably detect any statistically significant reductions in fish tissue Total PCB concentrations that may result due to remediation (assuming that such a metric can provide a reliable indication of cleanup effectiveness over

the long term). Annual variability in metrological factors that affect fish reproduction, growth, and foraging (together with numerous other sources of natural variability) make direct, short-term measurement of changes in fish tissue PCB levels difficult. However, in spite of these factors, it is recommended that an appropriate monitoring program be designed and implemented to provide a reliable indication of trends in bio-available levels of PCBs in the river system, which will provide a basis for measurement of long-term remediation progress (as a result of natural recovery processes and/or implementation of active remediation efforts such as dredging and/or capping.) Any such monitoring program should be carefully designed to control for natural variability to the extent possible, for accurate repetition in the future, and to provide for collection of representative data for different sections of the river. It is suggested that one monitoring location be established within the SADZ.

9. References

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Table 2.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

Targeted Sampling Areas, Data Needs and Sampling Objectives, and Chemical Analyses Conducted by Reach

Sampling Area	Sampling Area River Mile Limits	Data Needs and Sampling Objectives	Chemical Analyses
Downstream section	RM 1.5 to RM 4.1	Define the vertical distribution of target chemicals in the top 24 inches of sediment to evaluate natural attenuation, and current surface sediment exposure levels.	Total PCBs, Total lead, Total PAHs
Stickney Avenue Depositional Zone	RM 4.2 to RM 4.9	Further define spatial extent, vertical distribution, and surface sediment concentrations of target chemicals in the Stickney Avenue Depositional Zone.	Total PCBs, Total lead, Total PAHs
Landfill Section	RM 4.9 to RM 6.5	Assess the frequency of elevated target chemicals by selectively identifying and sampling soft sediment deposits.	Total PCBs, Total lead, Total PAHs
		Identify potential remediation target areas.	
Segment 4	RM 6.9 to RM 8.8	Assess the frequency of elevated target chemicals by selectively identifying and sampling soft sediment deposits.	Total PCBs, Total lead, Total PAHs
		Identify potential remediation target areas.	

Table 2.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

Water Depth, Probing Rod Depth, and Core Penetration Data at Each Sampling Location

Location	Date	Time	Latitude, N (Decimal Degrees)	Longitude, W (Decimal Degrees)	River Mile	River Reach	Water Depth (ft)	Probing Rod Depth (ft)	Core Penetration (ft)	Core Recovery (ft)	% Recovery
SB03-01	10/22/03	1050	41.72492904	-83.47246285	1.1	1	1.3	9	5	5	100.0
SB03-02	10/22/03	1135	41.72379997	-83.47774077	1.5	1	1.4	9	n/a	n/a	
SB03-03	10/22/03	1230	41.72294835	-83.48273009	1.8	1	1.7	11	10	10	100.0
SB03-04	10/22/03	1300	41.71928377	-83.48466163	2	1	1.4	12	5	5	100.0
SB03-05	10/22/03	1340	41.71053799	-83.49512991	3	1	1.5	12	5	5	100.0
SB03-06	10/22/03	1410	41.7101315	-83.49746126	3.1	1	0.9	3.5	n/a	n/a	
SB03-07	10/23/03	1015	41.71133289	-83.50252386	3.45	2	0.5	12	3	3	100.0
SB03-08	10/23/03	1040	41.71113447	-83.50457715	3.52	2	0.7	6	3	2.6	86.7
SB03-09	10/23/03	1100	41.71174423	-83.50433664	3.5	2	0.7	9	3.5	3.1	88.6
SB03-10	10/23/03	1150	41.70854205	-83.50948547	3.88	2	1.9	6	2.5	2	80.0
SB03-11	10/23/03	1215	41.70746781	-83.51132757	3.95	2	0.6	12	2.4	2.1	87.5
SB03-12	10/23/03	1250	41.70620901	-83.51404927	4.05	2	0.8	12	2.5	2.3	92.0
SB03-13	10/23/03	1410	41.70469151	-83.51639514	4.1	2	0.6	7	2.6	2.4	92.3
SB03-14	10/28/03	1600	41.704476	-83.51791825	4.16	2	1	4	4	4	100.0
SB03-15	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-16	10/28/03	1545	41.70412561	-83.5176589	4.16	2	1	12	6	6	100.0
SB03-17	10/28/03	1455	41.70328796	-83.52000195	4.35	2	1	12	10	10	100.0
SB03-18	10/28/03	1440	41.70315158	-83.51985143	4.35	2	3	12	10	10	100.0
SB03-19	10/28/03	1420	41.70302639	-83.51953232	4.35	2	1.9	7	10	10	100.0
SB03-20	10/28/03	1320	41.70286473	-83.52130674	4.45	2	0.9	12	10	10	100.0
SB03-21	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-22	10/28/03	1350	41.70245961	-83.52103187	4.45	2	1.7	12	10	10	100.0
SB03-23	10/28/03	1245	41.70265381	-83.52310334	4.6	2	1.8	12	10	10	100.0
SB03-24	10/28/03	1220	41.70246392	-83.52315607	4.6	2	5.5	12	10	7	70.0
SB03-25	10/28/03	1200	41.70246392	-83.52315607	4.6	2	1	12	10	10	100.0
SB03-26	10/28/03	1120	41.70357423	-83.52470103	4.75	2	4.8	3	5.5	5.3	96.4
SB03-27	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-28	10/28/03	1050	41.70335628	-83.52490165	4.75	2	0.9	12	10	10	100.0
SB03-29	10/28/03	1030	41.70384213	-83.52611932	4.8	2	1	12	8.5	8	94.1
SB03-30	10/28/03	1015	41.70364642	-83.52608566	4.8	2	3.5	12	10	9.5	95.0
SB03-31	10/28/03	1000	41.70350706	-83.52604333	4.8	2	1	12	10	9.5	95.0
SB03-32	10/27/03	1220	41.69908367	-83.52979657	5.45	3	4.5	3	5	5	100.0
SB03-33	10/27/03	1150	41.6973348	-83.52980393	5.52	3	1.8	6	4	3.8	95.0
SB03-34	10/27/03	1130	41.69636141	-83.53199052	5.6	3	2.4	5	4.7	4.7	100.0

Table 2.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

Water Depth, Probing Rod Depth, and Core Penetration Data at Each Sampling Location

Location	Date	Time	Latitude, N (Decimal Degrees)	Longitude, W (Decimal Degrees)	River Mile	River Reach	Water Depth (ft)	Probing Rod Depth (ft)	Core Penetration (ft)	Core Recovery (ft)	% Recovery
SB03-35	10/27/03	1045	41.69639877	-83.53310318	5.65	3	1.1	4	4.8	4.8	100.0
SB03-36	10/27/03	1025	41.69336523	-83.53274681	5.65	3	1.1	2.5	4.8	4.8	100.0
SB03-37	10/27/03	955	41.69424716	-83.53463464	5.72	3	1.9	6	8	7.9	98.8
SB03-38	10/27/03	925	41.69360238	-83.53522876	5.78	3	9	3	5	4.7	94.0
SB03-39	10/24/03	1155	41.69092419	-83.53809444	5.98	3	5.6	5	5	4.9	98.0
SB03-40	10/24/03	1230	41.68992278	-83.54150949	6.3	3	1	n/a	4.9	4.9	100.0
SB03-41	10/27/03	1310	41.68966364	-83.54264063	6.4	3	2.7	7	5	3.5	70.0
SB03-42	10/27/03	1355	41.68890656	-83.54658373	6.5	3	2.3	6.7	4.3	4.3	100.0
SB03-43	10/27/03	1435	41.68857632	-83.54796996	6.56	4	4.4	3.6	3.7	3.7	100.0
SB03-44	10/27/03	1500	41.68813586	-83.54953084	6.62	4	2.2	2	3.5	3.2	91.4
SB03-45	10/27/03	1530	41.68770806	-83.55184106	6.74	4	3	5	5	5	100.0
SB03-46	10/21/03	1010	See Note 3	See Note 3	7.25	4	2	6	3	3	100.0
SB03-47	10/21/03	1140	See Note 3	See Note 3	7.5	4	2	5	2	n/a	
SB03-48	10/21/03	1220	See Note 3	See Note 3	7.76	4	2.3	5	See Note 4	n/a	
SB03-49	10/21/03	1300	See Note 3	See Note 3	8.1	4	4.6	2	GRAB	n/a	
SB03-50	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-51	10/21/03	1440	See Note 3	See Note 3	8.35	2	n/a	n/a	GRAB	n/a	
SB03-52	10/28/2003	n/a	41.676166	-83.5752	8.52	4	0.83	n/a	GRAB	n/a	
SB03-53A	10/24/03	1115	41.692036	-83.535216	5.9	3	1.1	8	4.5	4.5	100.0
SB03-54A	10/24/03	1020	41.692461	-83.535041	5.86	3	1.3	5	3.9	3.9	100.0
SB03-55A	10/24/03	1045	41.693225	-83.535047	5.82	3	0.9	8	4.4	4.4	100.0

Notes:

1. All data related to sample coordinates, water depths, probing rod depths, and core penetration depths were collected by OEPA. Original data are in Appendix B.
2. River mile positions were calculated using GIS software and are based on distance upriver from the river mouth along an assigned river centerline.
3. Coordinates not available due to lack of available satellite signal during sampling.
4. At SB03-48 (13" Core) the top 6" are leaves and sticks. Whole core sediments composited, equivalent to a grab sample.
5. n/a - Information not recorded in field notes. Absence of probing depth data indicates very little or no soft sediment encountered.
6. Probing rod depth is directly equivalent to estimated total thickness of soft sediment

Table 2.3

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

List of Target Chemicals: Analytical Methods

Target Chemical	Analytes	Method
Polychlorinated Biphenyls (PCBs)	Aroclor 1016	EPA 8082
	Aroclor 1221	EPA 8082
	Aroclor 1232	EPA 8082
	Aroclor 1242	EPA 8082
	Aroclor 1248	EPA 8082
	Aroclor 1254	EPA 8082
	Aroclor 1260	EPA 8082
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	8270 SIM
	Acenaphthylene	8270 SIM
	Anthracene	8270 SIM
	Benz(a)anthracene	8270 SIM
	Benzo(a)pyrene	8270 SIM
	Benzo(b)fluoranthene	8270 SIM
	Benzo(g,h,i)perylene	8270 SIM
	Benzo(k)fluoranthene	8270 SIM
	Chrysene	8270 SIM
	Dibenz(a,h)anthracene	8270 SIM
	Fluoranthene	8270 SIM
	Fluorene	8270 SIM
	Indeno(1,2,3-cd)pyrene	8270 SIM
	Naphthalene	8270 SIM
	Pentachlorophenol	8270 SIM
	Phenanthrene	8270 SIM
	Pyrene	8270 SIM
Total Lead	-	6010B
Total Organic Carbon (TOC)	-	Walkley Black
Grain Size	-	ASTM D422

Table 3.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PCB Data

Sediment Sample ID	Congener Specific Results (µg/kg-dry)							
	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
SB03-01-0-6	ND	ND	ND	520	ND	93	ND	613
SB03-01-12-18	ND	ND	ND	380	ND	110	ND	490
SB03-01-18-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-01-6-12	ND	ND	ND	1,000	ND	320	ND	1,320
SB03-02-0-6	ND	ND	ND	1,200	ND	540	ND	1,740
SB03-02-12-18	ND	ND	ND	490	ND	ND	ND	490
SB03-02-18-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-02-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-03-0-6	ND	ND	ND	1,300	ND	360	ND	1,660
SB03-03-12-18	ND	ND	ND	670	ND	260	ND	930
SB03-03-18-24	ND	ND	ND	ND	ND	200	ND	200
SB03-03-6-12	ND	ND	ND	770	ND	250	ND	1,020
SB03-04-0-6	ND	ND	ND	1,500	ND	400	ND	1,900
SB03-04-12-18	ND	ND	ND	ND	ND	ND	ND	ND
SB03-04-18-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-04-6-12	ND	ND	ND	780	ND	280	ND	1,060
SB03-05-0-6	ND	ND	ND	1,400	ND	410	ND	1,810
SB03-05-12-18	ND	ND	ND	ND	ND	ND	ND	ND
SB03-05-18-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-05-6-12	ND	ND	ND	500	ND	110	ND	610
SB03-06-0-6	ND	ND	ND	1,000	ND	240	ND	1,240
SB03-06-12-18	ND	ND	ND	ND	ND	ND	ND	ND
SB03-06-18-24	ND	ND	ND	680	ND	190	ND	870
SB03-06-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-07-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-07-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-07-12-24(DUP)	ND	ND	ND	ND	ND	3,300	ND	3,300
SB03-07-24-36	ND	ND	ND	2,500	ND	820	ND	3,320
SB03-07-6-12	ND	ND	ND	590	ND	680	ND	1,270
SB03-08-0-6	ND	ND	ND	2,200	ND	960	ND	3,160
SB03-08-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-08-24-32	ND	ND	ND	ND	ND	ND	ND	ND
SB03-08-6-12	ND	ND	ND	340	ND	94	ND	434
SB03-09-0-6	ND	ND	ND	1,400	ND	370	ND	1,770
SB03-09-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-09-24-32	ND	ND	ND	ND	ND	ND	ND	ND
SB03-09-6-12	ND	ND	ND	620	ND	190	ND	810
SB03-10-0-6	ND	ND	ND	4,300	ND	1,100	ND	5,400
SB03-10-12-18	ND	ND	ND	ND	ND	ND	ND	ND
SB03-10-6-12	ND	ND	ND	740	ND	320	ND	1,060
SB03-11-0-6	ND	ND	ND	710	ND	160	ND	870
SB03-11-12-22	ND	ND	ND	2,800	ND	630	ND	3,430
SB03-11-6-12	ND	ND	ND	550	ND	140	ND	690
SB03-12-0-6	ND	ND	ND	660	ND	200	ND	860
SB03-12-12-25	ND	ND	ND	ND	ND	ND	ND	ND
SB03-12-6-12	ND	ND	ND	230	ND	76	ND	306
SB03-13-0-6	ND	ND	ND	900	ND	220	ND	1,120

Table 3.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PCB Data

Sediment Sample ID	Congener Specific Results (µg/kg-dry)							
	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
SB03-13-12-28	ND	ND	ND	ND	ND	ND	ND	ND
SB03-13-12-28(DUP)	ND	ND	ND	ND	ND	ND	ND	ND
SB03-13-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-36-48	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-48-60	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-15	NO CORE COLLECTED - NO SEDIMENT PRESENT							
SB03-16-0-6	ND	ND	ND	550	ND	150	ND	700
SB03-16-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-36-48	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-48-60	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-60-77	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-17-0-6	ND	ND	ND	260	ND	72	ND	332
SB03-17-108-117	ND	ND	ND	ND	ND	ND	ND	ND
SB03-17-12-24	ND	ND	ND	560	ND	110	ND	670
SB03-17-24-36	ND	ND	ND	960	ND	180	ND	1,140
SB03-17-36-48	ND	ND	ND	940	ND	290	ND	1,230
SB03-17-48-60	ND	ND	ND	1,700	ND	710	ND	2,410
SB03-17-60-72	ND	ND	ND	11,000	ND	1,100	ND	12,100
SB03-17-6-12	ND	ND	ND	450	ND	120	ND	570
SB03-17-72-84	ND	ND	ND	8,100	ND	1,600	ND	9,700
SB03-17-84-96	ND	ND	ND	220	ND	220	ND	440
SB03-17-96-108	ND	ND	ND	ND	ND	ND	510	510
SB03-18-0-6	ND	ND	ND	1,300	ND	ND	ND	1,300
SB03-18-108-115	ND	ND	ND	ND	ND	ND	ND	ND
SB03-18-12-24	ND	ND	ND	820	ND	270	ND	1,090
SB03-18-24-36	ND	ND	ND	3,800	ND	970	ND	4,770
SB03-18-36-48	ND	ND	ND	5,300	ND	1,300	ND	6,600
SB03-18-48-60	ND	ND	ND	14,000	ND	ND	740	14,740
SB03-18-60-72	ND	ND	ND	15,000	ND	1,700	ND	16,700
SB03-18-6-12	ND	ND	ND	3,000	ND	500	ND	3,500
SB03-18-72-84	ND	ND	ND	11,000	ND	1,900	ND	12,900
SB03-18-84-96	ND	ND	ND	370	ND	ND	ND	370
SB03-18-96-108	ND	ND	ND	140	ND	ND	140	280
SB03-19-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-36-48	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-48-60	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-60-72	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-72-96	ND	ND	ND	ND	ND	ND	ND	ND

Table 3.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PCB Data

Sediment Sample ID	Congener Specific Results (µg/kg-dry)							
	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
SB03-19-96-111	ND	ND	ND	ND	ND	ND	ND	ND
SB03-20-0-6	ND	ND	ND	670	ND	170	ND	840
SB03-20-12-24	ND	ND	ND	2,100	ND	430	ND	2,530
SB03-20-24-36	ND	ND	ND	1,000	ND	960	ND	1,960
SB03-20-36-48	ND	ND	ND	800	ND	1,600	ND	2,400
SB03-20-48-60	ND	ND	ND	610	ND	600	ND	1,210
SB03-20-60-72	ND	ND	ND	41,000	ND	4,800	ND	45,800
SB03-20-6-12	ND	ND	ND	660	ND	ND	ND	660
SB03-20-72-84	ND	ND	ND	450	ND	520	ND	970
SB03-20-84-96	ND	ND	ND	920	ND	840	ND	1,760
SB03-20-96-110	ND	ND	ND	ND	ND	ND	ND	ND
SB03-21	NO CORE COLLECTED - NO SEDIMENT PRESENT							
SB03-22-0-6	ND	ND	ND	690	ND	170	ND	860
SB03-22-12-24	ND	ND	ND	93	ND	78	ND	171
SB03-22-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-36-48	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-48-60	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-60-84	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-6-12	ND	ND	ND	340	ND	420	ND	760
SB03-22-84-119	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-0-6	ND	ND	ND	450	ND	ND	ND	450
SB03-23-108-119	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-12-24	ND	ND	ND	2,100	ND	500	ND	2,600
SB03-23-24-36	ND	ND	ND	85,000	ND	6,000	ND	91,000
SB03-23-36-48	ND	ND	ND	190	ND	240	ND	430
SB03-23-48-60	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-60-72	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-6-12	ND	ND	ND	800	ND	290	ND	1,090
SB03-23-72-84	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-84-96	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-96-108	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-0-6	ND	ND	ND	1,800	ND	330	ND	2,130
SB03-24-12-24	ND	ND	ND	12,000	ND	1,700	ND	13,700
SB03-24-24-36	ND	ND	ND	1,700	ND	570	ND	2,270
SB03-24-24-36(DUP)	ND	ND	ND	1,400	ND	550	ND	1,950
SB03-24-36-48	ND	ND	ND	220	ND	300	ND	520
SB03-24-48-60	ND	ND	ND	370	ND	310	ND	680
SB03-24-60-72	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-6-12	ND	ND	ND	5,600	ND	810	ND	6,410
SB03-24-72-84	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-84-96	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-96-105	ND	ND	ND	ND	ND	ND	ND	ND
SB03-25-0-6	ND	ND	ND	1,000	ND	230	ND	1,230
SB03-25-12-24	ND	ND	ND	1,700	ND	520	ND	2,220
SB03-25-24-36	ND	ND	ND	3,000	ND	880	ND	3,880
SB03-25-36-48	ND	ND	ND	24,000	ND	2,800	ND	26,800
SB03-25-36-48(DUP)	ND	ND	ND	15,000	ND	1,600	ND	16,600

Table 3.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PCB Data

Sediment Sample ID	Congener Specific Results (µg/kg-dry)							
	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
SB03-25-48-60	ND	ND	ND	1,200	ND	ND	ND	1,200
SB03-25-60-72	ND	ND	ND	530	ND	630	ND	1,160
SB03-25-6-12	ND	ND	ND	570	ND	160	ND	730
SB03-25-72-84	ND	ND	ND	250	ND	220	ND	470
SB03-25-84-96	ND	ND	ND	ND	ND	ND	ND	ND
SB03-25-96-111	ND	ND	ND	ND	ND	ND	ND	ND
SB03-26-0-6	ND	ND	ND	1,100	ND	1,000	ND	2,100
SB03-26-12-24	ND	ND	ND	500	ND	450	ND	950
SB03-26-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-26-36-48	ND	ND	ND	ND	ND	ND	ND	ND
SB03-26-48-65	ND	ND	ND	ND	ND	ND	ND	ND
SB03-26-6-12	ND	ND	ND	630	ND	890	ND	1,520
SB03-27	NO CORE COLLECTED - NO SEDIMENT PRESENT							
SB03-28-0-6	ND	ND	ND	2,600	ND	500	ND	3,100
SB03-28-12-24	ND	ND	ND	3,100	ND	590	ND	3,690
SB03-28-24-36	ND	ND	ND	1,500	ND	310	ND	1,810
SB03-28-36-48	ND	ND	ND	12,000	ND	2,300	ND	14,300
SB03-28-48-60	ND	ND	ND	8,300	ND	1,300	ND	9,600
SB03-28-60-72	ND	ND	ND	22,000	ND	2,400	ND	24,400
SB03-28-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-28-72-84	ND	ND	ND	31,000	ND	5,600	ND	36,600
SB03-28-84-96	ND	ND	ND	2,100	ND	1,400	ND	3,500
SB03-28-96-111	ND	ND	ND	390	ND	ND	ND	390
SB03-29-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-36-48	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-48-72	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-72-94	ND	ND	ND	ND	ND	ND	ND	ND
SB03-30-0-6	ND	ND	ND	630	ND	ND	ND	630
SB03-30-12-24	ND	ND	ND	2,900	ND	910	ND	3,810
SB03-30-24-36	ND	ND	ND	8,100	ND	1,300	ND	9,400
SB03-30-36-48	ND	ND	ND	18,000	ND	1,800	ND	19,800
SB03-30-48-60	ND	ND	ND	36,000	ND	4,900	ND	40,900
SB03-30-60-72	ND	ND	ND	ND	ND	580	ND	580
SB03-30-6-12	ND	ND	ND	1,200	ND	330	ND	1,530
SB03-30-72-84	ND	ND	ND	ND	ND	800	ND	800
SB03-30-84-110	ND	ND	ND	ND	ND	ND	ND	ND
SB03-31-0-6	ND	ND	ND	3,800	ND	700	ND	4,500
SB03-31-12-24	ND	ND	ND	1,100	ND	310	ND	1,410
SB03-31-24-36	ND	ND	ND	3,400	ND	850	ND	4,250
SB03-31-36-48	ND	ND	ND	14,000	ND	2,100	ND	16,100
SB03-31-48-60	ND	ND	ND	19,000	ND	2,200	ND	21,200
SB03-31-60-72	ND	ND	ND	60,000	ND	4,400	ND	64,400
SB03-31-6-12	ND	ND	ND	1,400	ND	300	ND	1,700
SB03-31-72-84	ND	ND	ND	4,400	ND	1,400	ND	5,800

Table 3.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PCB Data

Sediment Sample ID	Congener Specific Results (µg/kg-dry)							
	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
SB03-31-84-96	ND	ND	ND	ND	ND	ND	ND	ND
SB03-31-96-112	ND	ND	ND	340	ND	300	ND	640
SB03-32-0-6	ND	ND	ND	42,000	ND	2,300	ND	44,300
SB03-32-12-24	ND	ND	ND	800	ND	ND	ND	800
SB03-32-24-36	ND	ND	ND	170	ND	ND	ND	170
SB03-32-6-12	ND	ND	ND	40,000	ND	2,100	ND	42,100
SB03-33-0-6	ND	ND	ND	6,300	ND	900	ND	7,200
SB03-33-12-24	ND	ND	ND	6,900	ND	1,300	ND	8,200
SB03-33-24-36	ND	ND	ND	3,400	ND	650	ND	4,050
SB03-33-6-12	ND	ND	ND	21,000	ND	1,600	ND	22,600
SB03-34-0-6	ND	ND	ND	300	ND	1,100	ND	1,400
SB03-34-12-24	ND	ND	ND	110	ND	ND	ND	110
SB03-34-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-34-6-12	ND	ND	ND	220	ND	220	ND	440
SB03-35-0-6	ND	ND	ND	1,200	ND	320	ND	1,520
SB03-35-12-24	ND	ND	ND	12,000	ND	1,400	ND	13,400
SB03-35-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-35-6-12	ND	ND	ND	1,400	ND	370	ND	1,770
SB03-36-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-36-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-36-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-36-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-37 36-48	ND	ND	ND	ND	ND	310	ND	310
SB03-37 48-62	ND	ND	ND	ND	ND	310	ND	310
SB03-37-0-6	ND	ND	ND	41,000	ND	1,700	ND	42,700
SB03-37-12-24	ND	ND	ND	86,000	ND	2,700	ND	88,700
SB03-37-24-36	ND	ND	ND	3,100	ND	980	ND	4,080
SB03-37-24-36(DUP)	ND	ND	ND	2,600	ND	830	ND	3,430
SB03-37-6-12	ND	ND	ND	27,000	ND	1,800	ND	28,800
SB03-38-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-38-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-38-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-38-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-39-0-6	ND	ND	ND	400	ND	370	ND	770
SB03-39-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-39-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-39-24-36(DUP)	ND	ND	ND	ND	ND	ND	ND	ND
SB03-39-6-12	ND	ND	ND	200	ND	360	ND	560
SB03-40-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-40-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-40-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-40-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-41-0-6	ND	ND	ND	40,000	ND	4,200	ND	44,200
SB03-41-12-24	ND	ND	ND	180	ND	ND	ND	180
SB03-41-24-42	ND	ND	ND	ND	ND	ND	ND	ND
SB03-41-6-12	ND	ND	ND	4,500	ND	1,400	ND	5,900
SB03-42 36-52	ND	ND	ND	ND	ND	ND	ND	ND

Table 3.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PCB Data

Sediment Sample ID	Congener Specific Results (µg/kg-dry)							
	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
SB03-42-0-6	ND	ND	ND	1,000	ND	630	ND	1,630
SB03-42-12-24	ND	ND	ND	2,000	ND	1,700	ND	3,700
SB03-42-24-36	ND	ND	ND	1,000	ND	1,600	ND	2,600
SB03-42-6-12	ND	ND	ND	10,000	ND	2,500	ND	12,500
SB03-43-0-9	ND	ND	ND	350	ND	ND	46	396
SB03-43-16-28	ND	ND	ND	ND	ND	ND	ND	ND
SB03-43-28-41	ND	ND	ND	ND	ND	ND	ND	ND
SB03-43-9-16	ND	ND	ND	ND	ND	ND	ND	ND
SB03-44-0-6	ND	ND	ND	1,200	ND	1,100	ND	2,300
SB03-44-14-26	ND	ND	ND	ND	ND	ND	ND	ND
SB03-44-26-34	ND	ND	ND	ND	ND	ND	ND	ND
SB03-44-6-14	ND	ND	ND	67	ND	ND	ND	67
SB03-45-0-6	ND	ND	ND	190	ND	72	ND	262
SB03-45-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-45-24-36	ND	ND	ND	ND	ND	ND	ND	ND
SB03-45-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-46-0-6	ND	ND	ND	160	ND	ND	ND	160
SB03-46-12-24	ND	ND	ND	1,500	ND	630	ND	2,130
SB03-46-6-12	ND	ND	ND	240	ND	ND	ND	240
SB03-47-0-6	ND	ND	ND	84	ND	ND	ND	84
SB03-47-12-24	ND	ND	ND	2,200	ND	570	ND	2,770
SB03-47-6-12	ND	ND	ND	310	ND	99	ND	409
SB03-48-0-13	ND	ND	ND	190	ND	ND	ND	190
SB03-49-0-6	ND	ND	ND	79	ND	ND	ND	79
SB03-50	NO CORE COLLECTED - NO SEDIMENT PRESENT							
SB03-51-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-52-0-6	ND	ND	ND	250	ND	ND	ND	250
SB03-53A 36-48	ND	ND	ND	830	ND	360	ND	1,190
SB03-53A 48-56	ND	ND	ND	1,300	ND	410	ND	1,710
SB03-53A-0-6	ND	ND	ND	380,000	ND	5,500	ND	385,500
SB03-53A-12-24	ND	ND	ND	1,100,000	ND	42,000	ND	1,142,000
SB03-53A-24-36	ND	ND	ND	710,000	ND	ND	ND	710,000
SB03-53A-6-12	ND	ND	ND	120,000	ND	2,400	ND	122,400
SB03-54-12-24	ND	ND	ND	300	ND	80	ND	380
SB03-54A-0-6	ND	ND	ND	ND	150	ND	ND	150
SB03-54A-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-54A-24-36	ND	ND	ND	ND	ND	ND	ND	ND

Table 3.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PCB Data

Sediment Sample ID	Congener Specific Results (µg/kg-dry)							
	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total PCBs
SB03-54A-6-12	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-0-6	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-12-24	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-12-24(DUP)	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-24-36	ND	ND	ND	75	ND	ND	ND	75
SB03-55A-6-12	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

1. ND = Non-detect (reporting limit). Non-detect values ranged from 23 to 68 ug/kg.
2. Total PCB concentrations were computed by summing Aroclor results. ND results treated as zero in the sum.
3. DUP = duplicate field or analytical sample.
4. Sediment Sample ID: First portion after the "SB03" designation identifies core location, and last two numbers signify depth discrete interval, e.g., "0-6" indicates 0 to 6 inch interval.

