Record of Decision Amendment

Operable Unit 1

Lower Fox River and Green Bay Superfund Site

June 2008

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Abbreviations and acronyms used in this document

Agencies	Wisconsin Department of Natural Resources and United States Environmental Protection Agency
Amended Remedy	Remedy selected in Record of Decision Amendment, Operable Unit 1, Lower Fox River and Green Bay Superfund Site
ARARs	Applicable or Relevant and Appropriate Requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cy	cubic yards
footprint	Areas that encompass the 1 ppm PCB Remedial Action Level
kg	Kilograms
MNR	Monitored Natural Recovery
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	operation and maintenance
OU	Operable Unit
OU 1	Little Lake Butte des Morts reach
OU 2	Appleton to Little Rapids reach
OU 3	Little Rapids to De Pere reach
OU 4	De Pere to Green Bay reach
OU 5	Green Bay
PCB	polychlorinated biphenyl
ppm	parts per million
PRPs	Potentially Responsible Parties under CERCLA
RAL	Remedial Action Level
RAO	Remedial Action Objective
RIFS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RS	Responsiveness Summary
Site	Lower Fox River and Green Bay Site
Design Supplement	OU1 Design Supplement, Lower Fox River Operable Unit 1, November 2007
SWAC	Surface Weighted Average Concentration
TSCA	Toxic Substances Control Act
EPA	United States Environmental Protection Agency
WDNR	Wisconsin Department of Natural Resources
2002 ROD	Record of Decision, Operable Units 1 and 2, Lower Fox River and Green Bay Site, December 2002
2003 ROD	Record of Decision, Operable Units 3, 4, and 5, Lower Fox River and Green Bay Site, June 2003

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Record of Decision Amendment, Operable Unit 1
Outagamie and Winnebago Counties, Wisconsin

I. Introduction

Reasons for a Change in Remedy

This Record of Decision Amendment (ROD Amendment) for the Lower Fox River and Green Bay Site (Site) selects and explains an Amended Remedy that makes changes to parts of the remedy described in the Record of Decision for Operable Unit 1 (OU 1) of the Site, dated December 20, 2002 (2002 ROD). The ROD Amendment for Operable Units 2, 3, 4, and 5, dated June 26, 2007 (2007 ROD Amendment), is not affected by this amendment. This ROD Amendment is being issued by the United States Environmental Protection Agency (EPA) and the Wisconsin Department of Natural Resources (WDNR) under the authority of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, 42 U.S.C. §§ 9601-9675.

As explained below, the Amended Remedy is being adopted in response to new information that has been collected and analyzed since the 2002 ROD was issued. The 2002 ROD selected dredging and a contingency remedy (which allowed capping). This new information was obtained through experience with full-scale remediation activities in OU 1, and during intensive data collection and evaluation efforts performed as part of the remedial design for OU 1. For example, a wealth of new sediment data was collected and analyzed during 2003-2004 and 2006-2007 sediment collection activities in OU 1, including more than 5949 sediment samples at 996 locations, with 129 locations having no recoverable sediments. This new information can be found in the Administrative Record.[1]

Most of the new information for OU 1 is compiled and analyzed in the "OU1 Design Supplement Lower Fox River Operable Unit 1," dated November 16, 2007 (Design Supplement), approved by EPA and WDNR on November 20, 2007. The Design Supplement was developed by two Potentially Responsible Parties (PRPs), P.H. Glatfelter Company and WTMI Company, as part of the remedial design for OU 1. In addition to the Design Supplement, the PRPs submitted a document entitled "Concept Paper, Lower Fox River Operable Unit 1," dated November 19, 2007 (Concept Paper) which summarized and explained key aspects of the proposed design changes. The remedial design and remedial actions required under the 2002 ROD have been funded and implemented under a settlement agreement between the PRPs and EPA and WDNR. EPA and WDNR are overseeing all aspects of design evaluations prepared by the PRPs, as well as remedial actions required by the 2002 ROD.

[1] The Administrative Record contains detailed information EPA considered in selection of this Amended Remedy, and is available at the DNR Northeast Region office, 2984 Shawano Ave., Green Bay, Wis.; DNR Bureau of Watershed Management, 3rd Floor, 101 S. Webster St., Madison, Wis.; and the EPA Records Center, 7th floor, 77 W. Jackson Blvd., Chicago, Ill.

The new data and analyses presented in the Design Supplement and the Concept Paper showed that:

1. Polychlorinated biphenyls (PCBs) are more heavily concentrated in discrete areas in OU 1; and

2. The total PCB mass in the 1.0 ppm prism2 is less than predicted in the ROD, amounting to 2/3 of the 2002 ROD estimate; and

3. PCBs are present at low concentrations (i.e., slightly above the PCB Remedial Action Level (RAL) of 1.0 ppm) in areas containing large volumes and relatively thin deposits of contaminated sediment.

Additionally, operational experience shows that:

1. A specified dredge-line can only be attained if a dredging contractor is provided with an overcut allowance. Based on dredging experience in OU 1, an average 4-inch overcut is necessary to attain a dredge cut line to a degree of accuracy that attains remediation results that are acceptable to the Agencies. This results in additional dredging volume. This additional volume of material was not accounted for in the 2002 ROD and thus the total dredging cost was underestimated.

2. When the 1.0 ppm RAL cutline (elevation) is achieved, experience in OU 1 has demonstrated that all sediment containing more than 1.0 ppm PCBs can often be removed by dredging. However, generated dredge residuals sometimes remain above 1.0 ppm PCBs. Thus, a sand cover over selected areas having dredge residuals would be required in order to meet the Surface Weighted Average Concentration (SWAC) goal specified in the 2002 ROD. Sand cover costs were also not accounted for in the 2002 ROD estimate.

3 The cost of implementing the all-dredging remedy set forth in the 2002 ROD would be more than twice the cost estimated in the 2002 ROD. Based on additional data and operational experience discussed above, the current estimate for the 2002 ROD Remedy is $144 million, an increase of $78 million compared to the $66 million estimated by the 2002 ROD.

4. Dredging, capping and sand covering options are all implementable and environmentally protective.

Based upon this newly–obtained information, WDNR and EPA have determined that it is appropriate to modify the 2002 ROD remedy by selecting the Amended Remedy described in this ROD Amendment. WDNR and EPA are jointly signing this ROD

[2] The 1 ppm PCB dredge prism is the area and volume of sediments that includes all contaminated sediments that have PCB concentrations 1 ppm or greater.

Amendment. This Amended Remedy will be comparably protective or more protective, be completed faster, reduce risks sooner, and be more cost effective than the 2002 ROD Remedy.

II. Site History

For many years, a large number of paper production facilities have been and continue to be concentrated along the Lower Fox River. Some of the facilities manufactured a particular type of carbonless copy paper containing PCBs. Some of the other facilities reprocessed PCB-containing waste paper and used it as feedstock for the production of other paper products. In both of these processes, PCBs were released from the paper production facilities to the Fox River directly, or after passing through municipal wastewater treatment plants. PCBs were then transported within the river system as PCBs have a tendency to sink and adhere to sediments in the river bottom. As a result, PCB contaminated sediments are found in 39 mile stretch of the Lower Fox River and Green Bay.

Additional details on Site history appear in the 2002 ROD.

III. Site Location and Description

The Lower Fox River and Green Bay Site ("the Site") includes approximately 39 miles of the Lower Fox River (referred to herein as "the River") as well as the Bay of Green Bay (referred to herein as "the Bay") – see Figure 1 below. The River portion of the Site extends from the outlet of Lake Winnebago and continues downstream to the mouth of the River at Green Bay, Wisconsin. The Bay portion of the Site includes all of Green Bay, from the City of Green Bay to the point where Green Bay enters Lake Michigan.

EPA and WDNR have organized the Site into five Operable Units (OUs) and those OUs are addressed by two RODs and the 2007 ROD Amendment. These OUs, divided on the basis of similar features, characteristics and dam locations, are described in Table 1 and shown in Figure 1 below.

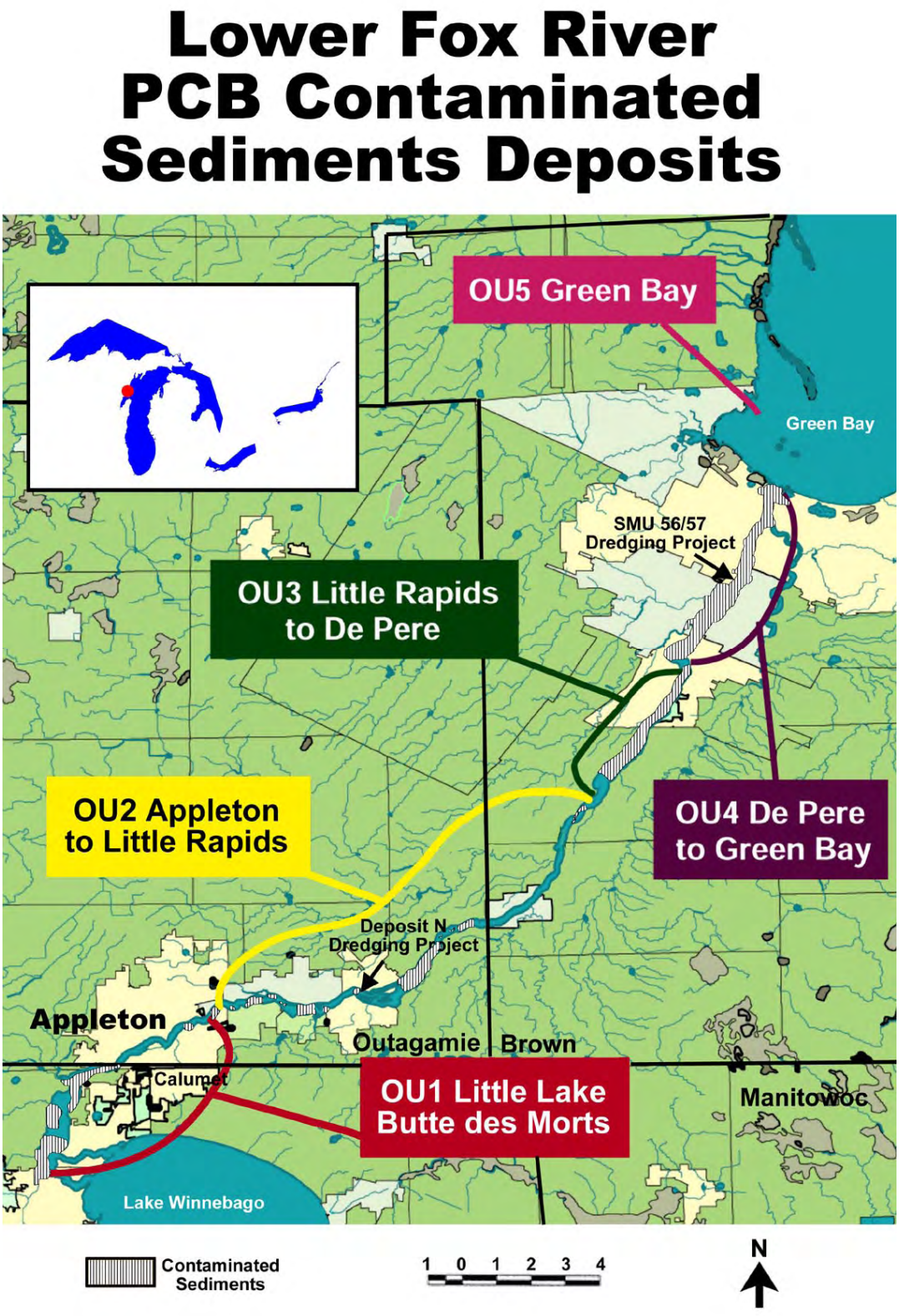

Figure 1. Lower Fox River PCB-Contaminated Sediment Deposits and Operable Units

TABLE 1. Operable Units and Previously Selected Remedies

ROD	Operable Unit	Location	Remedy
2002 ROD	1	Little Lake Butte des Morts	Dredging and disposal
	2	Appleton to Little Rapids	Monitored Natural Recovery
2007 ROD Amendment	3 (and OU 2 Deposit DD)	Little Rapids to De Pere	Dredging and disposal, Capping and Sand Covers
	4	De Pere to Green Bay	Dredging and disposal, Capping and Sand Covers
2007 ROD Amendment and 2003 ROD	5	Green Bay	Monitored Natural Recovery

This ROD Amendment addresses OU 1. With the exception of the remedial activities at Deposit DD, the remedy for OU 2 is unchanged from the 2002 ROD.

IV. Site Characteristics

Section 6 of the 2002 ROD provides a complete description of the characteristics of the Site. Additional post-ROD information regarding Site characteristics is in the Design Supplement, and is summarized in the Introduction above (new information).

V. Site Risks

Section 8 of the 2002 ROD provides a complete description of the risks to human health and the environment posed by the PCB-contaminated sediments at the Site. However, general conclusions from the Risk Assessments at the site are:

- The primary contaminant of concern is PCBs.
- Human health and ecological receptors are at risk from PCB bioaccumulation.

- Fish consumption is the exposure pathway presenting the greatest risk for human health and ecological receptors.

VI. Agency Evaluations and Decisions

A. Site Evaluations and Remedy Selection Decisions

The Agencies have conducted extensive evaluations, particularly beginning in 1989 with the Green Bay Mass Balance Study, as well as demonstration projects in two discrete areas of the river (known as Deposit N/O and Sediment Management Unit 56/57) from 1998 – 2000. Details of these projects are discussed in the 2002 and 2003 RODs.

WDNR released the draft Remedial Investigation/Feasibility Study (RIFS) for public review and comment in February 1999. The early release in the planning process of the draft RIFS for public comment allowed the Agencies to better evaluate public acceptance of cleanup alternatives. Comments were received from governmental agencies, the public, environmental groups, and private-sector corporations. These comments were used to revise and refine the scope of work that led to the finalization of the RIFS and Proposed Plan released for public comment in October 2001. Comments received from the PRPs, the public, and independent peer review committees were incorporated into the final RIFS. In December 2002, EPA and WDNR signed the ROD for OU 1 and OU 2. The 2002 ROD called for active remediation in OU 1 (i.e., dredging, with a capping contingency remedy) and "Monitored Natural Recovery" (MNR) in most of OU 2. In June 2003, a ROD was signed for OU 3, OU 4 and OU 5. The 2003 ROD called for active remediation in OU 2 (deposit DD), OU 3, OU 4 and MNR for OU 5. In 2006, upon completion of collecting additional sediment data and based upon additional analyses, the Agencies issued a Proposed Plan to modify the 2003 ROD for OUs 2 (deposit DD), OU 3, OU 4 and OU 5 (near the mouth of the river). Comments received from the public were incorporated into the 2007 ROD Amendment, which modified the original decision for OU 3, 4 and 5 from all-dredging to a combination of dredging, capping and sand covers.

B. Remedial Action Objectives

The 2002 and 2003 RODs adopted the same Site-wide Remedial Action Objectives (RAOs). Those RAOs are unchanged by this ROD Amendment. RAOs address protection of human health and the environment. No numeric cleanup standards have been promulgated by the federal government or the State of Wisconsin for PCB-contaminated sediment. Therefore, site-specific RAOs to protect human health and the environment were developed based on available information and standards, such as "Applicable or Relevant and Appropriate Requirements" (ARARs), guidelines that are referred to as factors "to be considered," and risk-based PCB chemical concentration levels established using the human and ecological risk assessments performed at the Site. As discussed in detail in Section 9 of the 2002 ROD, the following five RAOs have been established for the Lower Fox River and Green Bay Site.

- **RAO 1: Achieve, to the extent practicable, surface water quality criteria throughout the Lower Fox River and Green Bay.** This RAO is intended to reduce PCB concentrations in surface water as quickly as possible. The current water quality criteria for PCBs are 0.003 nanograms per liter (ng/L) for the protection of human health, and 0.012 ng/L for the protection of wild and domestic animals. Water quality criteria incorporate all routes of exposure assuming the maximum amount is ingested daily over a person's (or animals) lifetime.

- **RAO 2: Protect humans who consume fish from exposure to Contaminants of Concern (COCs) that exceed protective levels.** This RAO is intended to protect human health by targeting removal of fish consumption advisories as quickly as possible. The WDNR and EPA defined the expectation for the protection of human health as recreational and high intake fish consumers being able to safely eat unlimited amounts of fish within 10 years to 30 years, respectively.

- **RAO 3: Protect ecological receptors from exposure to COCs above protective levels.** RAO 3 is intended to protect ecological receptors such as invertebrates, birds, fish, and mammals. WDNR and EPA defined the ecological expectation of achieving safe ecological thresholds for fish-eating birds and mammals within 30 years following remedy completion. Although the Feasibility Study did not identify a specific time frame for evaluating ecological protection, the 30-year figure was used as a measurement tool.

- **RAO 4: Reduce transport of PCBs from the Lower Fox River into Green Bay and Lake Michigan.** The objective of this RAO is to reduce the transport of PCBs from the River into the Bay and Lake Michigan as quickly as possible. The WDNR and EPA defined the transport expectation as a reduction in loading to the Bay and Lake Michigan to levels comparable to the loading from other Lake Michigan tributaries. This RAO applies to each OU encompassing part of the River (sometimes referred to as River "reaches").

- **RAO 5: Minimize the downstream movement of PCBs during implementation of the remedy.** This objective would minimize as much as feasible the release of contaminants during remedial activities such as dredging, capping or placing sand covers.

C. New Information Gathered During 2003-2004 and 2006-2007 Sampling and 2004-2007 Remedial Activities and Its Bearing on the 2002 ROD

During sampling and analysis in 2003-2004 and 2006-2007, new PCB data from more than 5,900 sediment samples at 996 core locations was collected and analyzed in OU 1.[3] The results of that sampling are presented in the Design Supplement, and several significant findings based on that sampling data are summarized above in

[3] From page 10 of the Design Supplement.

Section I. Four of those findings are discussed in greater detail below, namely: (1) PCBs are more heavily concentrated in discrete areas in OU 1; (2) the total PCB mass in the prism that includes all contaminants above 1.0 ppm is less than predicted in the ROD, amounting to 2/3 of the 2002 ROD estimate; (3) it is now projected that the SWAC goals established by the 2002 ROD would not be met for a dredge only remedy even if the entire targeted volume of contaminated sediment were dredged; and (4) PCB concentrations in areas containing large volumes of contaminated sediment are low, with many areas only marginally above the Remedial Action Level (RAL) of 1.0 ppm.

Additionally, experience in dredging approximately 335,000 cy of PCB contaminated sediments and a cap placement test in OU 1 in 2007 demonstrated: (1) the need to "over-dredge" (discussed below); (2) some areas would still have elevated PCB concentrations even after dredging attempted to remove all contaminated sediments above the 1 ppm RAL (even after overdredging); and (3) both dredging and capping are implementable in OU 1.

1. PCBs are more heavily concentrated in discrete areas

As shown in Table 2 below, PCBs were determined to be more concentrated within discrete areas than was known prior to the 2002 ROD. For example, based on more recent data (i.e., 2003-2004 and 2006–2007 sampling and analysis), Sub-areas A, E and POG (shaded in Table 2 below) had 93.6 % of the total PCB mass compared to 63.5 % of the total mass based on the RIFS (1989 - 1999) data. Based on this information, recovery of a greater percentage of PCBs with targeted removal of the most highly contaminated sediments is expected.

Table 2. Comparison of OU 1 PCB Mass Estimates Within 1.0 ppm Prism

Sub-area	1989 - 1999 RIFS[1]		2003 – 2007 Post-RIFS[2]	
	kg	% of total	Kg	% of total
A	237	16.6	218.3	19.1
B	409	28.5	0	0
C	35	2.4	33.5	2.9
D	78	5.4	37.6	3.3
E	373	26.0	331.4	29.0
F	3	0.002	2.5	0.002
G	0	0	0	0
H	0.4	0.0003	0	0
POG	299	20.9	519.5	45.5
TOTAL	1,434.4	99.8[3]	1,142.8	99.8[3]

Table Notes:

Table adapted from Table 2-1, page 12, Design Supplement.

Shaded cells are contaminated sediment deposits removed during 2004 – 2007 dredging activities.

[1] Source: December 2002 RI, Table 5-14; December 2002 FS, Table 5-3. Data was compiled from data collected from 1989 – 1999.

[2] Source: Data collected in 2004 – 2004 and 2006 – 2007.

[3] Percent total is not 100 % because of rounding.

2. The Increased Sediment Volume Estimate

In order to ensure more complete removal of targeted sediments above the 1 ppm PCB RAL, OU 1 dredging operations demonstrated the need to remove an additional 4-inches of sediment. This additional dredge cut below the targeted dredge elevation is referred to as dredge overcut. With an average thickness of 1-foot of sediment to the 1 ppm PCB RAL in OU 1, an additional 4-inch overcut increases the actual dredge volume under the 2002 ROD remedy by 29% (from 721,200 cy to 928,400 cy). While the practical necessity of a dredge overcut was generally acknowledged in the Lower Fox River Feasibility Study (FS), the increased volume and cost implications was not addressed in the FS or the 2002 ROD.

3. The Revised SWAC Projections for the 2002 ROD Remedy

In addition to identifying a larger volume of sediment that would need to be removed under the 2002 ROD, the additional sampling and analyses performed during the remedial design process showed that dredging remedy alone would not meet the PCB SWAC goals as originally envisioned in the 2002 ROD. Specifically, concentrations would be reduced from an average PCB SWAC of 1.9 ppm to 0.48 ppm by dredging alone[4] whereas a combination of dredging higher concentration areas, capping and sand covers over lower concentrations would achieve a PCB SWAC of 0.25 ppm. There are two main reasons why dredging alone would not meet PCB SWAC goals.

- First, even if all sediment exceeding the 1.0 ppm PCB RAL is dredged in an area, the post-dredging surface concentrations may still exceed 1.0 ppm PCBs. That is because experience with dredging projects at OU 1 and other dredging projects has shown that the dredging process itself commonly re-suspends some contaminated sediment that is then re-deposited in a thin layer on top of the newly-dredged area. That re-deposited contamination is called “generated residuals.”[5] The 2002 ROD stated that generated residuals could be addressed by re-dredging and/or placement of sand covers over dredged areas.