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

	Compound Results (µg/kg-dry)																	
Sediment Sample ID	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benz(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b) fluoranthene**	**Benzo(g,h,i) perylene**	**Benzo(k) fluoranthene**	**Chrysene**	**Dibenz(a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Pentachlorophenol**	**Phenanthrene**	**Pyrene**	**Total PAHs**
SB03-01-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-01-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-01-12-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-01-18-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-02-0-6	ND	ND	ND	ND	220	210	170	210	170	ND	250	ND	160	ND	ND	ND	350	1,740
SB03-02-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-02-12-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-02-18-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-03-0-6	ND	ND	ND	460	670	740	590	660	680	200	860	ND	470	ND	ND	260	1,100	6,690
SB03-03-6-12	ND	ND	ND	230	560	600	490	520	1,100	140	1,100	ND	180	ND	ND	420	1,100	6,440
SB03-03-12-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-03-18-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-04-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-04-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-04-12-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-04-18-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-05-0-6	ND	ND	ND	ND	ND	180	140	160	ND	ND	200	ND	140	ND	ND	ND	180	1,000
SB03-05-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-05-12-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-05-18-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-06-0-6	ND	ND	ND	540	620	830	530	700	760	120	1,200	ND	600	ND	ND	380	1,200	7,480
SB03-06-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-06-12-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-06-18-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-07-0-6	ND	ND	420	980	930	1,100	630	960	1,100	170	1,700	130	740	ND	ND	1,100	1,900	11,860
SB03-07-6-12	ND	ND	ND	150	ND	290	220	280	230	ND	350	ND	220	ND	ND	130	290	2,160

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

Sediment Sample ID	Compound Results (µg/kg-dry)																	
	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Pentachlorophenol	Phenanthrene	Pyrene	Total PAHs
SB03-07-12-24	ND	ND	ND	340	290	450	330	420	520	ND	880	ND	340	ND	ND	500	790	4,860
SB03-07-12-24(DUP)	ND	ND	310	1,200	1,100	1,200	600	890	1,500	330	2,200	ND	720	ND	ND	1,600	2,800	14,450
SB03-07-24-36	140	ND	320	670	870	980	630	890	1,200	190	1,500	170	620	ND	ND	1,200	2,200	11,580
SB03-08-0-6	ND	ND	210	1,000	1,100	1,200	680	850	1,400	380	1,600	ND	820	ND	ND	620	2,200	12,060
SB03-08-6-12	ND	ND	ND	620	800	970	560	600	980	310	1,100	ND	630	ND	ND	410	1,800	8,780
SB03-08-12-24	ND	ND	ND	470	460	560	290	440	670	180	1,100	ND	370	ND	ND	300	1,300	6,140
SB03-08-24-32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-09-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-09-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-09-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-09-24-32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-10-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-10-6-12	ND	ND	ND	160	170	190	ND	170	230	ND	360	ND	140	ND	ND	ND	340	1,760
SB03-10-12-18	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-11-0-6	ND	ND	ND	120	140	190	130	170	180	ND	370	ND	150	ND	ND	ND	230	1,680
SB03-11-6-12	ND	ND	ND	ND	ND	130	ND	140	120	ND	270	ND	ND	ND	ND	130	240	1,030
SB03-11-12-22	ND	ND	ND	120	ND	180	130	170	160	ND	320	ND	140	ND	ND	ND	270	1,490
SB03-12-0-6	ND	ND	120	590	580	850	340	500	750	190	1,200	ND	440	ND	ND	650	1,700	7,910
SB03-12-6-12	ND	ND	ND	250	220	370	150	320	350	ND	460	ND	220	ND	ND	210	620	3,170
SB03-12-12-25	ND	ND	ND	ND	ND	160	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	160
SB03-13-0-6	ND	ND	ND	210	240	410	170	270	350	ND	460	ND	240	ND	ND	210	660	3,220
SB03-13-6-12	210	140	430	1,900	1,600	1,900	980	1,300	2,300	550	2,200	320	1,100	ND	ND	1,700	4,600	21,230
SB03-13-12-28	ND	ND	ND	430	340	510	200	330	580	150	890	ND	290	ND	ND	550	1,200	5,470
SB03-13-12-28(DUP)	ND	ND	ND	300	220	380	ND	310	400	ND	600	ND	220	ND	ND	370	1,100	3,900
SB03-14-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

Sediment Sample ID	Compound Results (µg/kg-dry)																	
	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Pentachlorophenol	Phenanthrene	Pyrene	Total PAHs
SB03-14-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-36-48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-14-48-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-15	NO CORE COLLECTED - NO SEDIMENT PRESENT																	
SB03-16-0-6	ND	ND	ND	290	310	370	ND	270	340	ND	560	ND	ND	ND	ND	200	410	2,750
SB03-16-6-12	410	ND	860	2,600	2,300	3,400	1,800	1,400	3,400	880	6,800	560	1,900	140	ND	1,600	3,700	31,750
SB03-16-12-24	ND	ND	310	740	490	680	400	400	970	240	1,700	ND	460	ND	ND	1,100	1,100	8,590
SB03-16-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-36-48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-48-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-16-60-77	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-17-0-6	ND	ND	140	620	690	720	240	620	690	150	1,200	ND	340	ND	ND	600	1,300	7,310
SB03-17-6-12	ND	ND	ND	150	160	250	65	170	210	ND	360	ND	140	ND	ND	210	400	2,115
SB03-17-12-24	ND	ND	220	530	490	610	350	500	640	190	1,500	110	430	ND	ND	1,200	1,100	7,870
SB03-17-24-36	ND	ND	120	320	360	430	160	340	430	110	970	ND	240	ND	ND	630	870	4,980
SB03-17-36-48	ND	ND	ND	260	300	490	140	190	380	ND	750	ND	220	ND	ND	380	610	3,720
SB03-17-48-60	ND	ND	ND	ND	ND	260	ND	140	190	ND	370	ND	130	ND	ND	180	300	1,570
SB03-17-60-72	ND	ND	ND	ND	ND	230	ND	ND	120	ND	200	ND	ND	ND	ND	ND	160	710
SB03-17-72-84	ND	ND	ND	120	ND	250	ND	110	170	ND	310	ND	130	ND	ND	170	240	1,500
SB03-17-84-96	ND	ND	ND	330	290	460	160	190	440	ND	820	ND	220	ND	ND	490	650	4,050
SB03-17-96-108	ND	ND	ND	340	340	470	150	290	520	ND	830	ND	240	ND	ND	520	840	4,540
SB03-17-108-117	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-18-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-18-6-12	ND	ND	ND	400	380	510	240	310	480	150	1,100	ND	320	ND	ND	560	730	5,180
SB03-18-12-24	ND	ND	160	620	590	680	400	610	750	ND	1,000	ND	440	ND	ND	660	1,200	7,110

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

	Compound Results (µg/kg-dry)																	
Sediment Sample ID	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benz(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b) fluoranthene**	**Benzo(g,h,i) perylene**	**Benzo(k) fluoranthene**	**Chrysene**	**Dibenz(a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Pentachlorophenol**	**Phenanthrene**	**Pyrene**	**Total PAHs**
SB03-18-24-36	ND	ND	ND	360	340	450	ND	430	510	ND	740	ND	ND	ND	ND	430	1,000	4,260
SB03-18-36-48	ND	ND	ND	180	190	280	ND	200	260	ND	360	ND	200	ND	ND	200	360	2,230
SB03-18-48-60	ND	ND	ND	ND	ND	ND	ND	ND	160	ND	250	ND	ND	ND	ND	140	250	800
SB03-18-60-72	ND	ND	ND	160	170	240	ND	190	260	ND	330	ND	190	ND	ND	220	390	2,150
SB03-18-72-84	ND	ND	ND	ND	ND	ND	ND	ND	130	ND	190	ND	ND	ND	ND	120	200	640
SB03-18-84-96	ND	ND	ND	ND	ND	ND	ND	ND	140	ND	250	ND	ND	ND	ND	150	190	730
SB03-18-96-108	ND	ND	ND	200	200	290	150	220	350	ND	400	ND	250	ND	ND	310	500	2,870
SB03-18-108-115	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-0-6	ND	ND	ND	180	150	190	ND	150	250	ND	340	ND	140	ND	ND	180	410	1,990
SB03-19-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-36-48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-48-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-60-72	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-72-96	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-19-96-111	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-20-0-6	ND	ND	ND	140	ND	ND	ND	ND	200	ND	290	ND	ND	ND	ND	ND	250	880
SB03-20-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-20-12-24	ND	ND	110	530	610	740	500	590	800	250	1,300	ND	530	ND	ND	600	1,000	7,560
SB03-20-24-36	ND	ND	ND	280	ND	ND	ND	ND	380	ND	560	ND	ND	ND	ND	ND	550	1,770
SB03-20-36-48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-20-48-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	340	ND	ND	ND	ND	250	260	850
SB03-20-60-72	ND	ND	ND	ND	ND	150	ND	ND	140	ND	230	ND	ND	ND	ND	ND	200	720
SB03-20-72-84	170	ND	440	1,200	1,100	1,400	870	870	1,700	470	3,400	350	980	ND	ND	2,100	1,900	16,950
SB03-20-84-96	ND	ND	170	530	450	610	340	330	790	210	1,300	150	370	ND	ND	820	820	6,890

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

	Compound Results (µg/kg-dry)																	
Sediment Sample ID	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benz(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b) fluoranthene**	**Benzo(g,h,i) perylene**	**Benzo(k) fluoranthene**	**Chrysene**	**Dibenz(a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Pentachlorophenol**	**Phenanthrene**	**Pyrene**	**Total PAHs**
SB03-20-96-110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-21	NO CORE COLLECTED - NO SEDIMENT PRESENT																	
SB03-22-0-6	ND	ND	ND	ND	ND	ND	ND	ND	87	ND	150	ND	ND	ND	ND	ND	130	367
SB03-22-6-12	ND	ND	ND	240	ND	ND	ND	ND	410	ND	500	ND	ND	ND	170	320	600	2,240
SB03-22-12-24	ND	ND	490	1,800	1,600	2,100	1,200	1,300	2,900	750	3,900	ND	1,500	ND	ND	1,900	3,800	23,240
SB03-22-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-36-48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-48-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-60-84	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-22-84-119	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-0-6	ND	ND	ND	ND	ND	290	130	130	ND	ND	150	ND	180	ND	ND	ND	120	1,000
SB03-23-6-12	ND	ND	ND	ND	ND	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	170
SB03-23-12-24	ND	ND	ND	ND	ND	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	170
SB03-23-24-36	ND	ND	ND	ND	ND	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	170
SB03-23-36-48	ND	ND	ND	ND	ND	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	170
SB03-23-48-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-60-72	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-72-84	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-84-96	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-96-108	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-23-108-119	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-0-6	ND	ND	ND	ND	ND	160	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	160
SB03-24-6-12	ND	ND	ND	ND	ND	220	ND	ND	ND	ND	140	ND	ND	ND	ND	ND	130	490
SB03-24-12-24	ND	ND	ND	ND	ND	250	ND	ND	180	ND	240	ND	ND	ND	ND	130	250	1,050
SB03-24-24-36	ND	ND	ND	ND	ND	210	ND	ND	ND	ND	140	ND	ND	ND	ND	ND	130	480
SB03-24-24-36(DUP)	ND	ND	ND	ND	ND	200	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

Sediment Sample ID	Compound Results (µg/kg-dry)																	
	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Pentachlorophenol	Phenanthrene	Pyrene	Total PAHs
SB03-24-36-48	ND	ND	ND	ND	ND	190	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	190
SB03-24-48-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-60-72	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-72-84	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-84-96	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-24-96-105	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-25-0-6	ND	ND	ND	210	260	400	140	240	300	ND	530	ND	220	ND	ND	250	510	3,060
SB03-25-6-12	ND	ND	ND	ND	ND	230	ND	ND	160	ND	270	ND	120	ND	ND	130	250	1,160
SB03-25-12-24	ND	ND	ND	110	120	220	ND	150	180	ND	300	ND	120	ND	ND	150	300	1,650
SB03-25-24-36	ND	ND	ND	180	200	380	ND	170	280	ND	480	ND	170	ND	ND	220	430	2,510
SB03-25-36-48	ND	ND	ND	ND	ND	230	ND	120	150	ND	280	ND	ND	ND	ND	150	220	1,150
SB03-25-36-48(DUP)	ND	ND	ND	160	ND	ND	ND	ND	210	ND	290	ND	ND	ND	ND	240	340	1,240
SB03-25-48-60	ND	ND	ND	ND	ND	250	ND	ND	150	ND	230	ND	ND	ND	ND	150	190	970
SB03-25-60-72	ND	ND	ND	250	310	470	170	240	480	ND	730	ND	260	ND	ND	440	670	4,020
SB03-25-72-84	ND	ND	ND	ND	ND	230	ND	ND	160	ND	250	ND	ND	ND	ND	ND	200	840
SB03-25-84-96	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-25-96-111	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-26-0-6	ND	ND	280	480	1,100	880	660	440	1,400	250	1,600	150	640	ND	ND	880	1,700	10,460
SB03-26-6-12	ND	ND	490	1,100	1,200	990	650	980	1,400	350	1,700	230	720	ND	ND	1,100	2,000	12,910
SB03-26-12-24	ND	ND	ND	1,400	2,400	1,100	1,000	1,100	1,700	630	3,300	ND	910	ND	ND	ND	2,900	16,440
SB03-26-24-36	ND	ND	ND	ND	ND	110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110
SB03-26-36-48	110	140	540	1,100	2,100	1,900	1,200	1,800	3,400	420	3,300	200	970	ND	ND	1,200	2,700	21,080
SB03-26-48-65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-27	NO CORE COLLECTED - NO SEDIMENT PRESENT																	
SB03-28-0-6	200	ND	590	1,800	1,800	2,200	1,400	1,800	2,400	670	4,700	240	1,600	ND	ND	2,500	3,000	24,900
SB03-28-6-12	ND	ND	280	1,200	1,100	1,400	920	1,100	1,500	420	2,600	110	980	ND	ND	1,400	1,900	14,910

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

	Compound Results (µg/kg-dry)																	
Sediment Sample ID	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benz(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b) fluoranthene**	**Benzo(g,h,i) perylene**	**Benzo(k) fluoranthene**	**Chrysene**	**Dibenz(a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Pentachlorophenol**	**Phenanthrene**	**Pyrene**	**Total PAHs**
SB03-28-12-24	ND	ND	ND	220	210	410	170	350	300	ND	150	ND	240	ND	ND	ND	130	2,180
SB03-28-24-36	110	ND	100	430	200	600	330	570	520	ND	1,200	150	400	ND	ND	1,300	1,000	6,910
SB03-28-36-48	ND	ND	ND	420	410	580	260	320	480	140	1,000	ND	320	ND	ND	510	760	5,200
SB03-28-48-60	ND	ND	ND	ND	ND	220	ND	ND	140	ND	220	ND	120	ND	ND	ND	180	880
SB03-28-60-72	ND	ND	ND	ND	ND	230	ND	ND	150	ND	260	ND	120	ND	ND	120	200	1,080
SB03-28-72-84	ND	ND	ND	180	180	290	ND	160	250	ND	450	ND	160	ND	ND	250	300	2,220
SB03-28-84-96	190	ND	590	920	820	840	340	590	870	210	2,600	310	440	ND	ND	2,200	1,700	12,620
SB03-28-96-111	ND	ND	ND	ND	ND	190	ND	ND	120	ND	220	ND	ND	ND	ND	140	170	840
SB03-29-0-6	ND	ND	180	400	310	470	160	140	520	ND	930	ND	240	ND	ND	210	960	4,520
SB03-29-6-12	ND	ND	ND	ND	ND	220	ND	ND	ND	ND	200	ND	ND	ND	ND	ND	170	590
SB03-29-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-36-48	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-48-72	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-29-72-94	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-30-0-6	ND	ND	ND	330	330	490	190	370	410	120	710	ND	270	ND	ND	290	530	4,040
SB03-30-6-12	ND	130	360	1,400	1,300	1,600	570	640	1,500	310	2,800	140	650	ND	ND	1,100	2,000	14,500
SB03-30-12-24	ND	ND	ND	260	280	400	150	220	330	ND	650	ND	220	ND	ND	350	440	3,300
SB03-30-24-36	ND	ND	ND	120	ND	260	67	ND	170	ND	280	ND	130	ND	ND	140	220	1,387
SB03-30-36-48	ND	ND	ND	140	140	340	ND	ND	190	ND	360	ND	150	ND	ND	160	290	1,770
SB03-30-48-60	ND	ND	ND	ND	330	420	200	310	ND	130	910	ND	260	ND	ND	440	660	3,660
SB03-30-60-72	ND	ND	110	300	290	410	140	240	380	ND	760	57	210	ND	ND	470	660	4,027
SB03-30-72-84	120	ND	290	700	600	680	340	580	790	190	1,700	170	390	ND	ND	1,100	1,400	9,050
SB03-30-84-110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-31-0-6	ND	ND	230	970	710	1,600	780	850	1,200	360	2,400	120	870	ND	ND	1,200	1,900	13,190
SB03-31-6-12	ND	ND	ND	98	ND	640	360	440	150	160	310	ND	420	ND	ND	140	230	2,948

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

Sediment Sample ID	Compound Results (µg/kg-dry)																	
	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Pentachlorophenol	Phenanthrene	Pyrene	Total PAHs
SB03-31-12-24	ND	ND	ND	180	ND	610	330	340	390	160	500	ND	390	ND	ND	450	390	3,740
SB03-31-24-36	ND	ND	ND	130	ND	540	330	410	210	170	390	ND	400	ND	ND	220	320	3,120
SB03-31-36-48	ND	ND	ND	ND	ND	230	ND	120	ND	ND	180	ND	130	ND	ND	ND	180	840
SB03-31-48-60	ND	ND	ND	150	ND	330	ND	180	220	ND	340	ND	170	ND	ND	200	350	1,940
SB03-31-60-72	190	ND	300	640	560	730	360	460	770	190	1,700	190	410	440	ND	2,000	1,700	10,640
SB03-31-72-84	ND	ND	170	420	390	520	180	280	510	ND	960	ND	260	ND	ND	890	1,100	5,680
SB03-31-84-96	ND	ND	ND	290	280	390	150	240	400	ND	700	ND	200	ND	ND	550	830	4,030
SB03-31-96-112	ND	ND	ND	ND	ND	130	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	92	222
SB03-32-0-6	ND	ND	210	710	690	800	390	700	1,000	220	1,300	130	490	ND	ND	760	1,700	9,100
SB03-32-6-12	ND	ND	140	520	460	620	320	470	620	190	960	ND	400	ND	ND	600	1,200	6,500
SB03-32-12-24	220	ND	390	860	770	840	410	520	1,000	240	1,300	290	480	ND	ND	1,400	2,600	11,320
SB03-32-24-36	ND	ND	ND	240	220	270	ND	210	320	ND	360	ND	150	ND	ND	160	440	2,370
SB03-33-0-6	190	ND	500	1,400	1,400	1,400	660	1,200	1,700	350	3,000	250	820	ND	ND	2,300	3,400	18,570
SB03-33-6-12	ND	ND	200	800	850	1,000	540	810	1,100	250	1,800	140	610	ND	ND	1,000	2,200	11,300
SB03-33-12-24	120	ND	250	1,000	1,100	1,200	580	990	1,300	320	2,000	160	680	ND	ND	1,200	2,700	13,600
SB03-33-24-36	410	82	1,900	9,500	6,000	7,100	1,400	2,500	9,600	930	17,000	910	1,800	ND	ND	11,000	16,000	86,132
SB03-34-0-6	ND	ND	ND	ND	ND	150	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	150
SB03-34-6-12	ND	ND	400	940	2,000	1,000	950	820	1,400	590	2,000	210	860	ND	ND	980	2,200	14,350
SB03-34-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	ND	ND	ND	ND	ND	ND	110
SB03-34-24-36	ND	ND	ND	ND	ND	130	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	130
SB03-35-0-6	ND	ND	270	540	1,200	1,100	940	1,100	1,800	340	2,400	ND	910	ND	ND	980	1,900	13,480
SB03-35-6-12	ND	ND	180	360	660	510	300	570	870	140	1,400	ND	330	ND	ND	610	980	6,910
SB03-35-12-24	ND	ND	ND	ND	ND	200	ND	ND	ND	ND	150	ND	ND	ND	ND	ND	150	500
SB03-35-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-36-0-6	230	ND	560	1,300	1,300	1,300	610	840	1,400	330	2,300	240	710	ND	ND	1,800	3,500	16,420
SB03-36-6-12	ND	ND	ND	ND	ND	150	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	150

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

	Compound Results (µg/kg-dry)																	
Sediment Sample ID	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benz(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b) fluoranthene**	**Benzo(g,h,i) perylene**	**Benzo(k) fluoranthene**	**Chrysene**	**Dibenz(a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Pentachlorophenol**	**Phenanthrene**	**Pyrene**	**Total PAHs**
SB03-36-12-24	ND	ND	ND	110	110	230	ND	ND	140	ND	270	ND	130	ND	ND	150	270	1,410
SB03-36-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-37-0-6	110	ND	240	970	970	1,100	460	850	1,300	240	2,200	150	530	ND	ND	1,300	2,500	12,920
SB03-37-6-12	ND	ND	160	490	510	650	260	460	660	140	1,200	110	330	ND	ND	750	1,400	7,120
SB03-37-12-24	ND	ND	200	600	590	670	280	550	760	170	1,400	160	350	ND	ND	1,000	1,800	8,530
SB03-37-24-36	170	210	440	1,400	1,300	1,200	620	1,100	1,500	360	2,200	320	750	ND	ND	1,500	3,100	16,170
SB03-37-24-36(DUP)	570	110	960	2,300	2,100	2,400	1,100	1,200	2,400	550	3,900	810	1,300	490	ND	11,000	14,000	45,190
SB03-38-0-6	ND	ND	260	ND	ND	91	ND	ND	140	ND	ND	ND	ND	ND	ND	ND	ND	491
SB03-38-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-38-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-38-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-39-0-6	ND	ND	ND	ND	ND	280	ND	ND	150	ND	240	ND	130	ND	ND	150	220	1,170
SB03-39-6-12	ND	ND	ND	ND	ND	170	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	170
SB03-39-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-39-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-39-24-36(DUP)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-40-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-40-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-40-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-40-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-41-0-6	ND	ND	190	690	630	810	460	630	910	240	1,200	170	540	ND	ND	900	1,700	9,070
SB03-41-6-12	340	170	1,000	2,400	2,000	2,200	1,100	1,200	2,400	630	4,000	630	1,300	ND	ND	3,400	4,900	27,670
SB03-41-12-24	93	ND	160	530	390	580	270	580	600	160	1,200	160	360	ND	ND	820	1,200	7,103
SB03-41-24-42	ND	ND	ND	120	ND	190	ND	110	120	ND	280	ND	89	ND	ND	200	250	1,359
SB03-42-0-6	220	ND	680	1,200	1,100	1,100	590	890	1,400	330	2,500	370	710	ND	ND	1,700	2,900	15,690
SB03-42-6-12	130	150	550	1,400	1,300	1,500	610	1,200	1,600	370	2,300	260	790	ND	ND	1,400	3,100	16,660

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

Sediment Sample ID	Compound Results (µg/kg-dry)																	
	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene	Chrysene	Dibenz(a,h) anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-cd)pyrene	Naphthalene	Pentachlorophenol	Phenanthrene	Pyrene	Total PAHs
SB03-42-12-24	ND	ND	160	490	510	600	240	420	610	160	1,100	150	340	ND	ND	900	1,300	6,980
SB03-42-24-36	ND	ND	170	740	630	880	400	530	840	230	1,400	130	510	ND	ND	960	1,700	9,120
SB03-43-0-9	ND	ND	ND	ND	ND	110	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	110
SB03-43-9-16	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-43-16-28	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-43-28-41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-44-0-6	ND	ND	ND	ND	ND	160	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	160
SB03-44-6-14	ND	ND	ND	150	150	310	ND	160	230	ND	370	ND	140	ND	ND	280	330	2,120
SB03-44-14-26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-44-26-34	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-45-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-45-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-45-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-45-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-46-0-6	ND	ND	150	650	530	500	350	470	500	ND	460	ND	590	ND	ND	390	1,200	5,790
SB03-46-6-12	ND	ND	ND	190	170	160	ND	150	130	ND	190	ND	200	ND	ND	150	340	1,680
SB03-46-12-24	300	ND	340	1,500	1,400	1,200	860	1,100	1,500	300	3,100	300	810	ND	ND	2,400	3,000	18,110
SB03-47-0-6	ND	ND	ND	250	240	230	170	230	200	ND	250	ND	310	ND	ND	180	380	2,440
SB03-47-6-12	ND	ND	ND	170	160	140	ND	130	140	ND	200	ND	220	ND	ND	160	280	1,600
SB03-47-12-24	ND	ND	190	870	740	700	490	650	680	ND	570	ND	810	ND	ND	440	1,400	7,540
SB03-48-0-13	ND	ND	130	430	320	280	170	290	270	ND	270	ND	420	ND	ND	300	820	3,700
SB03-49-0-6	ND	ND	ND	350	310	320	210	320	250	ND	300	ND	350	ND	110	180	590	3,290
SB03-50	NO CORE COLLECTED - NO SEDIMENT PRESENT																	
SB03-51-0-6	ND	ND	ND	400	370	430	310	370	330	ND	280	ND	630	ND	ND	180	770	4,070
SB03-52-0-6	370	ND	200	440	390	380	210	340	500	130	1,200	180	280	ND	ND	480	910	6,010
SB03-54-12-24	170	ND	240	1,400	1,200	1,300	760	780	1,300	260	2,300	190	840	ND	ND	710	2,700	14,150

Table 3.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - PAH Data

	Compound Results (µg/kg-dry)																	
Sediment Sample ID	**Acenaphthene**	**Acenaphthylene**	**Anthracene**	**Benz(a)anthracene**	**Benzo(a)pyrene**	**Benzo(b) fluoranthene**	**Benzo(g,h,i) perylene**	**Benzo(k) fluoranthene**	**Chrysene**	**Dibenz(a,h) anthracene**	**Fluoranthene**	**Fluorene**	**Indeno(1,2,3-cd)pyrene**	**Naphthalene**	**Pentachlorophenol**	**Phenanthrene**	**Pyrene**	**Total PAHs**
SB03-53A-0-6	490	ND	720	2,100	2,100	1,700	860	2,200	2,500	460	3,300	670	1,000	410	ND	4,300	6,800	29,610
SB03-53A-6-12	130	ND	150	570	570	780	290	270	840	160	1,100	270	350	ND	ND	1,000	1,800	8,280
SB03-53A-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	320	ND	ND	ND	ND	620	220	1,160
SB03-53A-24-36	ND	ND	ND	1,000	990	1,300	630	600	1,500	320	560	480	690	ND	ND	ND	3,500	11,570
SB03-54A-0-6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-54A-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-54A-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-54A-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-0-6	ND	ND	ND	440	900	530	280	360	940	ND	980	ND	330	ND	ND	ND	1,300	6,060
SB03-55A-6-12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-12-24	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-12-24(DUP)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
SB03-55A-24-36	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

1. Non-detect values ranged from 11 to 34 ug/kg.
2. Total PAH concentrations were computed by summing individual component results. ND results treated as zero in the sum.
3. DUP = duplicate field or analytical sample.
4. Sediment Sample ID: First portion after the "SB03" designation identifies core location, and last two numbers signify depth discrete interval, e.g., "0-6" indicates 0 to 6 inch interval.

Table 3.3

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Total Lead Data

Sediment Sample ID	Results (mg/kg-dry)
SB03-01-0-6	94
SB03-01-6-12	120
SB03-01-12-18	120
SB03-01-18-24	120
SB03-02-0-6	120
SB03-02-6-12	160
SB03-02-12-18	90
SB03-02-18-24	32
SB03-03-0-6	120
SB03-03-6-12	140
SB03-03-12-18	170
SB03-03-18-24	170
SB03-04-0-6	120
SB03-04-6-12	160
SB03-04-12-18	28
SB03-04-18-24	11 J
SB03-05-0-6	150
SB03-05-6-12	77
SB03-05-12-18	20
SB03-05-18-24	12 J
SB03-06-0-6	100
SB03-06-6-12	120
SB03-06-12-18	30
SB03-06-18-24	8.8
SB03-07-0-6	100
SB03-07-6-12	180
SB03-07-12-24	260
SB03-07-12-24(DUP)	260
SB03-07-24-36	250
SB03-08-0-6	160
SB03-08-6-12	290
SB03-08-12-24	190
SB03-08-24-32	15
SB03-09-0-6	120
SB03-09-6-12	170
SB03-09-12-24	240
SB03-09-24-32	100
SB03-10-0-6	180
SB03-10-6-12	120
SB03-10-12-18	5.3 J
SB03-11-0-6	130
SB03-11-6-12	200
SB03-11-12-22	190
SB03-12-0-6	160
SB03-12-6-12	140
SB03-12-12-25	30
SB03-13-0-6	180
SB03-13-6-12	260
SB03-25-72-84	77
SB03-25-84-96	49
SB03-25-96-111	4 J
SB03-26-0-6	270
SB03-13-12-28	420
SB03-13-12-28(DUP)	370
SB03-14-0-6	16
SB03-14-6-12	11
SB03-14-12-24	7.4
SB03-14-24-36	3.5 J
SB03-14-36-48	11
SB03-14-48-60	10
SB03-15	See Note 3
SB03-16-0-6	270
SB03-16-6-12	390
SB03-16-12-24	220
SB03-16-24-36	110
SB03-16-36-48	15
SB03-16-48-60	12
SB03-16-60-77	9.5
SB03-17-0-6	190
SB03-17-6-12	180
SB03-17-12-24	160
SB03-17-24-36	200
SB03-17-36-48	270
SB03-17-48-60	260
SB03-17-60-72	290
SB03-17-72-84	260
SB03-17-84-96	260
SB03-17-96-108	190
SB03-17-108-117	8.5
SB03-18-0-6	120
SB03-18-6-12	170
SB03-18-12-24	230
SB03-18-24-36	230
SB03-18-36-48	230
SB03-18-48-60	250
SB03-18-60-72	260
SB03-18-72-84	210
SB03-18-84-96	270
SB03-18-96-108	210
SB03-18-108-115	7.7
SB03-19-0-6	280
SB03-19-6-12	26
SB03-19-12-24	7.6 J
SB03-19-24-36	6.7 J
SB03-19-36-48	5.7 J
SB03-19-48-60	5.6 J
SB03-19-60-72	2.9 J
SB03-19-72-96	4.9 J
SB03-19-96-111	4.5 J
SB03-20-0-6	110
SB03-32-6-12	150
SB03-32-12-24	300
SB03-32-24-36	82
SB03-33-0-6	86
SB03-20-6-12	220
SB03-20-12-24	210
SB03-20-24-36	210
SB03-20-36-48	250
SB03-20-48-60	380
SB03-20-60-72	270
SB03-20-72-84	300
SB03-20-84-96	470
SB03-20-96-110	130
SB03-21	See Note 3
SB03-22-0-6	100
SB03-22-6-12	230
SB03-22-12-24	160
SB03-22-24-36	22
SB03-22-36-48	12
SB03-22-48-60	12
SB03-22-60-84	6.5
SB03-22-84-119	7.4
SB03-23-0-6	160
SB03-23-6-12	160
SB03-23-12-24	200
SB03-23-24-36	300
SB03-23-36-48	270
SB03-23-48-60	12
SB03-23-60-72	10
SB03-23-72-84	8.1
SB03-23-84-96	5.3 J
SB03-23-96-108	4.8 J
SB03-23-108-119	6.2
SB03-24-0-6	270
SB03-24-6-12	280
SB03-24-12-24	250
SB03-24-24-36	290
SB03-24-24-36(DUP)	250
SB03-24-36-48	270
SB03-24-48-60	56
SB03-24-60-72	6.2 J
SB03-24-72-84	5.3 J
SB03-24-84-96	5.6 J
SB03-24-96-105	5.3 J
SB03-25-0-6	120
SB03-25-6-12	170
SB03-25-12-24	220
SB03-25-24-36	230
SB03-25-36-48	250
SB03-25-36-48(DUP)	230
SB03-25-48-60	240
SB03-25-60-72	340
SB03-43-28-41	7.5
SB03-44-0-6	220
SB03-44-6-14	380
SB03-44-14-26	8.7

Table 3.3

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Total Lead Data

Sediment Sample ID	Results (mg/kg-dry)
SB03-26-6-12	370
SB03-26-12-24	330
SB03-26-24-36	25
SB03-26-36-48	10
SB03-26-48-65	9.6
SB03-27	See Note 3
SB03-28-0-6	100
SB03-28-6-12	120
SB03-28-12-24	120
SB03-28-24-36	220
SB03-28-24-36	230
SB03-28-36-48	290
SB03-28-48-60	250
SB03-28-60-72	270
SB03-28-72-84	250
SB03-28-84-96	260
SB03-28-96-111	170
SB03-29-0-6	300
SB03-29-6-12	160
SB03-29-12-24	61
SB03-29-24-36	7.4 J
SB03-29-36-48	3.6 J
SB03-29-48-72	3.6 J
SB03-29-72-94	2.1 J
SB03-30-0-6	170
SB03-30-6-12	130
SB03-30-12-24	210
SB03-30-24-36	210
SB03-30-36-48	260
SB03-30-48-60	320
SB03-30-60-72	260
SB03-30-72-84	280
SB03-30-84-110	5.5 J
SB03-31-0-6	110
SB03-31-6-12	110
SB03-31-12-24	170
SB03-31-24-36	210
SB03-31-36-48	260
SB03-31-48-60	290
SB03-31-60-72	270
SB03-31-72-84	260
SB03-31-84-96	260
SB03-31-96-112	60
SB03-32-0-6	170

Sediment Sample ID	Results (mg/kg-dry)
SB03-33-6-12	130
SB03-33-12-24	160
SB03-33-24-36	84
SB03-34-0-6	180
SB03-34-6-12	320
SB03-34-12-24	60
SB03-34-24-36	6.5 J
SB03-35-0-6	84
SB03-35-6-12	120
SB03-35-12-24	130
SB03-35-24-36	11 J
SB03-36-0-6	220
SB03-36-6-12	35
SB03-36-12-24	8.6
SB03-36-24-36	8.7
SB03-37-0-6	110
SB03-37-6-12	140
SB03-37-12-24	290
SB03-37-24-36	180
SB03-37-24-36(DUP)	530
SB03-38-0-6	5.6
SB03-38-6-12	6.2
SB03-38-12-24	6.9
SB03-38-24-36	6.6
SB03-39-0-6	370
SB03-39-6-12	320
SB03-39-12-24	18
SB03-39-24-36	22
SB03-39-24-36(DUP)	18
SB03-40-0-6	10
SB03-40-6-12	11
SB03-40-12-24	12
SB03-40-24-36	11
SB03-41-0-6	350
SB03-41-6-12	290
SB03-41-12-24	58
SB03-41-24-42	13
SB03-42-0-6	610
SB03-42-6-12	370
SB03-42-12-24	310
SB03-42-24-36	340
SB03-43-0-9	27
SB03-43-9-16	8
SB03-43-16-28	8.3

Sediment Sample ID	Results (mg/kg-dry)
SB03-44-26-34	8.5
SB03-45-0-6	14
SB03-45-6-12	14
SB03-45-12-24	8.5
SB03-45-24-36	7.6
SB03-46-0-6	85
SB03-46-6-12	300
SB03-46-12-24	180
SB03-47-0-6	200
SB03-47-6-12	270
SB03-47-12-24	230
SB03-48-0-13	110
SB03-49-0-6	44
SB03-50	See Note 3
SB03-51-0-6	38
SB03-52-0-6	13
SB03-53A-0-6	680
SB03-53A-6-12	400
SB03-53A-12-24	480
SB03-53A-24-36	400
SB03-54-12-24	190
SB03-54A-0-6	13
SB03-54A-6-12	15
SB03-54A-12-24	15
SB03-54A-24-36	14
SB03-55A-0-6	320
SB03-55A-6-12	34
SB03-55A-12-24(DUP)	13
SB03-55A-12-24	18
SB03-55A-24-36	7.1

Notes:

1. DUP = duplicate field or analytical sample.
2. J = Estimated value. Lead was detected in all samples.
3. No core collected because no sediment present.
4. Sediment Sample ID: First portion after the "SB03" designation identifies core location, and last two numbers signify depth discrete interval, e.g., "0-6" indicates 0 to 6 inch interval.