- Second, contrary to earlier expectations, the recent sampling data shows that large areas of relatively low PCB levels on the surface of undredged areas (i.e.,

[4] From page 10 of the Concept Paper, November 19, 2007.

[5] In this ROD Amendment, the term “generated residuals” is used to describe contaminated sediment that is re-deposited at the surface of a newly-dredged area (i.e., in the top six inches of the sediment surface). A different term – “undisturbed residuals” – is used to describe contaminated sediment that is more than six inches below the surface of a newly-dredged area.

in areas with no sediment exceeding the 1.0 ppm PCB RAL) might prevent an all-dredging remedy from reaching the OU-wide SWAC goals. If an all-dredging remedy did not meet those SWAC goals by the completion of active remediation, then additional time would be required for further reductions in surface concentrations through sediment deposition processes (before RAOs could be achieved).

4. Operational Experience at OU 1

Approximately 335,000 cubic yards have been dredged at OU 1 from 2004-2007. Operations have been refined and improved based on contractor experience. For example, a sediment screening and thickener was added to the dewatering process in 2006, improving efficiency of the dewatering operation by reducing the volume of water being pumped into the geotextile tubes and significantly improving dewatering operations. A slight (i.e., approximately 3 to 4 days out of a total 30 days) reduction in the time needed for dewatering was realized.

In addition to dredging and sand covering operations dredged residuals, cap placement test studies were also conducted in 2007. These test studies demonstrated the ability to consistently place a 6-inch sand layer overlain by 7-inches of armor stone (i.e., ASTM C33 gradation for fine aggregates and 1 ¼ inch-minus stone meeting C33 gradation for coarse aggregate No. 467). Other aspects relating to capping construction that were successfully evaluated included methods of cap material placement, production rates of material placement, sediment consolidation, monitoring and verification procedures, stability of underlying sediment, and impact to water quality during placement (which has been minimal). Some of these aspects, such as sediment consolidation, and monitoring and verification procedures will be further evaluated after construction completion.

The dredging experience and cap placement test studies have both demonstrated the viability and implementability of these operations.

5. Summary of 2002 ROD Remedy and Relevance Regarding New Information and Findings

A comparison of the Remedy Amendment and the 2002 ROD remedy follows below, and in Table 6, page 42.

- **Sediment removal.** The 2002 ROD called for removal of all sediment with a PCB concentration exceeding the 1.0 ppm RAL. The estimated volume of the sediment that would need to be removed under that remedy has increased. As discussed above in Section I, it is now estimated that approximately 928,400 cy of sediment would need to be dredged under the remedy selected by the 2002 ROD, in light of new sampling data and overdredge allowance. The 2002 ROD originally estimated approximately 784,200 cy would be removed, as it did not include overdredging volumes.

- **Sediment dewatering and disposal.** The 2002 ROD envisioned that contaminated sediment would be dewatered using mechanical processes similar to those used at other Fox River dredging projects (e.g., plate and frame presses). Experience at OU 1 has shown that geotextile tubes have proven to be effective for dewatering dredged sediments from OU 1.

- **Water treatment.** Water generated by dredging and dewatering operations will be treated prior to discharging it back to the Fox River to meet State and federal water quality standards, consistent with the 2002 ROD.

- **Capping.** A capping contingency plan included in the 2002 ROD allowed for the use of an engineered cap in limited areas it was shown to be protective and less costly than dredging. At a minimum, an Explanation of Significant Differenceswould have been required prior to implementation of capping. The capping portion of the Amended Remedy is consistent with the capping contingency allowed in the 2002 ROD.

- **Long-term monitoring.** Long-term monitoring of surface water and biota would continue until PCB concentrations and exposures are below risk levels.

- **Institutional controls.** Institutional controls (e.g., fish advisories) would be maintained to minimize human and ecological exposures to contaminants.

- **RAL and SWAC.** Sediments with PCB concentrations greater than the 1.0 ppm RAL were targeted for removal. The 2002 ROD stated that SWAC levels of approximately 0.25 ppm PCB would be achieved if all sediment above the 1.0 ppm RAL were removed by dredging. If all sediments above the 1.0 ppm RAL were not removed in OU 1 due to dredge-generated residuals remaining in dredge areas, then the 2002 ROD indicated that a SWAC of approximately 0.25 ppm for OU 1 could be met by other means, such as redredging, capping or placement of sand cover on dredged residual. The specific SWAC goals in the 2002 ROD were 0.25 ppm.

- **Natural recovery after remediation.** Although the 2002 ROD specified that the RAL requirement or SWAC goal would need to be met immediately after the completion of dredging in a particular OU, it was also recognized that it would take additional time for natural recovery before some of the RAOs would be achieved. For example, the 2002 ROD estimated that a SWAC of approximately 0.25 ppm PCBs would be achieved at construction completion, but the 2002 ROD also estimated that it would take another 14 years before reduced PCB levels in fish tissue would allow relatively safe consumption of walleye for high-intake consumers. If the 2002 ROD remedy did not achieve the SWAC goal, longer natural recovery periods would be required to meet RAOs.

- **Costs**. Based on new information gathered after issuing the 2002 ROD, the cost of implementing the 2002 ROD remedy in OU 1 is currently projected at $144 million. The 2002 ROD originally estimated the cost at $66.2 million. The lower cost estimate in the 2002 ROD did not include dredging overcut volumes. The additional volume is significant in OU 1 due to thin contaminant zones. The added volume increases costs for dewatering, transportation and disposal.

VII. Procedure for Changing the Remedy

Under CERCLA Section 117(c), 42 U.S.C. § 9617(c), and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. § 300.435(c)(2)(ii), if EPA proposes to fundamentally alter the basic features of the selected remedy with respect to scope, performance, or cost, then EPA is required to publish the proposed amendment and provide an opportunity for public comment. In this case, the decision by EPA and WDNR to modify the remedy for this Site fundamentally alters the basic features of the remedy previously selected, and that action necessitates the issuance of this ROD Amendment.

Accordingly, EPA and WDNR issued a Proposed Plan on November 26, 2007, and invited public comment on possible changes to the remedy in the 2002 ROD. After reviewing and fully considering the public comments submitted, EPA and WDNR have decided to modify the selected remedy. The 2002 ROD remedy required predominantly dredging PCB-contaminated sediments. This ROD Amendment employs a combination of the following actions:

- Dredging as the primary remedial approach

and the following alternate remedial approaches:

- capping, and

- sand covers for residuals management and as the sole remedial approach in certain areas.

In accordance with Section 300.825(a)(2) of the NCP, 40 C.F.R. § 300.825(a)(2), this ROD Amendment is part of the administrative record for the Site, available for public inspection at the following three locations, at the following times: 1) WDNR Northeast Region office, 2984 Shawano Avenue, Green Bay, Wisconsin, 7:45 AM – 4:30 PM, Monday-Friday; 2) WDNR Bureau of Watershed Management, 2nd Floor, 101 South Webster Street, Madison, Wisconsin, 7:45 AM – 4:30 PM, Monday-Friday; and 3) EPA Records Center, 7th Floor, 77 West Jackson Boulevard, Chicago, Ill, 8 AM – 4 PM, Monday-Friday. An index of documents contained in the administrative record is attached as Appendix A to this ROD Amendment. Details of this Amended Remedy are described in Section XI below.

VIII. Community Relations

EPA and WDNR issued the Proposed Plan for a ROD Amendment to the public on November 26, 2006. This issuance began a 66 day public comment period on proposed changes to the 2002 ROD. EPA and WDNR held a public meeting on December 13, 2007 to discuss and receive comments on the proposed ROD Amendment at Lawrence University, Appleton, Wisconsin. The comment period ended on January 31, 2008. See Section 3 of the 2002 ROD for the community relations history prior to the December 2002 ROD.

Since the 2002 ROD, the following major public meetings and press conferences have occurred:

- Oct. 2003 -- OU 1 cleanup Consent Decree press conference,
- Aug 2004 -- OU 1 2004 season pre-construction public meeting,
- May 2005 -- OU 3-5 design update public meeting,
- July 2005 -- OU 1 construction update public meeting,
- April 2006 – OU 4 Phase I Consent Decree press conference,
- June 2006 -- OU 1 construction update meeting,
- December 5, 2006 – Public meeting for comments on the Proposed Plan to amend the 2003 ROD, and
- December 13, 2007 – Public meeting for comments on the Proposed Plan to amend the 2002 ROD.

Additionally, since the issuance of the 2002 ROD, the Agencies' staffs have made presentations at or attended approximately 50 meetings or community events to discuss Site cleanup, restoration or regarding other site-relate issues, as requested by local officials, citizen groups, universities and other schools, unions, etc. The Agencies also continue to send the Agency Site newsletter, the Fox River *Current,* to 16,000 addresses. Agency and company websites with information for OU 1 also include:

- http://www.epa.gov/region5/sites/foxriver/index.html,
- http://www.dnr.state.wi.us/org/water/wm/foxriver/reportsanddocs.html, and
- http://www.littlelakecleanup.com/.

IX. Development of the Remedial Action Alternatives

The ROD Amendment involves evaluation of two remedial action alternatives: (1) the 2002 ROD Remedy; and (2) the Amended Remedy described in Section XI.

The development of the 2002 ROD Remedy alternative was fully described in the 2002 ROD itself.

The Amended Remedy alternative was developed based on new information and new engineering analyses that were outgrowths of the remedial design and remedial actions from 2004 to 2007 conducted under the 2002 ROD and Consent Decree (03-C-0949), and as summarized in Sections I and VI. The Design Supplement summarized and presented that new information and analyses. The Design Supplement also proposed a remedial design based on the new sediment data and operational dredging experience at OU 1. Details regarding scheduling, monitoring and costs were also evaluated in the Design Supplement. This ROD Amendment modifies the 2002 ROD to allow alternate remedial approaches under the criteria specified in Section XI (Description of the Amended Remedy).

As discussed in greater detail in Section X, the Amended Remedy is designed to have several advantages over the 2002 ROD remedy, including the following:

- Although the Amended Remedy is primarily a dredging remedy, the Amended Remedy also allows alternate remedial approaches in certain situations (such as sand covering or capping undredged areas). This will result in the Amended Remedy being more likely to produce PCB SWAC levels at or less than 0.25 ppm upon completion of active remediation.

- The Amended Remedy is projected to be completed by 2009 rather than 2014 under the 2002 ROD. The active remediation work will be done sooner (2 more years for the Amended Remedy, rather than 7 more years under the 2002 ROD Remedy – following 2007 cleanup activities). In addition, less time will be needed for post-remediation natural recovery in order to achieve the RAOs because the Amended Remedy is expected to yield a lower SWAC than the 2002 ROD Remedy.

- The Amended Remedy allows alternate remedial approaches that are much more efficient than dredging the relatively thin layer of PCB deposits found to be present in OU 1. Under the 2002 ROD Remedy a large volume of relatively clean sediment would need to be removed as the amount of overdredging (about 4-inches) would be significant due to the thin nature of the contaminated sediment deposits (in an average thickness of layers about 1-foot). Once removed, that relatively clean sediment would take up valuable disposal space since it would need to be disposed of in a landfill along with the more contaminated sediment. The Amended Remedy would allow caps or sand covers in some areas with thin layer deposits, if specified criteria can be met. It is estimated that the Amended Remedy would thereby reduce the overdredge volume by 122,000 cubic yards.

X. Evaluation of Alternatives

A. Evaluation Criteria

Remedial alternatives are evaluated based on the nine criteria set forth in the NCP, 40 CFR § 300.430(e)(9)(iii). These criteria are described below.

A remedial alternative is first judged in terms of the threshold criteria of protecting human health and the environment and complying with ARARs (Applicable or Relevant and Appropriate Requirements). If a proposed remedy meets these two threshold criteria, the remedial alternative is then evaluated under the balancing and modifying criteria, to arrive at a final recommended alternative.

Threshold Criteria

1. Overall protection of human health and the environment: Alternatives are assessed to determine whether they adequately protect human health and the environment from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at a site.

2. Compliance with ARARs: Alternatives are assessed to determine whether they attain applicable or relevant and appropriate requirements under federal environmental laws and state environmental or facility siting laws, or provide grounds for invoking a waiver.

Balancing Criteria

3. Long-term effectiveness and permanence: Alternatives are assessed for their ability to maintain protection of human health and the environment over time, and for the reliability of such protection.

4. Reduction of contaminant toxicity, mobility, or volume through treatment: Alternatives are assessed based upon the degree to which they use treatment to address the principal threats posed by a site.

5. Short-term effectiveness: Alternatives are assessed based on the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

6. Implementability: Alternatives are assessed based on the technical and administrative feasibility of implementing the alternative, such as the relative availability of goods and services.

7. Cost: The cost of each alternative is assessed, including each alternative's capital cost, annual operation and maintenance (O&M) cost, and net present value of capital and O&M cost. Net present value is the total cost of an alternative over time in

terms of today's dollars.

Modifying Criteria

8. State acceptance: The assessment of remedial alternatives includes consideration of concerns the State has raised with respect to the preferred alternative, other alternatives or with ARARs or ARAR waivers.

9. Community acceptance: The assessment of remedial alternatives also includes consideration of the extent to which interested community members support, have reservations about, or oppose certain components of the alternatives.

B. Application of the Evaluation Criteria to the Amended Remedy and the 2002 ROD Remedy

1. Overall Protection of Human Health and the Environment

Compared to the 2002 ROD Remedy, the Amended Remedy is more protective of human health and the environment in the short term, and at least as protective as the 2002 ROD Remedy in the long term.

In the short term, the Amended Remedy has the following advantages over the 2002 ROD remedy:

- The Amended Remedy is projected to achieve a lower PCB SWAC in OU 1 sediment than an all dredging remedy and thus reduce contaminant exposure sooner. The Amended Remedy will leave lower PCB surface concentrations in capped and sand cover areas, as compared to the higher expected levels that would remain at the surface if the same areas were dredged. The Amended Remedy also provides additional options for meeting the SWAC (e.g., placement of sand covers over undredged areas). Table 3 presents the estimated pre-remediation SWAC and the estimated SWAC results under the two remedial approaches, assuming a post-dredging sand cover for both remedies.

TABLE 3. Estimated Current PCB SWAC and Projected SWAC Results for OU 1 for an All-Dredging Remedy and Amended Remedy[6]

Pre-Remediation (ppm)	After all-dredging remedy (ppm)	After Amended Remedy (ppm)
1.9	0.48	0.25

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- The Amended Remedy will also achieve RAOs years before they would be achieved under the 2002 ROD Remedy. The active remediation work will be done sooner (within 2 more years under the Amended Remedy, rather than

[6] From the Concept Paper, page 10.

taking 7 more years under the 2002 ROD Remedy). In addition, less time will be needed for post-remediation natural recovery in order to achieve the RAOs because the Amended Remedy is expected to a yield lower SWAC than the 2002 ROD remedy. That lower post-construction SWAC would yield lower PCB concentrations in fish tissue sooner.

The Amended Remedy and the 2002 ROD Remedy would offer comparable protection over the long term. Both alternatives use the same RAL. Although a lower volume of contaminated sediment would be dredged under the Amended Remedy, 97% of all PCBs in OU 1 would still be removed, contained by a cap or sand cover.[7] The engineered caps that are allowed by the Amended Remedy are designed to remain protective over the long term, as the Amended Remedy includes stringent design criteria for caps and ongoing cap monitoring and maintenance requirements. If long term monitoring shows that a cap is deteriorating or damaged, EPA and WDNR could require that the cap be enhanced or removed (along with removal of the underlying sediment).

2. Compliance with ARARs

Both the 2002 ROD Remedy and the Amended Remedy will meet all ARARs. This is discussed in detail in Section XIV.2.

TSCA requirements are significant ARARs for sediment with PCB concentrations at or above 50 ppm PCBs (TSCA sediment). However, at OU 1 all TSCA sediments (with PCB concentrations equal to or greater than 50 ppm) were removed during dredging activities from 2004-2006. If additional TSCA sediments are discovered in subsequent sampling or remedial activities, TSCA sediment will be dredged from the River and that dredged material will be handled, stored, and disposed or capped in accordance with TSCA requirements.

3. Long-term Effectiveness and Permanence

Both the 2002 ROD Remedy and the Amended Remedy meet the long-term protectiveness and permanence requirements of the NCP. As discussed above, the Amended Remedy's design criteria for engineered caps require that the caps are designed to be durable and effective over the long term. Those design criteria were developed based on detailed evaluations of the following processes or events that could potentially compromise the integrity and protectiveness of a cap:

- **Scour from hydrodynamic flows.** The caps are designed to remain stable under maximum shear stresses for reasonable worst case scenarios (e.g., 100-year storm event). Experts in the fields of environmental engineering, hydrodynamic flow modeling, and sediment remediation have determined an

[7] 100% of PCBs are not addressed because some limited areas are inaccessible due to utilities or shoreline issues.

appropriately conservative design, reflected in the Amended Remedy.

- **Disruption from bioturbation (i.e., biological activity).** The caps are designed with thicknesses that will resist cap damage or exposure of underlying contamination due to bioturbation. Data from other similar Great Lakes sediment sites indicates that the potential bioturbation depth is approximately 4 inches. This is incorporated into the cap design.

- **Ice scour.** An independent expert evaluation of potential ice scour was conducted using available historic climate data, site visits, and interviews with local individuals who have significant experience on the Lower Fox River. Among other things, the evaluation considered the risk of frazil ice negatively impacting the capped areas (i.e., ice on the river bottom that occurs in super-cooled areas of the River with turbulent water). Areas in OU 1 with potential frazil ice formation were determined to be outside the areas that would be capped. Thus, the evaluation did not identify any areas where frazil ice or other ice forms (e.g., ice dams or jams) would be expected to cause erosion or damage to caps either directly from ice or indirectly from increased water velocities under the ice.

- **Scour from propeller wash.** The cap design criteria include minimum depth requirements (i.e., 6-foot water depth for post capped areas) and cap design requirements (such as an armor stone layer) to ensure that caps are resistant to propeller wash from recreational or commercial vessels. Those requirements were developed based on analyses of existing and possible future vessel types and river uses for OU 1, including physical tests and modeling.

- **Other technical considerations**. The caps are designed for stability, by requiring that a cap can only be installed if the underlying sediment has sufficient load bearing capacity and if the capped area will have stable side slopes.

The Amended Remedy also includes long-term monitoring and maintenance and Institutional Control requirements for caps as described in detail in Section XI.D.

Both the 2002 ROD Remedy and the Amended Remedy require long-term monitoring of surface water and biota and Institutional Controls (e.g., fish consumption advisories) until remedial objectives are met.

4. Reduction of Toxicity, Mobility or Volume through Treatment

Both the 2002 ROD Remedy and the Amended Remedy reduce contaminant mobility by either containment (under caps or sand covers) or removal and containment (by dredging and off-Site landfill disposal). Contaminated sediment would not receive further treatment under either the 2002 ROD or the Amended Remedy. Dredging

carrier water will be treated to meet State standards to remove PCBs or other contaminants, and recycled/discharged back into the Lower Fox River. Contaminated sediments removed from the Lower Fox River will be dewatered, transported, and landfilled.

5. Short-Term Effectiveness

As discussed above, in the short term, the Amended Remedy would be more effective than the 2002 ROD Remedy. The Amended Remedy would be done sooner, it would achieve a lower SWAC upon remedy completion, and it would achieve RAOs sooner.

Past experience at this Site has shown that minor amounts of contaminated sediment may be re-suspended and released during dredging. Those short-term impacts during remedy implementation would end sooner under the Amended Remedy because that remedy could be completed sooner (2 more years for the Amended Remedy versus 7 more years for the 2002 ROD Remedy to complete remediation after 2007 remediation).

6. Implementability

As discussed in Section VI.C.4 above, operational experience at OU 1 during dredging operations from 2004-2007 has demonstrated that sediment removal, transportation, dewatering and disposal methods envisioned by the 2002 ROD and the Amended Remedy are implementable. Additionally cap placement tests conducted during 2007 demonstrated that cap materials could be reliably and effectively placed, consistent with design standards discussed in the Design Supplement.

Services, materials and equipment would be locally available for both the 2002 ROD Remedy and the Amended Remedy (described in Section XI below). For example, materials required for capping (i.e., sand and armor stone) under the Amended Remedy are readily available in the area.

7. Cost

Table 4 below summarizes the most recent cost estimates for the 2002 ROD Remedy and the Amended Remedy, as presented in the Design Supplement. The original cost estimate for the 2002 ROD Remedy was $66 million. The most recent cost estimate for the 2002 ROD Remedy is $144 million, an increase of $78 million compared to the estimate in the 2002 ROD. That cost estimate increased for several reasons, but the most significant factor was the increased estimate of the volume that would need to be dredged and disposed, based on new sampling and recent estimates of overdredge requirements. Sampling and analysis of PCB contaminated sediments in 2003-2004 and 2006-2007 identified numerous thin layer PCB deposits in OU 1. Under the 2002 ROD Remedy, a significant volume of relatively clean sediment would need to be removed as overdredge allowance for dredging thin layer deposits. Once removed, that relatively clean sediment must be disposed of in a landfill along with the more contaminated sediment.

The estimated cost for the Amended Remedy is approximately $102 million. The Amended Remedy allows alternate remedial approaches that are much more efficient than dredging thin layer PCB deposits. The Amended Remedy would allow caps or sand covers in some areas with thin layer deposits, if specified criteria can be met (discussed detail in Section XI.A.2 below). It is estimated that the Amended Remedy would thereby reduce the overdredge volume by 122,000 cubic yards.

The cost estimates for both alternatives include preliminary estimates of operation and maintenance costs, including estimated costs of cap maintenance under the Amended Remedy. Refined estimates of operation and maintenance costs for the Amended Remedy will be developed during the remedial design process. The cost estimates do not include institutional control costs, although those costs are not expected to be significant compared to other cost components.

Because the Amended Remedy would cost an estimated approximately $42 million less than the 2002 ROD Remedy, and the Amended Remedy will achieve comparable or better results, it is more cost effective than the 2002 ROD Remedy.

TABLE 4. Comparative Costs of the 2002 ROD Remedy and Amended Remedy.

Item		2002 ROD	Amended Remedy
2004-2007 Dredging/dewatering/water treatment and disposal		$ 67,000,000	$ 67,000,000[1]
Post-2007	Dredging/dewatering/water treatment and disposal	$ 56,250,000[2]	$ 6,450,000[2]
	Capping	0	$ 9,650,000
	Sand Cover	$ 17,150,000[2]	$ 8,700,000[2]
	Demobilization	$ 1,750,000[2]	$ 1,750,000[2]
	Monitoring and Maintenance	$ 2,000,000	$ 4,650,000
	Contingency	0[3]	$ 4,050,000
	TOTAL	$ 144,150,000	$102,250,000

Table Notes:

Costs are from the Design Supplement, Sections 7.2.2 and 7.3, pages 50 and 51, respectively.

[1] Although these costs were for cleanup actions completed consistent with the 2002 ROD, they are listed here to allow comparison of overall cleanup costs.

[2] Averages are used for the estimated cost ranges.

[3] No contingency is used for the 2002 ROD costs because experience at OU 1 gives a high confidence based on actual operating expenses from dredging completed during 2004 to 2007 (with 335,000 cy of sediments dredged).

8. State Acceptance

WDNR agrees with the Amended Remedy and is co-signing this Record of Decision Amendment.

9. Community Acceptance

Community acceptance considers whether the local community supports or opposes particular alternatives. Comments on the Proposed Plan are an important indicator of community acceptance.

The Responsiveness Summary that is attached as Appendix A to this ROD Amendment summarizes and addresses 44 comments on the Proposed Plan. The majority of the public comments supported a remedial action addressing the PCB contamination at the Site. A number of comments expressed support for the Proposed Plan because it would achieve remedial goals sooner, and would be more cost effective, as compared to the 2002 ROD Remedy. Some comments expressed concerns regarding the permanence of caps (i.e., long-term stability and effectiveness), as well as concerns about long-term maintenance of caps. As noted above, the Amended Remedy includes several features that are designed to address those concerns, including stringent design and criteria for caps and long-term cap monitoring and maintenance requirements. None of the comments provided specific technical reasons or justifications for certain assertions that the Amended Remedy would not be effective or protective.

Results of Evaluation Using the Nine Criteria

Both the 2002 ROD Remedy and the Amended Remedy meet the threshold criteria described above. Both would provide for protection of human health and the environment; and meet state and federal ARARs.

The Amended Remedy has distinct advantages under the balancing criteria described above. It would be more effective than the 2002 ROD Remedy in achieving risk-reduction SWAC goals, and would be more cost-effective. Recent analyses also suggest that the 2002 ROD Remedy would be more difficult and take longer to implement.

The two alternatives have also been evaluated under the modifying criteria described above. WDNR supports adoption of the Amended Remedy and is co-signing this Record of Decision Amendment. In response to community input, certain requirements of the Amended Remedy have been clarified and strengthened.

Applying the nine remedy selection criteria, and fully considering comments from the public, EPA and WDNR have decided to change the remedy for the Site by amending the 2002 ROD, as described below.

XI. Description of the Amended Remedy

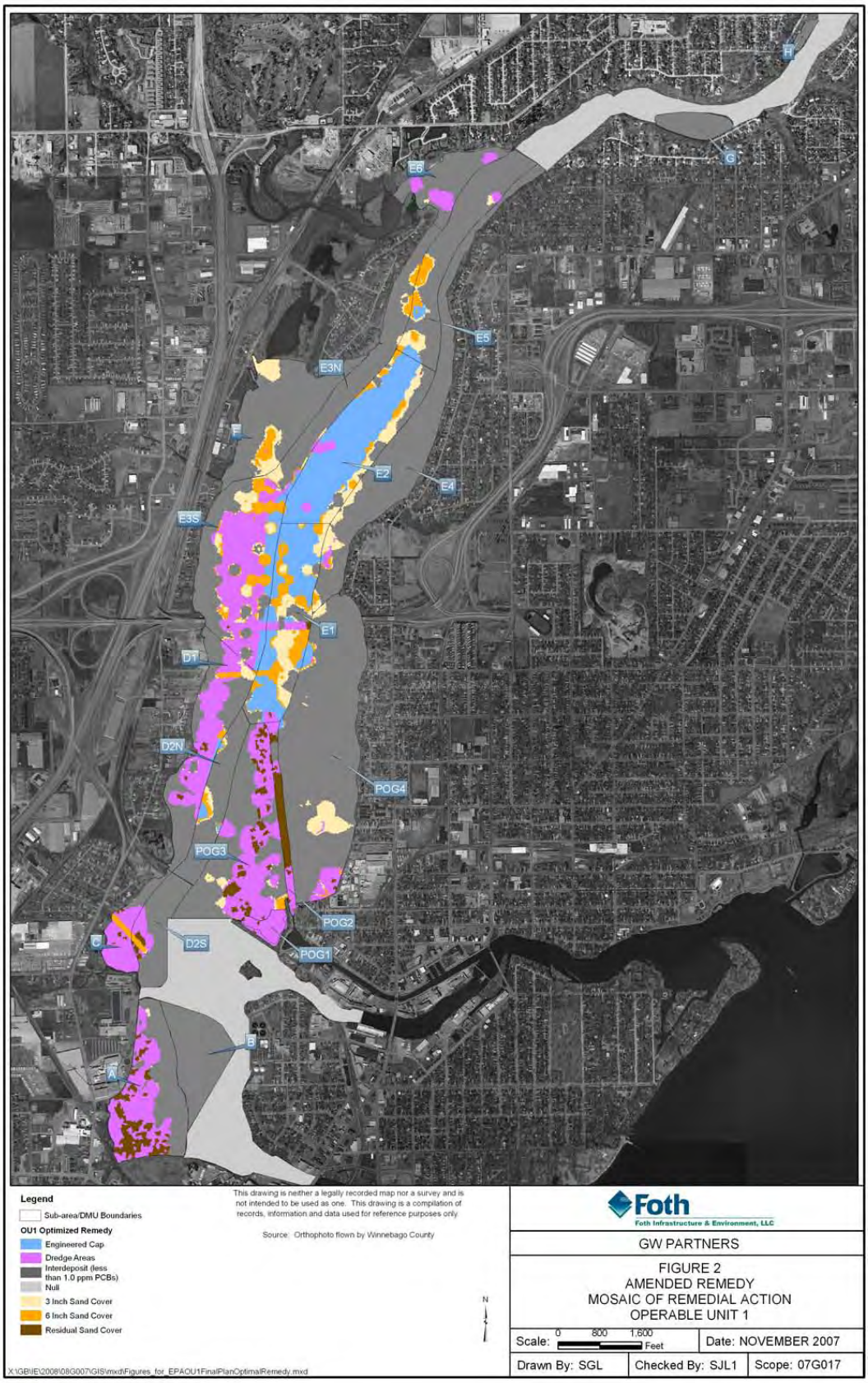
The Amended Remedy addresses all areas of OU 1 containing sediment with PCB concentrations greater than the 1.0 ppm RAL. The Amended Remedy adopts removal of contaminated sediments with dredging as the primary remedial approach for sediment exceeding the 1.0 ppm PCB RAL, but it allows alternative remedial approaches to be used instead of dredging (i.e., capping and placement of a sand cover) under the eligibility criteria specified below. The short-term and long-term objectives of the Amended Remedy include: removing and containing PCB-contaminated sediment in OU 1 to meet the RAL and/or OU-specific SWAC goals upon construction completion; achieving further reductions in PCB surface concentrations through natural recovery processes; achieving corresponding reductions in PCB levels in the water column and in fish tissue; and ensuring continuation of those benefits to human health and the environment through long-term operation and maintenance and application of institutional controls.

Although the Amended Remedy adopts sediment removal as the primary remedial approach for sediment with PCBs greater than the 1.0 ppm RAL, additional remedial measures will be necessary to meet the SWAC goals in many areas where dredging occurs. The Amended Remedy remains consistent with the 2002 Remedy as sediment removal is still the primary remediation approach at this Site. However the additional remedial measures selected here will fully achieve the original cleanup requirements in a shorter period of time.

As explained above, prior experience with dredging work at this Site and at other locations has shown that, during the dredging process, a small amount of sediment invariably becomes re-suspended and resettles in a thin layer of generated residuals at the surface of the newly-dredged area. The generated residuals could have unacceptably high levels of PCBs, and may continue to pose a risk unless the primary approach is modified. The Amended Remedy, therefore, includes post-removal survey and sampling requirements, and post-removal residuals management requirements, as outlined below.

The Amended Remedy allows alternate remedial approaches such as capping in certain areas at the Site where those alternate approaches can help achieve the overall remedial objectives more quickly, more effectively, and at a lower cost. However, unlike sediment removal, a containment approach such as capping would leave contaminated sediment in place in some areas at the Site, so the Amended Remedy includes two main features that are designed to ensure that capping would be as protective as sediment removal over the long term. First, the cap design and minimum depth requirements specified below are designed such that the caps will be durable over the long term, even with factors such as major flood events, ice scour, and propeller wash. Second, the Amended Remedy includes specific requirements for monitoring and maintaining caps that are installed, to confirm that the long-term objectives of the Amended Remedy are achieved.

The ROD Amendment establishes general criteria governing use of the primary remedial approach and the alternate remedial approaches in areas within OU 1, but more specific plans will be developed during the remedial design process. A conceptual design for dredging, capping, and sand covering areas is shown in Figures 2 and 3 below, and summarized in Table 5. As discussed in greater detail in the Design Supplement, that design would involve removing an estimated total of 406,100 cubic yards of sediment with PCB concentrations greater than 1.0 ppm by dredging, and containing 503,900 cubic yards by capping or a sand cover. The final remedial action design and implementation details will be subject to approval by EPA and WDNR, and the Agencies will require the remedial action to be consistent with all criteria and requirements of the Amended Remedy, as outlined below.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Sub-area/DMU Boundaries
OU1 Optimized Remedy
Engineered Cap
Dredge Areas
Interdeposit (less than 1.0 ppm PCBs)
Null
3 Inch Sand Cover
6 Inch Sand Cover
Residual Sand Cover
This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.
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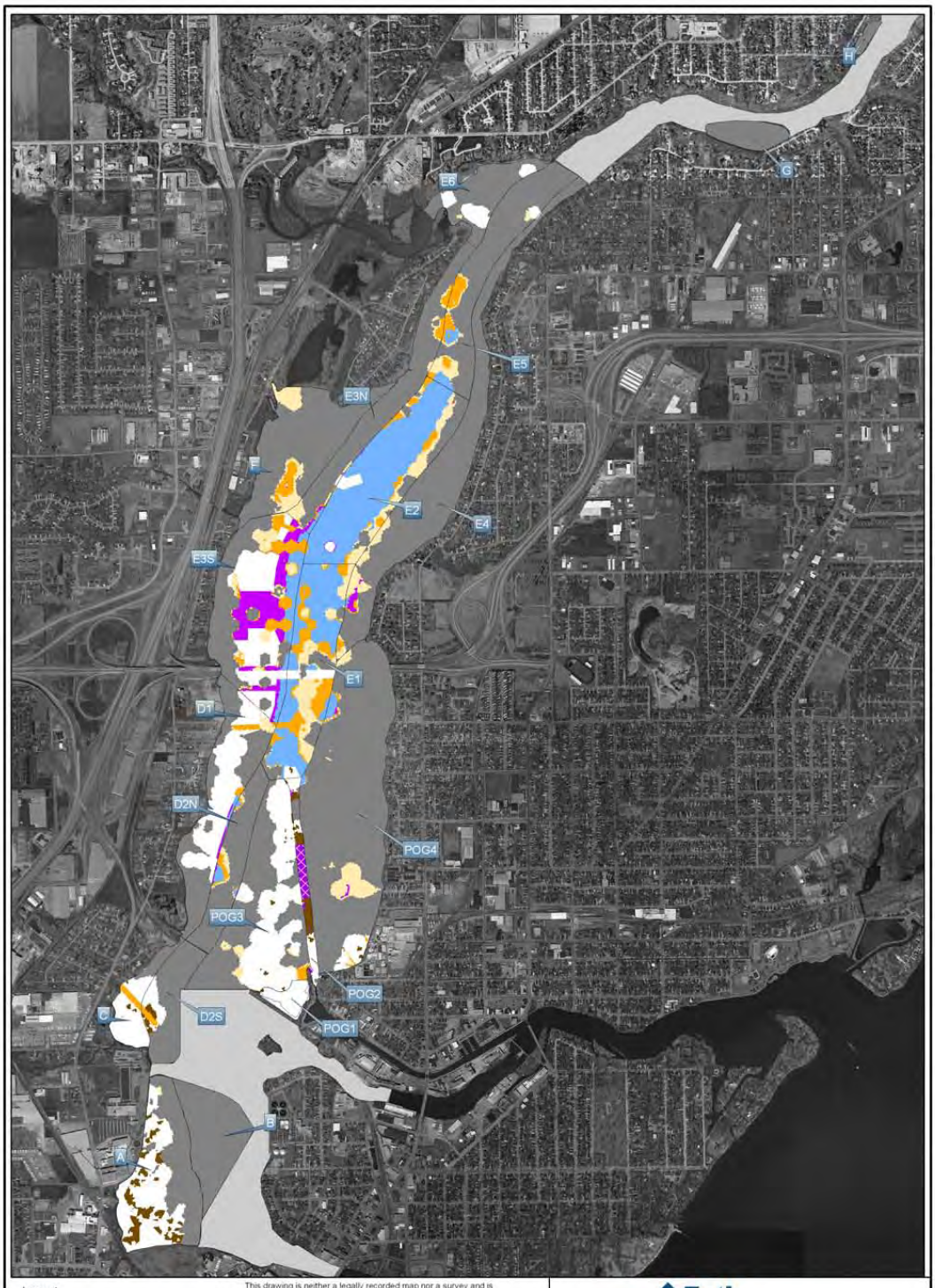
Date: NOVEMBER 2007
Drawn By: SGL
Checked By: SJL1
Scope: 07G017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Legend
Sub-area/DMU Boundaries
OU1 Optimized Remedy
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Dredge Areas
Dredge and 9" Sand Cover
Interdeposit (less than 1.0 ppm PCBs)
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This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. This drawing is a compilation of records, information and data used for reference purposes only.
Source: Orthophoto flown by Winnebago County
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Foth
Foth Infrastructure & Environment, LLC
GW PARTNERS
FIGURE 3
AMENDED REMEDY
MOSAIC OF REMEDIAL ACTION
POST 2007 PROJECT WORK
OPERABLE UNIT 1
Scale: 0 800 1,600 Feet
Date: NOVEMBER 2007
Drawn By: SGL
Checked By: SJL1
Scope: 07G017

A. The Primary Remedial Approach and the Alternate Remedial Approaches

1. The Primary Remedial Approach

The Amended Remedy adopts sediment removal (discussed below) as the primary remedial approach for sediment exceeding the 1.0 ppm PCB RAL. The primary remedial approach must be used to remediate such sediment unless the eligibility criteria for employing an alternate remedial approach in the specific area can be met and the alternate remedial approach is more feasible and more cost effective in that area.

Any final remedial action must incorporate the following minimum standards:

- **Sediment removal requirements.** All sediment with PCB concentrations exceeding the 1.0 ppm RAL will be targeted for removal in all areas within OU 1 unless use of an alternate remedial approach is approved by the Agencies for a particular area under the eligibility criteria listed below in Section XI.A.2. More specifically, in each sediment removal area, sediment shall be removed to a target elevation that: (1) encompasses all contaminated sediment exceeding the 1.0 ppm PCB RAL (as determined from 2003-2004, 2006-2007 and 2008 sampling data and data interpolation), including an overdredge allowance, as appropriate; and (2) includes any remaining sediments with PCB concentrations greater or equal to 50 ppm.

- **Sediment removal methods and precautions.** Sediment removal will be conducted using a dredge appropriate to Site conditions. In-water pipelines or other appropriate methods will transport the dredged sediment from the dredge to the staging area(s). Dredging experience at OU 1 from 2004 – 2007 has shown that with careful operation of environmental dredges, silt curtains or other containment devices generally are not necessary during dredging activities. However, if future operations indicate that controls are necessary to ensure protectiveness, then additional measures or modifications to the dredging process will be employed, as appropriate. Turbidity will be monitored during dredging operations. Buoys and other waterway markers will be installed around the perimeter of the in-water work area.

- **Sediment dewatering and disposal**. Dewatering will be employed at the staging facility for dredged sediment. The dewatering will be accomplished using processes such as plate and frame presses, belt filter presses, or geotextile tubes to remove water from PCB contaminated sediment before disposal. Based on dredging and dewatering from 2004 – 2007, it is expected that geotextile tubes will likely be used to complete the dewatering of dredged sediments for the remainder of the project. Dewatered contaminated sediment will be transported by truck, rail, and/or barge to a dedicated engineered landfill or another suitable upland disposal facility, consistent with applicable federal and state requirements. Based on previous

experience at OU 1, it is anticipated that trucks would be utilized to transport dredged PCB-contaminated sediments to an approved upland disposal facility. All known TSCA sediments were removed during dredging operations from 2004 to 2006. Although only non-TSCA sediments are expected to remain at OU 1, if TSCA sediments were found to still remain at OU 1, dewatered sediments subject to TSCA disposal requirements must be transported consistent with TSCA requirements by truck, rail, and/or barge to a landfill facility appropriately permitted to receive TSCA waste.

- **Water treatment.** Superfund cleanups are required to meet the substantive discharge requirements of the Clean Water Act, but National Pollutant Discharge Elimination System (NPDES) permits are not required for on-site work. Thus, water generated by dredging and dewatering operations will be treated prior to discharge back to the River and will meet all state and federal water quality standards. This may include (but not be limited to) bag filter and sand filtration and granulated activated carbon (GAC) treatment. Treated water will be sampled and analyzed to verify compliance with the appropriate discharge requirements according to plans that will be developed in the design phase and approved by the Agencies.

- **Post-removal confirmatory surveys and sampling.** After removal of sediments from a particular area, a survey and sampling activities will be performed to: (1) determine whether the sediment removal requirements specified above were met; and/or (2) determine whether there is a need for post-removal residuals management measures, as specified below. If the survey and/or sampling results show that the sediment removal requirements were not met in an area, then additional sediment in the area shall be removed until compliance with the sediment removal requirements is achieved. If the survey and/or sampling results in a particular area shows that post-removal dredge residuals management measures are needed, then those measures shall be implemented. The post-removal surveys and sampling will be done when the initial round of dredging in a particular area is completed.

- **Post-removal residuals management.** As explained above, this ROD Amendment uses the term “generated residuals” for sediment that is re-suspended and re-deposited on the surface of a newly-dredged area (i.e., within the top six inches of the sediment), and it uses the term “undisturbed residuals” for sediment that is more than six inches below the surface of the newly-dredged sediment. If post-removal confirmatory sampling in a sediment removal area reveals post-removal generated residuals or undisturbed residuals with PCB concentrations exceeding the 1.0 ppm PCB RAL, then one or more of the following must occur:

- **For management of generated residuals**

    - Generated residuals with a PCB concentration equal to or greater than 5.0 ppm must either be: (1) removed (typically by re-dredging) in accordance with the sediment removal requirements specified above; or (2) capped, if the eligibility criteria for that alternate remedial approach can be met, as specified below.

    - Generated residuals with a PCB concentration between 1.0 ppm and 5.0 ppm must be covered with at least 6 inches of clean sand from an off-Site source (referred to as a "residual sand cover").

    - Place a residual sand cover as necessary to meet the SWAC goal for the OU of 0.25 ppm.

- **For management of undisturbed residuals**

    - Unless EPA and WDNR approve use of a different residuals management approach in a particular area within OU 1, undisturbed residuals with a PCB concentration exceeding the 1.0 ppm PCB RAL must be removed (typically by re-dredging) in accordance with the sediment removal requirements specified above. EPA and WDNR may evaluate and approve the use of a different residuals management approach (such as a cap or a sand cover) for undisturbed residuals in limited areas if the eligibility criteria for alternate remedial approaches in Section XI.A.2 below is met.

2. Alternate Remedial Approaches

As noted above, the primary remedial approach shall be used to remediate sediment with a PCB concentration exceeding the 1.0 ppm PCB RAL, unless the eligibility criteria for employing an alternate remedial approach in the specific area can be met and the alternate remedial approach is more feasible and more cost-effective in that area. The Agencies have already determined that alternate remedial approaches will be more feasible and more cost-effective than dredging in certain areas identified in the Design Supplement, but the Design Supplement did not make final recommendations for all areas. Capping will only be allowed where the average PCB concentrations do not exceed 10.0 ppm in the top 8-inch interval of sediment underlying the cap.

The Design Supplement included alternate remedial approaches in some areas, but more specific plans for any alternate remedial approaches in OU 1 will be developed

before or during completion of the remedial action. Any final remedial action must incorporate the following minimum standards:

- **Engineered caps.** An engineered cap consisting of a sand layer and an armor stone layer may be installed in an area if the following eligibility criteria are satisfied:

  - **Minimum water depth criteria for capping.**

    - Capping will not be allowed in areas within the federally-authorized navigation channels. (Note: Sand covering will be allowed in the navigation channel(s) to manage dredged residuals. These sand covers must be at least 6 inches thick and must not impede navigation.)

    - Capping will be allowed in areas outside of the federally authorized navigation channel only if the top of the cap is at least 6 feet below the low water datum.

  - **Engineered caps of 13 inches in thickness.** This type of cap may be used in areas outside of the federally authorized navigational channel if the minimum water depth criteria for capping and all of the following additional criteria are met:

    - The cap shall be constructed of at least 3 inches of clean sand covered by at least 4 inches of armor stone, with an overplacement allowance of 3 inches of sand and 3 inches of armor stone.

    - The PCB concentration in the sediment in the eight inches immediately beneath the cap[8] shall not exceed an average of 10.0 ppm.

  - **Initial post-construction cap monitoring.** Immediately after completion of capping construction activities for both sand and then separately for armor layers, a hydrographic survey shall be performed and direct cap thickness verification sampling shall be conducted. The post–construction thickness sampling will verify that cap placement specifications and cap construction criteria have been met, including an evaluation of whether the installed cap is sufficient in aerial coverage and thickness, and whether the cap material meets all applicable physical and chemical design standards. If the initial post-construction cap monitoring in a particular area shows that the cap

[8] This eight inches is comprised of two 4-inch sampling intervals.

placement specifications and cap construction criteria have not been met, then the cap in that area shall be augmented or replaced to meet the applicable specifications and criteria.