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)
SB03-01-0-6	1	1.1	1	0	6	613	ND (23)	94
SB03-01-6-12	1	1.1	1	6	12	1,320	ND (22)	120
SB03-01-12-18	1	1.1	1	12	18	490	ND (21)	120
SB03-01-18-24	1	1.1	1	18	24	ND (41)	ND (21)	120
SB03-02-0-6	2	1.5	1	0	6	1,740	1,740	120
SB03-02-6-12	2	1.5	1	6	12	ND (42)	ND (21)	160
SB03-02-12-18	2	1.5	1	12	18	490	ND (21)	90
SB03-02-18-24	2	1.5	1	18	24	ND (42)	ND (21)	32
SB03-03-0-6	3	1.8	1	0	6	1,660	6,690	120
SB03-03-6-12	3	1.8	1	6	12	1,020	6,440	140
SB03-03-12-18	3	1.8	1	12	18	930	ND (22)	170
SB03-03-18-24	3	1.8	1	18	24	200	ND (23)	170
SB03-04-0-6	4	2	1	0	6	1,900	ND (22)	120
SB03-04-6-12	4	2	1	6	12	1,060	ND (22)	160
SB03-04-12-18	4	2	1	12	18	ND (52)	ND (26)	28
SB03-04-18-24	4	2	1	18	24	ND (68)	ND (34)	11 J
SB03-05-0-6	5	3	1	0	6	1,810	1,000	150
SB03-05-6-12	5	3	1	6	12	610	ND (23)	77
SB03-05-12-18	5	3	1	12	18	ND (61)	ND (30)	20
SB03-05-18-24	5	3	1	18	24	ND (64)	ND (32)	12 J
SB03-06-0-6	6	3.1	1	0	6	1,240	7,480	100
SB03-06-6-12	6	3.1	1	6	12	ND (33)	ND (17)	120
SB03-06-12-18	6	3.1	1	12	18	ND (31)	ND (15)	30
SB03-06-18-24	6	3.1	1	18	24	870	ND (12)	8.8
SB03-07-0-6	7	3.45	2	0	6	ND (34)	11,860	100
SB03-07-6-12	7	3.45	2	6	12	1,270	2,160	180
SB03-07-12-24	7	3.45	2	12	24	ND (45)	4,860	260
SB03-07-12-24(DUP)	7	3.45	2	12	24(DUP)	3,300	14,450	260
SB03-07-24-36	7	3.45	2	24	36	3,320	11,580	250
SB03-08-0-6	8	3.52	2	0	6	3,160	12,060	160
SB03-08-6-12	8	3.52	2	6	12	434	8,780	290
SB03-08-12-24	8	3.52	2	12	24	ND (43)	6,140	190
SB03-08-24-32	8	3.52	2	24	32	ND (52)	ND (26)	15
SB03-09-0-6	9	3.5	2	0	6	1,770	ND (19)	120
SB03-09-6-12	9	3.5	2	6	12	810	ND (19)	170
SB03-09-12-24	9	3.5	2	12	24	ND (42)	ND (21)	240
SB03-09-24-32	9	3.5	2	24	32	ND (52)	ND (25)	100
SB03-10-0-6	10	3.88	2	0	6	5,400	ND (19)	180
SB03-10-6-12	10	3.88	2	6	12	1,060	1,760	120
SB03-10-12-18	10	3.88	2	12	18	ND (47)	ND (24)	5.3 J
SB03-11-0-6	11	3.95	2	0	6	870	1,680	130
SB03-11-6-12	11	3.95	2	6	12	690	1,030	200
SB03-11-12-22	11	3.95	2	12	22	3,430	1,490	190
SB03-12-0-6	12	4.05	2	0	6	860	7,910	160
SB03-12-6-12	12	4.05	2	6	12	306	3,170	140
SB03-12-12-25	12	4.05	2	12	25	ND (39)	160	30
SB03-13-0-6	13	4.1	2	0	6	1,120	3,220	180
SB03-13-6-12	13	4.1	2	6	12	ND (41)	21,230	260

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)
SB03-13-12-28	13	4.1	2	12	28	ND (44)	5,470	420
SB03-13-12-28(DUP)	13	4.1	2	12	28(DUP)	ND (43)	3,900	370
SB03-14-0-6	14	4.16	2	0	6	ND (26)	ND (13)	16
SB03-14-6-12	14	4.16	2	6	12	ND (26)	ND (13)	11
SB03-14-12-24	14	4.16	2	12	24	ND (24)	ND (12)	7.4
SB03-14-24-36	14	4.16	2	24	36	ND (23)	ND (12)	3.5 J
SB03-14-36-48	14	4.16	2	36	48	ND (25)	ND (12)	11
SB03-14-48-60	14	4.16	2	48	60	ND (25)	ND (13)	10
SB03-15	15	NO CORE COLLECTED - NO SEDIMENT PRESENT						
SB03-16-0-6	16	4.16	2	0	6	700	2,750	270
SB03-16-6-12	16	4.16	2	6	12	ND (43)	31,750	390
SB03-16-12-24	16	4.16	2	12	24	ND (41)	8,590	220
SB03-16-24-36	16	4.16	2	24	36	ND (36)	ND (18)	110
SB03-16-36-48	16	4.16	2	36	48	ND (28)	ND (14)	15
SB03-16-48-60	16	4.16	2	48	60	ND (29)	ND (14)	12
SB03-16-60-77	16	4.16	2	60	77	ND (26)	ND (13)	9.5
SB03-17-0-6	17	4.35	2	0	6	332	7,310	190
SB03-17-6-12	17	4.35	2	6	12	570	2,115	180
SB03-17-12-24	17	4.35	2	12	24	670	7,870	160
SB03-17-24-36	17	4.35	2	24	36	1,140	4,980	200
SB03-17-36-48	17	4.35	2	36	48	1,230	3,720	270
SB03-17-48-60	17	4.35	2	48	60	2,410	1,570	260
SB03-17-60-72	17	4.35	2	60	72	12,100	710	290
SB03-17-72-84	17	4.35	2	72	84	9,700	1,500	260
SB03-17-84-96	17	4.35	2	84	96	440	4,050	260
SB03-17-96-108	17	4.35	2	96	108	510	4,540	190
SB03-17-108-117	17	4.35	2	108	117	ND (28)	ND (14)	8.5
SB03-18-0-6	18	4.35	2	0	6	1,300	ND (17)	120
SB03-18-6-12	18	4.35	2	6	12	3,500	5,180	170
SB03-18-12-24	18	4.35	2	12	24	1,090	7,110	230
SB03-18-24-36	18	4.35	2	24	36	4,770	4,260	230
SB03-18-36-48	18	4.35	2	36	48	6,600	2,230	230
SB03-18-48-60	18	4.35	2	48	60	14,740	800	250
SB03-18-60-72	18	4.35	2	60	72	16,700	2,150	260
SB03-18-72-84	18	4.35	2	72	84	12,900	640	210
SB03-18-84-96	18	4.35	2	84	96	370	730	270
SB03-18-96-108	18	4.35	2	96	108	280	2,870	210
SB03-18-108-115	18	4.35	2	108	115	ND (26)	ND (13)	7.7
SB03-19-0-6	19	4.35	2	0	6	ND (36)	1,190	280
SB03-19-6-12	19	4.35	2	6	12	ND (42)	ND (21)	26
SB03-19-12-24	19	4.35	2	12	24	ND (50)	ND (24)	7.6 J
SB03-19-24-36	19	4.35	2	24	36	ND (44)	ND (23)	6.7 J
SB03-19-36-48	19	4.35	2	36	48	ND (38)	ND (19)	5.7 J
SB03-19-48-60	19	4.35	2	48	60	ND (34)	ND (17)	5.6 J
SB03-19-60-72	19	4.35	2	60	72	ND (27)	ND (13)	2.9 J
SB03-19-72-96	19	4.35	2	72	96	ND (31)	ND (15)	4.9 J
SB03-19-96-111	19	4.35	2	96	111	ND (30)	ND (14)	4.5 J
SB03-20-0-6	20	4.45	2	0	6	840	880	110

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)
SB03-20-6-12	20	4.45	2	6	12	660	ND (16)	220
SB03-20-12-24	20	4.45	2	12	24	2,530	7,560	210
SB03-20-24-36	20	4.45	2	24	36	1,960	1,770	210
SB03-20-36-48	20	4.45	2	36	48	2,400	ND (18)	250
SB03-20-48-60	20	4.45	2	48	60	1,210	850	380
SB03-20-60-72	20	4.45	2	60	72	45,800	720	270
SB03-20-72-84	20	4.45	2	72	84	970	16,950	300
SB03-20-84-96	20	4.45	2	84	96	1,760	6,890	470
SB03-20-96-110	20	4.45	2	96	110	ND (32)	ND (16)	130
SB03-21	21	NO CORE COLLECTED - NO SEDIMENT PRESENT						
SB03-22-0-6	22	4.45	2	0	6	860	367	100
SB03-22-6-12	22	4.45	2	6	12	760	2,240	230
SB03-22-12-24	22	4.45	2	12	24	171	23,240	160
SB03-22-24-36	22	4.45	2	24	36	ND (27)	ND (13)	22
SB03-22-36-48	22	4.45	2	36	48	ND (26)	ND (14)	12
SB03-22-48-60	22	4.45	2	48	60	ND (25)	ND (13)	12
SB03-22-60-84	22	4.45	2	60	84	ND (24)	ND (11)	6.5
SB03-22-84-119	22	4.45	2	84	119	ND (24)	ND (12)	7.4
SB03-23-0-6	23	4.6	2	0	6	450	1,000	160
SB03-23-6-12	23	4.6	2	6	12	1,090	170	160
SB03-23-12-24	23	4.6	2	12	24	2,600	170	200
SB03-23-24-36	23	4.6	2	24	36	91,000	170	300
SB03-23-36-48	23	4.6	2	36	48	430	170	270
SB03-23-48-60	23	4.6	2	48	60	ND (25)	ND (13)	12
SB03-23-60-72	23	4.6	2	60	72	ND (26)	ND (13)	10
SB03-23-72-84	23	4.6	2	72	84	ND (24)	ND (12)	8.1
SB03-23-84-96	23	4.6	2	84	96	ND (24)	ND (12)	5.3 J
SB03-23-96-108	23	4.6	2	96	108	ND (24)	ND (12)	4.8 J
SB03-23-108-119	23	4.6	2	108	119	ND (24)	ND (12)	6.2
SB03-24-0-6	24	4.6	2	0	6	2,130	160	270
SB03-24-6-12	24	4.6	2	6	12	6,410	490	280
SB03-24-12-24	24	4.6	2	12	24	13,700	1,050	250
SB03-24-24-36	24	4.6	2	24	36	2,270	480	290
SB03-24-24-36(DUP)	24	4.6	2	24	36(DUP)	1,950	200	250
SB03-24-36-48	24	4.6	2	36	48	520	190	270
SB03-24-48-60	24	4.6	2	48	60	680	ND (15)	56
SB03-24-60-72	24	4.6	2	60	72	ND (29)	ND (15)	6.2 J
SB03-24-72-84	24	4.6	2	72	84	ND (27)	ND (14)	5.3 J
SB03-24-84-96	24	4.6	2	84	96	ND (25)	ND (13)	5.6 J
SB03-24-96-105	24	4.6	2	96	105	ND (U)	ND (12)	5.3 J
SB03-25-0-6	25	4.6	2	0	6	1,230	3,060	120
SB03-25-6-12	25	4.6	2	6	12	730	1,160	170
SB03-25-12-24	25	4.6	2	12	24	2,220	1,650	220
SB03-25-24-36	25	4.6	2	24	36	3,880	2,510	230
SB03-25-36-48	25	4.6	2	36	48	26,800	1,150	250
SB03-25-36-48(DUP)	25	4.6	2	36	48(DUP)	16,600	1,240	230
SB03-25-48-60	25	4.6	2	48	60	1,200	970	240
SB03-25-60-72	25	4.6	2	60	72	1,160	420	340

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)
SB03-25-72-84	25	4.6	2	72	84	470	840	77
SB03-25-84-96	25	4.6	2	84	96	ND (U)	ND (14)	49
SB03-25-96-111	25	4.6	2	96	111	ND (U)	ND (12)	4 J
SB03-26-0-6	26	4.75	2	0	6	2,100	10,460	270
SB03-26-6-12	26	4.75	2	6	12	1,520	12,910	370
SB03-26-12-24	26	4.75	2	12	24	950	16,440	330
SB03-26-24-36	26	4.75	2	24	36	ND (26)	110	25
SB03-26-36-48	26	4.75	2	36	48	ND (24)	21,080	10
SB03-26-48-65	26	4.75	2	48	65	ND (24)	ND (12)	9.6
SB03-27	27	NO CORE COLLECTED - NO SEDIMENT PRESENT						
SB03-28-0-6	28	4.75	2	0	6	3,100	24,900	100
SB03-28-6-12	28	4.75	2	6	12	ND (31)	1,080	120
SB03-28-12-24	28	4.75	2	12	24	3,690	2,180	120
SB03-28-24-36	28	4.75	2	24	36	1,810	6,910	220
SB03-28-36-48	28	4.75	2	36	48	14,300	5,200	290
SB03-28-48-60	28	4.75	2	48	60	9,600	880	250
SB03-28-60-72	28	4.75	2	60	72	24,400	1,080	270
SB03-28-72-84	28	4.75	2	72	84	36,600	2,220	250
SB03-28-84-96	28	4.75	2	84	96	3,500	12,620	260
SB03-28-96-111	28	4.75	2	96	111	390	840	170
SB03-29-0-6	29	4.8	2	0	6	ND (41)	4,520	300
SB03-29-6-12	29	4.8	2	6	12	ND (38)	590	160
SB03-29-12-24	29	4.8	2	12	24	ND (41)	ND (21)	61
SB03-29-24-36	29	4.8	2	24	36	ND (46)	ND (23)	7.4 J
SB03-29-36-48	29	4.8	2	36	48	ND (29)	ND (14)	3.6 J
SB03-29-48-72	29	4.8	2	48	72	ND (28)	ND (14)	3.6 J
SB03-29-72-94	29	4.8	2	72	94	ND (25)	ND (13)	2.1 J
SB03-30-0-6	30	4.8	2	0	6	630	4,040	170
SB03-30-6-12	30	4.8	2	6	12	1,530	14,500	130
SB03-30-12-24	30	4.8	2	12	24	3,810	3,300	210
SB03-30-24-36	30	4.8	2	24	36	9,400	1,387	210
SB03-30-36-48	30	4.8	2	36	48	19,800	1,770	260
SB03-30-48-60	30	4.8	2	48	60	40,900	3,660	320
SB03-30-60-72	30	4.8	2	60	72	580	4,027	260
SB03-30-72-84	30	4.8	2	72	84	800	9,050	280
SB03-30-84-110	30	4.8	2	84	110	ND (26)	ND (13)	5.5 J
SB03-31-0-6	31	4.8	2	0	6	4,500	13,190	110
SB03-31-6-12	31	4.8	2	6	12	1,700	2,948	110
SB03-31-12-24	31	4.8	2	12	24	1,410	3,740	170
SB03-31-24-36	31	4.8	2	24	36	4,250	3,120	210
SB03-31-36-48	31	4.8	2	36	48	16,100	840	260
SB03-31-48-60	31	4.8	2	48	60	21,200	1,940	290
SB03-31-60-72	31	4.8	2	60	72	64,400	10,640	270
SB03-31-72-84	31	4.8	2	72	84	5,800	5,680	260
SB03-31-84-96	31	4.8	2	84	96	ND (34)	4,030	260
SB03-31-96-112	31	4.8	2	96	112	640	222	60
SB03-32-0-6	32	5.45	3	0	6	44,300	9,100	170
SB03-32-6-12	32	5.45	3	6	12	42,100	6,500	150

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)
SB03-32-12-24	32	5.45	3	12	24	800	11,320	300
SB03-32-24-36	32	5.45	3	24	36	170	2,370	82
SB03-33-0-6	33	5.52	3	0	6	7,200	18,570	86
SB03-33-6-12	33	5.52	3	6	12	22,600	11,300	130

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)
SB03-33-12-24	33	5.52	3	12	24	8,200	13,600	160
SB03-33-24-36	33	5.52	3	24	36	4,050	86,132	84
SB03-34-0-6	34	5.6	3	0	6	1,400	150	180
SB03-34-6-12	34	5.6	3	6	12	440	14,350	320
SB03-34-12-24	34	5.6	3	12	24	110	110	60
SB03-34-24-36	34	5.6	3	24	36	ND (29)	130	6.5 J
SB03-35-0-6	35	5.65	3	0	6	1,520	13,480	84
SB03-35-6-12	35	5.65	3	6	12	1,770	6,910	120
SB03-35-12-24	35	5.65	3	12	24	13,400	500	130
SB03-35-24-36	35	5.65	3	24	36	ND (41)	ND (20)	11 J
SB03-36-0-6	36	5.65	3	0	6	ND (27)	16,420	220
SB03-36-6-12	36	5.65	3	6	12	ND (31)	150	35
SB03-36-12-24	36	5.65	3	12	24	ND (31)	1,410	8.6
SB03-36-24-36	36	5.65	3	24	36	ND (26)	ND (13)	8.7
SB03-37-0-6	37	5.72	3	0	6	42,700	12,920	110
SB03-37-6-12	37	5.72	3	6	12	28,800	7,120	140
SB03-37-12-24	37	5.72	3	12	24	88,700	8,530	290
SB03-37-24-36	37	5.72	3	24	36	4,080	16,170	180
SB03-37-24-36(DUP)	37	5.72	3	24	36(DUP)	3,430	45,190	530
SB03-37-36-48	37	5.72	3	36	48	310		
SB03-37-48-62	37	5.72	3	48	62	310		
SB03-38-0-6	38	5.78	3	0	6	ND (23)	491	5.6
SB03-38-6-12	38	5.78	3	6	12	ND (25)	ND (12)	6.2
SB03-38-12-24	38	5.78	3	12	24	ND (25)	ND (12)	6.9
SB03-38-24-36	38	5.78	3	24	36	ND (25)	ND (12)	6.6
SB03-39-0-6	39	5.98	3	0	6	770	1,170	370
SB03-39-6-12	39	5.98	3	6	12	560	170	320
SB03-39-12-24	39	5.98	3	12	24	ND (33)	ND (17)	18
SB03-39-24-36	39	5.98	3	24	36	ND (30)	ND (15)	22
SB03-39-24-36(DUP)	39	5.98	3	24	36(DUP)	ND (30)	ND (16)	18
SB03-40-0-6	40	6.3	3	0	6	ND (27)	ND (14)	10
SB03-40-6-12	40	6.3	3	6	12	ND (26)	ND (13)	11
SB03-40-12-24	40	6.3	3	12	24	ND (26)	ND (13)	12
SB03-40-24-36	40	6.3	3	24	36	ND (26)	ND (13)	11
SB03-41-0-6	41	6.4	3	0	6	44,200	9,070	350
SB03-41-6-12	41	6.4	3	6	12	5,900	27,670	290
SB03-41-12-24	41	6.4	3	12	24	180	7,103	58
SB03-41-24-42	41	6.4	3	24	42	ND (24)	1,359	13
SB03-42-0-6	42	6.5	3	0	6	1,630	15,690	610
SB03-42-6-12	42	6.5	3	6	12	12,500	16,660	370
SB03-42-12-24	42	6.5	3	12	24	3,700	6,980	310
SB03-42-24-36	42	6.5	3	24	36	2,600	9,120	340
SB03-42-36-52	42	6.5	3	36	52	ND (25)		

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)
SB03-43-0-9	43	6.56	4	0	9	396	110	27
SB03-43-9-16	43	6.56	4	9	16	ND (23)	ND (12)	8
SB03-43-16-28	43	6.56	4	16	28	ND (23)	ND (12)	8.3
SB03-43-28-41	43	6.56	4	28	41	ND (24)	ND (12)	7.5
SB03-44-0-6	44	6.62	4	0	6	2,300	160	220
SB03-44-6-14	44	6.62	4	6	14	67	2,120	380
SB03-44-14-26	44	6.62	4	14	26	ND (23)	ND (11)	8.7
SB03-44-26-34	44	6.62	4	26	34	ND (23)	ND (12)	8.5
SB03-45-0-6	45	6.74	4	0	6	262	ND (13)	14
SB03-45-6-12	45	6.74	4	6	12	ND (27)	ND (13)	14
SB03-45-12-24	45	6.74	4	12	24	ND (25)	ND (12)	8.5
SB03-45-24-36	45	6.74	4	24	36	ND (25)	ND (12)	7.6
SB03-46-0-6	46	7.25	4	0	6	160	5,790	85
SB03-46-6-12	46	7.25	4	6	12	240	1,680	300
SB03-46-12-24	46	7.25	4	12	24	2,130	18,110	180
SB03-47-0-6	47	7.5	4	0	6	84	2,440	200
SB03-47-6-12	47	7.5	4	6	12	409	1,600	270
SB03-47-12-24	47	7.5	4	12	24	2,770	7,540	230
SB03-48-0-13	48	7.76	4	0	13	190	3,700	110
SB03-49-0-6	49	8.1	4	0	6	79	3,290	44
SB03-50	50	NO CORE COLLECTED - NO SEDIMENT PRESENT						
SB03-51-0-6	51	8.35	4	0	6	ND (35)	4,070	38
SB03-52-0-6	52	8.52	4	0	6	250	6,010	13
SB03-54-12-24	54	7.25	4	12	24	380	14,150	190
SB03-53A-0-6	53A	5.9	3	0	6	385,500	29,610	680
SB03-53A-6-12	53A	5.9	3	6	12	122,400	8,280	400
SB03-53A-12-24	53A	5.9	3	12	24	1,142,000	1,160	480
SB03-53A-24-36	53A	5.9	3	24	36	710,000	11,570	400
SB03-53A-36-48	53A	5.9	3	36	48	1,190		
SB03-53A-48-56	53A	5.9	3	48	56	1,710		
SB03-54A-0-6	54A	5.86	3	0	6	150	ND (13)	13
SB03-54A-6-12	54A	5.86	3	6	12	ND (25)	ND (13)	15
SB03-54A-12-24	54A	5.86	3	12	24	ND (26)	ND (13)	15
SB03-54A-24-36	54A	5.86	3	24	36	ND (24)	ND (12)	14
SB03-55A-0-6	55A	5.82	3	0	6	ND (31)	6,060	320
SB03-55A-6-12	55A	5.82	3	6	12	ND (32)	ND (16)	34
SB03-55A-12-24(DUP)	55A	5.82	3	12	24(DUP)	ND (34)	ND (17)	13
SB03-55A-12-24	55A	5.82	3	12	24	ND (35)	ND (18)	18
SB03-55A-24-36	55A	5.82	3	24	36	75	ND (13)	7.1

Notes:

1. Shaded cells indicate that no analysis was conducted for the given depth.
2. Total PCB concentrations were computed by summing Aroclor results. ND results treated as zero in the sum.
3. Total PAH concentrations were computed by summing individual component results. ND results treated as zero in the sum.
4. J = Estimated value. Lead was detected in all samples.
5. DUP = duplicate field or analytical sample.

Table 3.4

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Summary of Total PCB, Total PAH, and Total Lead Data

Sediment Sample ID	Sample Location	River Mile	River Reach	Top Depth (in)	Bottom Depth (in)	Total PCB Concentration (µg/kg-dry)	Total PAH Concentration (µg/kg-dry)	Total Lead Concentration (mg/kg dry)

6. Sediment Sample ID: First portion after the "SB03" designation identifies core location, and last two numbers signify depth discrete interval, e.g., "0-6" indicates 0 to 6 inch interval.

Table 3.5

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

Summary Statistics by Reach for Total PCB, Total Lead, and Total PAH Data for All Samples

	2003 Sediment Data			
	Reach 1	Reach 2	Reach 3	Reach 4
River Mile / Parameter	0-3.2	3.2-4.9	4.9-6.5	6.5-8.8
Total PCBs (mg/kg dry)				
Total Number of Results	24	163	64	23
Average Concentration	0.67	4.04	43	0.43
Maximum Concentration	1.9	91	1,142	2.77
Minimum Concentration	ND	ND	ND	ND
Number of Detections	15	98	38	14
Detection Frequency	63%	60%	59%	61%
Standard Deviation	0.66	10.9	172.3	0.80
Total Lead (mg/kg dry)				
Total Number of Results	23	164	59	23
Average Concentration	95.1	158.6	143.0	103.1
Maximum Concentration	170	470	680	380
Minimum Concentration	9.0	2.0	6.0	8.0
Number of Detections	24	164	59	23
Detection Frequency	100%	100%	100%	100%
Standard Deviation	55.6	115.9	170.9	116.2
Total PAHs (mg/kg dry)				
Total Number of Results	24	163	59	23
Average Concentration	0.98	3.21	7.11	3.08
Maximum Concentration	7.48	31.8	86.1	18.1
Minimum Concentration	ND	ND	ND	ND
Number of Detections	5	107	39	14
Detection Frequency	21%	66%	66%	61%
Standard Deviation	2.31	5.37	13.26	4.74

Notes:

1. River reaches are designated as follows: Reach 1 = River Mile (RM) 0 to 3.2; Reach 2 = RM 3.2 to 4.9; Reach 3 = RM 4.9 to 6.5; Reach 4 = RM 6.5 to 8.8.
2. Non-detect (ND) values were designated as one half the detection limit for statistical calculations.
3. Duplicates are included in all calculations.

Table 3.6

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

Summary Statistics by Reach for Total PCB, Total Lead, and Total PAH Data for Surface Samples

	2003 Data			
	Reach 1	Reach 2	Reach 3	Reach 4
River Mile / Parameter	0-3.2	3.2-4.9	4.9-6.5	6.5-8.8
Total PCBs (mg/kg dry)				
Total Number of Results	6	22	14	9
Average Concentration	1.49	1.43	37.8	0.42
Maximum Concentration	1.9	5.4	385.5	2.3
Minimum Concentration	0.61	0.01	0.01	0.02
Number of Detections	6	18	10	8
Detection Frequency	100%	82%	71%	89%
Standard Deviation	0.49	1.46	101.67	0.72
Total Lead (mg/kg dry)				
Total Number of Results	6	22	14	9
Average Concentration	117.3	164.4	229.2	83.4
Maximum Concentration	150	300	680	220
Minimum Concentration	94	16	5.6	13
Number of Detections	6	22	14	9
Detection Frequency	100%	100%	100%	100%
Standard Deviation	19.66	73.65	214.38	78.69
Total PAHs (mg/kg dry)				
Total Number of Results	6	22	14	9
Average Concentration	2.82	5.03	9.48	2.84
Maximum Concentration	7.5	24.9	29.6	6.0
Minimum Concentration	ND	ND	ND	ND
Number of Detections	4	18	12	8
Detection Frequency	67%	82%	86%	89%
Standard Deviation	3.37	6.25	8.90	2.35

Notes:

1. River reaches are designated as follows: Reach 1 = River Mile (RM) 0 to 3.2; Reach 2 = RM 3.2 to 4.9; Reach 3 = RM 4.9 to 6.5; Reach 4 = RM 6.5 to 8.8.
2. Non-detect values were designated as one half the detection limit for statistical calculations
3. Duplicates are included in all calculations.