❍ **Sand covers in undredged areas.**

o A cover composed of at least an average of 6 inches (3-inch minimum thickness) of uncontaminated sand from an off-Site source may be placed over certain undredged areas that have low PCB concentrations in a relatively thin layer of PCB-contaminated sediment exceeding the 1.0 ppm PCB RAL if both of the following criteria are met:

- The sediment beneath the sand cover must not exceed 2.0 ppm at any depth within the sediment profile.

- The sediment profile shall contain only one 8-inch interval with PCB concentrations between 1.4 – 2.0 ppm.

o A cover composed of at least an average of 3 inches (1.5-inch minimum) of uncontaminated sand from an off-Site source may be placed over certain undredged areas that have low PCB concentrations in a relatively thin layer of PCB-contaminated sediment exceeding the 1.0 ppm PCB RAL if both of the following criteria are met:

- The sediment beneath the sand cover must not exceed 1.4 ppm at any depth within the sediment profile.

- The sediment profile shall contain only one 8-inch interval with PCB concentrations between 1.0 – 1.4 ppm.

Immediately after completion of sand cover placement activities, sand cover cores shall be collected. These initial post–construction cores or other measures approved by the agencies will verify that sand cover placement specifications have been met, including an evaluation of whether the sand cover is sufficient in areal coverage and thickness. If the initial post-construction sand cover monitoring in a particular area shows that the sand cover placement specifications have not been met, then the sand cover in that area shall be augmented or replaced to meet the applicable specifications and criteria.

❍ **Exceptional areas.** EPA and WNDR may approve use of modified remedial approaches or other remedial approaches in exceptional areas at the Site based upon a showing that use of another remedial approach in an exceptional area is sufficiently protective and is more feasible and more cost effective than the primary remedial approach or any of the alternate remedial

approaches described above. EPA and WDNR expect that there will only be a relatively small number of areas at the Site that will need to be treated as exceptional areas, including some shallower near shore areas or areas near utilities. The specific remedial approach for each exceptional area will be subject to review and approval by EPA and WDNR, and will be included in the final remedial design.

A summary of a preliminary design features for capped areas and sand cover areas is shown in Table 5 below.

TABLE 5. Summary of Design Features for Capping and Sand Covers

Description		Minimum post-cap/cover water depth	PCB concentration	Area covered by cap or sand cover
Cap: 6-inches of sand and 7-inches of gravel		6 feet	<=10 ppm[1]	112 acres
Sand Cover	6-inches of sand	Varies	1.4 - 2.0 ppm[2]	46 acres
	3-inches of sand	Varies	1.0 – 1.4 ppm[2]	68
	6-inches of sand	Varies	Dredge residuals	30

Table Notes:

[1] PCB average concentration in 0 – 0.5 foot depth below mudline.

[2] Maximum PCB concentration in any 8-inch interval. Sand cover is assumed to completely mix with the top three (3) inches of underlying sediment and will achieve the 1.0 ppm RAL in the 0 – 0.5 foot depth below mudline.

B. The Relationship Between the Remedial Action Level (RAL) Performance Standard and the Surface-Weighted Average Concentration (SWAC) Goal

This ROD Amendment requires remediation of all contaminated sediment exceeding the 1.0 ppm PCB Remedial Action Level (RAL) either by the primary remedial approach or by one of the alternate remedial approaches discussed above. The ROD Amendment also establishes two standards that will be used to judge the completion of construction of the Amended Remedy for OU 1: a RAL Performance Standard and a SWAC goal. As explained below, construction of the remedy will be deemed complete for OU 1 if the RAL Performance Standard has been met throughout the OU. If the RAL Performance Standard has not been met after employing the primary remedial approach and/or the alternate remedial approaches throughout the OU, then the remedy will be deemed complete if the SWAC, as determined by WDNR and EPA, meets the SWAC goal for the OU. The construction of the remedy will not be deemed complete based on the SWAC goal unless and until all sediment exceeding the RAL has been remediated using the primary remedial approach and/or the alternate remedial approaches.

As discussed in the 2002 ROD, EPA and WDNR selected the 1.0 ppm PCB RAL because it would achieve cost-effective removal and/or containment of PCBs, and substantially reduce migration of PCBs downstream. The Amended Remedy adopts that same RAL, and it incorporates a presumption in favor of remediation by sediment removal, but it also allows remediation of sediment above the RAL by alternate remedial approaches. The mass and volume of contaminated sediment to be removed under the primary remedial approach will depend upon the horizontal footprint and depth of the contamination exceeding the 1.0 ppm PCB RAL. The use of alternate remedial approaches for remediation of sediment exceeding the 1.0 ppm PCB RAL will depend upon the depth and level of contamination of the sediment and location-specific design requirements and eligibility criteria, as detailed above.

If all sediment exceeding the 1.0 ppm PCB RAL within OU 1 is removed and/or contained using the primary remedial approach and/or the alternate remedial approaches, then construction of the remedy in OU 1 will be deemed complete based on achievement of the RAL Performance Standard. Achievement of the RAL Performance Standard will be assessed soon after completion of sediment removal, capping, and sand cover placement activities. As discussed below, even if the RAL Performance Standard is not met, construction of the remedy in OU 1 can still be deemed complete based on the Agencies' determination that the SWAC goal has been achieved.

Explanation of Remedial Action Level and Surface-Weighted Average Concentration

The term Remedial Action Level (RAL) refers to a PCB concentration in sediment used to define an area or volume of contaminated sediment that is targeted for remediation. In other words, the RAL in this ROD calls for remediation by dredging, or application of capping or a sand cover, of all sediment in OU 1 having a PCB concentration of greater than 1.0 ppm. If all sediment with a concentration greater than the 1.0 ppm RAL is addressed by dredging, capping and sand covers, it is predicted that the residual Surface-Weighted Average Concentration (SWAC) of sediment will be approximately 0.25 ppm. The SWAC goal in this instance is less than the RAL performance standard because a SWAC is calculated as an average concentration over the entire Operable Unit, after dredging, capping or placement of a sand cover in discrete areas that are above the RAL, and includes averaging over areas in which there are surface concentrations less than the RAL. SWAC calculations are discussed in Section 5.2 of the 2002 Feasibility Study.

As explained in the 2002 ROD, a SWAC at or near 0.25 ppm is expected to reduce PCB levels in sport fish to acceptable levels within a reasonable time period after completion of active remediation (e.g., for walleye, it would take an estimated 9 years for recreational fishers and 14 years for high-intake fish consumers). The Amended Remedy therefore requires achievement of an OU-specific SWAC goal if the RAL Performance Standard has not been met after employing the primary remedial approach and/or the alternate remedial approach throughout OU 1 (e.g., if post-removal residuals exceeding the 1.0 ppm PCB RAL remain in an area after it has been dredged to the required target elevation). Under the Amended Remedy, the PCB SWAC goal for OU 1 is 0.25 ppm PCBs. If the SWAC calculation, as determined by the EPA and WDNR, is met within OU 1 after all sediment exceeding the 1.0 ppm PCB RAL has been remediated using the primary remedial approach and/or the alternate remedial approaches, then the

construction of the remedial action can be deemed complete based on the Agencies' determination that the SWAC goal has been achieved.

The Amended Remedy offers a range of options for completing construction of the remedy if all contaminated sediment exceeding the 1.0 ppm PCB RAL has been remediated in OU 1 using the primary remedial approach and/or the alternate remedial approaches, but it still appears that the RAL Performance Standard or achievement of the SWAC goal will not be met. Those options are:

1. Performing additional dredging or capping to ensure that all sediments with PCB concentrations greater than the 1.0 ppm PCB RAL are removed, contained or covered;

2. Installing capping in areas with higher PCB concentrations (provided minimum water depth criteria and other capping criteria and design requirements are met);

3. Placing a residual sand cover over dredged areas; and

4. Placing a sand cover over undredged areas (consistent with the general requirements for sand covers outlined above).

Once the Agencies have determined that the RAL Performance Standard or the SWAC goal is achieved in OU 1, the construction of the OU 1 remedy will be deemed complete (although ongoing monitoring and maintenance requirements and contingencies that are part of the Amended Remedy will continue to apply).

C. Other Features of the Amended Remedy

The Amended Remedy includes the following additional elements:

- **Site mobilization and preparation.** Staging area(s) will be required for facilities associated with sediment dewatering, sediment handling, water treatment, and material handling for cap and cover operations. Specific staging areas will likely be facilities previously utilized for the OU 1 project from 2004 to 2007. Docking facilities for dredging equipment and ancillary equipment for capping or sand covers at the existing facility will also likely be utilized.

- **Demobilization and staging area(s) restoration.** Demobilization, staging area(s) restoration, and decontamination of all equipment will require removing all equipment from the staging and work areas and restoring the staging area(s) as needed to meet the legal requirements or any agreement with the property owner.

- **Natural recovery after remediation.** Although the RAL Performance Standard or the SWAC goal will need to be met before construction of the remedial action can be deemed complete in OU 1, it will take additional time for natural recovery before some of the remedial action objectives are achieved. Sediment Quality Thresholds vary depending on the sensitivity of the particular receptor (such as recreational anglers, high-intake fish consumers walleye, mink, etc.), but post-remediation natural recovery will need to occur before certain SQTs and other remedial action objectives can be achieved. This is unchanged from the 2002 ROD, because the 2002 ROD and the Amended Remedy selected the same RAL and comparable SWACs.

- **Long-term monitoring, cap maintenance, and institutional controls**. These requirements are discussed below in Section XI.D

- **Monitored Natural Recovery and Institutional Controls.** This ROD Amendment does not change the original remedy for OU 2 in the 2002 ROD (i.e., Monitored Natural Recovery and Institutional Controls other than in Deposit DD).

- **Estimated costs.** Costs for the Amended Remedy are estimated to be approximately $102 million and are presented in detail in Table 4 above.

D. Long Term Monitoring, Cap Maintenance, and Institutional Controls

- **Long-term monitoring of surface water and biota.** The Amended Remedy requires long-term monitoring of surface water and biota to assess progress in achieving the remedial action objectives. Monitoring will continue until acceptable levels of PCBs are reached in surface water and fish. A detailed Long-Term Monitoring Plan, specifying the types and frequency of monitoring, will be developed.

- **Long-term cap monitoring.** The Amended Remedy requires long-term monitoring of any engineered caps that are installed at the Site to confirm their long-term integrity and protectiveness. The long-term monitoring will include:

    - **Hydrographic surveys and core sampling.** A hydrographic survey shall be performed and cores of the cap shall be collected, at a minimum, 2 years and 4 years after the initial post-construction survey and every 5 years thereafter. Based on the results observed in that periodic monitoring, EPA and WDNR may increase or decrease the frequency of periodic monitoring. EPA and WDNR may require additional cap monitoring (between periodic monitoring events) after particular events that could cause cap damage, such as major storm events, ice scour events, or propeller wash scour events.

- **Monitoring for physical integrity.** Hydrographic survey results and core samples collected during cap monitoring events will be analyzed to determine cap thickness and integrity.

- **Monitoring for chemical containment.** Some core samples collected during cap monitoring events will also be analyzed for PCB contamination within 6 inch intervals (or less) to determine whether contamination is being effectively contained and isolated from the biota.

❍ **Cap enhancement and/or removal in response to cap degradation.** If monitoring, or other information, indicates that the cap in an area no longer meets its original as-built design criteria and that degradation of the cap in the area may result in an actual or threatened release of PCBs at or from the area, then EPA and WDNR shall identify additional response activities to be undertaken in the area. If monitoring or other information shows a pattern of cap degradation in multiple areas, then EPA and WDNR may identify additional response activities to be undertaken in multiple capped areas at the Site (including in areas that have not yet shown any signs of degradation). The additional response activities shall include either:

- Cap enhancement (e.g., application of a thicker sand layer or stone layer or use of larger armor stone); and/or

- Cap removal and removal of underlying contaminated sediment (consistent with the requirements of the primary remedial approach).

❍ **Cap enhancement and/or removal in response to changed water levels.** EPA and WDNR may identify additional response activities to be undertaken in a capped area if monitoring or other information indicates that the minimum water depth criteria for capping are no longer being met in the area and that the failure to meet the water depth criteria: (1) may result in an actual or threatened release of PCBs at or from the area (e.g., due to an increased risk of damage caused by propeller wash, ice scour, or other factors); or (2) may have adverse impacts on Lower Fox River uses. The additional response activities may include either:

- Cap enhancement; and/or

- Cap removal and removal of underlying contaminated sediment (consistent with the requirements of the primary remedial approach).

❍ **Institutional controls.** Institutional Controls (ICs) are necessary to prevent interference with the remedy and to reduce exposure of contaminants to

human or ecological receptors. ICs are defined as non-engineered instruments, such as administrative and legal controls that help minimize potential for exposure to contamination and protect the integrity of the remedy. ICs are also required to assure long-term protectiveness for those areas that do not allow for unlimited use and unrestricted exposure. ICs are also required to maintain the integrity of the remedy. At this Site, ICs are required to protect the cap (engineered remedy), and reduce potential exposure for all areas where residual contamination will remain. Also, interim ICs may be necessary to prevent exposure to contaminants which may be released during construction activities such as dredging, capping and placing of sand covers. Long-term protectiveness requires compliance with effective ICs. Hence, effective ICs must be implemented, monitored and maintained.

Institutional controls will be identified as part of the remedial design process in an Institutional Control Implementation and Assurance Plan (ICIAP) for review and approval by EPA and WDNR. The required ICs may include property use controls (such as easements and restrictive covenants), governmental controls (including zoning ordinances and local permits), and informational devices (including signage and fish consumption advisories). The ICIAP shall identify parties responsible (i.e., federal, State or local authorities or private entities) for implementation, enforcement, and monitoring and long-term assurance of each institutional control including costs, both short-term and long-term, and methods to fund the costs and responsibilities for each step.

The ICIAP shall include maps, which shall describe coordinates of the restricted areas on paper and provide shape files in an acceptable GIS format (i.e., NAD 83) depicting all areas that do not allow unlimited use/unrestricted exposure, where dredging is not allowed (e.g., capped areas, buried utilities and near highway bridges) and areas where ICs have been implemented along with a schedule for updating them. The maps and information about the ICs shall be made available to the public in at least several ways, such as a website that is easily accessible to the public and posted in the public library. In addition the ICIAP shall identify reporting requirements associated with each institutional control which shall include at a minimum an annual certification regarding the status and effectiveness of the ICs.

Among other things, the ICIAP shall include the following institutional controls for any capped areas:

- By using governmental and/or property use ICs, establishment of a Regulated Navigation Area (designating areas including an appropriate buffer) where use restrictions are required such as water use restrictions (e.g., limitations on anchoring, dredging, spudding, or dragging limitations, conducting salvage operations, establishment of "no wake" areas and other operating restrictions for commercial and non-commercial vessels which could potentially disturb the riverbed or the engineered remedy limitations); construction limitations (e.g.,

restrictions on utilities such as laying cable, new bridges or dredging limitations for marina expansion or maintenance); and monitoring and maintenance requirements for all areas including dams.

- Provide additional information to the public to assure protectiveness of the remedy (such as fish consumption advisories.)

XII. Comparison of the Amended Remedy and the 2002 ROD Remedy

Table 6 summarizes the differences between the 2002 ROD Remedy and the Amended Remedy. Table 7 compares the estimated sediment volumes, contaminant masses, and acreages remediated under the 2002 ROD Remedy and the Amended Remedy.

TABLE 6. Summary of Changes to 2002 ROD

Remedy Element	2002 ROD	Amended Remedy
Remedial Action Level	1.0 ppm PCBs	1.0 ppm PCBs
SWAC Goal for OU 1	0.25 ppm PCBs	0.25 ppm PCBs
Dredging Volume removed	928,400 cubic yards	406,100 cubic yards
PCB Mass removed (kilograms)	1143	843
Engineered Cap	Allowed under contingent remedy	Estimated 112 acres or less
Sand cover over sediments with PCB concentrations 1.0 – 2.0 ppm and 8-inch thickness or less that exceed the 1.0 ppm PCB RAL	None (not allowed)	Estimated 114 acres or less
Post-dredging sand cover in dredged areas if contaminants have PCB concentrations greater than the 1.0 ppm PCB RAL	Required (as necessary to meet the SWAC)	Estimated 30 acres
Transportation of dredge slurry from dredge to river-side facility	In-water pipeline	In-water pipeline
Separation of water from sediments	Mechanical presses	Geotextile tubes
Transportation of contaminated sediment from a river-side dewatering facility to landfill for final disposal	Trucks	Trucks
Disposal of dredged sediments	Contaminated sediments will go to a landfill that complies with all applicable federal and state laws and regulations	Contaminated sediments will go to a landfill that complies with all applicable federal and state laws and regulations
Institutional Controls until contaminants are at acceptable levels	Required	Required
Long-term monitoring of biota and water until contaminants are at acceptable levels	Required	Required
Monitored Natural Recovery until contaminants are at acceptable levels	Required	Required
Long-term monitoring and maintenance of cap	Required for contingent remedy	Required
Time (from 2007) to complete remediation	7 years	2 years
Cost	$144 million	$102 million

Fundamental change

Table 7. Comparison of Remedy Volumes, Mass Removal, and Remediation Areas for OU 1[1]

	Sediment Volume Addressed (cubic yards; cy)		Mass Removed (kilograms; kg)		Area Remediated (acres)	
Remedial Action	**2002 ROD**	**Amended Remedy**	**2002 ROD**	**Amended Remedy**	**2002 ROD**	**Amended Remedy**
Dredge/dispose [3]	928,400 [2]	406,100	1,143	843	426	216
Engineered cap [4]	0	325,100	0	0	0	112
Sand cover over PCB concentrations 1.0 - 2.0 ppm	0	178,800	0	0	0	114
Remedial action area total	928,400	910,000	1,143	843	426	442

Table Notes:

[1] Figures are modeled estimates except for dredge and residual sand cover components which are based on actual data. Because of variation between actual conditions and modeled estimates, the total acreage, sediment volume, and PCB mass projected for the Amended Remedy vary from the acreage, sediment volume and PCB mass estimate for the 2002 ROD Remedy.

[2] The ROD estimate did not account for overcut. In addition, the 928,400 cubic yard volume estimate is a modeled estimate and does not account for "high subgrade" (i.e., areas that have a hard undredgable surface at higher than expected elevation underneath the zone of contaminated sediments, resulting in a lower volume than predicted of contaminated sediments). Based on actual dredging experience, high subgrade is estimated to reduce the total dredge volume by up to 90,000 cubic yards.

[3] Values indicated are based on actual data for the 2004-2006 RA activities and projections for the 2007 and 2008 RA activities. This Amended Remedy includes dredging in the following areas beyond those areas already identified by the 2007 RA Work Plan: re-dredge of Sub-Area POG2 and areas north of the trestle trail with residual concentrations above 5.0 ppm; 7-8 acres in Sub-Area D1; 40 acres in Sub-Areas D2N, E3 North, E3 South, E4, POG4, and F (due to capping constraints, based on a 6-foot post-cap water depth requirement); and 0.7 acres in Sub-Area E2.

[4] Approximate average of 13-inches includes 3-inch overplacement allowances in both the sand and armor layers.

XIII. Statutory Findings

Under CERCLA Section 121, 42 U.S.C. § 9621 and the NCP, 40 C.F.R. § 300.430, the remedies that are selected for Superfund sites are required to be protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatments that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element, and there is a bias against off-site disposal of untreated wastes. The following sections discuss how the Amended Remedy meets these legal requirements.

This ROD Amendment satisfies these requirements as follows:

1. Protection of Human Health and the Environment

Implementation of the Amended Remedy will adequately protect human health and the environment and achieve the RAOs discussed in Section IV above, through the following actions:

- **Dredging and off-site disposal of PCB-contaminated sediment.** Dredging is focused on sediments with higher PCB concentrations.

- **In-place containment of PCB contaminated sediments under engineered caps designed to provide long-term stability.** Capping will generally be performed where PCB concentrations are lower and contaminated deposits are relatively thin.

- **Enhanced natural recovery by placement of a sand cover.** Natural recovery will be accelerated where PCB concentrations are only slightly above the 1.0 ppm PCB RAL (i.e., between 1.0 to 2.0 ppm) and would also be limited to areas where the thickness of sediment at those PCB levels is eight inches or less.

- **Construction monitoring to ensure that there are no significant releases of contaminants during remedial activities.**

- **Long-term monitoring and maintenance of caps.**

- **Long-term monitoring of surface water and biota.**

- **Implementation of an Institutional Control Implementation and Assurance Plan.**

The Amended Remedy will address sediment with PCB concentrations exceeding the 1.0 ppm RAL. The estimated post remediation PCB SWAC will meet the SWAC goals if

the RAL is not achieved in all areas within OU 1.

Implementation of the Amended Remedy in OU 1 will result in reductions in fish tissue PCB concentrations to acceptable levels within a reasonable time and in a shorter time than the 2002 ROD Remedy. Monitoring will help assess achievement of remedial action objectives. The Amended Remedy does not pose unacceptable short-term risk because experience on other projects has shown that environmental dredging and capping does not result in significant contaminant releases during implementation.

2. Attainment of Applicable or Relevant and Appropriate Requirements

ARARs are discussed in detail in the 2002 ROD for the Site, and are summarized in Table 8 below. These ARARs will be met by the Amended Remedy.

TABLE 8. Fox River ARARs

Act/Regulation	Citation
Federal Chemical-Specific ARARs	
TSCA[1]	40 CFR 761.79 and EPA Disposal Approval 40 CFR 761.75 40 CFR 761.61(c)
Clean Water Act – Federal Water Quality Standards	40 CFR 131 and 33 CFR 323
Federal Action-/Location-Specific ARARs	
Fish and Wildlife Coordination Act	16 USC 661 *et seq.* 33 CFR 320-330 – Rivers and Harbors Act 40 CFR 6.304
Endangered Species Act	16 USC 1531 *et seq.* 50 CFR 200 50 CFR 402
Rivers and Harbors Act	33 USC 403; 33 CFR 322, 323
National Historic Preservation Act	15 USC 470; *et seq.* 36 CFR Part 800
Floodplain and Wetlands Regulations and Executive Orders	40 CFR 264.18(b) and Executive Order 11988
State Chemical-Specific ARARs	
Surface Water Quality Standards	NR 102, 105 (*To Be Considered*), and 207 NR 722.09 1–2
Groundwater Quality Standards	NR 140
Soil Cleanup Standards	NR 720 and 722
Hazardous Waste Statutes and Rules	NR 600–685
State Action-/Location-Specific ARARs	
Management of PCBs and Products Containing PCBs	NR 157
Wisconsin's Floodplain Management Program	NR 116
Solid Waste Management	NR 500–520
Fish and Game	Chapter 29.415 – Wisconsin Statutes

Note 1: TSCA establishes requirements for the handling, storage, and disposal of PCB-containing materials equal to or greater than 50 ppm. TSCA is an ARAR at the Site with respect to any PCB-

containing materials with PCB concentrations equal to or greater than 50 ppm that are removed from the Site. However, all known TSCA sediments in OU 1 have been removed during dredging operations from 2004 to 2006. This is unchanged from the 2002 ROD and all TSCA requirements for off-site disposal will still be met.

3. Cost Effectiveness

The Amended Remedy will cost approximately $42 million less to implement than the 2002 ROD Remedy. A significant portion of the cost savings is due to the smaller volume of relatively clean sediment that will be disposed of at a landfill under the Amended Remedy. The Amended Remedy will generally achieve equivalent or better results at lower cost, so it is more cost-effective than the 2002 ROD Remedy.

4. Use of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA and WDNR have determined that the Amended Remedy represents the maximum extent to which permanent solutions and treatment technologies can be used in a cost-effective manner for the Site.

5. Preference for Treatment as a Principal Element of the Remedy

Neither the 2002 ROD Remedy nor the Amended Remedy satisfies the statutory preference for treatment of the hazardous substances present at the Site because treatment was not found to be practical or cost-effective. For example, the most promising treatment technology, vitrification, was fully evaluated, but was not cost-effective and it had implementability issues (e.g., engineering uncertainties because a full-scale sediment vitrification facility had never been designed, permitted, or constructed). However, water separated from dredged sediments will be treated prior to discharge back to the Lower Fox River.

6. Five Year Review Requirements

CERCLA Section 121(c), 42 U.S.C. § 9621(c) and the NCP at 40 C.F.R. § 300.430(f)(4)(ii), require a 5-year review if the remedial action results in hazardous substances, pollutants, or contaminants remaining on Site above levels that allow for unlimited use and unrestricted exposure. Because this remedy will result in hazardous contaminants remaining on Site above levels that allow for unlimited exposure, a statutory review will be conducted within 5 years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

XIV. Public Participation and Documentation of Significant Changes from Proposed Plan

To fulfill the requirements of CERCLA Section 117(b), 42 U.S.C. § 9617(b), and the NCP at 40 C.F.R. §§ 300.430(f)(5)(iii)(B) and 300.430(f)(3)(ii)(A)), a ROD Amendment must document and discuss the reasons for any significant changes made to the Proposed Plan. Public participation requirements listed above, as well as those in NCP (40 C.F.R. §§ 300.435(c)(2)(ii) have been met.

The Proposed Plan was released for public comment on November 26, 2007. It proposed modifying the 2002 ROD Remedy from an all-dredging remedy with a capping contingency to: 1) dredging, 2) capping, and 3) sand cover. Compared to the 2002 ROD, the RAL and the SWAC goals are unchanged. Agency responses to all significant public comments are included in the Responsiveness Summary, attached to this ROD Amendment as Appendix A`.

XV. New Information Obtained During the Public Comment Period

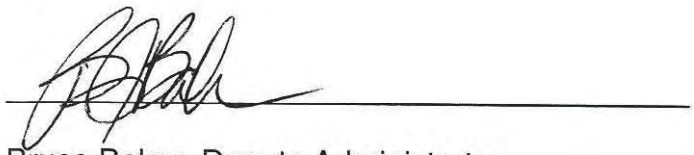
While there were a number of comments on the Proposed Plan that expressed concerns regarding the permanence or effectiveness of capping, no comments provided new information or evaluations based on engineering or scientific analyses or data, that demonstrated capping or sand covers would not be effective or protective.

In conclusion, there were no fundamental changes to the Proposed Plan due to new information or considerations raised in the public comment period.

6/12/08

for Richard C. Karl, Director
Superfund Division
EPA – Region 5

Date



Bruce Baker, Deputy Administrator
Water Division

Date June 6, 2008

Appendix A

Responsiveness Summary

Responsiveness Summary

Operable Unit 1

Lower Fox River and Green Bay Superfund Site

June 2008

CONTENTS

Abbreviations and acronyms used in this document

Agencies	Wisconsin Department of Natural Resources and United States Environmental Protection Agency
Amended Remedy	Remedy selected in Record of Decision Amendment, Operable Unit 1, Lower Fox River and Green Bay Superfund Site
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cy	cubic yards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	Operable Unit
OU 1	Little Lake Butte des Morts reach
OU 2	Appleton to Little Rapids reach
OU 3	Little Rapids to De Pere reach
OU 4	De Pere to Green Bay reach
OU 5	Green Bay
PCB	polychlorinated biphenyl
ppm	parts per million
PRPs	Potentially Responsible Parties under CERCLA
RAL	Remedial Action Level
RIFS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
Design Supplement	OU1 Design Supplement, Lower Fox River Operable Unit 1, November 2007
SWAC	Surface Weighted Average Concentration
USEPA	United States Environmental Protection Agency
WDNR	Wisconsin Department of Natural Resources
2002 ROD	Record of Decision, Operable Units 1 and 2, Lower Fox River and Green Bay Site, December 2002

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INTRODUCTION

On November 26, 2007, the United States Environmental Protection Agency (USEPA) and the Wisconsin Department of Natural Resources (WDNR) jointly released to the public the Proposed Plan for Portions of Operable Unit 1 (also known as the Little Lake Butte des Morts reach) of the Lower Fox River and Green Bay Superfund site. See USEPA Fact Sheet entitled "EPA Proposes Revisions to Cleanup Plan for Little Lake Butte des Morts." USEPA held a public meeting regarding the Proposed Plan on December 13, 2007, at Lawrence University, Youngchild Hall, Appleton, Wisconsin. This meeting was attended by approximately 60 citizens.

This Responsiveness Summary summarizes the written comments received by USEPA from the community during the public comment period and responds to those comments. This Responsiveness Summary also includes the transcript from the December 13, 2007, public hearing and responses to certain verbal comments.

In total, USEPA received 44 written comments. Comments providing specific and scientific information relevant to the remediation of the Fox River were given greater consideration than were comments expressing general opinions and concerns.

This Responsiveness Summary has three sections: Section 1 summarizes and responds to common concerns expressed by multiple commenters; Section 2 presents and responds to certain specific and more scientifically-based comments; and Section 3 sets out certain verbal comments made at the public hearing, and provides the Agencies' responses.

Acronyms and abbreviations which are used throughout the Responsiveness Summary, are shown in a Table of Abbreviations and Acronyms, on page 3. All public comments received have been compiled and are included in the Administrative Record.

Section 1. SUMMARY OF SIMILAR COMMENTS RAISED BY MEMBERS OF THE LOCAL COMMUNITY, AND AGENCIES' RESPONSES

1. Permanency of Capping as a Remedy

Comment: Commenters expressed the following concerns:

- natural forces (flooding, ice effects, biological action, etc.) could damage the caps and cause a release of PCB contamination from capped sediments.
- capping is not a technology that has been proven to be effective in containing contaminants in a river system, and is too experimental.
- capping might not permanently contain PCB contaminated sediments, and
- a preference for removal of contaminants by dredging.

Agencies Responses

At the Fox River Site, leading experts in the fields of sediment transport, ice flow, bioturbation effects, and propeller wash were consulted. These experts comprehensively evaluated these issues and, based on these analyses, a cap has been designed to remain stable over the long term, and effectively contain PCB contamination in OU1. This design also incorporates an additional margin of safety to support long-term stability and effectiveness.

To verify that the cap will be constructed to design specifications necessary for stability and effectiveness, upon completion of cap construction, evaluations will be performed to confirm that the cap was properly installed consistent with requirements in the Amended Remedy and the final design. At a minimum, these evaluations will include bathymetry surveys, coring, and if appropriate, sediment traps. Cores samples will determine whether the necessary thickness of "clean" sand and armor stone have been placed over target areas. The core samples will also be used to measure the PCB concentrations in the caps.

While the design specifications provide the necessary construction standards for long-term stability and effectiveness of caps, an additional measure of protectiveness will be provided by a long-term monitoring program. This will consist of surveys similar to post-construction monitoring described above to evaluate possible contaminant migration through the cap. For long-term monitoring, the integrity and containment effectiveness of the cap will be evaluated at a minimum, 2 years and 4 years after construction, and every 5 years thereafter. Monitoring of the cap will continue as long as contamination remains that could pose a threat to human health and the environment (effectively in perpetuity). Additionally, if a large storm event occurs (a 50 year storm or greater) or other events that might impact a cap's integrity occur, additional cap monitoring will be conducted, if required by the Agencies. If monitoring shows that caps are not effective in containing PCBs, cap enhancement, cap repair, or cap removal along with the removal of underlying contaminated sediments, would be performed as needed.

Regarding the “unproven” nature of capping technology, Attachment 1 provides a summary of experience for thirty-four (34) contaminated sediment capping projects in the United States and throughout the world. This includes at least six river capping projects, as listed in Attachment 1, page 68, as follows:

1. Sheboygan River/Harbor, Wisconsin;
2. Wausau River Site, Wisconsin;
3. Manistique Capping Project, Michigan;
4. McCormick and Baxter, Portland, Oregon;
5. Duwamish Waterway, Seattle, Washington; and
6. Mill-Quinniapiac River, Connecticut.

Experience on these projects has demonstrated the viability and effectiveness of capping in rivers and similar environments as a method to contain contamination, and to reduce risks to human health and the environment.

In addition to monitoring the physical integrity of the cap, environmental monitoring of surface water and fish will be conducted, as described in the Long-Term Monitoring Plan for the Fox River (discussed in greater detail in the Amended Remedy in Section XI.D).

Finally, certain “institutional controls” will be established to reduce the possibility of damage to the cap. These “institutional controls” may include, among other things, restrictions on anchoring, construction activities in the river, and dredging and maintenance and monitoring of dams. The institutional controls are discussed in greater detail in Section XI.D of the Amended Remedy.

Regarding a preference for dredging as expressed by some commenters, Agencies experience at OU1 shows that while dredging has successfully removed a significant mass of PCBs from the Fox River, dredging alone would not likely achieve the cleanup standards required in the 2002 ROD. Based on results from dredging 335,000 cubic yards of sediments at OU1, it is projected that dredging alone (without including sand cover for some areas) would result in a PCB surface weighted average concentration (SWAC) of 0.48 ppm from the current PCB SWAC concentrations of 1.9 ppm. The 0.48 ppm PCBs achieved by dredging is higher than the 0.25 ppm PCB SWAC goal contained in the ROD. Thus, the Agencies other steps may need to be taken to achieve the 0.25 ppm goal, such as using a combination of dredging, capping and sand covers to more quickly and consistent attain the 0.25 ppm goal.

Post-construction PCB sampling results from other capping projects are similar to the results obtained from the Fox River OU1 dredging project, with generated residuals having between 2 to 9 percent of the mass of contaminated sediments in the last dredging “cut.” The impact of PCB residuals on the ability to achieve PCB reduction goals is described in greater detail in, “The Four Rs of Environmental

Dredging: Resuspension, Release, Residual, and Risk," U.S. Army Corps of Engineers, January 2008.

2. The lower costs of capping compared to the higher costs of dredging are allegedly driving the ROD Amendment

Comment: Commenters felt that USEPA and WDNR are allowing cost to be the primary consideration in amending the ROD to include more capping, and less dredging.

Agencies Response

Under the National Contingency Plan, 40 C.F.R. Part 300 promulgated under CERCLA, cost is one of nine criteria that USEPA considers in making remedy decisions. The first two "threshold criteria" under the NCP are ability to protect human health and the environment, and ability to comply with Applicable or Relevant and Appropriate Requirements (ARARs). Both the Amended Remedy and the 2002 ROD remedy meet the two threshold criteria equally well. The alternatives were then evaluated against the balancing criteria (of which cost criteria is just one) and the modifying criteria, to decide whether to modify the remedy. The "balancing criteria" of short-term effectiveness, implementability and cost did play important roles in the decision to modify the remedy. For these and other balancing criteria, the evaluation showed that the Proposed Plan (as reflected in this Amended Remedy) is equally or more advantageous than the 2002 Remedy. The relative advantages of the 2002 ROD remedy and the Amended Remedy is discussed in greater detail in Section X.B of the Amended Remedy.

3. Concern that capping might limit restoration of the shipping channel in OU1

Comment: One commenter was concerned that capping might interfere with use of the historical shipping channel in OU1.

Agencies Response

The historical shipping channel will be dredged and will not be capped. Therefore, the Amended Remedy should not impair navigability. A significant portion of the channel has already been dredged.

4. Treatment by destroying PCBs is the preferred approach

Comment: Some commenters believe that treatment of sediment by vitrification (or "burning") would be a better approach because it would permanently destroy PCBs, and would be more cost-effective.

Agencies Response

Vitrification is a process whereby PCB sediments (or other pollutants) are heated to high temperatures which destroys the PCB molecule. The Agencies have previously evaluated vitrification technology for potential use at the Fox River Site in response to comments of citizens who believed this treatment method might be preferable to dredging and disposal. However, the Agencies have determined that vitrification would result in the release of chlorine gas which would require capture and treatment as part of an air pollution control permit limitation. The sediment is transformed into a glass-like material, with any remaining contaminants (e.g., metals) tightly bound in the glass matrix in an inert and non-hazardous form. Although vitrification appeared promising initially, the Agencies concluded that it would not be cost-effective or implementable on a large- scale basis. The capital costs involved in constructing a treatment plant capable of handling the volume of sediment from the Fox River would be high, as would the cost of fuel needed to remove water from the sediments. Obtaining all environmental permits (including but not limited to air permits) necessary to operate such a facility would be a daunting task, particularly given that such a facility would likely be opposed by people who reside or work in the vicinity of any proposed site.

In summary, vitrification is an innovative, but as yet not a sufficiently proven technology. Given the magnitude of the Fox River/Green Bay Site, the Agencies believe that proven and demonstrated technologies should be used in a remedial action that addresses contamination at a Superfund site of this size.

5. Complaints about the public meeting

Comment: Some commenters felt that the public meeting was poorly timed relative to the holidays. Some commenters also argued that priority should have been given to the verbal comments of community members, rather than allowing the verbal comments of remedial action contractors to have equal time and weight with community commenters.

Agencies Response

USEPA balanced the timing of the public meeting to allow attendees adequate time following the meeting's November 27, 2007 announcement to review the Proposed Plan, but not to make the meeting so late in December that it would interfere with the holiday season. Hence a meeting date of December 13, 2007 was selected. USEPA also provided a 66-day public comment period for submittal of written comments, exceeding the minimum 30-day comment period, to give the public extra time to submit comments.

Regarding giving contractors' comments equal consideration at the public meeting, the Agencies often do not know commenters' affiliation, nor do they restrict access to the community involvement process based on affiliation. The Agencies give all commenters equal consideration.

Section 2. COMMENTS REPRODUCED VERBATIM AND THE AGENCIES' RESPONSES

In this Section the Agencies shall reproduce verbatim significant comments that they received from the public concerning the Proposed Remedy, and will respond to those comments. Agencies responses to these comments are included in **bold** within the body of the comment under "Agencies' Response."

Comments by Ken Stromberg

These comments on the proposed (November, 2007) revisions to the cleanup plan for Little Lake Butte des Mortes (LLBDM) are not detailed technical comments, instead, they address the overall strategy behind this proposal and the overwhelming failures of that strategy in enhancing remediation of this site. This proposal represents a repudiation of long-standing accepted principles underlying this site for the past 20 years. As far back as the late 1980s, when the Green Bay Remedial Action Plan was being developed with major citizen involvement, technical opinion and citizen acceptance revolved around one underlying fact, namely, that remediation required removing toxic materials from the lotic environment insofar as possible. Covering up sediment deposits was always regarded as an unacceptable alternative unless there was no other course of action available because of unusual characteristics of minor localized deposits. The logic was elegantly simple then and it remains so today. Erosive forces downcut river beds and move material. Failure to accept this fact reveals a denial by advocates of capping as a first choice that the laws of physics somehow do not apply to contaminated sediments in the Fox River system. No matter how large the armies of consultants employed by the Responsible Parties, physical laws still apply and their arguments to the contrary should be rejected as the obfuscations that they are. The Action Agencies should not lose sight of these realities and push remediation, or the results of failure to remediate, off onto future generations. Recent suggestions that permanent is a relative condition defy logic. Permanent as defined in Webster's Ninth is, "continuing or enduring without fundamental or marked change." There is no indication in this standard definition that permanent has a time limit.

Agencies' Response

As discussed in the Amended Remedy, Section X.B.3, and in the Agencies' response in Comment 1, Section 1 above, the long-term effectiveness of capping has been rigorously and comprehensively evaluated, including consideration of the following:

1) scour from water flow (i.e., floods and storms),
2) bioturbation,
3) ice scour,
4) propeller wash scour, and
5) other technical considerations (cap stability, etc).

These evaluations demonstrate that an engineered cap will be effective in the long-term in containing contaminants in the Fox River. The engineered cap design includes a robust armored layer, to resist erosive forces, and to help secure long-term stability.

It is shocking to discover that a cover up of the hazardous materials in the river is now regarded as solving any long-term environmental problem. The real rationale for this proposed action can only be based on reduced cost for the polluters. This should have little or no bearing on chosing alternative cleanup strategies when compared to actual performance in removing hazardous materials from the river bed. These costs rightly should be borne by the irresponsible corporations that created the problem in the first place and have now resisted taking effective remedial actions for more than 30 years. The Action Agencies should remind themselves that their responsibility is to the citizens of this area, not to corporate balance sheets.

Agencies' Response

The Agencies overriding concern is that the Amended Remedy be protective of human health and the environment, consistent with requirements set forth in CERCLA and the National Contingency Plan (NCP). USEPA has carefully followed the procedures set forth in CERCLA and the NCP for amending a remedy at a Superfund site, and has found that this Amended Remedy meets the standards for such amendments. Cost is only one of nine criteria that the NCP requires USEPA to consider in selecting or modifying a remedy for Superfund Sites. At this site, USEPA compared the Amended Remedy against the 2002 ROD Remedy under each of the nine NCP criteria. The first two threshold criteria are: 1) that the proposed remedy is protective of human health and the environment, and 2) that all Applicable or Relevant and Appropriate Requirements (ARARs) can be met by the Amended Remedy. In USEPA's judgment, both the 2002 ROD Remedy and the Amended Remedy meet the first two threshold criteria equally well. Given that, USEPA next considered the "balancing criteria" under the NCP. The Amended Remedy and the 2002 ROD Remedy were considered both to be implementable and to provide long-term and short-term effectiveness. The Amended Remedy was found to be more cost effective (i.e., $102 million versus $144 million). Both remedies are acceptable to the State Agencies (i.e., WDNR), as witnessed by WDNR's cosigning this Amended Remedy. Regarding community acceptance, while some commenters opposed the Proposed Plan and Amended Remedy, others supported it. Overall, the comments did not cause the Agencies to change their view that amending the ROD is appropriate.

The argument that cleanup targets will be reached one or three years quicker is fatuous at best. Actions to clean up the PCB mess at this site have been in the talking stage for more than 30 years already. A delay of even a few years is insignificant if the result is actual remediation and PCBs are permanently removed from the River. Similarly, arguments about additional disposal volumes are disingenuous. If the volume of material to be landfilled was a real concern, as it should have been, the thermal

destruction option would not have been abandoned in the early stages of planning. Making this argument now to support leaving PCBs in the River merely reinforces the fact that extremely poor judgements were made when thermal destruction was rejected.

Agencies Response

While it is arguable that recovery of the Fox River 5 years sooner is not a large improvement to the recovery time, it is nevertheless worthy of consideration. Besides achieving a protective result sooner, this would reduce the short-term environmental effects from construction related activities as compared to the 2002 ROD remedy.

Regarding vitrification, (discussed in the Agencies Response in Section 1, Comment 4, page 8, above), as previously stated, the Agencies previously evaluated that treatment technology vitrification and concluded that it posed air pollution concerns, would be difficult to implement- due to the number of environmental permits that would be required and the community resistence that would result from any attempt to site the facility.

In short, the Agencies did not believe that vitrification is not a sufficiently proven technology to be used on a wide-scale basis for a large Superfund site such as the Fox River/Green Bay site.

Aside from these operational considerations, the most serious flaw in this proposed plan is reliance on a nonexistent monitoring plan to detect cap failures and spur repair of them. It is absurd to think that any further actions will be taken once the equipment is demobilized and enforcement attention is focused elsewhere. The Responsible Parties, even if the Agencies could find a way to force them to the table, would make the argument that whatever failure exists is just a minor problem of far too little significance to justify additional actions. Given the publicly available evidence, there is no substantive monitoring plan yet, and despite a long history of promises, the Agencies have no public credibility that there is any substantial effort being expended on actually developing such a plan. Monitored Natural Recovery has been selected as an option for the most important parts of this overall project and there is no visible progress on developing even this most visible monitoring program. The public should not be expected to believe any claims by Agencies or Responsible Parties that they are actually addressing these most important actions. Endless meetings of Agency technical staff and Responsible Party consultants do not indicate progress on developing monitoring plans, instead they illustrate the failure of the Agencies to compel the Responsible Parties to meet their legal responsibilities. Vital opportunities to obtain baseline information have been washed down the River into Green Bay and Lake Michigan, evaporated into the atmosphere, and absorbed into biota while these two groups negotiate at cross purposes.