Table 3.7

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Particle Size Distribution Results

		% Gravel		% Sand			% Fines		% Fines	%Sand	% Gravel
Sediment Sample ID	**Lab Sample ID No.**	**Coarse**	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**	**Sum**	**Sum**	**Sum**
SB03-01-0-6	03-383	--	--	--	0.1	1.1	60.3	38.5	98.8	1.2	--
SB03-02-0-6	03-384	--	--	--	0.3	3.6	61.7	34.4	96.1	3.9	--
SB03-03-0-6	03-385	--	--	--	0.2	0.7	64	35.1	99.1	0.9	--
SB03-03-18-36	03-386	--	--	--	0.5	4.5	62	33	95	5	--
SB03-03-36-48	03-387	--	--	--	1.3	20.9	62.3	15.5	77.8	22.2	--
SB03-03-48-56	03-388	--	--	0.1	4.7	50.7	29.7	14.8	44.5	55.5	--
SB03-03-56-96	03-389	--	0.1	0.2	15.5	70.4	8.9	4.9	13.8	86.1	0.1
SB03-03-96-120	03-390	--	0.2	--	0.5	3.4	68	27.9	95.9	3.9	0.2
SB03-04-0-6	03-391	--	--	--	0.2	1.9	65	32.9	97.9	2.1	--
SB03-05-0-6	03-392	--	--	--	0.4	9.3	67.5	22.8	90.3	9.7	--
SB03-06-0-6	03-393	--	--	--	0.4	9.3	66.8	23.5	90.3	9.7	--
SB03-07	03-398	--	--	0.1	1.5	35.7	59.5	13.2	72.7	37.3	--
SB03-08	03-399	--	0.1	0.1	1.1	14.1	63.7	20.9	84.6	15.3	0.1
SB03-09	03-400	--	--	--	0.3	3.2	72.4	24.1	96.5	3.5	--
SB03-10	03-401	--	--	0.4	1.3	25.5	55.5	17.3	72.8	27.2	--
SB03-11	03-402	--	0.1	--	0.7	15	68.8	15.4	84.2	15.7	0.1
SB03-12	03-403	--	--	0.1	1.3	42.1	49.7	6.8	56.5	43.5	--
SB03-13	03-404	--	--	0.1	1.5	12.7	69.6	16.1	85.7	14.3	--
SB03-14	03-414	--	0.2	2.5	5.8	35.2	41.4	14.9	56.3	43.5	0.2
SB03-15	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-16	03-416	--	0.1	0.1	1.1	11.8	69.4	17.5	86.9	13	0.1
SB03-17	03-413	--	0.5	1	2.7	45	42	8.8	50.8	48.7	0.5
SB03-18	03-415	--	0.2	0.5	1.9	58.3	29.6	9.5	39.1	60.7	0.2
SB03-19	03-417	--	0.2	0.5	6.2	80.9	8.5	3.7	12.2	87.6	0.2
SB03-20-0-6	03-438	--	--	0.1	0.6	22	68.2	9.1	77.3	22.7	--
SB03-21	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-22	03-418	--	0.1	0.1	0.9	42.1	47.3	9.5	56.8	43.1	0.1
SB03-23	03-419	--	0.2	0.3	1.6	59.2	31.6	7.1	38.7	61.1	0.2
SB03-23-0-6	03-442	--	--	0.1	0.9	27.1	62.5	9.4	71.9	28.1	--
SB03-23-3-14	03-448	--	--	0.1	0.6	17.8	67.8	13.7	81.5	18.5	--
SB03-23-14-48	03-449	--	--	0.7	0.5	7	68.3	23.5	91.8	8.2	--
SB03-23-48-78	03-450	--	--	--	0.1	5.8	68.9	25.2	94.1	5.9	--

Table 3.7

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Particle Size Distribution Results

		% Gravel		% Sand			% Fines		% Fines	%Sand	% Gravel
Sediment Sample ID	**Lab Sample ID No.**	**Coarse**	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**	**Sum**	**Sum**	**Sum**
SB03-23-78-92	03-451	--	--	--	0.3	10.8	79.1	9.8	88.9	11.1	--
SB03-23-92-111	03-452	--	--	--	3.7	58.7	30.7	6.9	37.6	62.4	--
SB03-23-111-119	03-453	--	--	0.1	2.1	33.8	53.2	10.8	64	36	--
SB03-24-0-6	03-441	--	0.1	3.1	0.5	11.6	65.6	19.1	84.7	15.2	0.1
SB03-25-0-6	03-443	--	0.3	0.8	2.5	33.2	52.2	11	63.2	36.5	0.3
SB03-26-0-6	03-437	--	0.1	0.7	1.2	21.9	62.3	13.8	76.1	23.8	0.1
SB03-27	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-28-0-6	03-439	--	--	0.1	2.1	72.7	22.2	2.9	25.1	74.9	--
SB03-29-0-6	03-446	--	0.3	0.4	0.8	42	46.4	10.1	56.5	43.2	0.3
SB03-30-0-6	03-447	--	3.6	4	17.8	51.5	17.6	5.5	23.1	73.3	3.6
SB03-31-0-6	03-440	--	0.2	0.6	2.2	67.3	24	5.7	29.7	70.1	0.2
SB03-32	03-424	--	--	0.1	0.9	51.5	39.5	8	47.5	52.5	--
SB03-34	03-422	--	0.9	2.9	12.1	73.2	7.8	3.1	10.9	88.2	0.9
SB03-35	03-423	--	0.2	0.4	2.8	50.3	39	7.3	46.3	53.5	0.2
SB03-36	03-425	--	0.8	0.9	3.5	78.8	13.5	2.5	16	83.2	0.8
SB03-37-0-6	03-426	--	0.8	0.6	2	68.7	25	2.9	27.9	71.3	0.8
SB03-37-13-22	03-430	--	0.9	4.6	3.2	28.3	46.8	16.2	63	36.1	0.9
SB03-37-0-13	03-431	--	1.4	0.7	3.5	47.7	36.9	9.8	46.7	51.9	1.4
SB03-37-48-62	03-432	--	0.8	2.3	11.8	40.7	35.5	8.9	44.4	54.8	0.8
SB03-37-22-48	03-433	--	7.9	12	26.8	45.4	7	0.9	7.9	84.2	7.9
SB03-37-90-93	03-434	--	0.2	1.7	15.9	45.4	29.4	7.4	36.8	63	0.2
SB03-37-62-78	03-435	--	--	--	0.8	20.8	68.9	9.5	78.4	21.6	--
SB03-37-78-90	03-436	--	3.3	7.2	28.5	39	17.5	4.5	22	74.7	3.3
SB03-38-0-6	03-427	--	1.5	1.1	2	51.3	38.3	5.8	44.1	54.4	1.5
SB03-39-0-6	03-410	--	0.1	0.5	2.9	27.2	56.7	12.6	69.3	30.6	0.1
SB03-40-0-6	03-411	--	4.9	3.6	9.6	41.7	28.5	11.7	40.2	54.9	4.9
SB03-41	03-420	--	0.3	0.6	2.4	84.9	8.7	3.1	11.8	87.9	0.3
SB03-42	03-421	--	1.4	2.1	12.9	72.4	3.5	7.7	11.2	87.4	1.4
SB03-43-0-6	03-444	--	5.2	3.8	9.6	14.2	42.4	24.8	67.2	27.6	5.2
SB03-44-0-6	03-429	--	0.9	0.4	2.2	90.7	3.2	2.6	5.8	93.3	0.9
SB03-45-0-6	03-428	--	1.3	1.8	9.2	79.6	6.7	1.4	8.1	90.6	1.3
SB03-46-0-6	03-378	--	--	0.3	1.5	64.2	28.1	5.9	34	66	--

Table 3.7

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program - Particle Size Distribution Results

		% Gravel		% Sand			% Fines		% Fines	%Sand	% Gravel
Sediment Sample ID	**Lab Sample ID No.**	**Coarse**	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**	**Sum**	**Sum**	**Sum**
SB03-47-0-6	03-379	--	--	0.2	0.6	68.6	25.6	5	30.6	69.4	--
SB03-48-0-6	03-380	--	1.6	4.6	47.5	39	5.8	1.5	7.3	91.1	1.6
SB03-49-0-6	03-381	--	0.5	0.2	1.8	66.6	23.4	7.5	30.9	68.6	0.5
SB03-50	NO CORE COLLECTED - NO SEDIMENT PRESENT										
SB03-51-0-6	03-382	--	--	0.5	1.3	34.6	47.4	16.2	63.6	36.4	--
SB03-52-0-6	03-445	--	12.3	10.2	23.7	50.7	1.8	1.3	3.1	84.6	12.3
SB03-53A-0-6	03-409	--	6.5	0.9	3	23.4	45.3	20.9	66.2	27.3	6.5
SB03-54-0-6	03-407	50.3	24.9	0.8	1.5	12.2	5.2	5.1	10.3	14.5	75.2
SB03-55A-0-6	03-408	--	--	--	0.1	21.6	61.2	17.1	78.3	21.7	--
SB03-55A-10-29	03-405	--	0.4	0.4	3.9	23	55.5	16.8	72.3	27.3	0.4
SB03-55A-29-54	03-406	18.3	4.9	7	13	22.6	29.4	4.8	34.2	42.6	23.2

Notes:

1. Where no depth interval given with Sediment Sample ID, the sample is a surface sediment sample.
2. Sample from the 0 to 6 inch depth interval are referred to as "surface sediments".
3. Sediment Sample ID: First portion after the "SB03" designation identifies core location, and last two numbers signify depth discrete interval, e.g., "0-6" indicates 0 to 6 inch interval.

Table 3.8

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program -Total Organic Carbon Data

Sediment Sample ID	Results (%C-dry)
SB03-01-0-6	2.2
SB03-01-6-12	2.1
SB03-01-12-18	2.4
SB03-01-18-24	2.8
SB03-02-0-6	2.3
SB03-02-6-12	3
SB03-02-12-18	2.7
SB03-02-18-24	3
SB03-03-0-6	2
SB03-03-6-12	2.1
SB03-03-12-18	2.7
SB03-03-18-24	3.2
SB03-04-0-6	2.1
SB03-04-6-12	2.7
SB03-04-12-18	5.3
SB03-04-18-24	7.8
SB03-05-0-6	2.3
SB03-05-6-12	4.2
SB03-05-12-18	8.4
SB03-05-18-24	7.7
SB03-06-0-6	2
SB03-06-6-12	2.1
SB03-06-12-18	2
SB03-06-18-24	0.42
SB03-07-0-6	2
SB03-07-6-12	3.2
SB03-07-12-24	4.7
SB03-07-12-24(DUP)	4.4
SB03-07-24-36	3.6
SB03-08-0-6	3.8
SB03-08-6-12	3.4
SB03-08-12-24	3
SB03-08-24-32	4.6
SB03-09-0-6	2.1
SB03-09-6-12	2.9
SB03-09-12-24	4.2
SB03-09-24-32	4.5
SB03-10-0-6	2.4
SB03-10-6-12	2.4
SB03-10-12-18	2.7
SB03-11-0-6	1.8
SB03-11-6-12	2.2
SB03-11-12-22	2.2
SB03-12-0-6	1.9
SB03-12-6-12	1.9
SB03-12-12-25	2.9
SB03-13-0-6	2.1
SB03-13-6-12	3.6
SB03-25-72-84	2.8
SB03-25-84-96	1.2
SB03-25-96-111	0.33

Sediment Sample ID	Results (%C-dry)
SB03-13-12-28	4
SB03-13-12-28(DUP)	4.3
SB03-14-0-6	0.51
SB03-14-6-12	0.3
SB03-14-12-24	<0.12
SB03-14-24-36	<0.12
SB03-14-36-48	0.19
SB03-14-48-60	0.23
SB03-15	See Note 1
SB03-16-0-6	3.9
SB03-16-6-12	4.5
SB03-16-12-24	4.3
SB03-16-24-36	2.3
SB03-16-36-48	0.39
SB03-16-48-60	0.78
SB03-16-60-77	0.24
SB03-17-0-6	1.6
SB03-17-6-12	1.2
SB03-17-12-24	1.7
SB03-17-24-36	1.8
SB03-17-36-48	3.1
SB03-17-48-60	2.6
SB03-17-60-72	2.4
SB03-17-72-84	2.8
SB03-17-84-96	2.4
SB03-17-96-108	1.8
SB03-17-108-117	0.47
SB03-18-0-6	1.8
SB03-18-6-12	2.1
SB03-18-12-24	2.2
SB03-18-24-36	2.2
SB03-18-36-48	2.6
SB03-18-48-60	2.7
SB03-18-60-72	2.5
SB03-18-72-84	2.6
SB03-18-84-96	2.7
SB03-18-96-108	2.7
SB03-18-108-115	0.78
SB03-19-0-6	3.3
SB03-19-6-12	2.9
SB03-19-12-24	4.6
SB03-19-24-36	4.5
SB03-19-36-48	3.9
SB03-19-48-60	2
SB03-19-60-72	1.1
SB03-19-72-96	1.3
SB03-19-96-111	1.5
SB03-20-0-6	2.1
SB03-32-6-12	1.70
SB03-32-12-24	1.50
SB03-32-24-36	1.60

Sediment Sample ID	Results (%C-dry)
SB03-20-6-12	2.1
SB03-20-12-24	2.5
SB03-20-24-36	2.2
SB03-20-36-48	2.7
SB03-20-48-60	4
SB03-20-60-72	2.8
SB03-20-72-84	3.5
SB03-20-84-96	5.2
SB03-20-96-110	2.4
SB03-21	See Note 1
SB03-22-0-6	1.5
SB03-22-6-12	2.9
SB03-22-12-24	3.4
SB03-22-24-36	0.2
SB03-22-36-48	0.14
SB03-22-48-60	0.17
SB03-22-60-84	0.15
SB03-22-84-119	0.16
SB03-23-0-6	1.8
SB03-23-6-12	1.7
SB03-23-12-24	2
SB03-23-24-36	2.8
SB03-23-36-48	3.3
SB03-23-48-60	0.13
SB03-23-60-72	0.077
SB03-23-72-84	0.2
SB03-23-84-96	0.17
SB03-23-96-108	0.13
SB03-23-108-119	0.15
SB03-24-0-6	2.3
SB03-24-6-12	2.7
SB03-24-12-24	2.6
SB03-24-24-36	2.2
SB03-24-24-36(DUP)	2.7
SB03-24-36-48	2.8
SB03-24-48-60	1.6
SB03-24-60-72	1.3
SB03-24-72-84	1.2
SB03-24-84-96	0.87
SB03-24-96-105	0.25
SB03-25-0-6	2.7
SB03-25-6-12	3.1
SB03-25-12-24	2.4
SB03-25-24-36	2.7
SB03-25-36-48	2.4
SB03-25-36-48(DUP)	2.50
SB03-25-48-60	3.5
SB03-25-60-72	3.5
SB03-43-28-41	1.40
SB03-44-0-6	1.70
SB03-44-6-14	2.10

Table 3.8

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

October 2003 Sediment Sampling Program -Total Organic Carbon Data

Sediment Sample ID	Results (%C-dry)
SB03-26-0-6	2.70
SB03-26-6-12	2.60
SB03-26-12-24	3.90
SB03-26-24-36	0.84
SB03-26-36-48	0.65
SB03-26-48-65	0.69
SB03-27	See Note 1
SB03-28-0-6	3.10
SB03-28-6-12	1.60
SB03-28-12-24	1.20
SB03-28-24-36	1.70
SB03-28-24-36	1.70
SB03-28-36-48	2.80
SB03-28-48-60	3.00
SB03-28-60-72	3.20
SB03-28-72-84	3.10
SB03-28-84-96	2.50
SB03-28-96-111	2.20
SB03-29-0-6	4.70
SB03-29-6-12	1.20
SB03-29-12-24	4.50
SB03-29-24-36	5.30
SB03-29-36-48	1.20
SB03-29-48-72	1.10
SB03-29-72-94	0.29
SB03-30-0-6	1.80
SB03-30-6-12	1.70
SB03-30-12-24	2.30
SB03-30-24-36	2.50
SB03-30-36-48	2.90
SB03-30-48-60	3.60
SB03-30-60-72	2.80
SB03-30-72-84	2.10
SB03-30-84-110	0.83
SB03-31-0-6	0.95
SB03-31-6-12	0.81
SB03-31-12-24	1.50
SB03-31-24-36	2.00
SB03-31-36-48	2.70
SB03-31-48-60	2.70
SB03-31-60-72	2.20
SB03-31-72-84	2.60
SB03-31-84-96	2.90
SB03-31-96-112	1.50
SB03-32-0-6	2.30

Sediment Sample ID	Results (%C-dry)
SB03-33-0-6	1.00
SB03-33-6-12	2.20
SB03-33-12-24	1.60
SB03-33-24-36	0.32
SB03-34-0-6	1.30
SB03-34-6-12	2.90
SB03-34-12-24	1.20
SB03-34-24-36	1.80
SB03-35-0-6	1.30
SB03-35-6-12	1.20
SB03-35-12-24	1.80
SB03-35-24-36	1.90
SB03-36-0-6	1.60
SB03-36-6-12	1.90
SB03-36-12-24	0.80
SB03-36-24-36	0.47
SB03-37-0-6	1.50
SB03-37-6-12	1.30
SB03-37-12-24	2.60
SB03-37-24-36	1.60
SB03-37-24-36(DUP)	1.50
SB03-38-0-6	0.16
SB03-38-6-12	0.20
SB03-38-12-24	0.27
SB03-38-24-36	0.44
SB03-39-0-6	3.90
SB03-39-6-12	3.40
SB03-39-12-24	2.10
SB03-39-24-36	1.70
SB03-39-24-36(DUP)	1.90
SB03-40-0-6	0.22
SB03-40-6-12	0.39
SB03-40-12-24	0.29
SB03-40-24-36	0.21
SB03-41-0-6	2.70
SB03-41-6-12	2.10
SB03-41-12-24	0.55
SB03-41-24-42	0.30
SB03-42-0-6	0.57
SB03-42-6-12	3.20
SB03-42-12-24	2.00
SB03-42-24-36	2.70
SB03-43-0-9	0.97
SB03-43-9-16	0.79
SB03-43-16-28	0.76

Sediment Sample ID	Results (%C-dry)
SB03-44-14-26	0.75
SB03-44-26-34	0.67
SB03-45-0-6	0.32
SB03-45-6-12	0.25
SB03-45-12-24	0.31
SB03-45-24-36	0.31
SB03-46-0-6	1.70
SB03-46-6-12	2.20
SB03-46-12-24	1.40
SB03-47-0-6	1.40
SB03-47-6-12	2.10
SB03-47-12-24	2.10
SB03-48-0-13	1.60
SB03-49-0-6	1.20
SB03-50	See Note 1
SB03-51-0-6	1.40
SB03-52-0-6	0.29
SB03-54-12-24	1.30
SB03-53A-0-6	3.40
SB03-53A-6-12	3.30
SB03-53A-12-24	3.40
SB03-53A-24-36	3.00
SB03-54A-0-6	0.27
SB03-54A-6-12	0.18
SB03-54A-12-24	0.14
SB03-54A-24-36	0.25
SB03-55A-0-6	3.50
SB03-55A-6-12	1.90
SB03-55A-12-24	2.40
SB03-55A-12-24(DUP)	2.10
SB03-55A-24-36	0.66

Notes:

1. No core collected because no sediment present.
2. Sediment Sample ID: First portion after the "SB03" designation identifies core location, and last two numbers signify depth discrete interval, e.g., "0-6" indicates 0 to 6 inch interval.
3. DUP = duplicate field or analytical sample.

Table 3.9

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remedialtion Priorities Project

Summary Statistics by Reach for Particle Size and Total Organic Carbon Data for All Samples

	2003 Sediment Data			
	Reach 1	Reach 2	Reach 3	Reach 4
River Mile / Parameter	0-3.2	3.2-4.9	4.9-6.5	6.5-8.8
% Gravel				
Total Number of Results	11	29	21	10
Arithmetic Mean	0.0	0.2	2.6	9.7
Median	0.0	0.1	0.8	1.1
Maximum	0.2	3.6	23.2	75.2
Minimum	0.0	0.0	0.0	0.0
10th Percentile	0.0	0.0	0.0	0.0
90th Percentile	0.1	0.3	6.5	18.6
Standard Deviation	0.1	0.7	5.2	23.3
% Sand				
Total Number of Results	11	29	21	10
Arithmetic Mean	18.2	36.0	55.7	64.2
Median	5.0	36.0	54.4	69.0
Maximum	86.1	87.6	88.2	93.3
Minimum	0.9	3.5	21.6	14.5
10th Percentile	1.2	10.5	27.3	26.3
90th Percentile	55.5	70.7	87.4	91.3
Standard Deviation	27.6	23.5	22.9	28.5
% Fines				
Total Number of Results	11	29	21	10
Arithmetic Mean	81.8	64.1	41.7	26.1
Median	95.0	71.9	44.1	20.5
Maximum	99.1	96.5	78.4	67.2
Minimum	13.8	12.2	7.9	3.1
10th Percentile	44.5	28.8	11.2	5.5
90th Percentile	98.8	89.5	72.3	64.0
Standard Deviation	27.6	23.8	23.2	23.7
TOC (%C - dry)				
Total Number of Results	24	163	59	23
Arithmetic Mean	3.2	2.2	1.6	1.2
Median	2.6	2.3	1.6	1.3
Maximum	8.4	5.3	3.9	2.2
Minimum	0.4	0.0	0.1	0.3
10th Percentile	2.0	0.3	0.2	0.3
90th Percentile	7.0	3.9	3.2	2.1
Standard Deviation	2.0	1.3	1.1	0.6

Notes:

1. River sections are designated as follows: Reach 1 = River Mile (RM) 0 to 3.2; Reach 2 = RM 3.2 to 4.9; Reach 3 = RM 4.9 to 6.5; and Reach 4 = RM 6.5 to 8.8.
2. Non-detect values were designated as zero for statistical calculations.

Table 3.10

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

Summary Statistics by Reach for Water Depth, Probing Rod Depth, Core Penetration, and % Core Recovery

	2003 Sediment Data			
	Reach 1	Reach 2	Reach 3	Reach 4
River Mile / Parameter	0-3.2	3.2-4.9	4.9-6.5	6.5-8.8
Water Depth				
Total Number of Results	6	22	14	7
Arithmetic Mean	1.4	1.6	2.6	2.9
Median	1.4	1.0	1.9	2.3
Maximum	1.7	5.5	9.0	4.6
Minimum	0.9	0.5	0.9	2.0
10th Percentile	1.1	0.6	1.0	2.0
90th Percentile	1.6	3.5	5.3	4.5
Standard Deviation	0.3	1.4	2.3	1.1
Probing Rod Depth				
Total Number of Results	6	22	13	7
Arithmetic Mean	9.4	10.1	5.3	4.1
Median	10.0	12.0	5.0	5.0
Maximum	12.0	12.0	8.0	6.0
Minimum	3.5	3.0	2.5	2.0
10th Percentile	6.3	6.0	3.0	2.0
90th Percentile	12.0	12.0	7.8	5.4
Standard Deviation	3.2	3.1	1.8	1.6
Core Penetration				
Total Number of Results	4	22	14	4
Arithmetic Mean	8.0	7.0	4.9	3.8
Median	7.5	9.3	4.8	3.6
Maximum	12.0	10.0	8.0	5.0
Minimum	5.0	2.4	3.9	3.0
10th Percentile	5.0	2.5	4.1	3.2
90th Percentile	11.4	10.0	5.0	4.6
Standard Deviation	3.6	3.4	1.0	0.9
% Core Recovery				
Total Number of Results	4	22	14	4
Arithmetic Mean	85.4	94.4	96.8	97.9
Median	100	98.2	100	100
Maximum	100	100	100	100
Minimum	41.7	70	70	91.4
10th Percentile	59.2	86.8	94.3	94.0
90th Percentile	100	100	100	100
Standard Deviation	29.2	7.9	8.0	4.3

Notes:

1. River sections are designated as follows: Reach 1 = River Mile (RM) 0 to 3.2; Reach 2 = RM 3.2 to 4.9; Reach 3 = RM 4.9 to 6.5; and Reach 4 = RM 6.5 to 8.8.
2. Non-detect values were designated as zero for statistical calculations.

Table 4.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

PCB MPA Calculation

Sample ID	Coordinates		River Mile	Reach	Total MPA (g/m^2)
	Latitude	Longitude			
SB03-01	41.72492904	-83.47246285	1.1	1	0.23
SB03-02	41.72379997	-83.47774077	1.5	1	0.20
SB03-03	41.72294835	-83.48273009	1.8	1	0.36
SB03-04	41.71928377	-83.48466163	2	1	0.28
SB03-05	41.71053799	-83.49512991	3	1	0.26
SB03-06	41.7101315	-83.49746126	3.1	1	0.37
SB03-07	41.71133289	-83.50252386	3.45	2	1.58
SB03-08	41.71113447	-83.50457715	3.52	2	0.30
SB03-09	41.71174423	-83.50433664	3.5	2	0.30
SB03-10	41.70854205	-83.50948547	3.88	2	0.72
SB03-11	41.70746781	-83.51132757	3.95	2	0.96
SB03-12	41.70620901	-83.51404927	4.05	2	0.18
SB03-13	41.70469151	-83.51639514	4.1	2	0.15
SB03-14	41.704476	-83.51791825	4.16	2	0.01
SB03-16	41.70412561	-83.5176589	4.16	2	0.07
SB03-17	41.70328796	-83.52000195	4.35	2	7.88
SB03-18	41.70315158	-83.51985143	4.35	2	16.22
SB03-19	41.70302639	-83.51953232	4.35	2	0.01
SB03-20	41.70286473	-83.52130674	4.45	2	16.11
SB03-22	41.70245961	-83.52103187	4.45	2	0.39
SB03-23	41.70265381	-83.52310334	4.6	2	21.55
SB03-24	41.70246392	-83.52315607	4.6	2	5.27
SB03-25	41.70246392	-83.52315607	4.6	2	9.27
SB03-26	41.70357423	-83.52470103	4.75	2	0.66
SB03-28	41.70335628	-83.52490165	4.75	2	25.53
SB03-29	41.70384213	-83.52611932	4.8	2	0.01
SB03-30	41.70364642	-83.52608566	4.8	2	18.97
SB03-31	41.70350706	-83.52604333	4.8	2	31.58
SB03-32	41.69908367	-83.52979657	5.45	3	11.79
SB03-33	41.6973348	-83.52980393	5.52	3	14.23
SB03-34	41.69636141	-83.53199052	5.6	3	0.31
SB03-35	41.69639877	-83.53310318	5.65	3	4.34
SB03-36	41.69336523	-83.53274681	5.65	3	0.00
SB03-37	41.69424716	-83.53463464	5.72	3	40.11
SB03-38	41.69360238	-83.53522876	5.78	3	0.01
SB03-39	41.69092419	-83.53809444	5.98	3	0.16
SB03-40	41.68992278	-83.54150949	6.3	3	0.01
SB03-41	41.68966364	-83.54264063	6.4	3	6.38
SB03-42	41.68890656	-83.54658373	6.5	3	3.75

Table 4.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

PCB MPA Calculation

Sample ID	Coordinates		River Mile	Reach	Total MPA (g/m^2)
	Latitude	Longitude			
SB03-43	41.68857632	-83.54796996	6.56	4	0.11
SB03-44	41.68813586	-83.54953084	6.62	4	0.32
SB03-45	41.68770806	-83.55184106	6.74	4	0.06
SB03-46	See Note 3	See Note 3	7.25	4	1.37
SB03-47	See Note 3	See Note 3	7.5	4	1.58
SB03-48	See Note 3	See Note 3	7.76	4	0.06
SB03-49	See Note 3	See Note 3	8.1	4	0.01
SB03-51	See Note 3	See Note 3	8.35	4	0.00
SB03-52	41.676166	-83.5752	8.52	4	0.06
SB03-53A	41.692036	-83.535216	5.9	3	470.60
SB03-54A	41.692461	-83.535041	5.86	3	0.03
SB03-55A	41.693225	-83.535047	5.82	3	0.04

Notes:

1. Duplicates not included in MPA calculations.
2. River mile positions were calculated in GIS software based on distance upriver from Lake Erie along an assigned river centerline.
3. Coordinates not available due to lack of satellite signal available during sampling.
4. For samples containing PCB in the bottom most depth interval, an additional one foot interval with the same PCB concentration as the depth interval above it was added for MPA calcs.
5. For surface samples and subsurface samples with ND at all depth intervals, a one foot interval with a concentration equal to one half the detection limit was used for the MPA calculation.

Table 4.2

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

MPA Summary Statistics by Reach

	2003 Data			
	Reach 1	Reach 2	Reach 3	Reach 4
River Mile	0-3.2	3.2-4.9	4.9-6.5	6.5-8.8
Parameter				
Total MPA (g/m^2)				
Total Number of Results	6	22	14	9
Average	0.28	7.17	39.4	0.37
Maximum	0.37	31.6	470.6	1.58
Minimum	0.20	0.01	0.005	0.004
Standard Deviation	0.07	9.87	124.6	0.62

Notes:

1. Reaches are designated as follows: Reach 1 = River Mile (RM) 0 to 3.2; Reach 2 = RM 3.2 to 4.9; Reach 3 = RM 4.9 to 6.5; and Reach 4 = RM 6.5 to 8.8.
2. Duplicates are not included in all calculations.
3. For samples containing PCB in the bottom most depth interval, an additional one foot interval with the same PCB concentration as the depth interval above it was added.
4. For surface samples and subsurface samples with ND at all depth intervals, a one foot interval with a concentration equal to one half the detection limit was used for the MPA calculation.

Table 7.1

Toledo Metropolitan Area Council of Governments
Lucas County, Ohio
Ottawa River Sediment Remediation Priorities Project

Preliminary Cost Estimate for Removal-Based Remedy for Priority Area 2 (Lagrange Remediation Target Areas)

ITEM NO.	DESCRIPTION	UNIT	NO. OF UNITS	UNIT COST	ESTIMATED COST
1	Mobilization/Demobilization	LS	1	$120,000	$ 120,000
2	Access Area Development	LS	1	$160,000	$ 160,000
3	Pre-design Investigation	LS	1	$110,000	$ 110,000
4	Survey Control	LS	1	$40,000	$ 40,000
5	Silt Curtain System Materials/Installation/Removal/ Additional Silt Curtain Setup	SF	40,000	$5	$ 200,000
6	Mechanical Dredging/Dewatering/Stabilization	CY	13,400	$175	$ 2,350,000
7	Water Treatment	Gal	536,000	$0.10	$ 60,000
8a	TSCA - Transportation and Disposal of Sediments	Ton	1,600	$110	$ 180,000
8b	Non-TSCA Transportation and Disposal of Sediments	Ton	16,200	$47	$ 770,000
9	Post-Dredge Thin Cap/Backfill	SF	145,000	$2.75	$ 400,000
10	Water Quality Monitoring	MO	1	$10,000	$ 10,000
11	Post-construction Sampling	LS	1	$60,000	$ 60,000
12	Oversight	MO	29	$18,000	$ 520,000
13	Engineering and Administration	LS	1	$150,000	$ 150,000
				Subtotal	$ 5,130,000
				Contingency (25%)	$ 1,290,000
				Total	$ 6,420,000

All estimated costs are rounded up to the nearest $10,000.

Assumptions:

a. This preliminary cost estimate assumes that sediments will be removed via mechanical dredge and is based on the area, depth, and PCB concentration information available at this time, as discussed in Section 6. Further sampling and testing is required and may substantially modify these assumptions.

b. All costs are provided in 2004 dollars and all capital cost expenditures are assumed to occur in 2004.

c. Work is estimated to take approximately one construction season (i.e., 7 total 30-day months) to complete and it is anticipated that Site dredging may be accomplished using a combination of shore- and barge-based approaches. Mobilization/demobilization for dredging has been estimated at 3% of project subtotal excluding transfer and disposal costs.

d. One area located near the Former Unnamed Tributary and one area located near Stickney Avenue would be used for Site access purposes. The cost to construct/prepare the access areas in preparation for dredging is exclusive of real estate, permitting, access, legal or other fees, and assumes that the area requires minimal preparation.

e. Work to be conducted six days per week.

f. Dredging work would require a single-tier silt curtain held in place by integrated weighting. The unit price provided includes purchase of material and cost to install/remove each setup, and assumes that silt curtain will not be reused.

g. The production rate for dredging is estimated to be 100 cy/day. Backfill rate is estimated at 200 cy/day. For project duration estimating, it is conservatively assumed that there is no schedule overlap of dredging and backfilling.

h. It is assumed that materials will be gravity dewatered and mixed with lime or similar stabilization material. No other pretreatment of solids is assumed. The stabilization process will increase the dewatered ex-situ volume by 10%.

I. Water treatment would consist of particulate and carbon filters, and assume PCBs are the only constituent of concern. Volume for treatment estimated at 40 gal/cy.

j. Disposal costs assume 1.2 tons/cy and disposal of materials at Detroit- and/or Toledo-area landfill(s).