In summary, the proposed changes to the LLBDM cleanup plan are unacceptable because they do not contribute to permanent remediation of the River, they primarily constitute a cover up solution which will eventually result in

the release of the PCBs buried. The arguments advanced to support the capping alternative do not stand up to the only real tests, effectiveness and permanence. Finally, the lack of information on long term monitoring reinforces the failure of this proposal to address the real issue here, permanently reducing the exposure of environmental receptors to PCBs originating from contaminated Fox River sediments.

/s/
Kenneth L. Stromborg, Ph.D., CWB

Agencies Response (to the last two paragraphs above)

In addition to conservative engineering of the cap design, concerns regarding the remedy's protectiveness and effectiveness are also addressed by stringent requirements for long-term monitoring and maintenance. Monitoring in this ROD Amendment includes both cap integrity and performance evaluations, as well as "environmental" monitoring (i.e., of surface water and fish). If monitoring indicates that the remedy is not achieving the Remedial Action Goals, then USEPA will, if necessary, require additional measures. The details of this monitoring will be developed further in the design prior to remedy implementation.

Finally, the evaluations and performance of other capping projects demonstrate the effectiveness of capping. Monitoring for capping projects for several decades are summarized in Attachment 1, page 68.

Comment by Dr. Peter De Fur, Environmental Stewardship Concepts on behalf of the Clean Water Action Council

Comments on OU1 Design Supplement Lower Fox River Operable Unit 1

Prepared by Dr. Peter de Fur, Environmental Stewardship Concepts, on Behalf of the Clean Water Action Council --- December 12, 2007

Summary of Issues and Recommendations

- **The Optimized Remedy presented in this Design Supplement represents a significant step backward from the original goals of the cleanup**
- **We maintain our strong opposition to capping and natural recovery in the Fox River**
- **The only proven remedy to contaminated sediments in rivers like the Fox is removal**
- **"Natural recovery" is completely unproven and undocumented as a remedy**
- **The placement of caps within the Fox River violates NRC guidance on capping**
- **Capping should be restricted only to locations where sediment removal presents a threat to the structural integrity of cultural features**
- **Dredging of contaminated sediments should be performed using an environmental bucket dredge rather than cutterhead hydraulic dredge whenever possible**
- **Strict institutional controls should be implemented during dredging such as limiting dredging activity to certain times and conditions to limit the resuspension of contaminated sediments**
- **If sand covers are used at all, they should be at least 6 inches thick to compensate for the effects of inevitable erosional forces that will act on the river bottom**
- **The schedule for monitoring efforts must be presented definitively and cannot be considered reliable in its current form**

- **Post-capping sampling and surveys must specifically require annual inspections in the spring to ensure the continuing effectiveness of the remedy**

- **The Design Supplement must include a contingency plan outlining the steps to be taken if caps prove to be ineffective or are damaged**

Document Summary

This document incorporates the changes proposed in the recent Optimized Remedy regarding PCB contamination in the Fox River for OU 1, the area of the Fox River directly adjacent to Lake Winnebago running through Appleton. By relying on capping, loose sand covers, and monitored natural recovery, the Optimized Remedy represents a significant step backward in efforts to re6uce risks to public health and the environment from PCBs within the river. The Design Supplement is intended to provide specifics regarding cap construction, dredging methods and other activities involved in the cleanup of OU1.

General Comments

The Design Supplement for OU 1 suffers from most of the same flaws as presented previously for OU2-5. The reliance on capping and sand covers is misplaced and has a high probability of failure particularly in some locations. Our position on natural recovery, sand covers, caps, and dredging remains unchanged: "natural recovery" is completely unproven and undocumented while caps and covers have no demonstrated successes in rivers like the Fox. Removal is the only proven approach to dealing with contaminated sediments in freshwater systems like the Fox River. The following comments and recommendations are intended to mitigate some of the risks we have previously identified and improve the overall cleanup.

Agencies Response

The Agencies do not agree that there is "a high probability of failure" for engineered caps. To the contrary, Attachment 1, page 68, summarizes the design, operation and monitoring results for 32 capping projects that were constructed between 1978 and 2001, and demonstrates that these caps have been effective. Attachment 1 includes a summary of the following information for these projects: Chemicals of Concern, Site Conditions, Design Thickness, Cap Material, Year Constructed (1978 to 2001), Performance Results, and other pertinent information. A similar table was also included in the Responsiveness Summary to the 2002 ROD (Responsiveness Summary, White Paper 6B, Attachment 1). Information on these projects indicates that to-date, these caps have been effective in providing contaminant containment for a considerable range of physical conditions. The cap design for OU1 has been designed with a robust armor layer to resist erosive forces and help secure long term stability of the caps.

It is not necessary that sand covers stay in-place over the long-term, but instead mixing with the underlying sediment using the "worst case" scenario will ensure that no sediments above the PCB Remedial Action Limit (RAL) will remain. Thus their use is restricted to certain conditions. Sand covers will only be employed as the primary remedy if PCB concentrations are 2 ppm or less, and only in areas where

the contaminant zone is 8-inches or less. Sand covers also will be employed to manage dredge residuals when the surficial samples are 1 to 5 ppm total PCBs. Thus, if the underlying sediments were mixed with the cover materials, the resulting concentrations will be less than the 1 ppm PCB Action Level.

The Agencies agree there are no sites where monitored natural recovery alone has resulted in contaminants reaching protective levels. However, natural recovery is not relied upon as a "stand-alone" for this remedy. Rather, it is only considered for dredge areas where sediments will be removed as much as is feasible, with additional recovery of the system through natural processes, further reducing contaminant concentrations in surficial sediments. Based on historical data and trends (documented in Appendix B or the Remedial Investigation for the Lower Fox River and Green Bay, Wisconsin, dated December 2002), natural recovery trends for the Fox River would achieve some recovery, but would not achieve a protective result in a reasonable amount of time. However, computer modeling predicts dredging, capping and sand covering actions in combination with natural recovery, would result in recovery to protective levels in fish and other biota in OU1 in a reasonable amount of time.

The reliance on capping and monitored natural attenuation to contain PCBs is based on weak assumptions and no documentation. The basis of the rationale for their use is frequently contradicted by the data. While capping may provide adequate protection at some sites, it is far less suited for others. The key factor in a cap's ability to adequately isolate contamination is the long term stability of the cap. Unfortunately, little to no long term monitoring of caps has been reported in peer reviewed literature, especially in areas that are hydrogeographically similar to the Fox River.

For this reason, the combination of dredging and capping in certain areas of the Fox River is ill advised. The Optimized Remedy would leave the most contaminated sediments in place, increasing risks to human health and wildlife in the event of a cap failure. A cap cannot be guaranteed to be 100% effective over the long term (100+ years), making the safest solution the dredging of all contaminated sediments.

Agencies Response

Responses to these comments are addressed in Section 1, Agencies Response to Comment 1, page 7, above. In addition, the most contaminated sediments in OU1 have already been or will be dredged. Capping will occur after dredging in OU1.

There are a number of factors that contribute to the likelihood that a cap in the Fox River would be compromised. Chief among these is ice, either as frazil ice or ice jams. Frazil ice is ice that forms within the water column, and occurs most often in turbulent, shallow waters at extreme temperatures (below 0^0 F) (Daly, 1994). The greatest threat from frazil ice occurs when the ice attaches itself to bottom sediments, after which it is classified as "anchor ice." The formation of anchor ice not only facilitates increased scouring, but also encourages ice jams that have an even greater impact on the riverbed. These ice formations have the potential to occur within the Fox River over one third of the year. The placement of caps within the Fox River runs against National Research

Council (NRC) and EPA guidance regarding the placement of caps for this and other reasons (NRC 1997, Palermo et al 1998).

Agencies Response

An expert in the field of ice scour determined that the potential for ice scour in OU1 is negligible particularly given where the proposed capped areas are located (miles downstream from turbulent flow areas and where post-capping water depths will be 6-feet or more). See Appendix E of the Design Supplement for more details.

A critical component to successful capping is source control. If contaminated sediments continue to be deposited on top of a cap once it is in place, the cap is of limited effectiveness. The placement of a cap in such situations also makes future remedial act ions more complicated and difficult. Cap armoring effectively prevents many types of dredging and would have to be removed prior to any remedy. Currently, there is no documented comprehensive plan to limit continued PCB loading into the Fox River. Without such a plan, placement of a cap in the Fox River violates NRC and EPA guidance (NRC 2001, Palermo et al 1998).

Agencies Response

There are no known new point sources of PCBs to the Fox River discharges. Regarding contaminant non-point sources of PCBs into the Fox River, these sources are presently being addressed by WDNR's permitting and water quality division in various ways, including but not limited to Chapter NR216 of the Wisconsin Administrative Code, which requires industrial sources of storm water runoff to develop "stormwater pollution prevention plans."

Previous work documented in the Feasibility Study issued December 2002 provides the basis for the remedial action based on the nine criteria in CERCLA guidance for selection of the remedy. That work considered the relative contributions of various PCBs sources into the system, and determined that the sediment of the river was by far the largest source of PCBs presenting an unacceptable level of risk to human health and the environment. While other PCB sources were acknowledged to exist, these other sources are much smaller, and not environmentally significant.

Thus, current PCB sources to the Fox River (both point sources and non-point sources) are not significant, although they merit ongoing monitoring to assure that no new sources of PCBs are introduced into the Fox River. Non-point sources are being addressed as part of the storm water management program, and other State programs. Finally, atmospheric sources are very small due to the small surface area of the Fox River.

The equipment proposed to dredge contaminated sediments needs to be optimized to reduce resuspended sediment, spillage, and sediment left in place, collectively referred to as residuals. Section 4.2.2 proposes that 2008 dredging will be conducted using swinging ladder cutterhead dredges. Environmental bucket dredges would be much more effective and efficient. Resuspension rates from environmental bucket dredges typically run at one percent of the dredged volume or less when properly operated (NYNJ Harbor Partnership 2003). Not only would the use of environmental bucket dredges

reduce the amount of PCBs that are widely distributed through the Fox River but would also reduce the number of instances that locations will have to be re-dredged.

Agencies Response

The dredge that has been used for OU1 has been very effective in minimizing resuspension and release of contaminated sediments. In fact, a silt curtain has not been necessary as there have been essentially no turbidity measurements above background. Turbidity is monitored during all dredging and capping actions and results for OU1 show that neither action has significantly exceeded the trigger concentrations that would require shutting down operations.

Regardless of the type of environmental dredge, the dredging portion of the remedy is unchanged for the Amended Remedy compared to the 2002 ROD remedy. Section 4.2.2 of the Design Supplement is a more detailed consideration of how the dredging would be done to meet the ROD's performance standards and has no bearing on the Amended Remedy. The Amended Remedy does not specify dredge type.

The implementation of institutional controls during dredging would have a similar effect. Actions such as erecting silt curtains and only dredging under specific conditions such as low wind and flow rates would also reduce the amount of residual contaminated sediment that is released (Francingues and Palermo 2005). Dredge operators should also have documented experience working at contaminated sites and this documentation should be accessible to the public. The above are all logical steps that will greatly reduce dredging residuals as well as costs by reducing the chances that some areas will need to be re-dredged.

The criteria for the selection of which areas will be redredged are unacceptable, as are the proposed solutions to residuals. The Design Supplement states that only areas with residual PCB concentrations over 5.0 ppm will be dredged Residuals under this value will be covered by a layer of sand. Presumably dredging is occurring in areas where capping would not be acceptable, either because of the sheer stress from natural flow patterns or other reasons. Sand covers will not persist in such areas. Much of the dredging will occur in locations where recreational boat traffic is common. Prop wash, keels, and anchors from these vessels would easily disturb a loose sand cover. This situation could easily result in the average concentration of PCBs in some areas actually increasing after dredging. The dredge management plan needs to be revised to minimize both the resuspension and spread of contaminated sediments. If residuals with PCB concentrations over 1 ppm remain after dredging, the area must be redredged.

The data in Table 2-5 are confusing because it appears to assume that in one Sub-Area (POG2) PCB concentrations will still increase from 2.1 to 3.7 pprn after dredging even if all precautions are successful. Remedial actions that increase risks over the original concentrations are completely unacceptable. It is unclear how the removal of contaminated sediments could actually increase the average concentration of sediments in POG2, or if this increase is expected as a result of dredging residuals, a miscalculation, or some other factor. If this is not a calculation error, then it demonstrates a significant flaw in the cleanup design for this area, and the design flaw needs to be immediately addressed.

Agencies Response

Experience on OU1 has shown that the best way to minimize residuals is to employ different types of dredges for different conditions. A new dredge called the "Vic Vac" has proven effective in minimizing residual sediments with PCB contamination, particularly for conditions at OU1 (thin contaminated deposits over a hard surface). Silt curtains have been shown to have limited effectiveness in containing resuspension. The action of deploying and retrieving the curtains often causes similar releases to the dredging activities.

The increase in concentrations discussed in the Design Supplement relates to contaminant concentrations in the sediment surface layer (dredged residuals). Any increase in this surface layer is a result of deeper sediments having higher PCB concentrations that may be re-exposed.

Regardless of these considerations, the suggested actions relative to residuals have no bearing on selection of the remedy, but are instead more detailed design considerations.

The placement of sand covers over sediments with low concentrations of PCBs is not advisable, since these covers can be quickly eroded. However, we acknowledge that this remedy has been agreed upon by the regulatory agencies and that it will eventually be implemented. To account for the inherent risks from erosion to these sand covers, all sand covers should be at least six inches in depth instead of placing three inch layers in areas with lower contamination. Three inch layers of sand could erode after even one high flow event, and scoured even more easily. Such thin sand layers though less costly in the short term would inevitably lose their effectiveness over time, particularly in locations with low deposition rates. Data within the supplemental design report support this possibility. For example, in Sub-Area F of OU1 a three inch sand cover is proposed but according to Appendix D the areas where the cover will be placed will be subject to the highest sheer stress from the combination of wind and waves. A three inch cover in this area will not persist for very long. If the sand cover is to be implemented, it should at least be thick enough to have a chance to make difference in overall PCB concentrations in the Fox River rather than being eroded away completely after one significant event.

Agencies Response

Both 3-inch and 6-inch sand covers are primarily a method to accelerate natural recovery and are not intended to be permanent features. Sand covers are an effective method for designated areas because the concentrations are only slightly above the 1.0 PCB RAL. The sand covers will be 3-inches thick for an 8-inch or thinner zone with PCB concentrations between 1.0 ppm and 1.4 ppm, and 6-inches thick for an 8-inch or thinner zone with PCB concentrations between 1.4 ppm and 2.0 ppm. A "worst case" scenario of complete mixing of the sand cover would still result in meeting the 1.0 ppm PCB RAL for cover areas.

Long term considerations also dictate that an in-depth monitoring program be in place to regularly assess all remedies. We are pleased that there is a mandate for such a program within the design supplement, but disappointed

that the design supplement provides few specifics. The lack of specifics in the Design Supplement is disconcerting, particularly given the backward step that the Optimized Remedy represents in terms of the effectiveness of the cleanup. Nothing has changed to reduce the concerns that severe weather events could compromise either the caps or the sand covers. There is ample evidence that scouring from ice or severe weather is likely, and therefore WDNR needs to monitor both the integrity of the caps as well as sediment, water column, and fish tissue concentrations of PCBs annually at minimum. The selection of the Optimized Remedy has damaged the public's faith in WDNR's efforts to protect public health and the environment in and around the Fox River, and the lack of specifics in the monitoring plan only reinforces this notion.

Agencies Response

Severe weather events have been factored into the cap design. If "trigger events" are deemed to occur, there would be additional monitoring. Cores would be evaluated to ensure cap integrity and chemical analysis to confirm containment of PCBs. Section XI.D of the Amended Remedy gives an outline for cap monitoring, including hydrographic surveys and core sampling for caps, as well as the monitoring schedule. Further details of the monitoring program will be developed in design with final approval by the Agencies.

Inspections of caps should occur in the spring to evaluate if caps were impacted by ice. Severe scouring from ice that occurs in the winter months often cannot be detected until the spring (EPA 2005). Inspections can be carried out either visually with diving equipment or other means like bathymetric sonar surveys. We are aware of the conclusions in the ROD as well as in Appendix A of this design supplement that ice scour will not be an issue, but we do not share the same confidence in this opinion as the WDNR. There are simply not enough data to rule out this possibility and what data do exist imply that scouring has a high likelihood of occurring. For more information regarding these risks please review our previous comments on the ROD for OU2-5.

Agencies Response

An expert in the field of ice scour has determined that the potential for ice scour is negligible (Appendix E of the Design Supplement), especially in the areas to be capped (with post-capping water depths of 6-feet or more). Further, capping will not be performed in shallow areas and ice damming has not been observed in OU1.

Annual monitoring is critical to measuring progress, understanding needed changes, and establishing confidence in WDNR's efforts to protect the public given the very real risks involved. Even isolated instances of damage to caps or sand covers could-quick1y expand and compromise cleanup goals.

Agencies Response

Semi-annual monitoring will be done for the few years after cap installation and every 5 years thereafter. Results for other capping projects (see Attachment 1, page 68) demonstrate the adequacy of this monitoring schedule.

The Design Supplement should also include a contingency plan detailing what steps WDNR will take if a cap is compromised or fish tissue concentrations fail to drop as expected. If there is a failure in a cap there will not be months for WDNR to make a decision on how to act. Damage to the caps could quickly expand, and particularly in areas where high concentrations of PCBs will remain directly under the capping damage could result in significant releases of contaminants in a short period of time. WDNR has been made well aware of the risks associated with capping these areas and should be prepared to address them.

Agencies Response

It is highly unlikely that the cap would be completely removed as a result of erosive forces. It is more likely that impacts to the cap, if they occurred, would be localized. If impacts occur, an analysis of the injury to the cap will be conducted. Results will determine whether the cap will be repaired with similar materials, repaired with more robust materials, or removed along with the underlying contaminated sediments. Furthermore, residual risk for capping areas is limited, as dredging will have removed 72 % of the PCBs above the 1 ppm PCB RAL prior to capping activities.

We remain unconvinced that the Optimized Remedy represents an effective solution to PCB contamination in the Fox River. Capping represents only a temporary solution and without a source control plan the placement of caps will only complicate inevitable future remedial actions. If the Optimized Remedy is to be implemented, simple protective steps must be implemented to make it as effective as it can possibly be. Thesesteps include making sand covers deep enough to at least be temporarily effective, dredging in ways that minimize resuspension and residuals, and developing specific monitoring and contingency plans. Any final document that does not include these basic steps represents a failure to protect both human health and the environment from PCB contamination in the Fox River.

Agencies Response

PCB sources on OU1 have been controlled and, as discussed above, caps installed on other projects have proven to be effective for containing contaminants over the long-term (Attachment 1). The cap and sand cover designs have considered the site specific conditions with a robust design to provide long-term effectiveness and protectiveness. This will satisfy the requirement that the Amended Remedy is protective of human health and the environment.

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Section 3. PUBLIC MEETING TRANSCRIPT AND AGENCIES RESPONSES

A public meeting was held December 13, 2007. Approximately 60 people attended this meeting. The transcript of the comment portion of this meeting and written Agencies responses by the Agencies are below. Page numbers and page headers (i.e., “Transcript of Little Lake Butte des Morts Proposed Plan Meeting 12/13/2007”) from the original hardcopy report were deleted, but there are no substantive alterations. The complete meeting transcript, including a presentation by the Agencies and questions and answers can be found in the Administrative Record.

Transcript of Little Lake Butte des Morts Proposed Plan Meeting 12/13/2007
1 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
PUBLIC MEETING
Lower Fox River/Green Bay Site
6 Little Lake Butte des Morts Proposed Plan Meeting
Lawrence University
9 Youngchild Hall, Room 121
10 Appleton, WI
11
12 Thursday, December 13, 2007
13 6:30 p.m.

1 INDEX OF COMMENTS
2 SPEAKER PAGE

22
23
24
25
1 SUSAN PASTOR: Hi, everyone. I'm Sue
2 Pastor. I'm with the U.S. Environmental Protection
3 AgencY. I'm the Community Involvement Coordinator.
4 I work on the Lower Fox River Project. I have been
5 working on this project a long time, I think since
6 about 1998, 1999. Next to me is Jim Hahnenberg. He

also has been working on this even longer. He's the Remedial Project Manager. He is my co-worker and he's the technical person who works on this. He also works closely with the DNR and Department of Health and various other parties. They are all in the audience tonight, so if we need help answering questions, we have representatives from the Department of Natural Resources, Wisconsin Department of Health and Family Services. The companies are represented. So if there is a question that we need some help with, we have a person who might be able to help us out in that area, too.

I hope you picked up an agenda tonight, because we want to stick to it and try to move it along. We have this room, well, we will have it until ten o'clock. Hopefully we won't be here that long, but we can if we need to be, which means by nine-thirty we will probably have to wrap up so we can honor the University's wishes and be out by ten.

I also want to call your attention to our court reporter sitting over there. She is taking down the minutes of the meeting, and the transcript will be available in the libraries in the area here, as well as on our website. Our information repositories, which is another way of saying libraries, are in Green Bay, right here in Appleton, Sturgeon Bay, Oneida, and Oshkosh. So all of our technical documents related to this project are there, and most of them are on either our website or the DNR's website or both, or they're linked to each other. You can find what you need.

The public comment period I want to remind you goes till January 31. So the court reporter is here to take your comments for the record tonight if you want to do that verbally. You probably took a number, and we will call you in order of those numbers later on. According to the agenda, that's towards the end, because we have a short presentation and slides to show you. Then we will be happy to take your questions. And then after that you can make a statement for the record. We would like to limit it to three minutes to make sure that everybody has a chance to make a comment, and if we have a little more time after that we will see how it goes. We want to make sure that we get everybody's comments and questions taken care of.

If you signed in, we appreciate it if you did. If you didn't, we would like you to. That way you are on our mailing list. And we do cross check you to make sure that we have your current mailing address and that way you will get all of our informational pieces we put out every so often. And they are all posted on line, too, so if you don't want pieces of paper coming to you, everything is on our website.

So one of the pieces that we picked that

you probably picked up and/or got in the mail was this piece here (indicating), and it outlines our proposal; and inside there there is a form that you can turn in for a written comment. If you don't like to speak before a room full of people and you just want to hand this to somebody, anybody pretty much with a name tag on your way out will take those, and those will also be for the record. You can mail those in, you can fax it in, you can comment on line from our website. There is an electronic form you can send to us. It comes directly to Jim and I. And all the comments will be looked at and they will be addressed and put together in what we call a Responsiveness Summary. And that's attached to our final document that will outline the cleanup plan that we'll go with, and that's called a Record of Decision. In this case it will be Amended Record of Decision.
Jim will talk a little bit about the proposed plan and what our recommendations are. And at this point it is just a recommendation, and that's why we are here, to let you know what we are thinking about and take your questions and your comments and use all that feedback to make a final decision. So I'll turn it over to Jim. Hold your questions till we are done. We appreciate that.
JIM HAHNENBERG: Thank you, Sue. And thank you for coming out tonight. Cold December night. I'll try and keep my presentation fairly short so that I'll try and give you the essentials of kind of the outline of the proposal to be sure that people have a basic understanding of what we are proposing. It is in the Fact Sheet, as Sue mentioned. So, with that, I'll proceed.
So the current plan, which was from our Record of Decision of 2002, is for dredging and disposal of all PCB-contaminated sediments in Little Lake Butte des Morts that exceed one part per million of concentration.
In that decision, we did have what we call a capping contingency. What that was was it allowed the possibility of some capping in the lake with certain restrictions. It was found that it would be cost-effective and still protective. In that decision it was indicated that it was thought that the capping would be protective.
The proposed plan that we will talk about tonight is similar in some respects to the original plan, but it changes from an all-dredging remedy to a partial dredging, capping, and sand cover remedy. We would still have about half the volume and the areas would still be dredged. We will actually remove about three-quarters of the PCB's that would be removed under the original plan. The remaining 25 or so percent of the PCB's in that one part per million footprint would be capped or would have sand covers placed over them. The plan, the new plan,

the proposed plan, also does require long-term cap maintenance and monitoring. And that would be required under this remedy to make sure that we monitor the cap to confirm that it is in place and remaining effective.
This slide is kind of a summary of the different scopes of the different actions. From dredging, you can see we would dredge around 216 acres and would remove 1,900 pounds, about 2,500 pounds of PCB's. So that would be around almost three-quarters of the PCB's would be removed under this plan of dredging. The remainder would be capped, an engineered cap, and the caps would be six inches of sand and seven inches of armor stone. And the engineering for the cap was such that the evaluation informed us what was necessary to make sure that this cap would remain in place even under storm events; propeller wash if a boat came along, to make sure they did not disrupt the cap; and also the potential for ice scour.
There would also be sand covers over the concentrations that are just above the one ppm action level, which means one to two parts per million, we would put sand covers down in those areas as well. And sand covers comprise -- PCB's in those areas comprise a little over two percent of the total amount of PCB's in the one part per million footprint. So it would be a relatively small portion of the PCB's and only in very low concentrations.
This is a map that shows where we would do capping, where we would do dredging and sand covers. The purple shows the dredge areas, and the blues show the engineered caps, and this cap would have six inches of sand and seven inches of armor stone. And I don't know if you saw the display in the lobby, but there is a plexiglas tube there that shows what these caps would consist of. If you saw it, you can see the black sediment underneath the bottom and then the sand, which is the course sand, and then the armor stone, which is gravel and a little bit larger rocks as well. The yellow and orange areas in this map show where we would have sand covers. And it's hard to see, but the dark, kind of dark brownish areas of these maps show where we would dredge we would also need to put down the sand cover to make sure the concentrations overall in the lake would be low enough to meet our cleanup objectives.
There are a number of things in this proposal that do not change from the original remedy. One is, the most important consideration, is that this is a protective remedy of people and the environment. Secondly, there is substantial dredging. As I indicated, about half the area would still be dredged. Most of that's already been done. We would remove about three-quarters relative to the

current plan.
This plan actually would remove everything that's above 50 parts per million, what we call Tosk (phonetic) in Superfund lingo, which is a regulation that regulates PCB's. And that's actually already been done, the dredging to date, which, by the way, I should mention that the dredging that's been done in the Lake Butte des Morts since 2004 has actually removed 335,000 cubic yards of sediment, which is a very large dredging project. In fact, that alone would be one of the largest dredging projects in this country. And in the Fox River in general, since we have been doing the remediation, we have had to remove a total in the river of 550,000 cubic yards of sediment totally from the river. But in Little Lake Butte des Morts, since 2004 we have removed around 235,000 cubic yards.
Some of the things that don't change, we will continue to still have long-term monitoring of the fish in the surface water. This is in addition to the depth monitoring. And what this tells us is it tells us what's actually going on for the important environmental indicators. So we just don't take it for granted that we are achieving good results by physically achieving what we think we need to do; but we also monitor the fish in the surface water to anticipate observing declining concentrations in the fish in the surface water.
The cleanup standards don't change this proposed plan also. We would still have an action level of one part per million. What that means is every place there is a concentration of more than one part per million something will be done. Either it will be dredged or it will be capped or it would be covered.
Finally, the average surface concentration in the sediment in Little Lake Butte des Morts would need to meet the 0.25 ppm standard. So once we are done with the remedy, the concentrations in Little Lake Butte des Morts on average in the surface would be 0.25 ppm. And that was a number that, in the risk assessment back in 2000 we determined that that was the necessary concentration to be protective for many ecological receptors and to achieve good results relative to human health, although we still have to rely on some time for additional recovery to get even better results. But that would start us on the right trail.
The basis for this proposal. People say well, why are you proposing something different here than you did before? The reason we are proposing something different is because we have learned a lot since we had the original Record of Decision. The companies working on the Lake Butte des Morts actually took over six thousand samples in the lake, new sediment samples, and this compares to about 539 samples that was done for the original decision. So

it's more than ten times the number of samples that were taken from the lake, which would give us a much more precise understanding of where the contamination is and, also, a better idea of kind of how to go about doing the cleanup.
We took actually about one sample per acre in some areas and one sample per two acres in other areas. This allowed us to really find exactly where we dredge. Under this evaluation we did determine that there was a greater volume that does need to be dredged in the current plan. And one of the main reasons for this additional volume of sediment was because the need to do what we call overdredging. What that means is, if you have one part per million concentration down to a certain level that's one foot down, you need to go about another four inches to make sure you get everything above the one part per million concentration out. On average, we do have about a one-foot thickness in the Lake Butte des Morts. So you think four inches doesn't sound like a lot, but if you are only dredging a foot, you are adding four inches of sediment that need to be removed, it adds a very large amount of volume relative to the whole project. So that's another determination that came out of the evaluations and the new data.
Finally, I mentioned all the dredging we have actually completed on the Lake Butte des Morts, and from that experience we learned a lot about what dredging can do and what dredging cannot do. What we have learned from that is dredging alone will not allow to us meet our cleanup objectives. We cannot get down to 0.25 by just dredging. So we have to do something besides just dredging in order to get to a low concentration of sediment.
In addition to that, of the capping projects since the Record of Decision, the decision in 2002 for the Little Lake Butte des Morts, since that time, a lot of other dredging projects have -- excuse me. Other capping projects have continued to be done and, also, we have gotten additional information of these other capping projects which inform us that these other capping projects can effectively contain contaminants. And these other capping projects have been done under a wide variety of environments.
There have been three projects in this country, environmental projects, that have been done by EPA or Army Corps of Engineers. And from those projects we have determined that capping can be implemented without a lot of disruption in the water bottom, without a lot of mixing up the sediments, and it can effectively contain the contaminants. These other projects have been done in a wide variety of conditions. These have been done in harbors, estuaries, rivers, and some even in the deep ocean, which are somewhat less permanent, but

quite a wide variety of conditions. The importance of that is that all these different conditions, all these other kinds of sites, have allowed us to observe caps under a wide variety of conditions, such as high water flow velocity, potential for ice scour. In fact, there was one project where there was some ice scour. It was not armored and we had not looked at the ice scour was an issue and it did disrupt the cap, then an evaluation was done for that project to determine under what conditions you might expect ice scour. And we have applied those lessons on this project to make sure that we looked at these, all these different considerations to make sure that any caps that are in place consider all these processes to make sure the caps we put in are going to be stable and effective to contain the PCB's on a very long-term basis.

And these are just some pictures of the dredging project that's been going on with Little Lake Butte des Morts since 2004. I mentioned we've learned a lot in terms of what dredging can do and kind of the ins and outs of the operation. We got a lot done here and have gotten about 70 percent of the PCB's out to date. And that's what this slide essentially says.

Some points I made already, that we have removed a large portion of the PCB's out already. We have about 30 percent of the PCB's still remaining. Under this plan we went through some additional dredging, but we would be doing additional capping as well.

And, again, to reiterate in terms of the caps, we have considered a variety of processes that are important relative to the stability of the caps. And these really boil down to a number of items, and these are: Storm events and waves, these are things like propeller wash from boats, and potential ice scour. All those need to be evaluated very thoroughly by experts in the field to make sure that any caps that may be put in place would be stable and would be a relatively permanent fixture.

We also did look at potential for groundwater. The concern is you might have groundwater moving through the cap, pushing contaminants through the cap. So we did look at the potential for groundwater moving through the cap, and we have found that it's highly unlikely. And the reason is because we don't -- the strong evidence suggests that there really is no significant upward movement through a cap from the groundwater. One reason for this is the dams that have actually created artificially high water levels in the lake and cause the hydrologic conditions such that it would be more likely to have downgrading than upgrading because of the artificially high lake design. You can see at the bottom, this is the

contaminated sediment. Then we would have six inches of sand and seven inches of armor stone. In the lobby we have a model of sorts of a plexiglas tube which shows you the actual materials that would be anticipated to be used for this kind of a cap and gives you an idea of concretely exactly what we are talking about.
The advantages of the proposed plan is, one thing, with less dredging and less over-dredging, really for the cleaner material, we would use less landfill capacity; this remedy would have a lower cost; and, more importantly, the last three items are it would allow us to complete the work sooner and have fish recovery and environmental recovery in general to occur sooner. And we would have lower concentrations in the surface sediment afterwards in this project than from an all-dredging project. Finally, this is commonly protected to the current plan and would be protective.
With that, I turn it back over to Sue, and we can have the questions.
SUSAN PASTOR: If you have a question, raise your hand and we will call on you. We have microphones down here, so if you could come down to the microphone and then the court reporter will be able to hear you better. If you'd state your name. For sure for the comments portion of the meeting we will want you to state your name and spell it for the court reporter's benefit. But if you want to tell us who you are and who you represent for Q and A, that would be fine, too. So who has a question? Come on down. And if she can't hear you or understand something, she may have to stop you.
PENNY BERNARD SHABER: I am Penny Bernard Shaber from Appleton. And, Jim, I have a question about, you said that the PCB levels that you found in your extra studies were higher so that dredging would not take us to a safe level. Why will covering that up make it any safer?
And the other question I have is about the armor stone. I've had armor stone in my driveway, and I see gullies in that when there is a huge rain storm. I've seen armor stone in other places where there are gullies that are developed. And, also, I've seen where armor stone does not allow anything to grow over the armor stone. So how can that not disrupt the bottom of the river?
JIM HAHNENBERG: The first question related to the concentrations after dredging. Actually, concentrations aren't greater. We didn't find concentrations significantly greater than we had known about. But what we did discover from the dredging is that we can't get everything out that we want to get out in terms of getting to a lower concentration. The reason for that in many cases is because you have a hardpan clay underneath the contaminated sediments and it's very difficult to

dredge to remove everything within this little layer we can't quite get out.
So in those areas it's very difficult, if not impossible, to get down to a very low concentration. That's why we have higher concentrations remaining after dredging. What that means is, then, we really can't, in dredging alone, get to the lower enough levels that we want to get to. So that's why in those areas we would have to place some sand.
The reason capping gives you a better result, having the sand covers relative to dredging, is because, once you are done with the dredging project, even with sand covers, or maybe not in some areas, but even in the sand covers you end up with some PCB's in that layer. Whereas, in the caps, you end up with a very clean layer once you are done.
Actually, you would have no PCB's at all in that top layer, as well as the sand cover. So that allows us to get a lower concentration once we are done in the surface sediments.
Of course, that does rely on the caps, making sure that they do stay in place and do remain a stable feature to permanently contain the PCB's.
And the way we make sure that those caps will remain in place and will be stable is we do look at all those processs I mentioned to make sure that they do contain the PCB's. Besides that, besides the engineering which we believe will create stable conditions with the cap, but just as like a belt and suspenders, we will also have monitoring to make sure that we monitor those caps that they do, in fact, stay in place and do remain effective. So it's really a two-pronged approach: One, the engineering tells us that they will remain a stable feature and will stay there; but, just to be extra sure, we do monitor those caps. And, if there do appear to be problems, then we would do whatever maintenance would be necessary to maintain those caps.
SUSAN PASTOR: Who else has a question? Come on down.
DALE SHABER: I'm Dale Shaber. I live in Appleton. Jim, in your proposal, you mentioned that there was going to be you mentioned now, answering my wife's question, monitoring and maintenance will be included. What's the time line for that? What happens if, let's say, 20 years down the road that a cap doesn't last? Where is the money going to come from to take care of that? That's one question.
The other one is: How long is this monitoring and maintenance going to be? Is it going to be forever? What's the time line involved?
JIM HAHNENBERG: I'll just tell you the schedule that would be anticipated for the monitoring. We would -- of course, after we had the caps in place, we would make sure that they were put

in place as we designed them to be. Then we would have additional monitoring two years probably and then four years and then every five years thereafter.
DALE SHABER: You said hereafter. Is that forever?
JIM HAHNENBERG: As long as the contaminants are in place and the caps need to be there, the PCB's are still there and at above concentration, that could pose a threat, the monitoring would continue, however long that would be.
DALE SHABER: So we could say forever?
JIM HAHNENBERG: One could say that.
DALE SHABER: If the PCB's are there.
JIM HAHNENBERG: There would be no time limit. It would be however long is necessary. Who would pay for it? It would be the companies paying for the cleanup would also have to pay for monitoring. That would continue as long as necessary.
DALE SHABER: So is the money, then, for that maintenance and monitoring going to be given to EPA now? Because there is cost savings.
JIM HAHNENBERG: Well, any agreement that we would have with the companies for doing the work, we also in that agreement have what we call financial assurance. What that is is that's the assurance from the companies doing the work that basically make sure that the money is available to implement the remedy. That's part of the agreement that we would have with companies to make sure that the money will be there to perform the remedy.
DALE SHABER: So, in other words, that money will be there until the PCB's are still in the river.
JIM HAHNENBERG: Correct.
DALE SHABER: So, in other words, forever, almost. Until sometime --
JIM HAHNENBERG: Forever is a long time, but for a long, long time, yes.
DALE SHABER: So what I am saying is, I just want to understand that, if you talk about monitoring and maintenance, it's going to cost money to do that. I just want to make sure that there have been -- and you've mentioned to me some ways of making sure money will be available. Because I would really be very disappointed if that responsibility then would go to the citizens of Wisconsin to take care of a problem that should have been taken care of now.
JIM HAHNENBERG: Well, it should not happen. We have legal tools to make sure that that doesn't happen. As I said, we would have a financial assurance provision which would make sure that the companies would be able to provide the funding necessary for the remedy. And that would be

part of the remedy, certainly.
DALE SHABER: Thank you.
UNIDENTIFIED AUDIENCE MEMBER: I was going to ask the same question that he was going to ask, but I want to go further with that as to what kind of problems have you studied that have already happened with capping that have been done other places? And, when you have studied these problems, whatever -- I'd like to know what you have seen happen. What is your plan of action to take care of some of these things? In other words, what do you expect may happen? What are the risks and what would you do? Thank you.
JIM HAHNENBERG: Thank you. We actually don't anticipate that there would be any substantial damage to the cap. But, if it did happen, then the cap would be repaired. Probably you would add sand and gravel or maybe increase the armor stone perhaps. If worse came to worse, as it became apparent that the cap simply was not going to be able to remain in that area, then you could remove the cap and the sediment underneath.
Other projects where we have seen erosion of the caps is there is the Grass River in New York on the St. Lawrence Seaway. There was an ice scour event, I mentioned that earlier, and that was an event that did cause some damage to the cap. The cap was not armored, and, actually, that cap was put in place not necessarily to be a permanent cap. It was really more of a placement test of the materials. But it was still -- it was a good piece of information that informed the agencies things that might happen to a cap related to ice scour. And so the agencies have taken that lesson to heart, and, therefore, in these projects we looked at ice scour to make sure that if there is a potential for ice scour that might create conditions where it just isn't feasible to put a cap, then we wouldn't cap. In the Dumington (phonetic) area where we had a similar decision and there were areas down there where we looked at ice scours, it looked like ice scours could be an issue with the cap. In those areas we didn't cap, we dredged it.
In Little Lake Butte des Morts, it's a different set of conditions. It's really more lake-like than a river. In Little Lake Butte des Morts, we did do a very thorough ice scour analysis by an expert who used to work for the Army Corps of Engineers, one of the preeminent experts in the field, and his analysis told us that ice scour in Little Lake Butte des Morts would not be expected to be an issue, that it would not in this area create conditions that could disrupt the cap.
So we did look at that, as I indicated, other possible disruptive factors. There is also up in Peninsula Bay a project where they really anticipated it, whereby there is propeller wash from

like tug boats. They anticipated that they would, in fact, erode a cap, and it did. But that was known likely to be an effect.
And that is another issue that we did look at here. We did extensive work and evaluations to look at propeller wash, erosion potentially, from vessels that might operate in Little Lake Butte des Morts. And out of that analysis it told us that you needed a certain size stone to make sure it would stay in place. And that actually turned out that that related to the water depth as much as anything, and that, in shallower water, where you have propellers that might be closer to the cap, they would exert a much more powerful influence.
Therefore, on this project, we are only capping out from the central part of the lake, for the most part. In fact, wherever we would cap, we would need at least six feet of water once we were done. And we would not cap in areas where you would have less than six feet of water. What that does is it allows you to cap in areas where you would be less likely to have any significant influence from the propeller wash.
So we looked at all those things, other processes that have, in fact, impacted other capping projects, and we have looked at those in great detail, very rigorously, using modeling and actual results in other projects to make sure that our design is a good one and that our caps would remain stable.
SUSAN PASTOR: Okay. Someone else have a question? Yes, sir.
ROGER CANT: My name is Roger Cant from Menasha. Just to follow up on the other comments here. One of the other thoughts is, in putting the cap on, in the case of where you find out that it's not effective, for whatever reason, there is a cost to repair it, replace, whatever. Might it be that that possibly could exceed the cost of the original project if, for whatever reason, taking the stuff out is harder than just dumping on top?
JIM HAHNENBERG: We don't think so. Based on our analysis, the caps would be stable. And, while it's possible there could be some small areas you could have some erosion of the cap, our analysis tells us that that should not happen and that, if there were any problems with the cap, it would be very localized and relatively minor. And that the cost of that would not exceed, by any means, what the current proposal would cost. So that shouldn't be an issue.
There would be money that would be available, though. If there was some maintenance that was required, it would be done. But, based on other projects, we haven't seen that as a major cost issue, even when other caps might need minor maintenance. But that would be -- the money would

be available to do that, and, based on our analysis, that wouldn't be a significant cost. It really wouldn't create a major problem in that regard.
SUSAN PASTOR: Someone else have a question? Yes, ma'am.
RAYANNEN BENTLEY: I am Rayannen Bentley, and I represent the University of Wisconsin Fox Valley Students Association, as well as the Campus Activities Board. And I didn't hear you address the first woman's question about nothing being able to grow on top of the cap. And then I have another question after that.
JIM HAHNENBERG: Well, that's sort of a habitat question. But the stone on top of the cap would be a different substrate than what is there currently. You would expect to have some deposition naturally over the cap from natural sedimentation, so that it would restore some of the conditions. But one thing to keep in mind is that there would be 200 acres that would be affected by this cap out of about 1,400 in the lake, and it would be in areas that would be out in the central part of the lake. So we don't think the habitat would be a major issue. And you are going to get some recovery, also, in that area. Over time you would get some deposition out of that to create some recovery in terms of the habitat.
RAYANNEN BENTLEY: Then my second question is: You say that this is going to be a relatively permanent cap and that it will be in place for a long time. But then how long have the caps that you have studied and the problems that you have studied been in place for if we are talking about a semi-permanent condition?
JIM HAHNENBERG: Environmental projects, caps were first being installed in 1978. So it's been nearly 30 years that they have been in place on these projects. So we have 30 years of information to tell us that they have been effective in containing contaminants. And there have been many events on these projects over time to inform us that these caps, in fact, can resist these kinds of events and shown us that we would expect them to be stable over a long time period of -- a long time.
SUSAN PASTOR: Who else has a question?
REBECCA KADERS: Rebecca Kaders from Clean Water Action Council in Green Bay. I just have one question, really. That is: Isn't it true that two-thirds of the citizen comments you received on the last plan were opposed to capping? You said that last spring, and Congressman --
JIM HAHNENBERG: Maybe in that ballpark. I don't remember exactly the number, but yes, there were a substantial number of comments that were not supportive of the proposed plan, which is similar to this one.
REBECCA KADERS: And isn't it also true

that people have repeatedly asked you not to schedule these public hearings right before Christmas?
JIM HAHNENBERG: That's why we tried to not crowd the holidays any more than we need to. We started the comment period in November, and we wanted to give people some advance notice from the start of the comment period. So I know your organization likes to have a little extra time once we announce it to give your members notice and for you to arrange your needs. So we were trying to accommodate those kinds of considerations as well as not crowding the holidays. So we tried to schedule it so that it was not any closer to the holidays than we needed to.
REBECCA KADERS: This is right in the middle of final exams for students, teachers wrapping up the semester, people are getting ready for the holidays. This is about the worst possible time of year to hold a hearing on this.
SUSAN PASTOR: Actually, I've never had that complaint other than from you. I haven't had anybody call and say that.
REBECCA KADERS: That's nonsense. I've heard it myself at these same hearings.
SUSAN PASTOR: Well, we had 270 people come to our meeting last year and we had 600 comments. So I'm inclined to agree at the beginning, but it looks like people came through and came to the meeting, called us, e-mailed us, faxed us. We had a really rousing response from people over the phone, via e-mail, via paper mail. And I answered all of them. And I really don't get that. Which is another reason why we extended the comment period even longer than 60 days, and we seemed to still get a very good response and turn-out.
REBECCA KADERS: This is a low turn-out, given the importance of this tonight. People no longer have any faith in your listening to them.
SUSAN PASTOR: Anyone else have a question?
PENNY BERNARD SHABER: Penny Bernard Shaber again. To follow up on Becky's question, isn't community acceptance of the plan supposed to be a large part of approval of the final plan? And then I have a follow-up question.
JIM HAHNENBERG: Yes, it is. It is what we call modifying criteria. The comments that we receive, the consideration that we give various weights to are comments that would tell us if the plan would not be protective, would not be implementable, would not be what we call consistent with our laws and regulations, would not be effective in the long-term, would not be effective in the short-term. And there are a couple of others, but basically those are the considerations that we look at. If there is a comment that tells

us that the remedy -- demonstrates to us clearly with compelling information that tells us the remedy would not be protective, then we would give great weight to that comment. If we get a comment that just simply says we don't like capping, I mean that's not a lot we can react to, other than, I mean, thank you for your comment. But we have to have a technical basis to make our decision. And that's what we look for in our comments. It's not a voting procedure, it's a comment where -- it's a comment process that is seeking comments that inform us on issues that may pertain to implementability or effectiveness or protectiveness of the remedy. So those are the comments that are of the greatest influence.