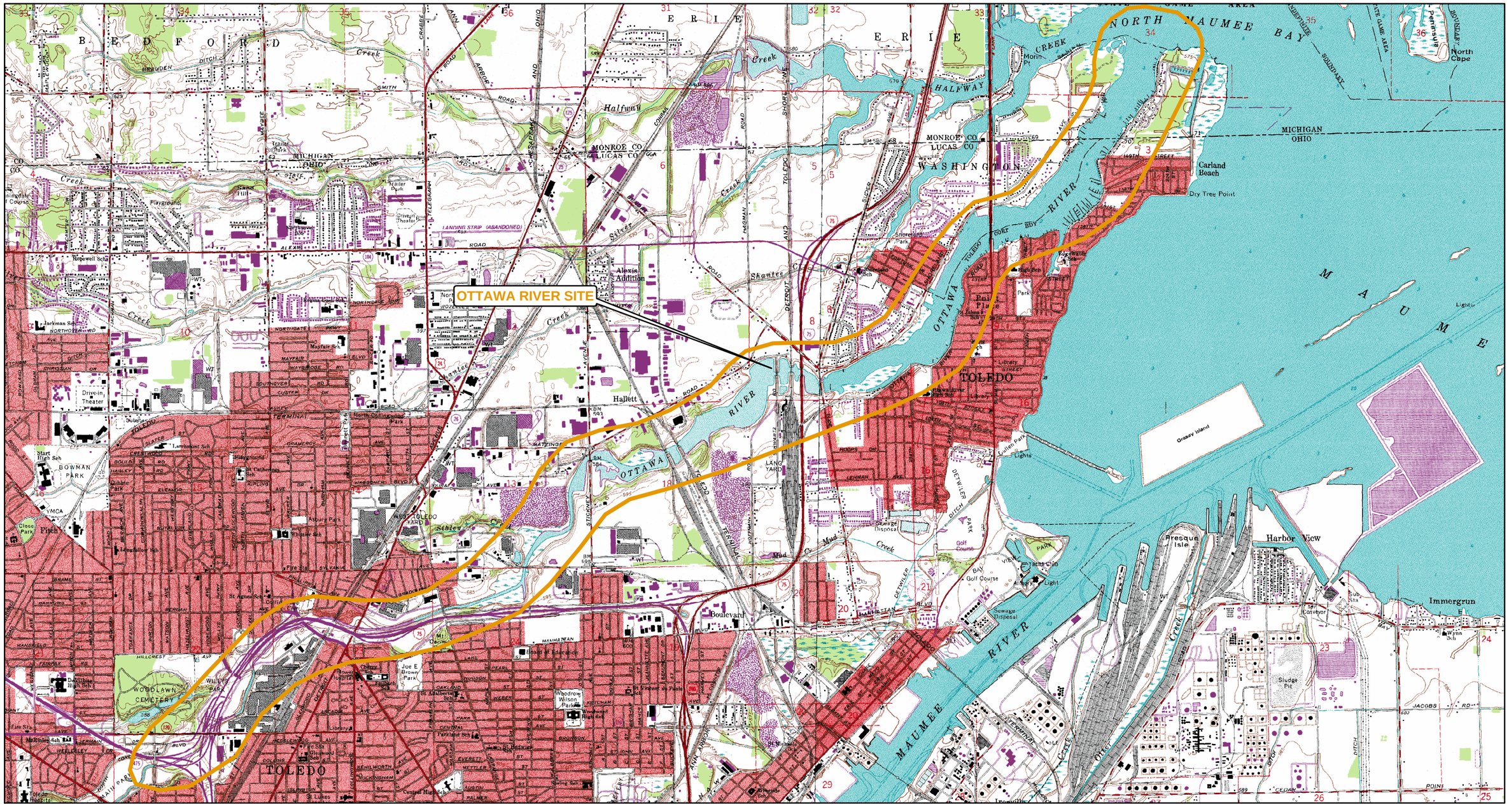
k. Construction monitoring/oversight estimated at $600/day, and excludes monitoring activities other than basic turbidity monitoring.

l. A contingency allowance can be included to account for unforeseen circumstances or variability in the volumes, labor, or material costs. The contingency typically ranges from 15 to 25% of the remediation costs as recommended by the USEPA (USEPA, 1987 and USEPA, 2000). For purposes of this estimate a value of 25% is considered.

m. Any long-term monitoring/operation and maintenance program costs are specifically excluded.

n. Estimated costs do not include property costs (if necessary), access costs, permitting costs, legal fees, and regulatory oversight, and public relations efforts.

o. Post-dredge thin cap/backfill assumes placing backfill into dredged areas, comprised of either: 1) a target average of four inches of AquaBlok (hydrated) plus an overlying target average of four inches of gravel/sand or 2) a target average eight inches of gravel/sand, depending on residual contamination levels, location, and other factors.



SOURCE: IMAGES WERE DOWNLOADED FROM THE OHIO DEPARTMENT OF ADMINISTRATIVE SERVICES - GIS SUPPORT CENTER.

0 0.5 1 Miles

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

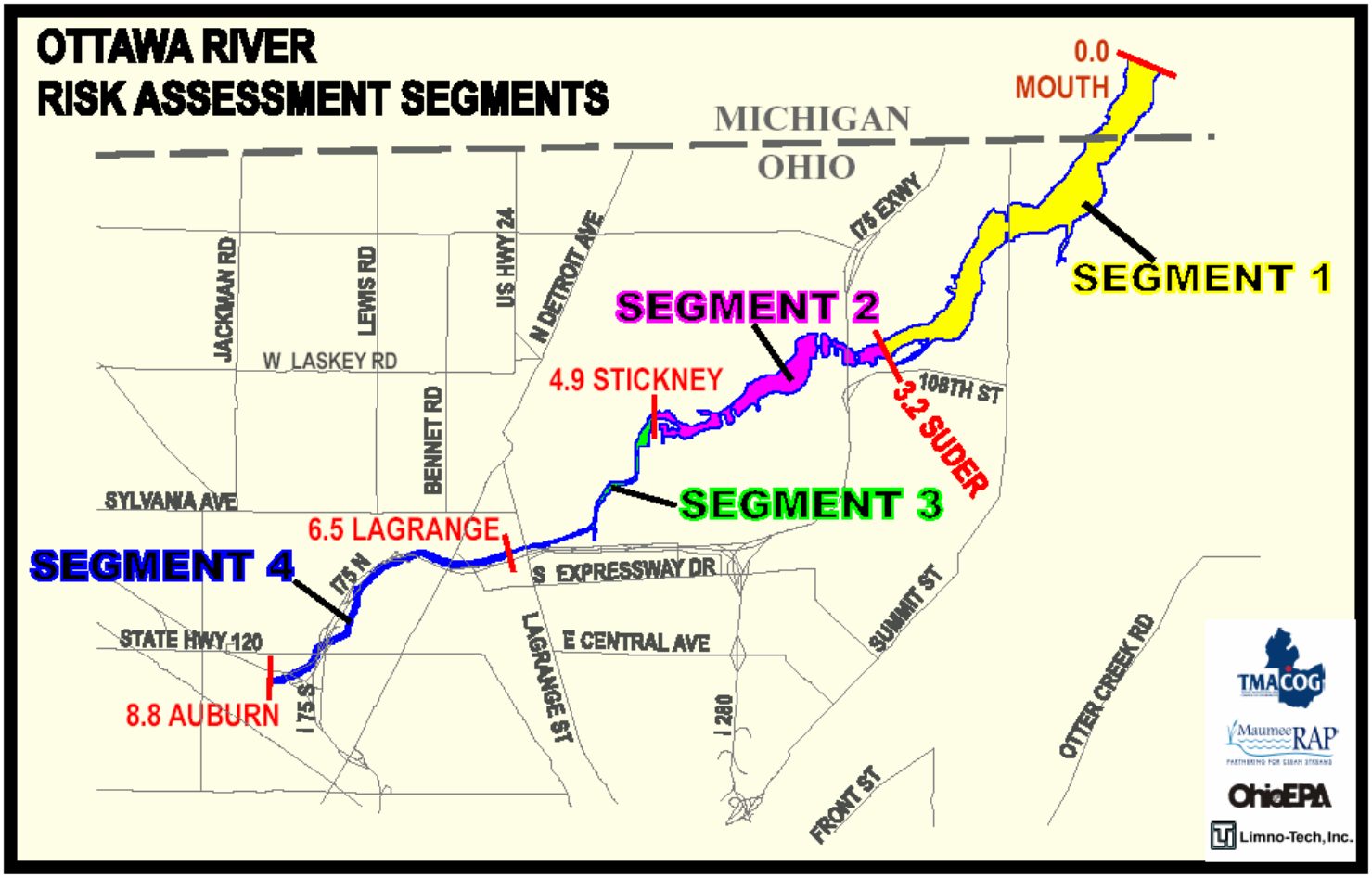
OTTAWA RIVER SITE LOCATION MAP

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

Hull & associates, inc.

FIGURE 1.1

10/7/04 SYR-85 MTK
Ottawa River 73952.005
Q:\OttawaRiver\mxd\Site Location Map 11x17.mxd



Notes:

1. The Screening-Level Human Health and Ecological Risk Assessment used the term "SEGMENT" to refer to portions of the river considered for the studies. The current report uses the term "REACHES" to refer to those same areas. "REACHES" is considered a more conventional term for referring to river sections.
2. Figure provided by TMACOG.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

OTTAWA RIVER REACHES 1 THROUGH 4

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
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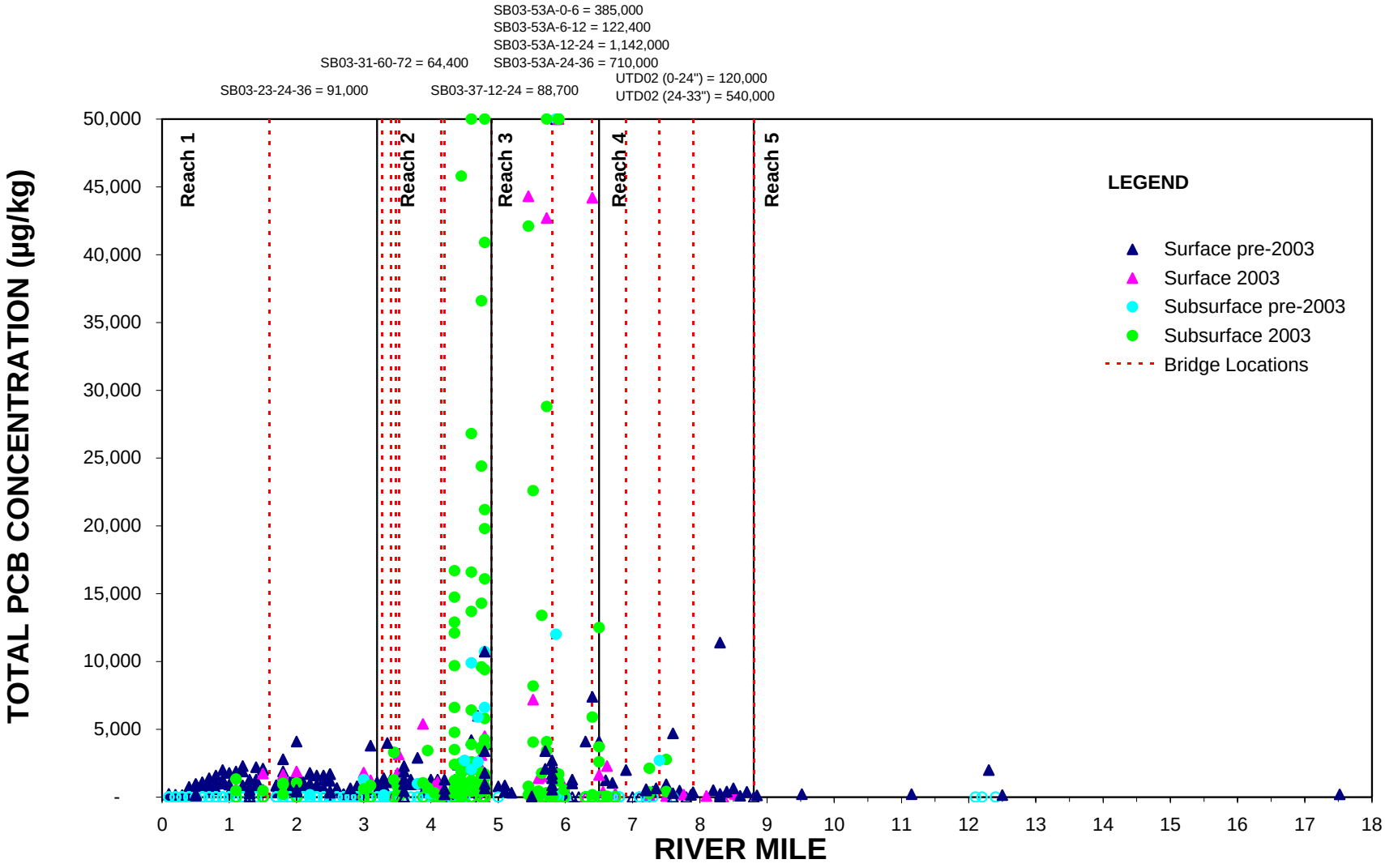
FIGURE
1.2

73952



Notes:

1. 1994, 1998, and 2000 sediment samples collected and analyzed as part of OEPA studies.
2. 2003 sediment data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
3. Open symbols indicate non-detect results.
4. Values greater than 50,000 µg/kg plotted at maximum y-axis value of 50,000 µg/kg; actual value noted above data point.
5. Concentrations given as dry weight values.

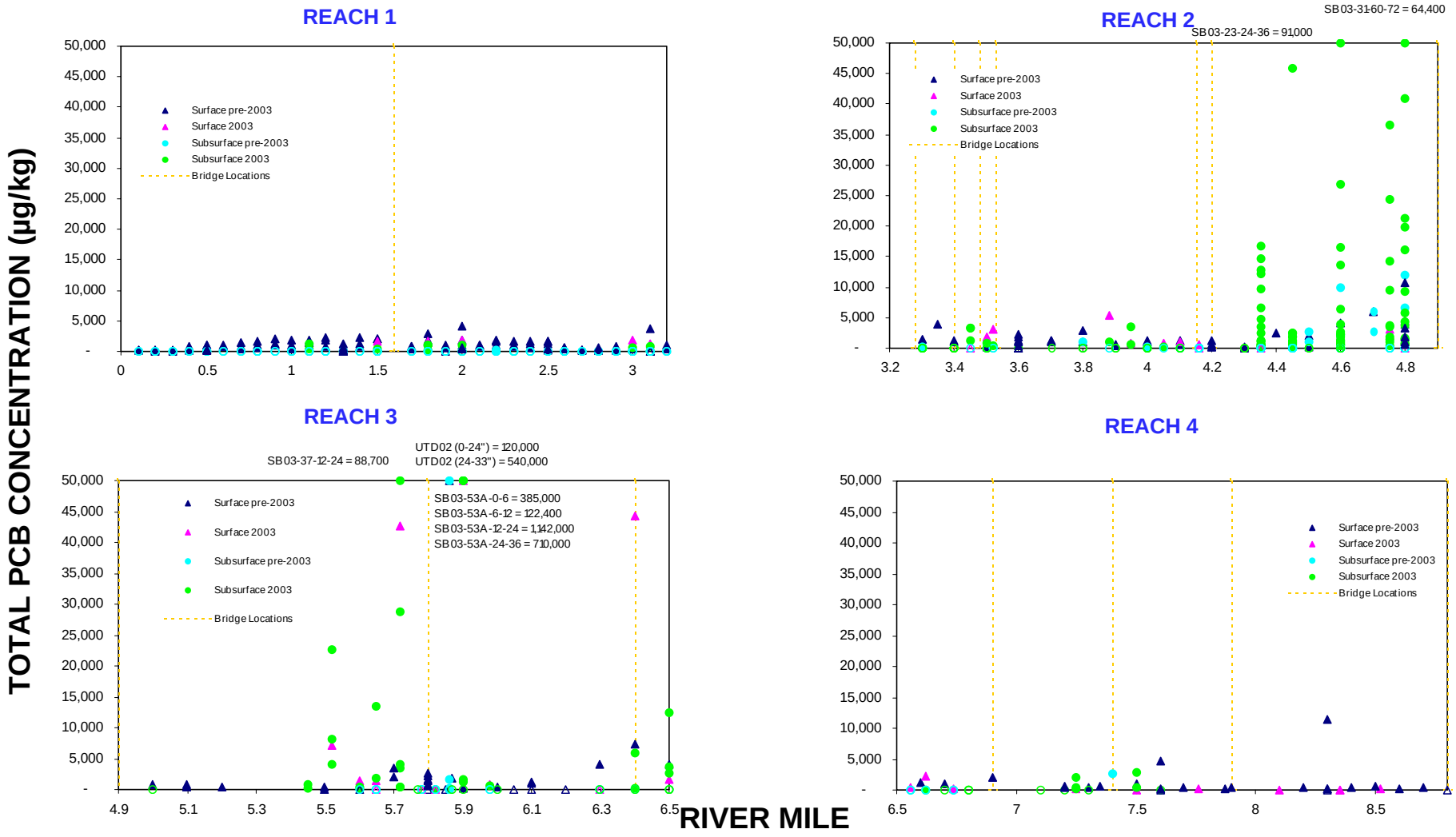
OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB CONCENTRATIONS
BY RIVER MILE – PRE 2003 AND 2003 DATA

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.1

73952



Notes:

1. 1994, 1998, and 2000 sediment samples collected and analyzed as part of OEPA studies.
2. 2003 sediment data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
3. Open symbols indicate non-detect results.
4. Values greater than 50,000 µg/kg plotted at maximum y-axis value of 50,000 µg/kg; actual value noted above data point.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB CONCENTRATIONS BY REACH - PRE-2003 AND 2003 DATA

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

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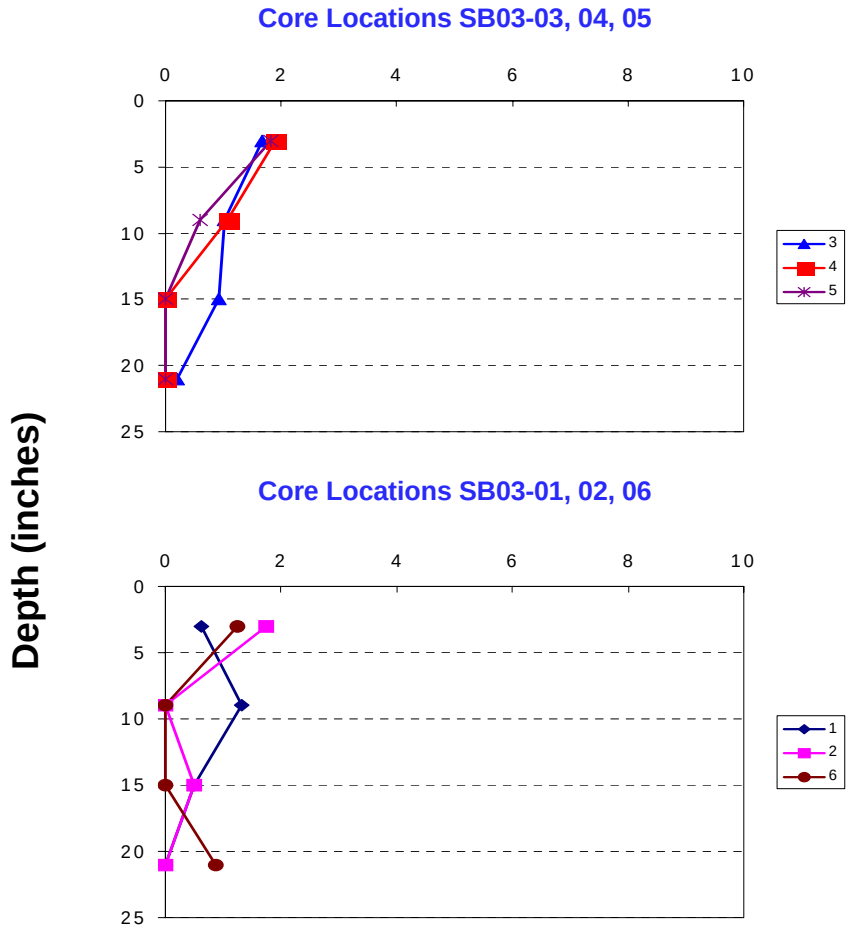
FIGURE

3.2

73952

Total PCB Concentration (mg/kg)



REACH 1 (River Mile 0-3.2)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB CONCENTRATION
DEPTH PROFILES - REACH 1

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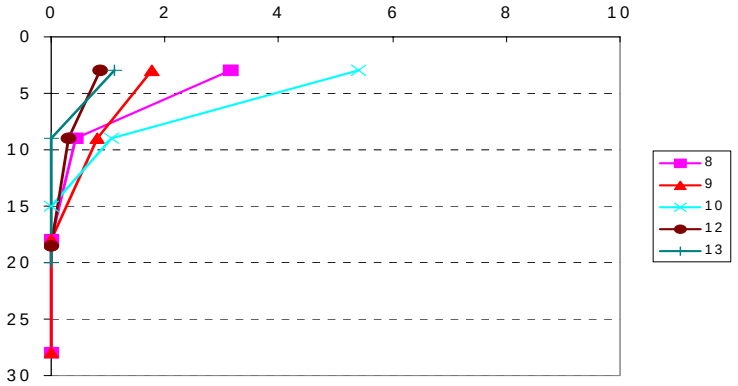
FIGURE
3.3

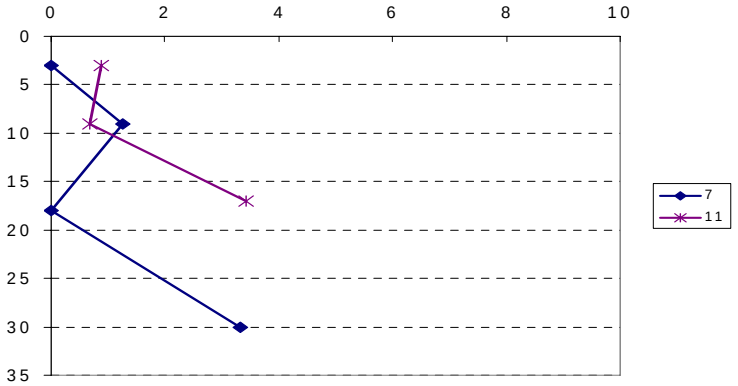
73952

Total PCB Concentration (mg/kg)

Core Locations SB03-08, 09, 10, 12, 13



Core Locations SB03-07, 11



Depth (inches)

Notes:

Core SB03-14: Non-detect at all depths

Core SB03-16: Non-detect at all depths except 0-6" (which was .7 ppm)

REACH 2a (River Mile 3.2-4.9)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB CONCENTRATION
DEPTH PROFILES - REACH 2a

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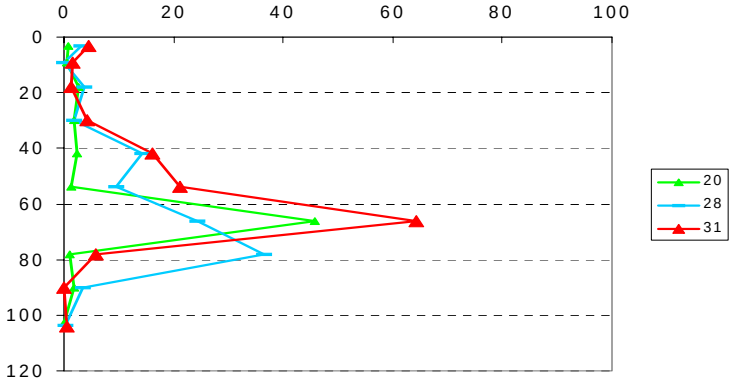
FIGURE
3.4a

73952

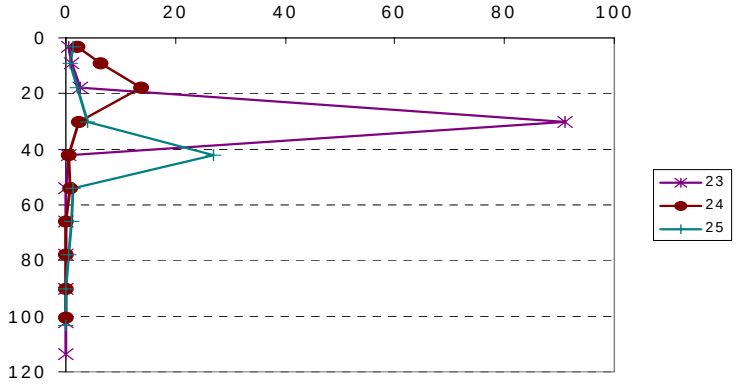
Total PCB Concentration (mg/kg)

Depth (inches)

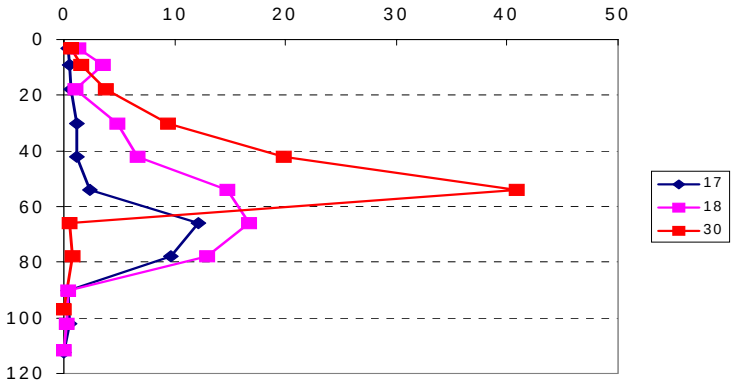
Core Locations SB03-20, 28, 31



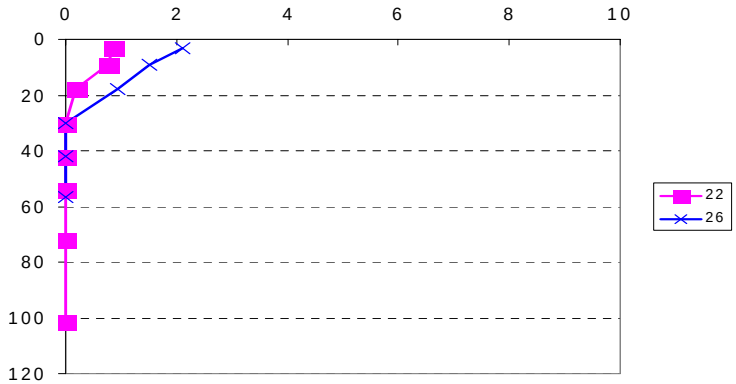
Core Locations SB03-23, 24, 25



Core Locations SB03-17, 18, 30



Core Locations SB03-22, 26



REACH 2b (River Mile 3.2-4.9, Stickney Ave. Depositional Zone)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB CONCENTRATION
DEPTH PROFILES - REACH 2b

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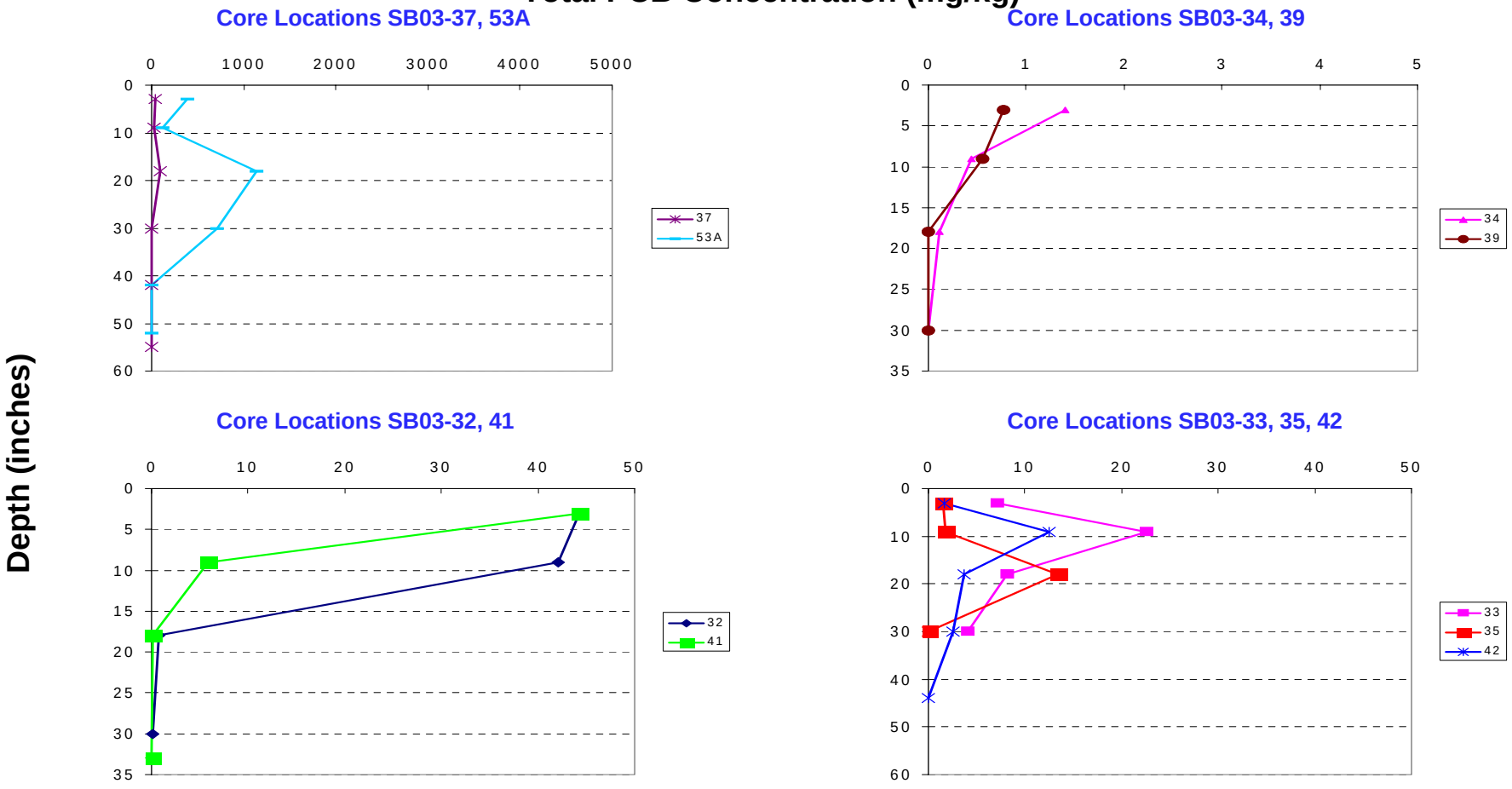
FIGURE
3.4b

73952

Total PCB Concentration (mg/kg)



REACH 3 (River Mile 4.9-6.5)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB CONCENTRATION
DEPTH PROFILES - REACH 3

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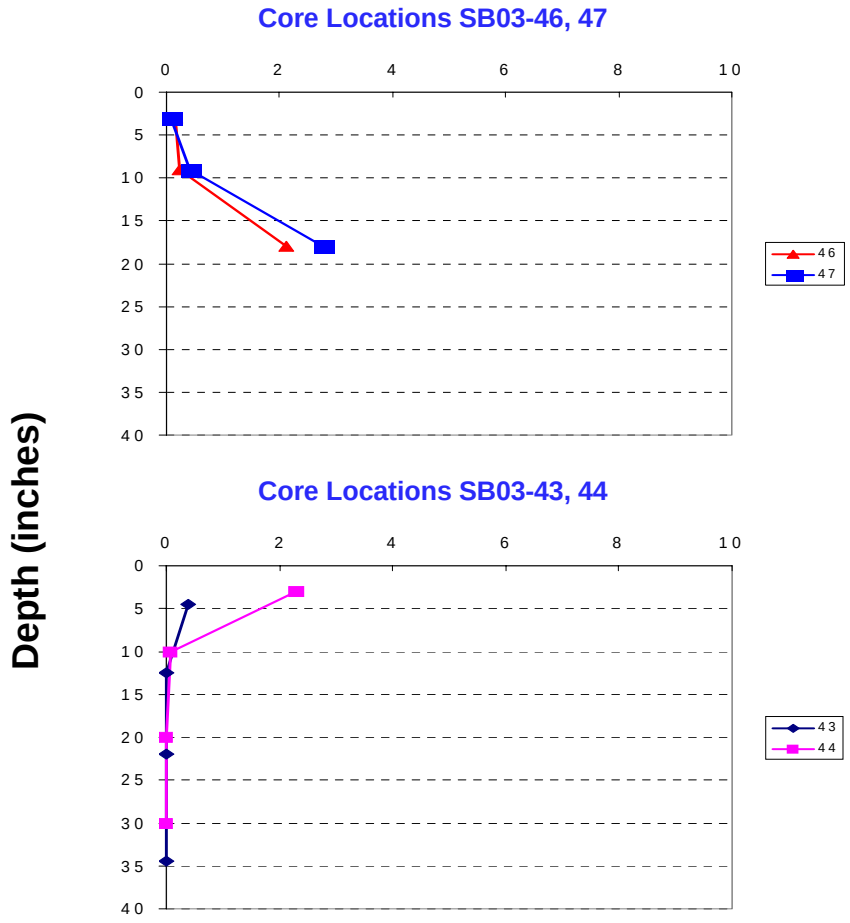
FIGURE
3.5

73952

Total PCB Concentration (mg/kg)



REACH 4 (River Mile 6.5-8.8)

Notes:
1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB CONCENTRATION
DEPTH PROFILES - REACH 4

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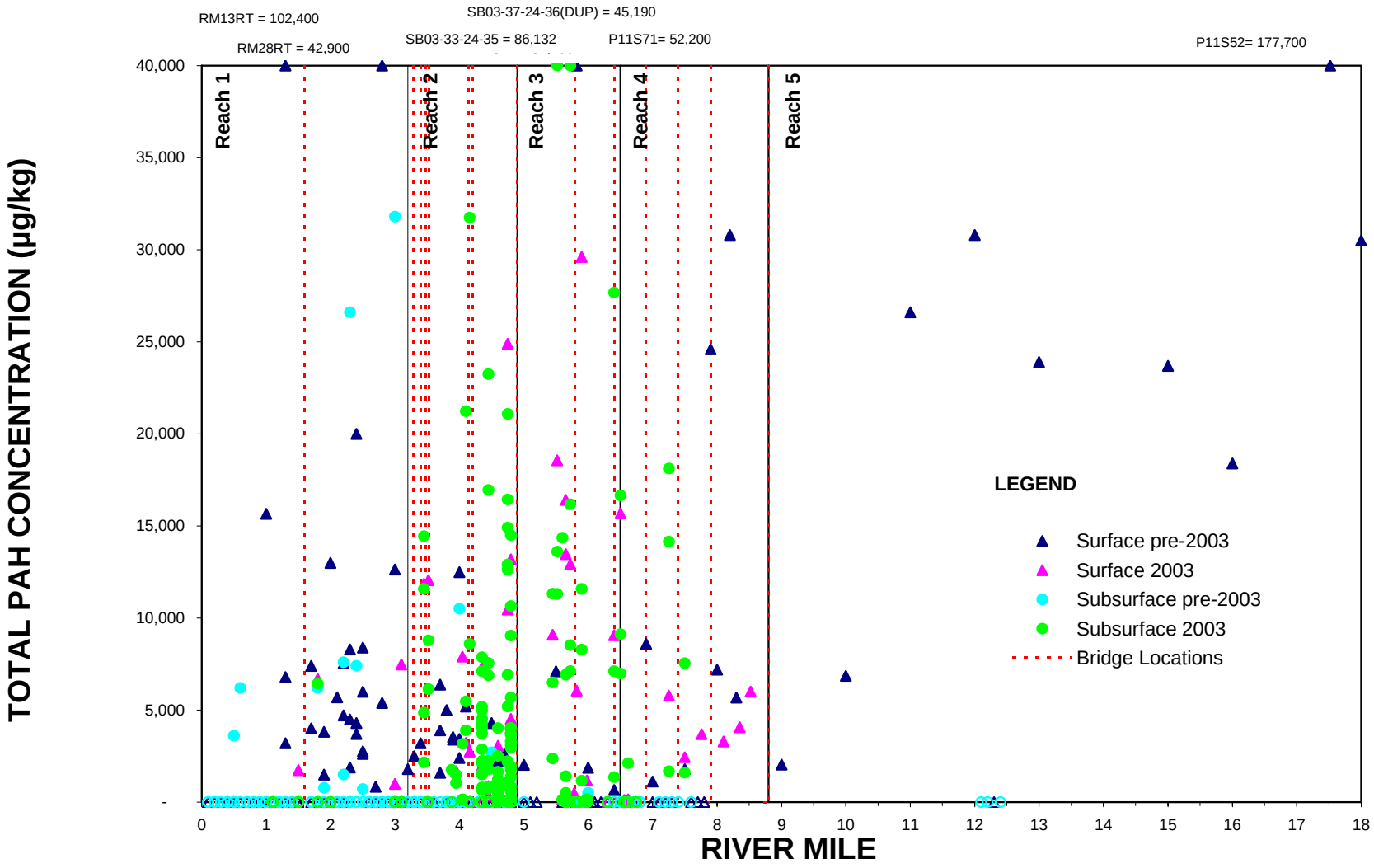
FIGURE
3.6

73952



Notes:

1. 1994, 1998, and 2000 sediment samples collected and analyzed as part of OEPA studies.
2. 2003 sediment data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
3. Open symbols indicate non-detect results.
4. Values greater than 40,000 µg/kg plotted at maximum y-axis value of 40,000 µg/kg; actual value noted above data point.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PAH CONCENTRATIONS
BY RIVER MILE – PRE 2003 AND 2003 DATA

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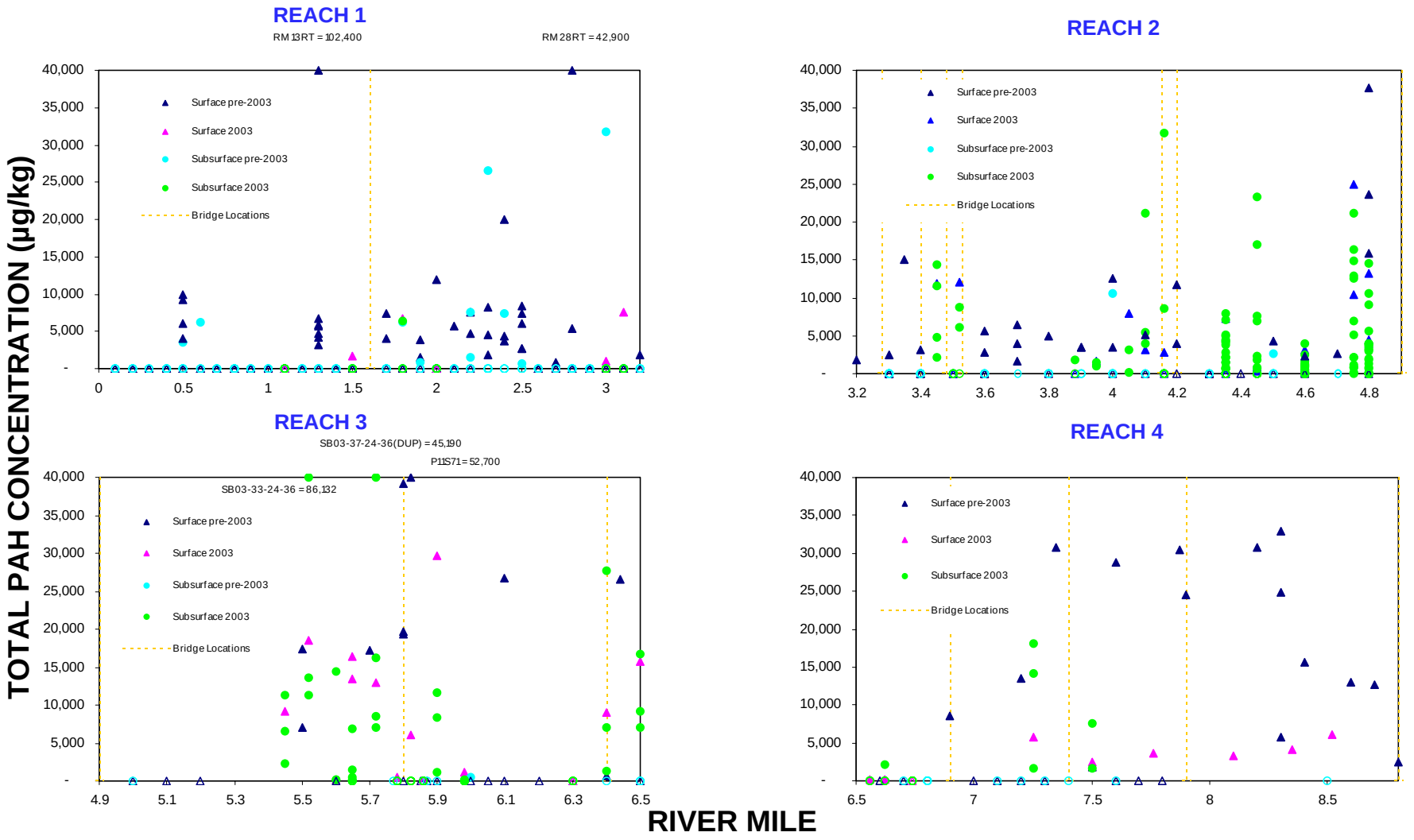
FIGURE
3.7

73952



Notes:

1. 1994, 1998, and 2000 sediment samples collected and analyzed as part of OEPA studies.
2. 2003 sediment data presented are from 2003 sampling event by OEPA, with analysis by Belmont Labs.
3. Open symbols indicate non-detect results.
4. Values greater than 40,000 µg/kg plotted at maximum y-axis value of 40,000 µg/kg; actual value noted above data point.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PAH CONCENTRATIONS
BY REACH – PRE 2003 AND 2003 DATA

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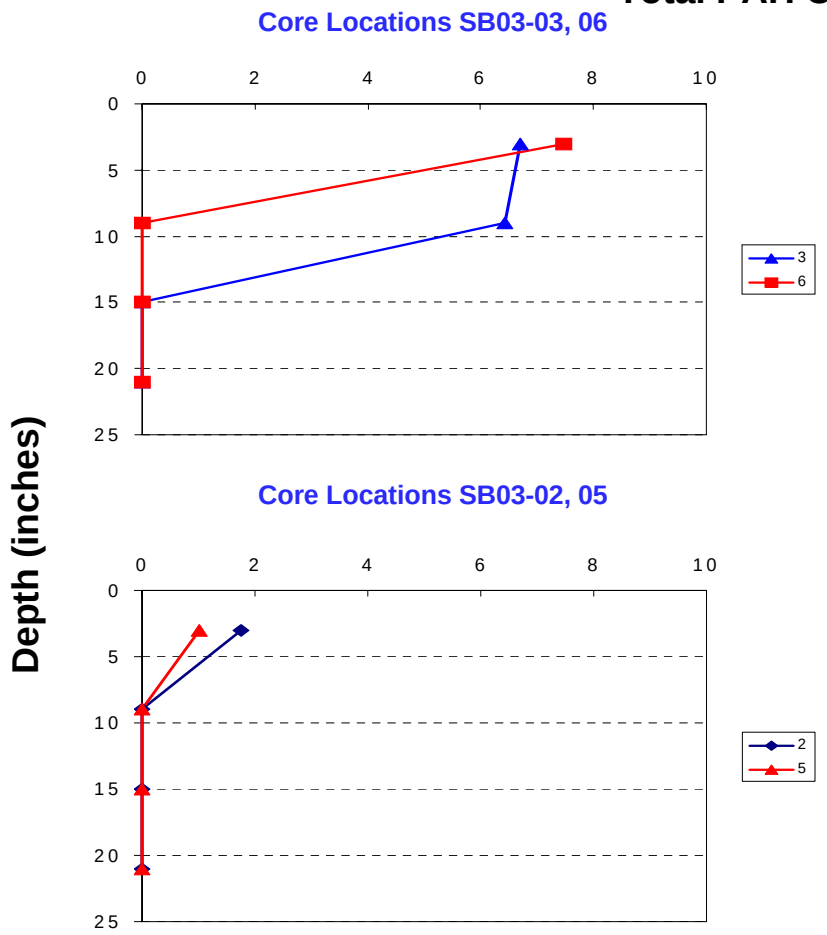
FIGURE
3.8

73952

Total PAH Concentration (mg/kg)



REACH 1 (River Mile 0-3.2)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PAH CONCENTRATION
DEPTH PROFILES - REACH 1

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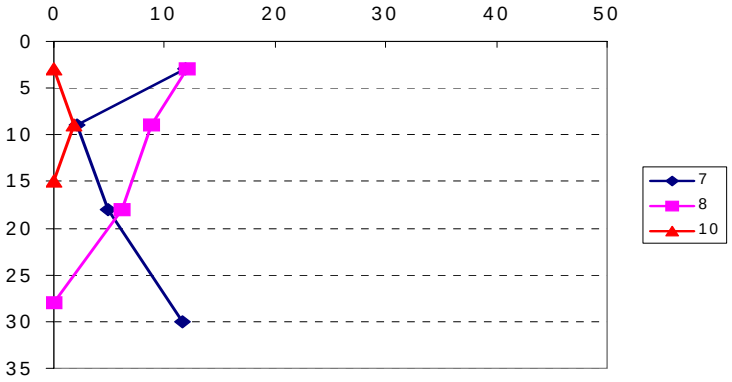
Hull & associates, inc.

FIGURE
3.9

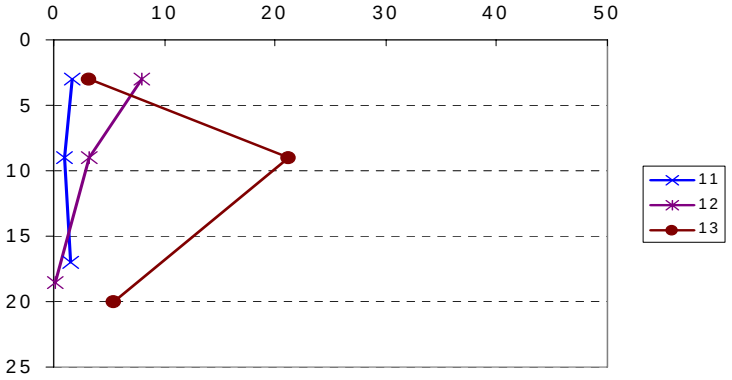
73952

Total PAH Concentration (mg/kg)

Core Locations SB03-07, 08, 10



Core Locations SB03-11, 12, 13



Depth (inches)

REACH 2a (River Mile 3.2-4.9)

Notes:
1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PAH CONCENTRATION
DEPTH PROFILES - REACH 2a

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

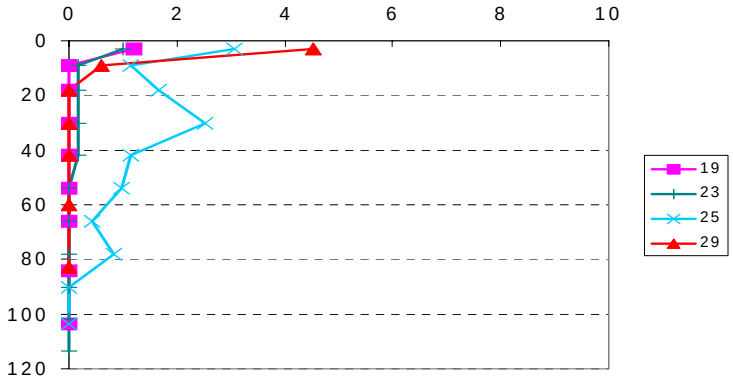
FIGURE
3.10a

73952

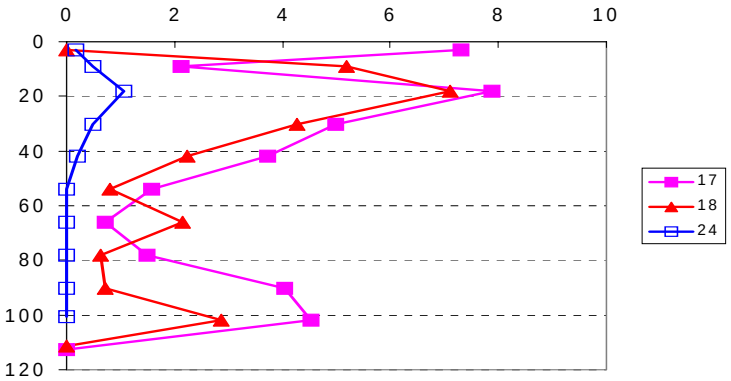
Total PAH Concentration (mg/kg)

Depth (inches)

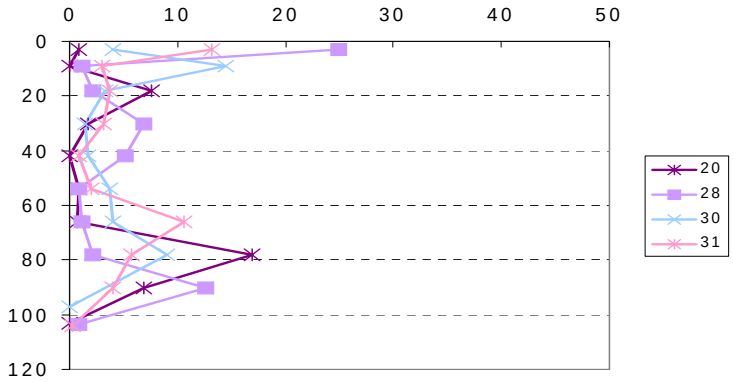
Core Locations SB03-19, 23, 25, 29



Core Locations SB03-17, 18, 24



Core Locations SB03-20, 28, 30, 31



REACH 2b (River Mile 3.2-4.9, Stickney Ave. Depositional Zone)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PAH CONCENTRATION
DEPTH PROFILES - REACH 2b

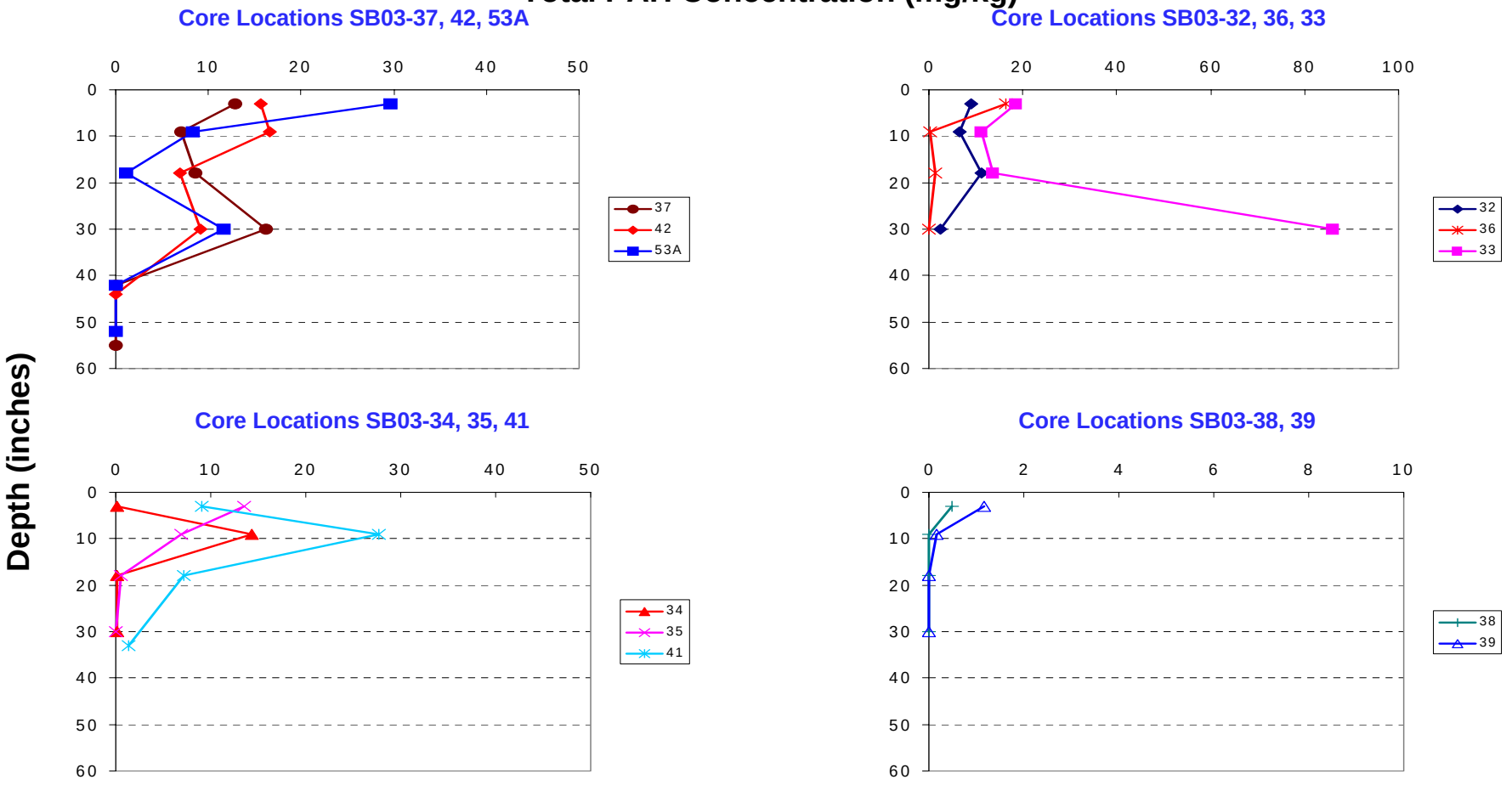
BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

Hull & associates, inc.

FIGURE
3.10b

73952

Total PAH Concentration (mg/kg)



REACH 3 (River Mile 4.9-6.5)

Notes:
1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PAH CONCENTRATION
DEPTH PROFILES - REACH 3

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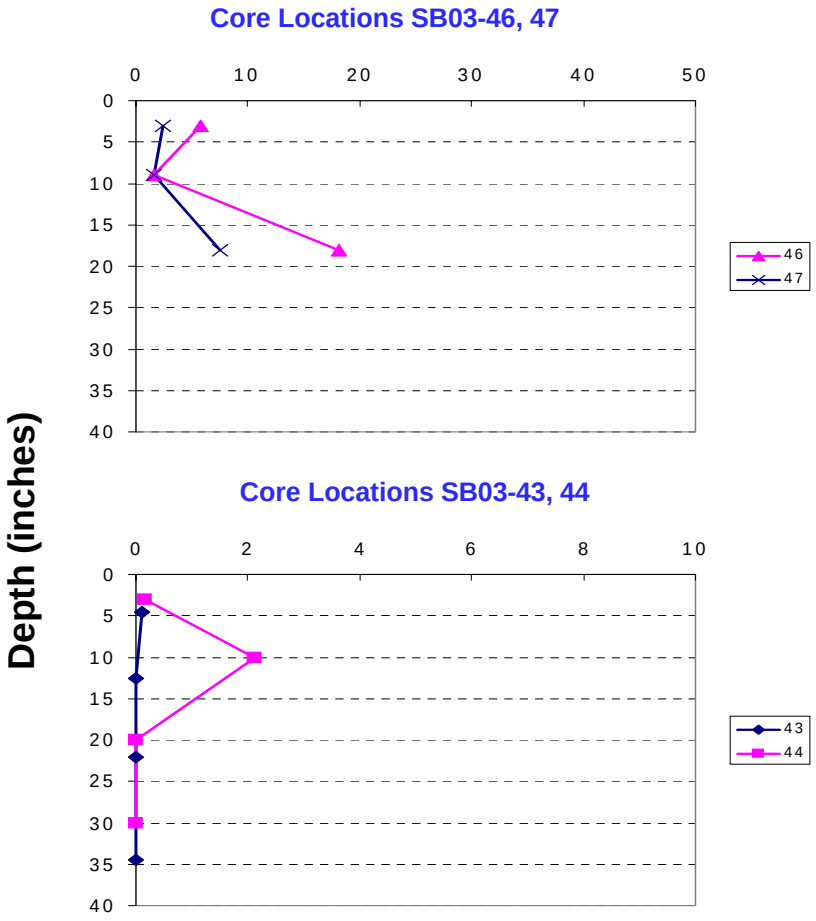
Hull & associates, inc.

FIGURE
3.11

73952

Total PAH Concentration (mg/kg)



REACH 4 (River Mile 6.5-8.8)

Notes:
1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

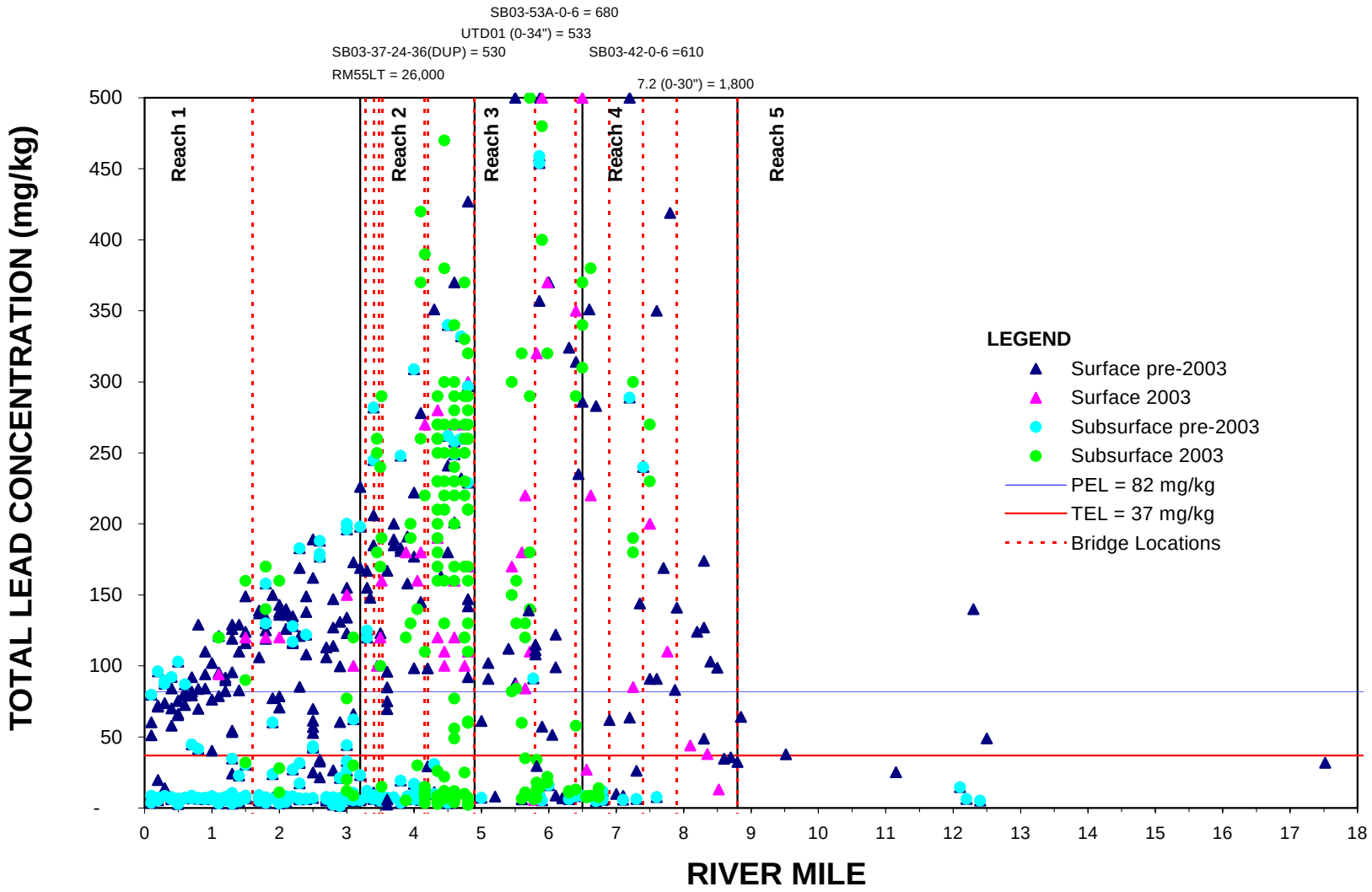
OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PAH CONCENTRATION
DEPTH PROFILES - REACH 4

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.12

73952



Notes:

1. 1994, 1998, and 2000 sediment samples collected and analyzed as part of OEPA studies.
2. 2003 sediment data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
3. Open symbols indicate non-detect results.
4. Values greater than 500 mg/kg plotted at maximum y-axis value of 500 mg/kg; actual value noted above data point.
5. PEL and TEL values from Ingersoll et al. 1996 were taken from the Ecological Screening Level Risk Assesment (Parametrix, 2001)
6. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

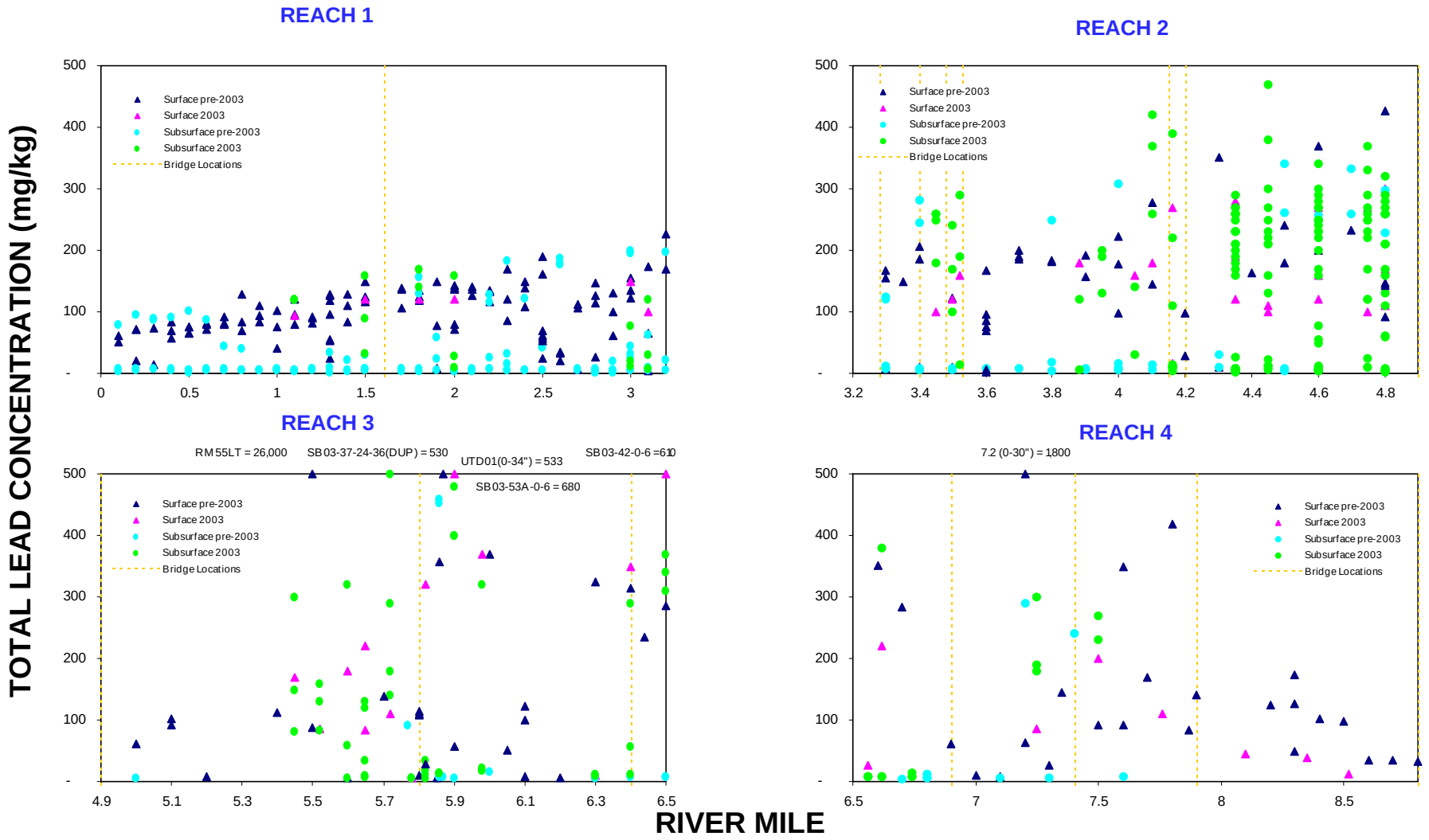
SEDIMENT TOTAL LEAD CONCENTRATIONS
BY RIVER MILE – PRE 2003 AND 2003 DATA

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

Hull & associates, inc.

FIGURE
3.13

73952



Notes:

1. 1994, 1998, and 2000 sediment samples collected and analyzed as part of OEPA studies.
2. 2003 sediment data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
3. Open symbols indicate non-detect results.
4. Values greater than 500 mg/kg plotted at maximum y-axis value of 500 mg/kg; actual value noted above data point.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

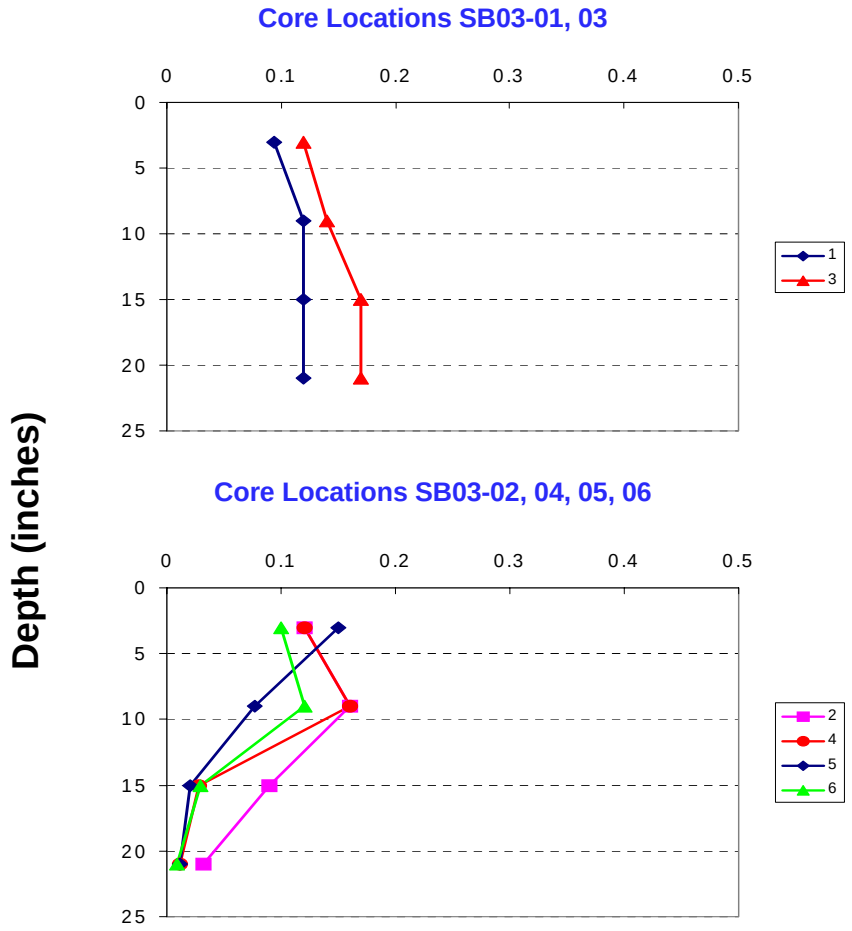
SEDIMENT TOTAL LEAD CONCENTRATIONS
BY REACH – PRE 2003 AND 2003 DATA

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.14

73952

Total Lead Concentration (mg/kg)



REACH 1 (River Mile 0-3.2)

Notes:
1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL LEAD CONCENTRATION
DEPTH PROFILES - REACH 1

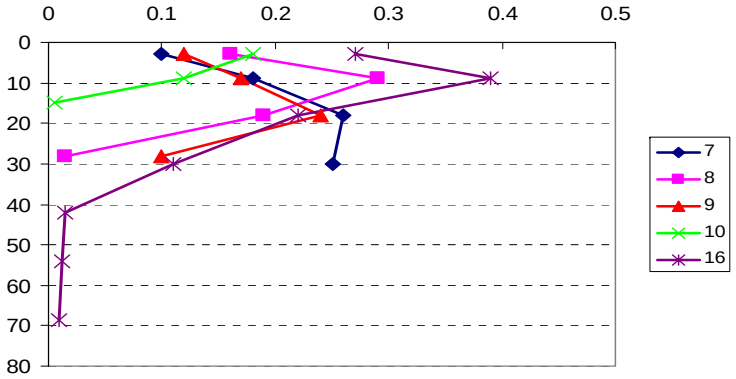
BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.15

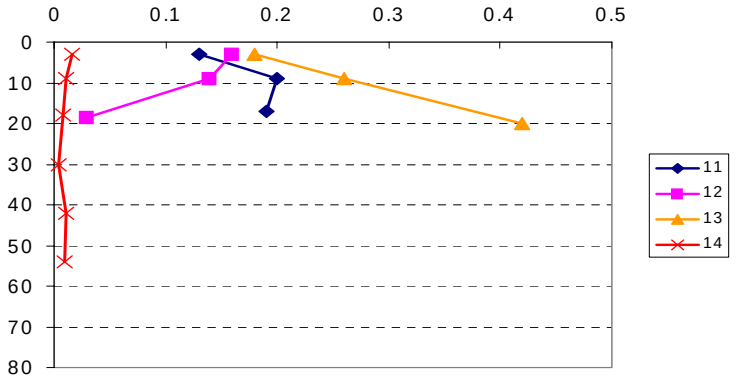
73952

Total Lead Concentration (mg/kg)

Core Locations SB03-07, 08, 09, 10, 16



Core Locations SB03-11, 12, 13, 14



Depth (inches)

REACH 2a (River Mile 3.2-4.9)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

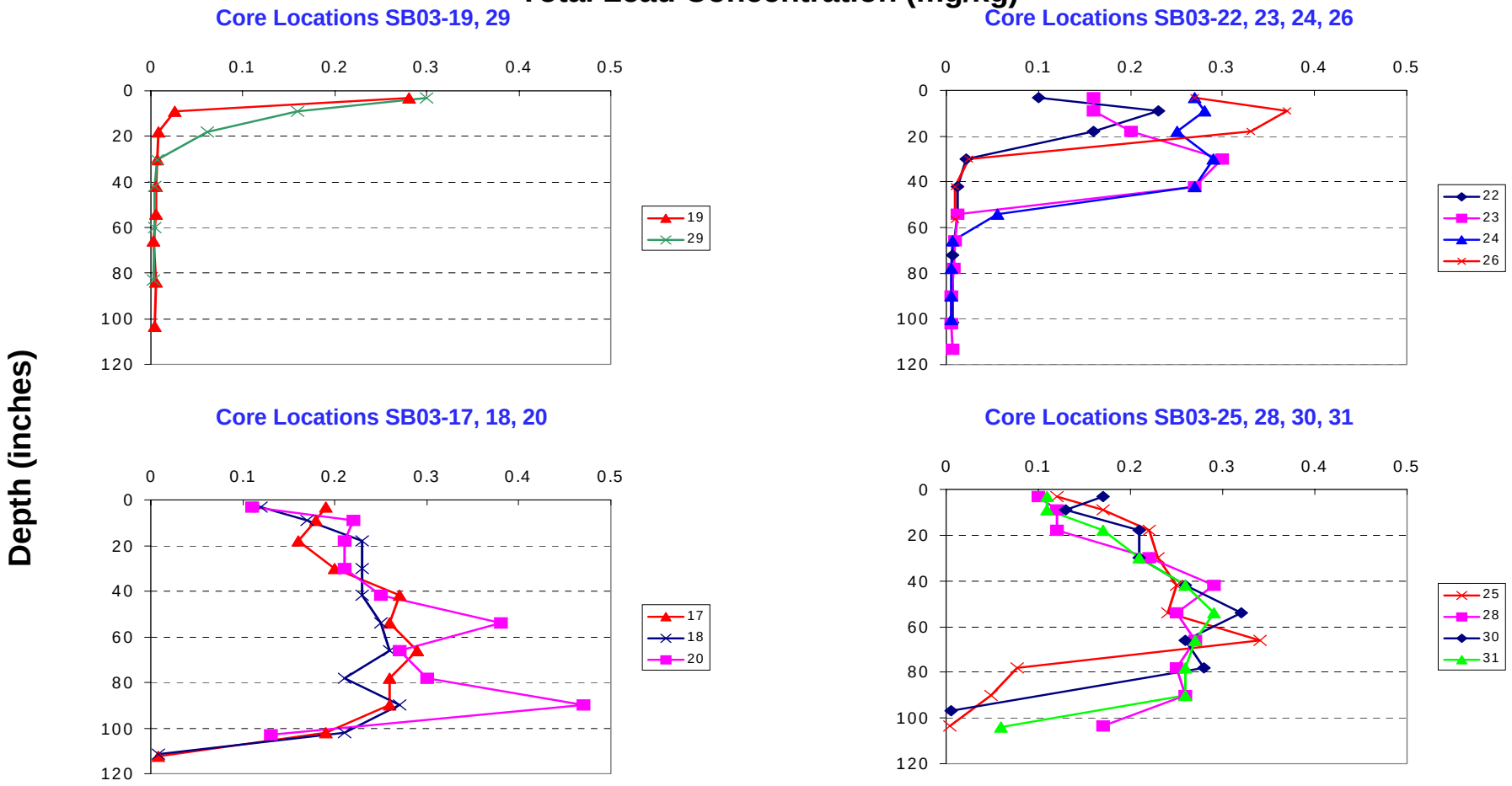
SEDIMENT TOTAL LEAD CONCENTRATION
DEPTH PROFILES - REACH 2a

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.16a

73952

Total Lead Concentration (mg/kg)



REACH 2b (River Mile 3.2-4.9, Stickney Ave. Depositional Zone)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

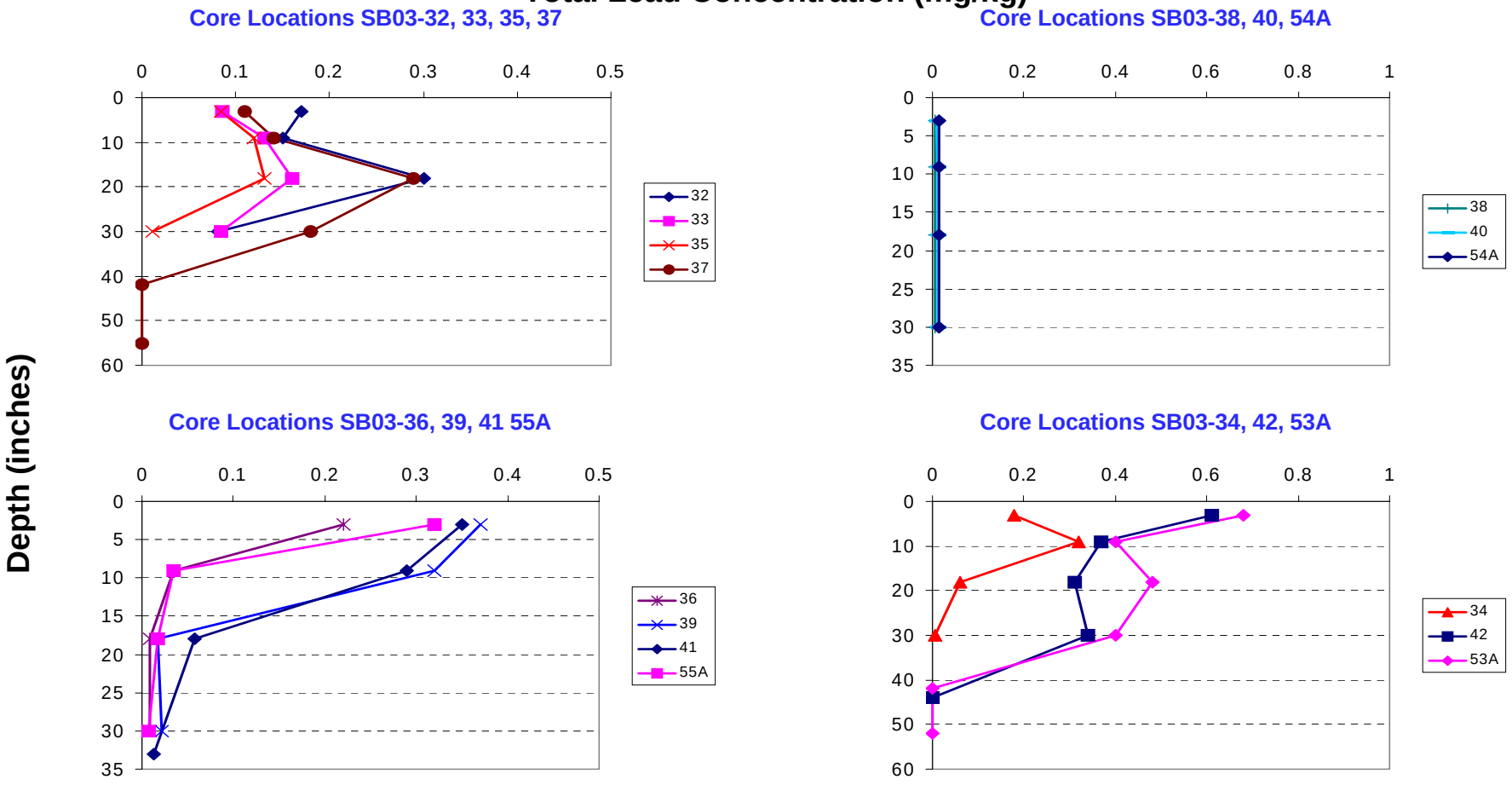
SEDIMENT TOTAL LEAD CONCENTRATION
DEPTH PROFILES - REACH 2b

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.16b

73952

Total Lead Concentration (mg/kg)



REACH 3 (River Mile 4.9-6.5)

Notes:
1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

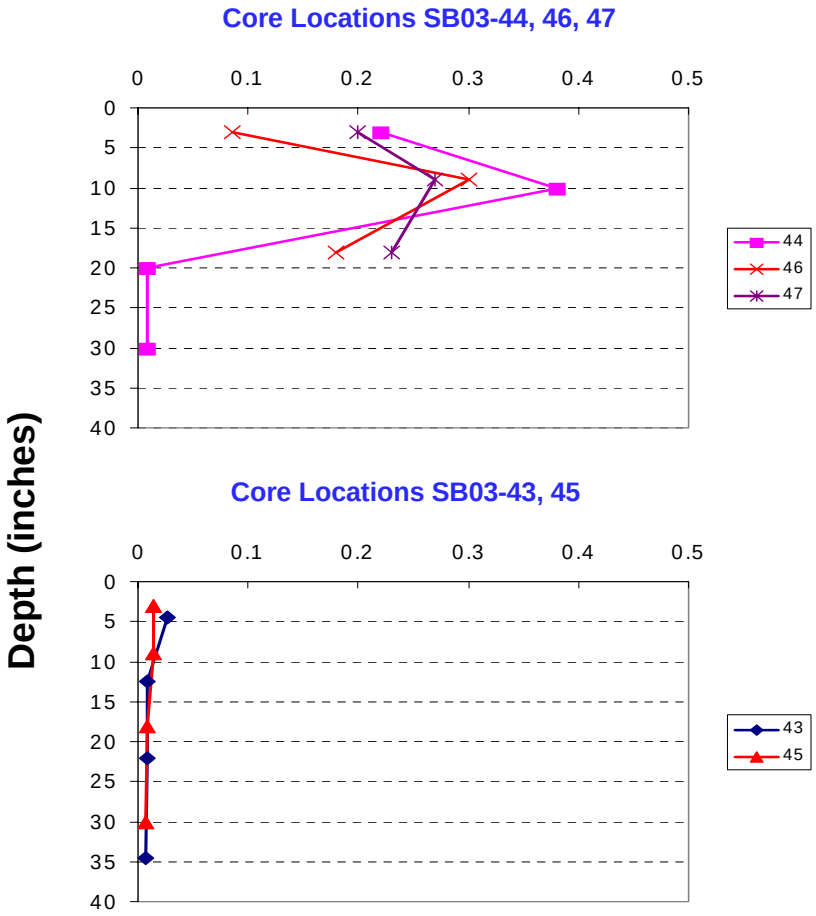
SEDIMENT TOTAL LEAD CONCENTRATION
DEPTH PROFILES - REACH 3

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.17

73952

Total Lead Concentration (mg/kg)



REACH 4 (River Mile 6.5-8.8)

Notes:

1. Data presented are from October 2003 sampling event by OEPA, with analysis by Belmont Labs.
2. Depth-discrete data values plotted at average depth of core section interval for each sample.
3. Non-detect concentrations are represented as zero values.
4. Concentration scales vary by plot.
5. Concentrations given as dry weight values.

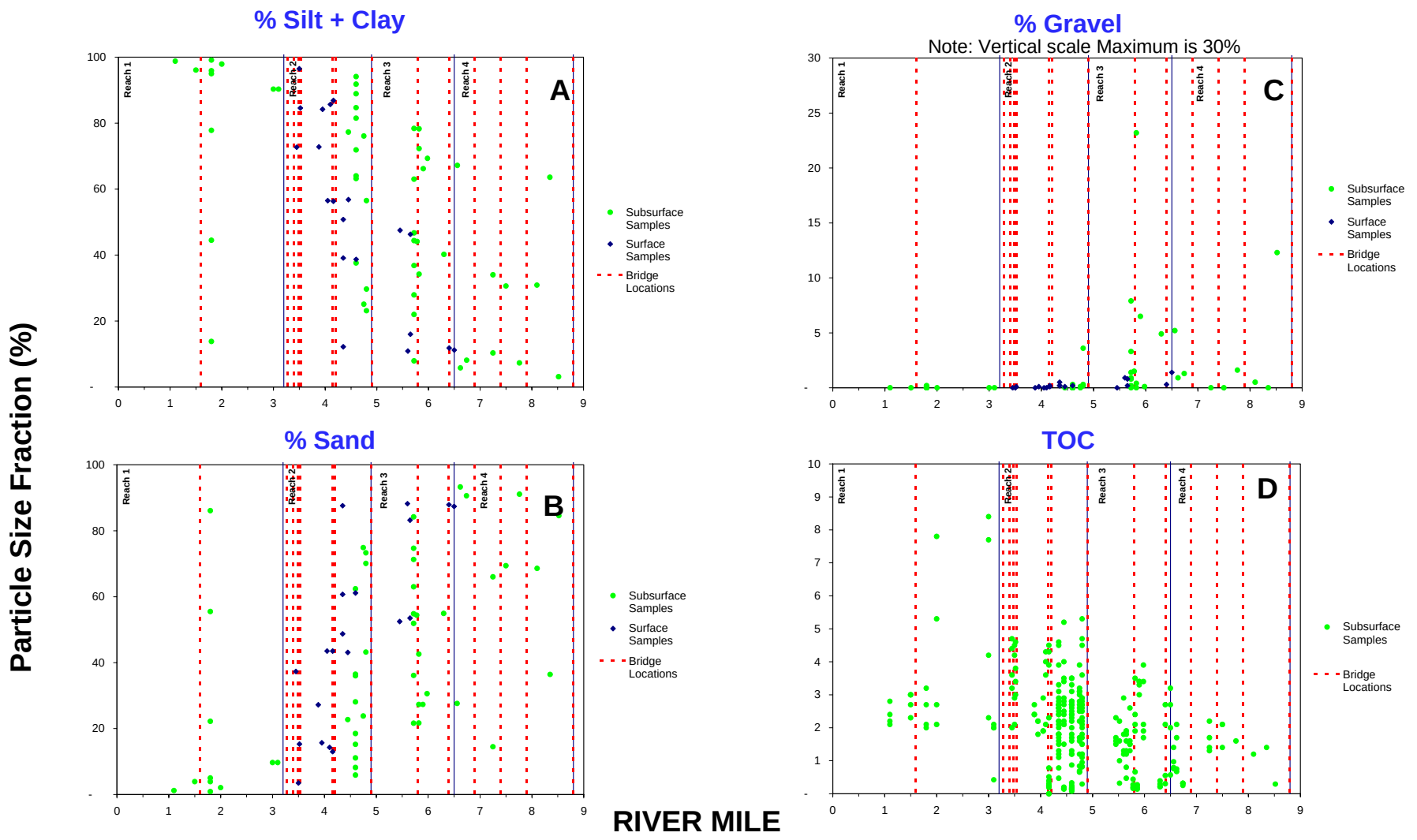
OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL LEAD CONCENTRATION
DEPTH PROFILES - REACH 4

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
3.18

73952



Notes:

1. Data presented are from October 2003 sampling event conducted by OEPA, with particle size analysis conducted by Hull & Associates, Inc. and TOC analysis conducted by Belmont Labs.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT PARTICLE SIZE FRACTIONS AND TOC
BY RIVER MILE – 2003 DATA

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists

Hull & associates, inc.

FIGURE
3.19

73952

LEGEND:
4.2 RIVER MILE

0 350 700 Feet

4.9

4.2

NORTHEAST

KETTERING

MATZINGER

FLOW DIRECTION

STICKNEY

CSX RAILROAD BRIDGE

BACKWATER
MARSH AREA

STICKNEY AVENUE DEPOSITIONAL ZONE

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

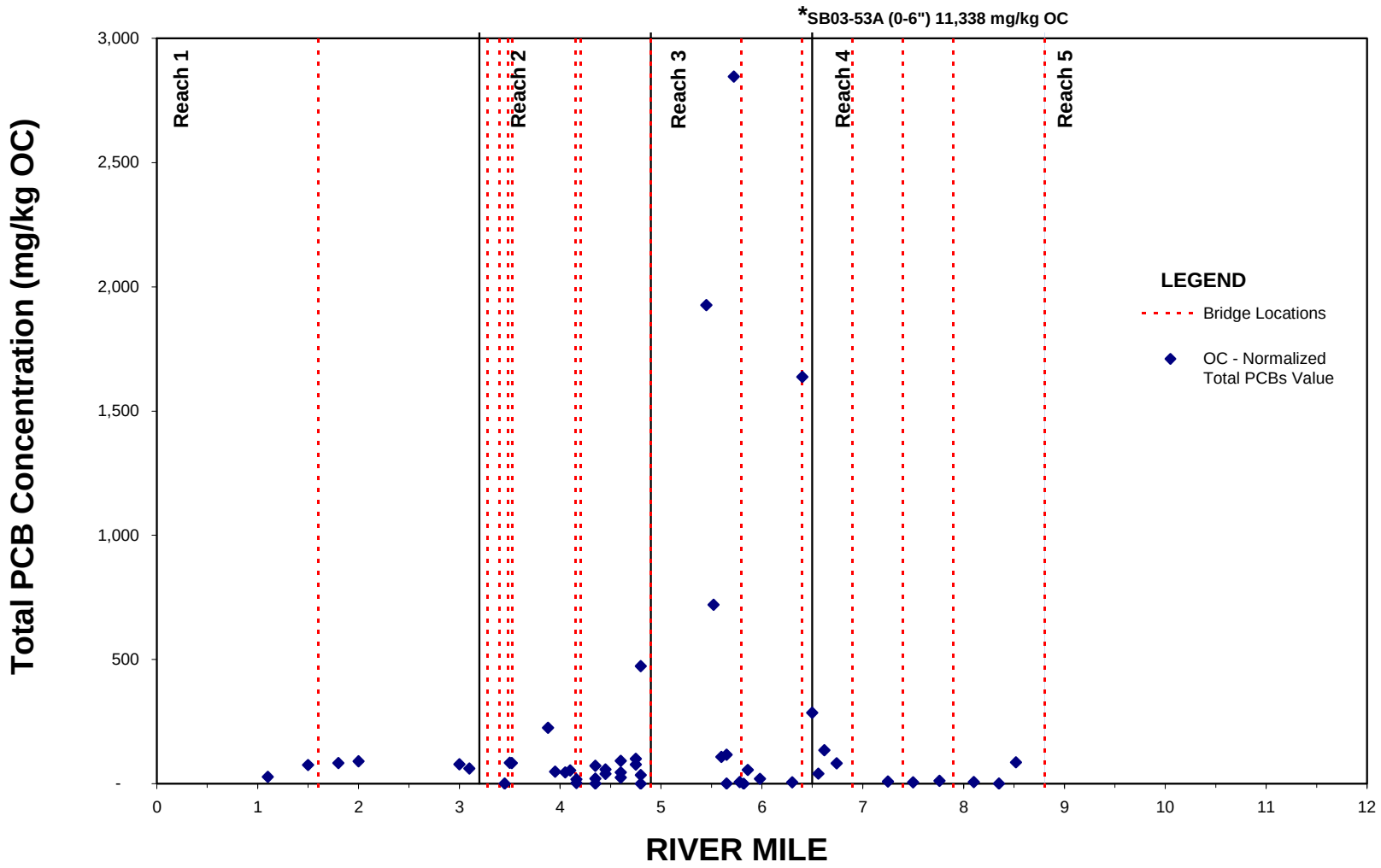
STICKNEY AVENUE DEPOSITIONAL ZONE (SADZ)

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

Hull & associates, inc.

FIGURE
4.1

10/7/04 SYR-85 MTK
Ottawa River 73952.005
Q:\OttawaRiver\mxd\Stickney Ave Dep Area.mxd



Notes:

1. Organic carbon (OC) values greater than 3,000 mg/kg OC plotted at maximum y-axis value of 3,000 mg/kg OC; actual value noted above data point.
2. Data presented are from October 2003 sedimentsampling event conducted by OEPA, with analysis by Belmont Labs.
3. Duplicates not included in calculations.
4. Concentrations given as dry weight values.
5. One half the detection limit value was used for samples with non-detect concentrations of PCB and TOC.

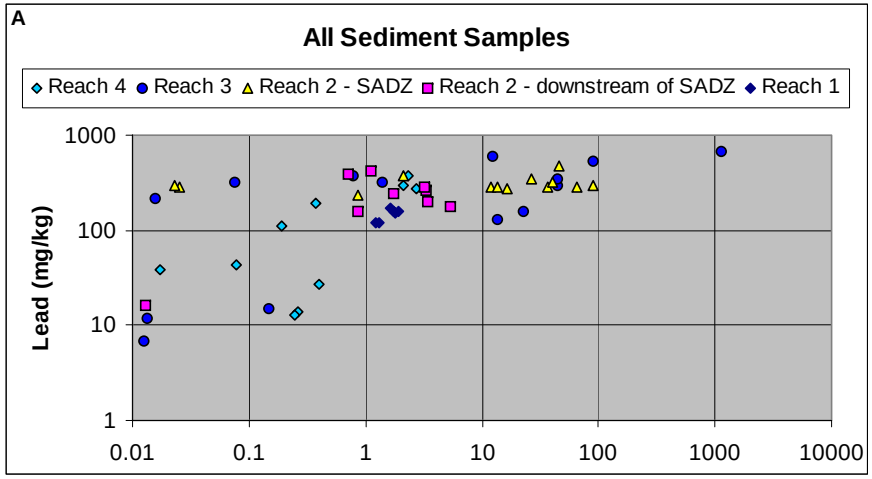
OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

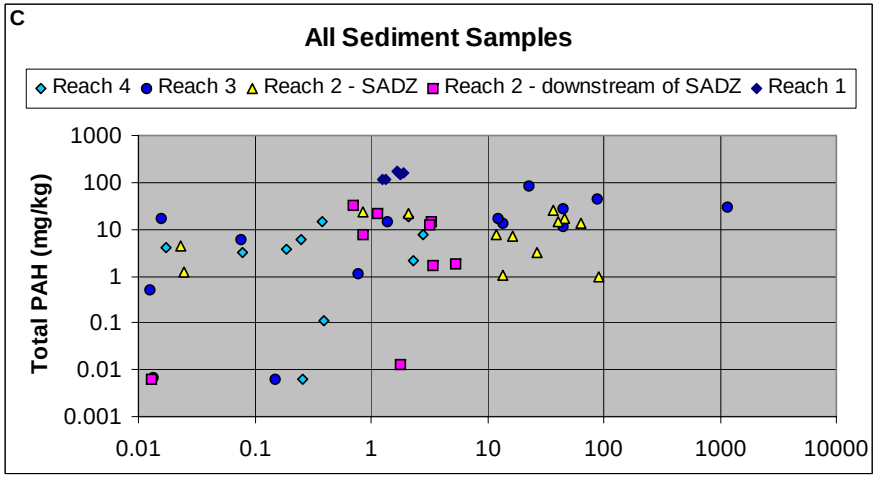
SURFACE SEDIMENT OC-NORMALIZED TOTAL PCB CONCENTRATION BY RIVER MILE – 2003 DATA

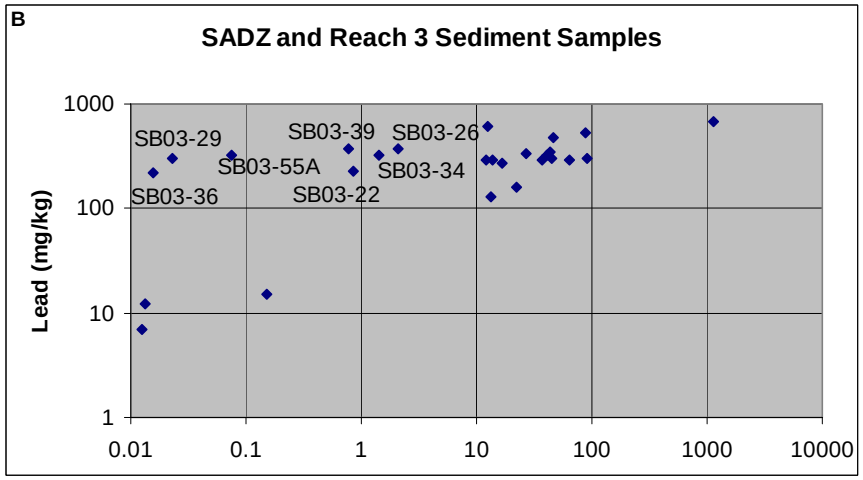
BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

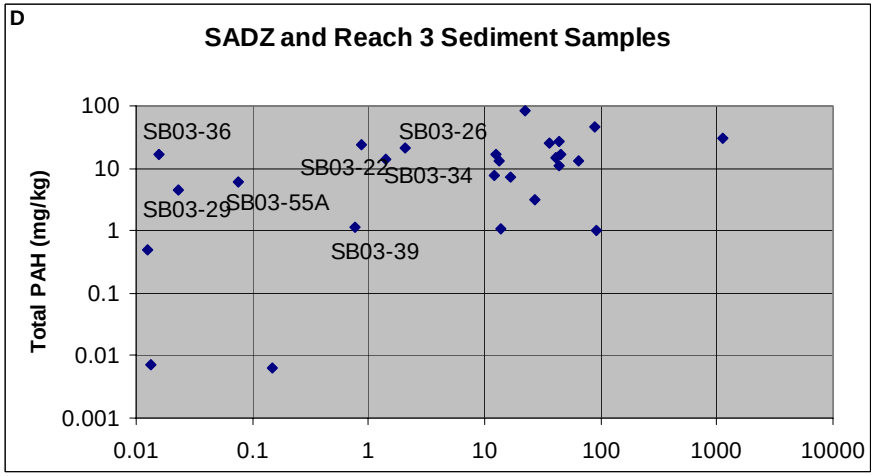
FIGURE
4.2

73952









Total PCB (mg/kg)

Notes:

1. Correlations show the maximum in-core Total lead and Total PAH concentrations plotted versus the maximum in-core Total PCB concentrations.
2. Data presented are from October 2003 sediment sampling event conducted by OEPA, with analysis by Belmont Labs.
3. Duplicates not included in calculations.
4. Concentrations given as dry weight values.
5. One half the detection limit value was used for samples with non-detect concentrations of PCB.

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

CORE MAX SEDIMENT TOTAL LEAD AND TOTAL PAH CORRELATIONS WITH CORE MAX TOTAL PCB – 2003 DATA

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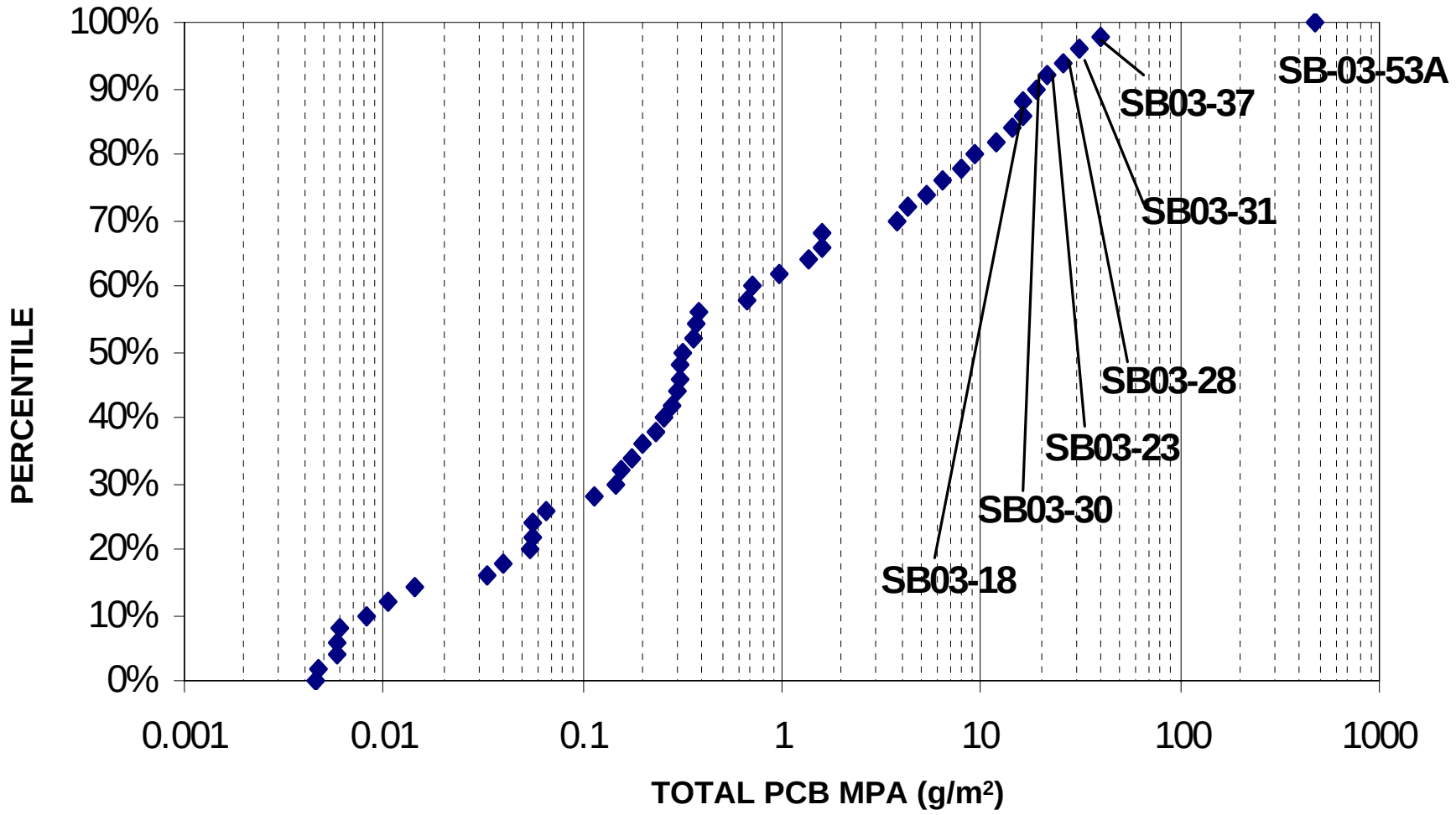
FIGURE
4.3

73952



Notes:

1. MPA = Mass Per Area
2. Duplicates not included in MPA calculations.
3. For samples containing PCBs in the bottom-most depth interval, an additional one-foot interval with the same PCB concentrations as the depth interval above it was added for MPA calculations.
4. For surface samples and subsurface samples with ND at all depth intervals, a one-foot depth interval with a concentration of one-half the detection limit was used for the MPA calculation..
5. MPA for each core computed based on calculated bulk Total PCB concentration and sample-depth intervals.

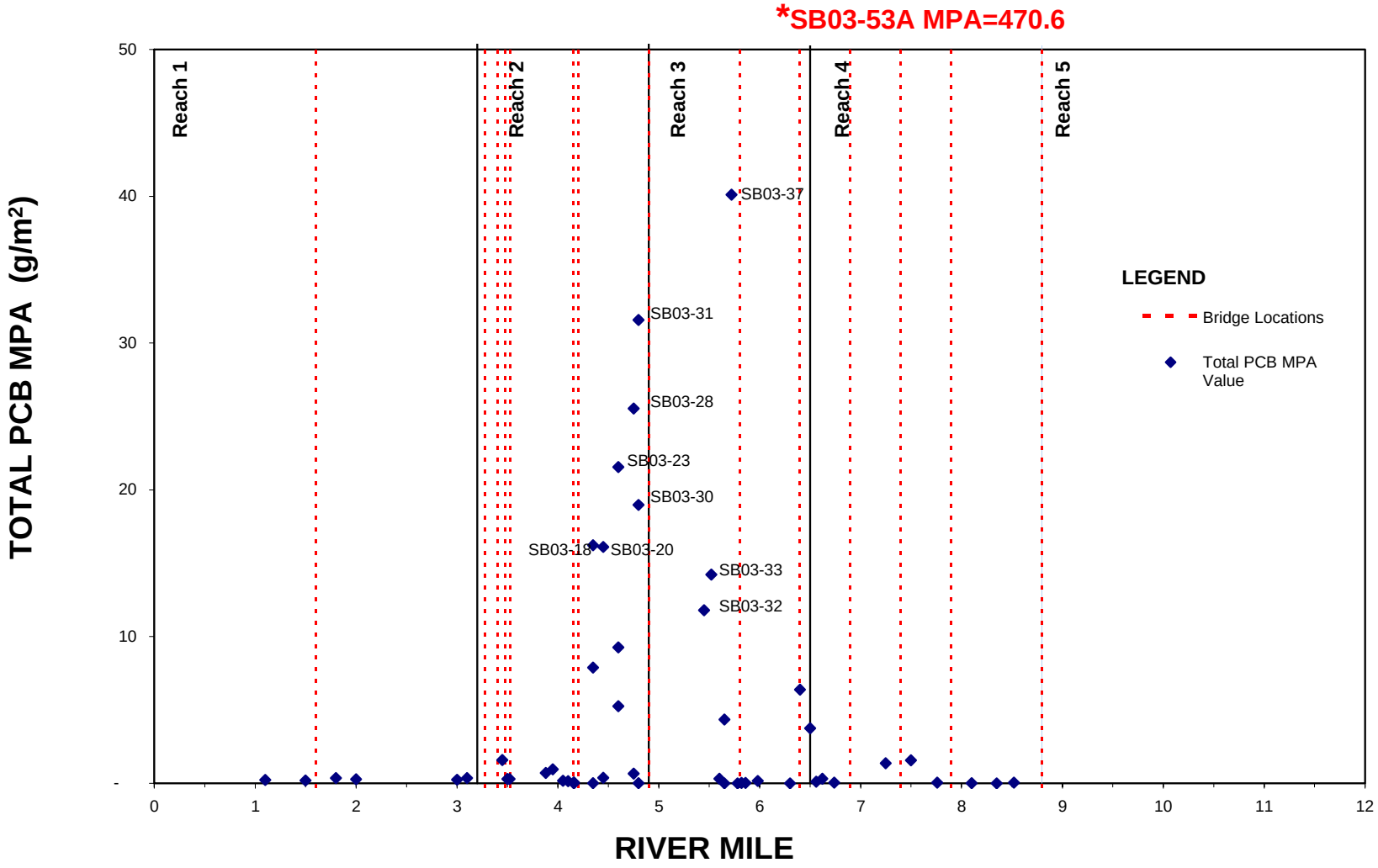
OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

SEDIMENT TOTAL PCB MPA CUMULATIVE
FREQUENCY DISTRIBUTION (CFD) – 2003 DATA

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
4.4

73952



Notes:

1. MPA = Mass Per Area
2. Duplicates not included in MPA calculations.
3. For samples containing PCBs in the bottom-most depth interval, an additional one-foot interval with the same PCB concentrations as the depth interval above it was added for MPA calculations.
4. For surface samples and subsurface samples with ND at all depth intervals, a one-foot depth interval with a concentration of one half the detection limit was used for the MPA calculation.
5. Values greater than 50 g/m² plotted at maximum y-axis value of 50 g/m²; actual value noted above or below data point.

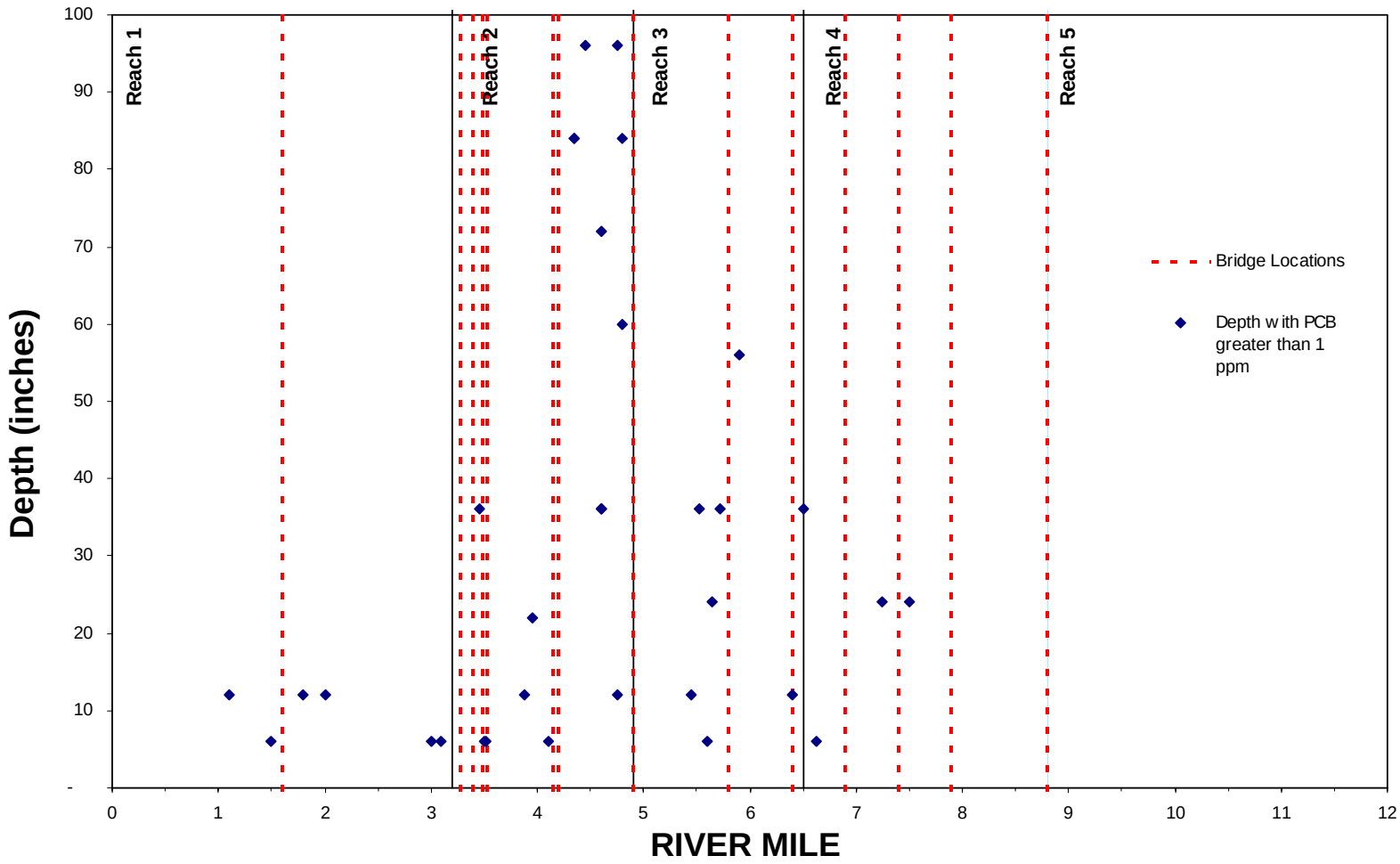
73952

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

TOTAL PCB MPA
BY RIVER MILE – 2003 DATA

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
4.5



Notes:

1. Not all core sampling locations contained Total PCB concentration in sediments of > 1 ppm at some depth. Figure only shows those that do.
2. Sediment depth at which point is plotted consistent with bottom of depth interval for deepest sample in core with PCB >1 ppm.
3. Data presented are from October 2003 sediment sampling event by OEPA, with analysis by Belmont Labs.

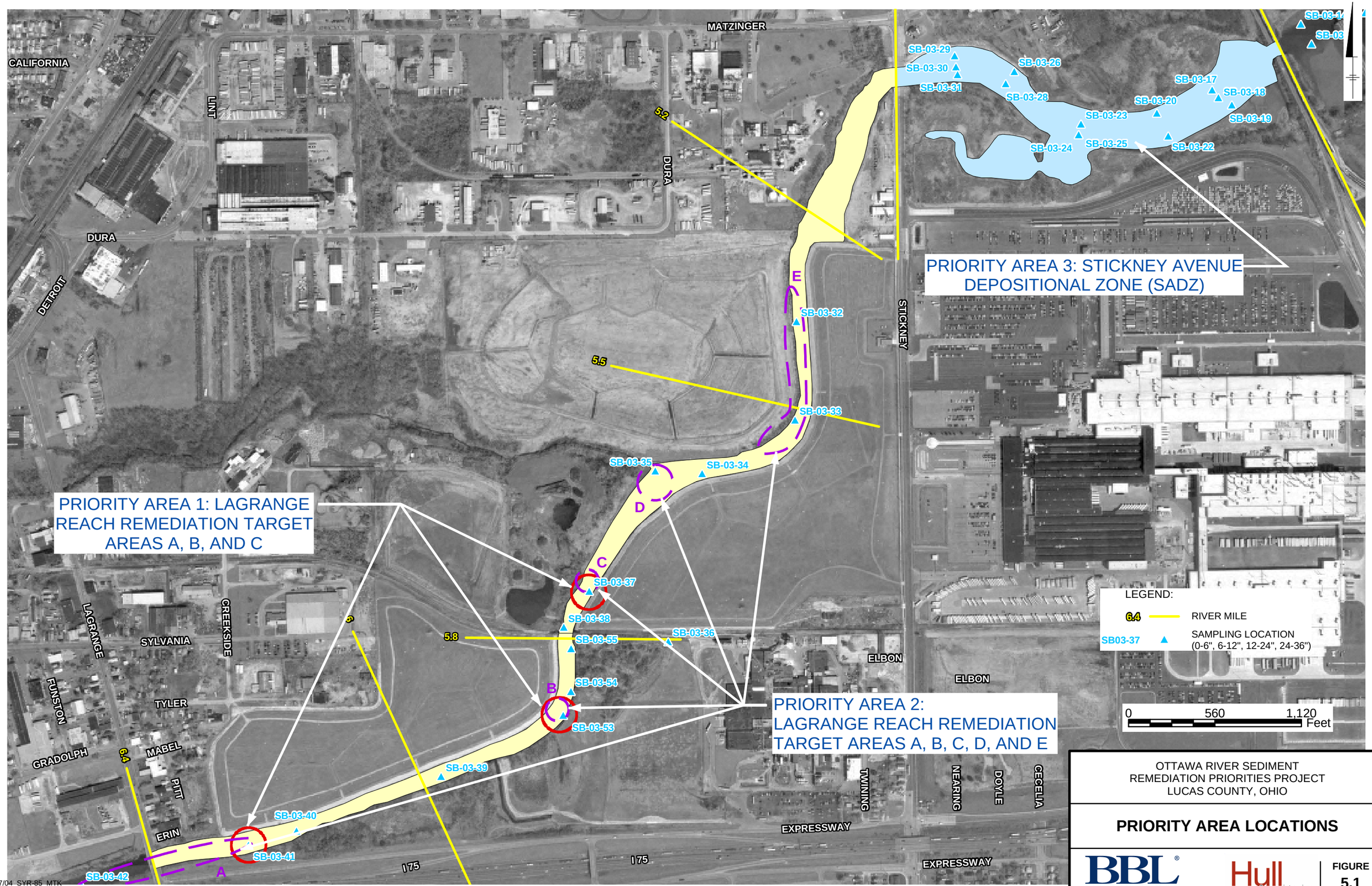
OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

DEPTHS WITH TOTAL PCBS > 1 PPM BY RIVER MILE
2003 DATA

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
4.6

73952



10/7/04 SYR-85 MTK
Ottawa River 73592.005
Q:\OttawaRiver\mxd\Priority Areas.mxd

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

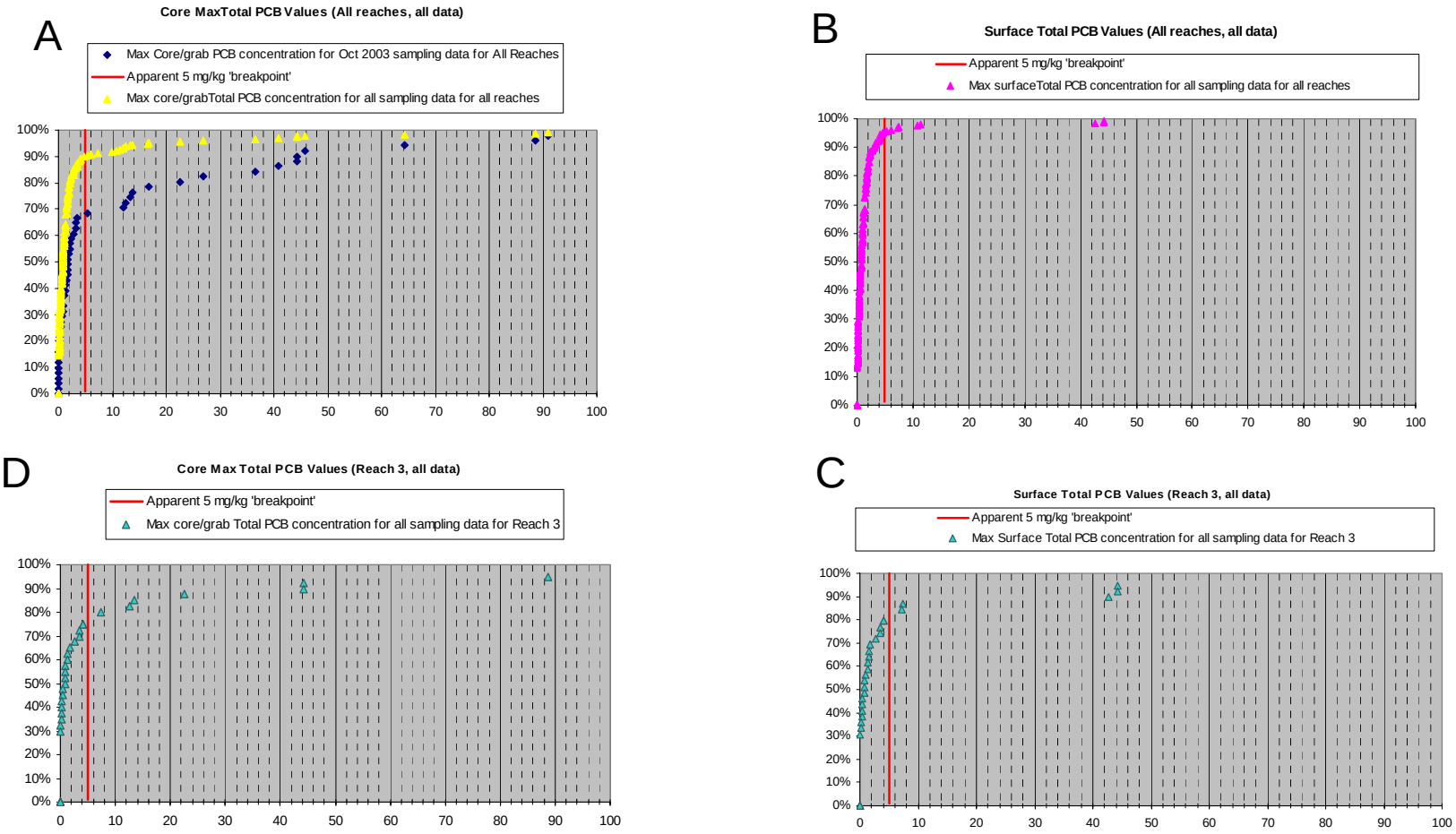
PRIORITY AREA LOCATIONS

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

Hull & associates, inc.

FIGURE 5.1

Cumulative Frequency Distributions for Sediment Total PCB Concentrations



Notes:

1. 1994, 1998, and 2000 sediment samples collected and analyzed as part of OEPA studies.
2. 2003 sediment data presented are from October 2003, sampling event by OEPA, with analysis by Belmont Labs.
3. Duplicates not included in calculations.
4. Non-detect concentrations are represented as zero values.
5. Surface samples are those with a first depth interval with top depth of zero.
6. The phrase "all data" in above plots refers to 2003 plus pre-2003 data.

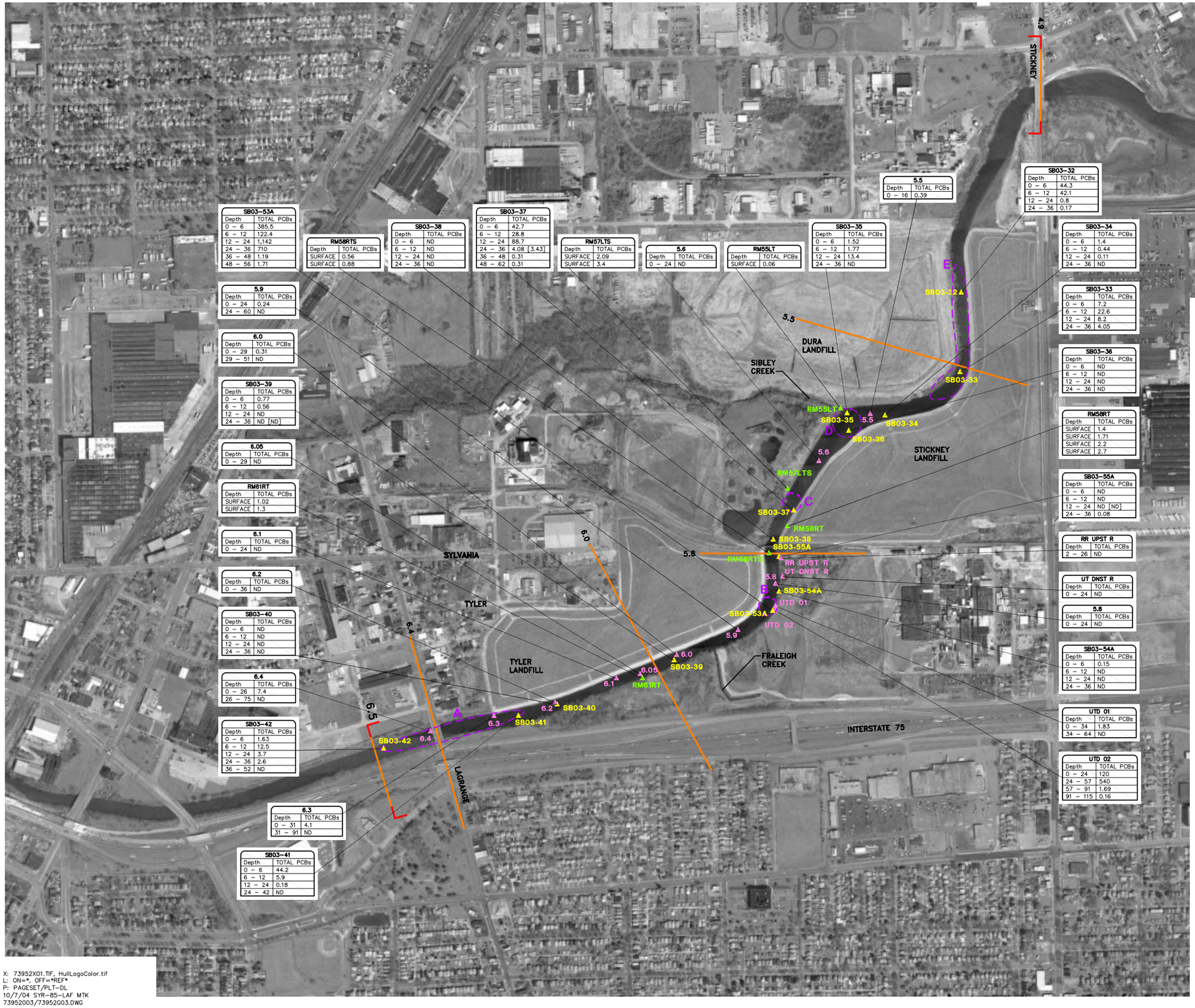
OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITIES PROJECT
LUCAS COUNTY, OHIO

CUMULATIVE FREQUENCY DISTRIBUTIONS FOR SEDIMENT TOTAL PCB CONCENTRATIONS

BBL® BLASLAND, BOUCK & LEE, INC. engineers & scientists
Hull & associates, inc.

FIGURE
5.2

73952



SB03-53A	
Depth	TOTAL PCBs
0 – 6	385.5
6 – 12	122.4
12 – 24	1,142
24 – 36	710
36 – 48	1.19
48 – 56	1.71

RM58RTS	
Depth	TOTAL PCBs
SURFACE	0.56
SURFACE	0.88

SB03-38	
Depth	TOTAL PCBs
0 – 6	ND
6 – 12	ND
12 – 24	ND
24 – 36	ND

SB03-37	
Depth	TOTAL PCBs
0 – 6	42.7
6 – 12	28.8
12 – 24	88.7
24 – 36	4.08 [3.43]
36 – 48	0.31
48 – 62	0.31

RM57LTS	
Depth	TOTAL PCBs
SURFACE	2.09
SURFACE	3.4

5.6	
Depth	TOTAL PCBs
0 – 24	ND

RM55LT	
Depth	TOTAL PCBs
SURFACE	0.06

SB03-35	
Depth	TOTAL PCBs
0 – 6	1.52
6 – 12	1.77
12 – 24	13.4
24 – 36	ND

5.5	
Depth	TOTAL PCBs
0 – 16	0.39

SB03-32	
Depth	TOTAL PCBs
0 – 6	44.3
6 – 12	42.1
12 – 24	0.8
24 – 36	0.17

SB03-34	
Depth	TOTAL PCBs
0 – 6	1.4
6 – 12	0.44
12 – 24	0.11
24 – 36	ND

SB03-33	
Depth	TOTAL PCBs
0 – 6	7.2
6 – 12	22.6
12 – 24	8.2
24 – 36	4.05

SB03-36	
Depth	TOTAL PCBs
0 – 6	ND
6 – 12	ND
12 – 24	ND
24 – 36	ND

RM58RT	
Depth	TOTAL PCBs
SURFACE	1.4
SURFACE	1.71
SURFACE	2.2
SURFACE	2.7

SB03-55A	
Depth	TOTAL PCBs
0 – 6	ND
6 – 12	ND
12 – 24	ND [ND]
24 – 36	0.08

RR UPST R	
Depth	TOTAL PCBs
2 – 26	ND

UT DNST R	
Depth	TOTAL PCBs
0 – 24	ND

5.8	
Depth	TOTAL PCBs
0 – 24	ND

SB03-54A	
Depth	TOTAL PCBs
0 – 6	0.15
6 – 12	ND
12 – 24	ND
24 – 36	ND

UTD 01	
Depth	TOTAL PCBs
0 – 34	1.83
34 – 64	ND

UTD 02	
Depth	TOTAL PCBs
0 – 24	120
24 – 57	540
57 – 91	1.69
91 – 115	0.16

5.9	
Depth	TOTAL PCBs
0 – 24	0.24
24 – 60	ND

6.0	
Depth	TOTAL PCBs
0 – 29	0.31
29 – 51	ND

SB03-39	
Depth	TOTAL PCBs
0 – 6	0.77
6 – 12	0.56
12 – 24	ND
24 – 36	ND [ND]

6.05	
Depth	TOTAL PCBs
0 – 29	ND

RM61RT	
Depth	TOTAL PCBs
SURFACE	1.02
SURFACE	1.3

6.1	
Depth	TOTAL PCBs
0 – 24	ND

6.2	
Depth	TOTAL PCBs
0 – 36	ND

SB03-40	
Depth	TOTAL PCBs
0 – 6	ND
6 – 12	ND
12 – 24	ND
24 – 36	ND

6.4	
Depth	TOTAL PCBs
0 – 26	7.4
26 – 75	ND

SB03-42	
Depth	TOTAL PCBs
0 – 6	1.63
6 – 12	12.5
12 – 24	3.7
24 – 36	2.6
36 – 52	ND

6.3	
Depth	TOTAL PCBs
0 – 31	4.1
31 – 91	ND

SB03-41	
Depth	TOTAL PCBs
0 – 6	44.2
6 – 12	5.9
12 – 24	0.18
24 – 42	ND

LEGEND:

4.2 RIVER MILE

REACH LIMITS

2003 SEDIMENT SAMPLING LOCATION

2000 SEDIMENT SAMPLING LOCATION

1998 SEDIMENT SAMPLING LOCATION

REMEDIATION TARGET AREA

NOTES:

1. BASEMAP IS AN IMAGE OBTAINED FROM HULL & ASSOCIATES, INC. ENTITLED "OCTOBER 2003 SEDIMENT SAMPLING LOCATIONS REACH 3" DATED NOVEMBER 2003 AT A SCALE OF 1:4800, FILE NO. ORS001. IMAGE SOURCE DATES: APRIL 2001, AND APRIL 1994.

2. ALL LOCATIONS ARE APPROXIMATE.

3. APPARENT COORDINATE SYSTEM IS NAD83, OHIO STATE PLANES, NORTH ZONE, US FOOT.

4. TOTAL PCBS RESULTS ARE PRESENTED IN MG/KG DRY WEIGHT.

5. 1998 AND 2000 DATA DERIVED FROM LIMNO-TECH, INC. OTTAWA RIVER RISK ASSESSMENT, NOVEMBER 2001. 2003 DATA COLLECTED BY OEPA.

0 400' 800'

GRAPHIC SCALE

X: 73952X01.TIF, HullLogoColor.tif
L: ON=*, OFF=*REF*
P: PAGESET/PLT-DL
10/7/04 SYR-85-LAF MTK
73952003/73952G03.DWG

OTTAWA RIVER SEDIMENT
REMEDIATION PRIORITITES PROJECT
LUCAS COUNTY, OHIO

LAGRANGE REACH REMEDIATION TARGET AREAS AND AVAILABLE PCB DATA

BBL BLASLAND, BOUCK & LEE, INC. engineers, scientists, economists

Hull & associates, inc.

5.3