PENNY BERNARD SHABER: But community acceptance is not a technical thing. Community acceptance is a subjective personal opinion that should be weighted also, because we live in this community, and we need to be sure that this community will be safer than it is right now. So if you think that community acceptance is important, then I don't believe that it should be weighted differently than the technical information, because community acceptance is not technical, other than it's more than the number of people oppose it than the number of people support it, then that's technical and that's true. If two-thirds of the people said don't do this, that should tell you a lot.

Then my other question is about the river is becoming much more a part of the communities now-a-days. The river has been ignored for a long time and people have not used it actively and there has not been development active along the river. And now there is. There is a huge interest in this river. And there is interest in increasing the number of buildings along the river and increasing the activity in the river. And if you are going to be capping areas where eventually there may be a need to further dredge because people want to use the river, how will that work?

JIM HAHNENBERG: Well, when the caps are being put in place in Little Lake Butte des Morts, it would be in the central part of the lake, which is the deepest part of the lake.

PENNY BERNARD SHABER: That's only about six feet deep. It's not hugely deep.

JIM HAHNENBERG: The central part of the lake, according to the maps I have seen, the central part of the lake is 10 to 15 feet deep. And that would be where most of the capping would occur. Now, there are some areas along the edges that it would be done, but, in any event, there would be no areas where the water depth would be any less than six feet in the capped areas.

PENNY BERNARD SHABER: So how will that

impact people if they decide they want to build along the river, which people are currently doing? And when they are building along the river, they want to have access to the river with boat houses or with a dock or with whatever. How will that be addressed?
JIM HAHNENBERG: That wouldn't affect access to the river at all, because it would only be implemented in the deeper parts of the lake. And one thing, too, in terms of river use, the big advantage for this proposal in terms of river use is, once we are done, we would have a cleaner lake and we would have recovery of the fish population and improvement in the fish population. The fish population would be healthier, they would not be contaminated. Eventually we would hope to have consumption advisories reduced, if not eliminated, and that certainly would enhance the use of the river. So, from that standpoint, you would have great improvement in terms of the potential river use.
PENNY BERNARD SHABER: That would also happen if you did the dredging and removal versus capping.
JIM HAHNENBERG: The capping actually does get you there faster, and it also gives you a good result, a better result, really, in terms of immediately after dredging you would actually have lower concentrations -- excuse me. Immediately after the project would be done, you would actually have lower concentrations and a better environmental result post-implementation. So you would actually have a lower concentration under this proposal. That's one reason we believe that this proposal is a better approach.
SUSAN PASTOR: Somebody else who hasn't had a chance to ask a question. Come on down.
FRED STEENIS: When do we use the card with the number 18 on it?
SUSAN PASTOR: That's during the comments. This is just open questions right now.
FRED STEENIS: Okay. I might get into the comments, then, too.
My name is Fred Steenis. I am in the town of Menasha, and I am a resident on the Lake Butte des Morts. I've got so many questions I would take up the whole night if I gave them all to you, but I'm just going to hit you with a couple of them. In the northwest bay of Little Lake Butte des Morts near Scoby Island, no dredging has been done and nothing has been done in that bay. About 25 years ago, I had to clean out our boat channel due to the fact that they put in a treatment plant next door to my house and stirred all the mud, came all the way down and plugged up the boat channel. We had to get a permit. We got a permit just to dredge that channel. We had to remove all

of the muck that came out of that boat channel and bring it down there on a separate barge, put it up on the shoreline, and cap it because it was so full of PCB's. That's what we did. We spent a lot of money doing this. Now people tell me that they don't have to do any dredging in the Little Lake Butte des Morts west, northwest because it doesn't have enough PCB's in it to do that. And you can't cap it because you just got through saying that you won't cap -- you can't cap -- you have to cap it beyond six feet. Well, that whole bay is all, I'm going to say, from five feet to no feet, and you are doing nothing with it. What's the situation?

JIM HAHNENBERG: Specifically, I don't know the exact concentrations in the area you are talking about, but I would suspect that they are below our action levels. If there is not any action there, it would be below the one ppm action level, which is what we say is the level that we think we need to take action in order to have a protective result for the project. So I am assuming that your area, then, would be less than the ppm.

As far as other permitting processes, you would have to talk to the State about that. That I don't know about. In terms of what might be required under the State permitting process, I don't know. Unless somebody from the State would want to address that one.

FRED STEENIS: When you did have your map up or your Power Point up here earlier, I did notice all the circles and so forth where you did dredge. That whole bay is not even touched. And they did come in there with their equipment and went all along the shoreline and everything, right in front of my dock and so forth, and checked this all over. But nothing has been done with it. I don't understand why that would be. Why is this? Is it because perhaps the sewage treatment plant is just south of my house? And the current comes out of that plant which is supposed to discharge to the center of the river, which is the reason they originally built it, but they ran out of funding so they had to dump it on the shoreline instead of going out to the middle of the river. It created all the muck and they put it in all the boat channels and so forth. Are they planning on just not doing anything in that bay because that's where they are going to continue to discharge the sewage treatment plant in that bay? Why should we clean it up? Thank you.

BILL HARDING: Mr. Steenis, I'm Bill Harding. I am the project manager. We had spoken on the phone. And since I spoke to you, I was able to talk to the engineers and the scientists that went out and collected the samples. And, like Jim mentioned, there are no high, elevated PCB concentrations in that entire area. In fact, I do

22 have a printout and I will be happy to share it with
23 you.
24 FRED STEENIS: Then why did I have to take
25 them out of there?
1 BILL HARDING: I can't answer that. I
2 have no idea what the PCB concentrations were at
3 that time.
4 FRED STEENIS: Okay. Blow me off.
5 BILL HARDING: All I can do is give you
6 the data that is currently available.
7 JIM HAHNENBERG: Bill is the project
8 manager working on the project for Little Lake Butte
9 des Morts, for those of you who don't know. We do
10 have newer data for the whole entire area of Little
11 Lake Butte des Morts, and there is likely some data
12 points in that area, and we would be happy to
13 provide you with that so we know exactly what we are
14 talking about for those concentrations that are out
15 there. It sounds like they are under our action
16 level of one part per million, which is not a level
17 of great concern, at least not enough that we need
18 to go in there and take them out or cap them or do
19 anything.
20 SUSAN PASTOR: Someone else have a
21 question? Someone who hasn't asked one yet. Okay,
22 you are on.
23 UNIDENTIFIED AUDIENCE MEMBER: Jim, how
24 long have those 30 capping projects actually been in
25 place? Have any of them gone for a couple of
1 decades, three decades? And do they actually
2 involve northern rivers, flowing rivers?
3 JIM HAHNENBERG: Some do.
4 UNIDENTIFIED AUDIENCE MEMBER: Name them.
5 JIM HAHNENBERG: The Wannish (phonetic)
6 River is one.
7 UNIDENTIFIED AUDIENCE MEMBER: No, they
8 have not had a capping in that river, not a
9 successful one.
10 JIM HAHNENBERG: The Wannish River they
11 have.

Agencies followup to discussion above.

On Attachment 1, page 68, the Duwamish Waterway, Seattle Washington project is listed as one of the successful capping projects. This project is discussed in greater detail in the, “Duwamish Waterway Capping Demonstration Project: Engineering Analysis and Results of Physical Monitoring,” by the U.S. Army Corps of Engineers, March 1986. Additionally, at least five other river capping projects are listed in Attachment 1, page 69 as follows:

1. Sheboygan River/Harbor, Wisconsin;
2. Wausau River Site, Wisconsin;
3. Manistique Capping Project, Michigan;
4. McCormick and Baxter, Portland, Oregon; and
5. Mill-Quinniapiac River, Conneticut.

UNIDENTIFIED AUDIENCE MEMBER: No. I talked to the people at the Wannish River, the citizen groups that were monitoring the situation there, and it's not a cap in the river. It's downstream, it's in a bay area. It's not in the river itself.
JIM HAHNENBERG: Well, I can tell you this. There have been capping projects that have been done since 1978. Many of them, not all of them, but many of them have been monitored extensively, and what the monitoring has shown is that these caps are effective and contain contaminants. These projects have been done in a wide variety of environments with similar processes -- well, actually the same processes as what we are talking about.
And what's most important is, when you are looking at these projects, you have to consider what are the processes that are potentially influencing the caps in terms of water flow, in terms of prop wash, in terms of ice scour, those kinds of processes. You have to look at those and then evaluate those relative to whether a cap is implementable, whether it could be expected to be stable. And then, if it is a reasonable candidate for capping, then you design for those conditions to make sure that the cap will remain stable over the long-term.
And the way you do that is you have large enough stone on the top of the cap to make sure it doesn't move. And you have other things you need to do in terms of the certain thickness of sand relative to making sure you contain contaminants.
So you have to look at all those things and then design a cap to make sure it will be effective. And that's what we've done.
Every river is going to have different conditions anyway, so you always have to look at all those kinds of considerations regardless of the situation, whether it's a river, an estuary, a harbor, or whatever. And that's what we have done.
UNIDENTIFIED AUDIENCE MEMBER: I'm sorry, but I have heard different stories related to these projects that are not as glowing as the ones you tell.
JIM HAHNENBERG: Well, you can submit that as a comment. Do you have data on --
UNIDENTIFIED AUDIENCE MEMBER: Who is listening? Who's listening? You've already made up your minds. That's the whole point.
SUSAN PASTOR: Do we have any other questions? Yes, ma'am.
KATHLEEN MEYERS: Yes, I have several, seeing as I am a victim of your PCB's. Many people are victims in Wisconsin. I would like to know from way back when I started with my research project and

had lunch with the federal government because the health issues were not allowed to be presented out to the public. Those were hushed. Okay? And I had my life threatened, not that it matters, because it's a hot issue. Back in time.
Back in time what we did is you guys covered up a petition by a hundred signatures when it was -- the baby was beginning for the profits that are ongoing, while the people are becoming deathly ill, and there are no cures.
Another question, or another concern of mine, I should say -- I'm not going to ask you guys questions because I already know what your payoff is. And it was horrifying to hear that you just said that it's going to be an indefinite project when at one point in time it was supposed to be a Superfund. By the way, I bought in on that meeting with some of my research with lunch for a payoff to get in on hand picked only at the Paper Valley hotel, which I will not forget, because I have the papers in my packets at home. And it was interesting, because the only reason I went there was to see who the players were going to be for the kickback with the money.
By the way, the taxpayers are paying for this, if anybody is paying attention. Glatfelter Corporation slipped out the back door. But another thing is I took notes. Those books were at the libraries for about eight months. If anybody wanted a copy of all of them, it was about $700, if I reflect back in time. As I was sitting there for three days taking notes, and everything I do has to be referred back to from notes when it's in detail from the memory losses from the auto-immunities that I have had to live with. And believe you me, these are very costly ventures with your health. And I'll get into that a little later with my comments from my previous researches on the health issues, which were kept hushed to the public.
We live in the most highly toxic state in the USA. There is 100 chemicals that run through the waters. And if anybody is playing with the dollar here, they are playing with lives on a serious note and it travels a long distance, all the way to Texas and across the waters to Norway, which is why the scientists were in here from Norway back when this started, to study our land, water, and air. Likewise, they were in here from parts of Europe. I got to meet the one from Europe and my son got to meet the one from Norway at the time.
But all of this has been not an issue, because we don't want to discuss the real issues, which are people dropping over like flies from serious cancers that are unbeknown to man, due to the PCB's once they hit the fatty tissues and get into the bloodstream and turn into poison. This is real. Your death warrant is in Wisconsin. Why

would anybody want to stay here? Why?
And I have another comment when we had that private meeting that I got in on.
SUSAN PASTOR: Is there a question we can help you with?
KATHLEEN MEYERS: A question?
SUSAN PASTOR: Yeah.
KATHLEEN MEYERS: Okay. One is why the public was shut out and there was a private meeting called with the doctors and the hospitals. And that was behind our back, because the public was never allowed to know the seriousness of the health issues. And I guess I probably would have to think that the public would be shut out of the serious notations that followed with those health issues. And my brother is a big-time builder, and so I got to hear the inside story about the deaths that took place at our lovely Theda Clark hospital due to the PCB's that were hushed to the public. And those people would have lost their jobs if they would have let that out. But I'm going to leave it up to the public now, because that was another hush under the table when people were dying from the throat, and what happens from the PCB's when they hit the glands.
SUSAN PASTOR: I don't think we have answers to questions about doctor visits.
KATHLEEN MEYERS: I think this is very serious, because it all has to do with health. The animals, the fish, the people, we are all dying here. And what I am telling you is these are very costly operations which you all stand to gain a lot of wealth from, except our lives are at stake. Could any of us have that $700 piece of paper which is many pages long when the red levels were in Green Bay? The red levels of contamination were high off the charts in Menasha and in Little Lake Butte des Morts, as I recall when I was looking at the maps, other than the deathly, deathly high contaminants of arsenic and poison that was sitting in the waters and is still there and you will not answer that question. And you will not tell the truth about how it seeped into the waters. And I went under cover and went to the land dump site over at Sunnyville down the street from where I lived at the time when the government took the initiative to take over that land dump site and not let the public know about that one and threatened the guy that ran it that he would lose his business if he opened his mouth. So he had to shut up. And I was pretending I was looking for a secretary that eight o'clock in the morning day to see who the players were and what they were doing over there.
Anyway, it's all been a lot of fun. Sixty thousand dollars later my face got put back together, and that's all been very interesting. And

all the tests that I could have done if I had a lot more money to play with for the other ball park players in the field, which are the physicians that are going to reap the benefits off the serious consequences. As I recall, going with the town of Inland to help them with their lawsuits against the state and federal government because they are all making a ton of billions on long-term projects off the taxpayers in the state of Wisconsin while they are coming up with serious cancers unbeknown to them. And they have to go outside the state, by the way, because these cancers that come from PCB's are ones we haven't seen before.

SUSAN PASTOR: We are going to have to see if someone else has a question pertaining to our recommended cleanup action. And, if you do, come on down. Anyone else that hasn't had a chance to ask a question?

Okay. Well, then I think we will go ahead and move into the comment portion of the meeting. And this is really for the benefit of the court reporter and for us. If you picked a number, we will go according to the numerical order. We would like you to state your name clearly for the court reporter so she can get it down properly for the transcript. Spell it if it's a name that needs to be spelled, if you represent a particular organization.

If you have something in writing that you want to give us for the record, too, that would be fine. If you want to hand it to someone on your way out, hand it to us. Or you can speak it and read it for the record at the microphone. Since we probably gave out a lot of numbers tonight, we ask that you keep your comments to three minutes so that everybody will have a chance to get a chance to say what they want to say. And if we have a little extra time we can go back and give everybody another chance. But, for now, if you would keep them short, we would appreciate it so that everybody can get a chance to get their comment in. So who has number one?

MIKE JURY: My name is Mike Jury. I'm a professional engineer with CH2M Hill, which is an engineering firm responsible for the OU-1 remedial design under contract to WTM-1 Company, which is formerly Wisconsin Tissue Mills. The design is being performed under agreement with the U.S. EPA and Wisconsin DNR.

I have been the OU-1 remedial design project manager since the design started in mid-2003. With my more than 30 years of experience in environmental projects and OU-1 background, I would like to make a few important points regarding the OU-1 optimized remedy.

First a few facts about the PCB mass that's being sand covered or capped. The total PCB

mass in the whole lower Fox River is approximately 25,000 kilograms. The total mass in the sediments that we are going to sand cover, and these are the sand cover that goes over undredged sediments, is 36 kilograms. So that's 36 kilograms out of the total in the lower Fox River of 25,000 kilograms. That's .1 percent of the total mass in the lower Fox River. In other words, that's one one-thousandth of the total mass that's being covered by these sand covers.
Now, similarly, the total PCB mass underneath the engineered cap is 229 kilograms, which is 1 percent of the total mass in the lower Fox River.
With regard to dredging under the proposed OU-1 optimized remedy, by next summer we will have dredged in the order of 400,000 cubic yards of sediment. To give you an idea of what that is, if you take a football field and you go goal line to goal line, sideline to sideline, and go up 225 feet, that's the volume equivalent to 400,000 cubic yards. So we've done a lot of dredging. But dredging, as we know from this project and other projects, has its limitations. And we just can't get down to zero PCB's with dredging.
And, as Jim has stated before, we can't get to the .25 ppm surface weighted average concentrations just with dredging. We have to do something else, which brings us to the caps. Engineered caps. We are confident that the engineered caps are going to be protective and permanent because of the conservative approach that we've used in our design.
For the first part, we've already removed the high concentrations of PCB's, so we only have low concentrations to put our caps over. And the other one, and Jim has mentioned this several times, is that we are only going to cap to where we have at least six feet of water depth over the cap when we are done. And the deeper water provides extra protection for the effects of boat propeller wash, river current, wave action, ice flow, that type of thing.
So, in summary, the proposed OU-1 optimized remedy is protective of human health and the environment in the same manner as the original remedy. Thank you.

Agencies Response

Thank you for your comment.

SUSAN PASTOR: Okay. Who has number two?
FAWN SCHILLINGLAW: My name is Fawn Schillinglaw. All my life I have lived right on the shore of the Fox River: In Kaukauna as a kid in a

house right on the river; at Lawrence College right here on the river; and I've raised my children where I still live now, in a house in Appleton, right on the shore of the river. I know this river. It is well used by the public: Jet skis, water skiing, speed boats and so on. River development is now actively promoted: New condos, gigantic houses, and more and more docks constantly. There is bigger and bigger boats. River use is increasing every year. I'm 63. I know that. I've lived here all this time.

This creates traffic and turbulence and waves and erosion. I know that. We've lost a lot of our shoreline, and we have quite a big lot. There is a lot of sediment eruption. It's all part of the progress in this area. And this has a lot to do with capping or dumping sand and gravel as a coverup over the PCB's. I call it a mixmaster effect what's happening in the river in front of our house because of the ever-increasing water traffic. Especially if the lots open in the future, you are going to even see more and more water traffic. We have a marina in front of Sturby (phonetic) Island, we have a marina in Lutz Park, and the traffic level in front of our house is dangerous. People in our area have tried to get a no wake zone because of the safety concerns. The water in this river moves. This sand, in my opinion, is not going to stay put. High water, there is water level changes in this river all the time. I know that. It goes up and down all the time. I go down to the river often. The ice moves. The sand, in my opinion, is not going to stay in place. I don't see, from what I have read, that there is any proof of a similar use working over time. And, as Jim has said, every river is different. Conditions in the Fox River are going to be unique. We don't know what's going to happen. This is an experiment.

Now, there is a lot of talk about monitoring, but I feel that monitoring is only going to tell us when the movement of the caps finally is going to cause a big problem and the PCB's are uncovered, and then in the future, as there's been other people here asking, who is going to be around to foot the bill? Is it going to be the taxpayers? Is it going to be us? That's why capping to me seems only a cheap, fast cover-up of PCB's to get the polluters off the hook as fast as possible. The public should not be fooled by this plan. The only right way to clean up our river is to get the PCB's out of it, not cover them up for our grandchildren to clean up.

I read a lot of the documents about the word "averages." That certainly means to me that some areas to be covered up are higher than average, some may be lower. But an average is an average.

How high are some of these? How much different than the average?
Also, I asked my husband before we left tonight to read some of these documents. He's a fisherman. He had some different opinions. He said ask about the organisms in the water that will burrow into these sand caps. He's concerned about the fish eating what gets down through the sand. He said consider a worm. Consider what's down in that water that's living. This is a living body of water with plants and animals and microorganisms in it. What's going to get down in through that rock and in through that sand and collect PCB's and bring it out? Three inches of sand doesn't keep a worm out. My family, my two sons, my little nine-year-old grandson, always fish from our little dock. We've never been able to eat one fish. Never bring one up to the house and have a fish dinner. What a shame. We have been a good community area down here along the Fox River. We support and we work many of the people in this area in the industries that have polluted our river. They owe it to our health to take their pollution out of our river before PCB's are allowed to flow out into Green Bay and Lake Michigan in the future. Consider that. It can happen. Why should we take that risk? Please get the PCB's out while we still can. My dad, who is now dead, always used to say to me, do a job right the first time. I say let's do it right. Let's get the PCB's out of there. Don't just cover them up. Thank you.

Agencies Response

Responses to these comments are addressed in Section 1, Agencies Response to Comment 1, page 7, above.

SUSAN PASTOR: Okay. Number three.
WALLY BERGSTROM: My name is Wally Bergstrom. I live at 382 Lake Road in Menasha. I'm a private citizen interested in clean water and a realistic solution. My family has lived in Neenah and Menasha for seven generations. I've lived and worked in and enjoyed the water wonderland my whole life. Testimony of that is a closet full of tackle boxes and a number of boats used for runabout, fishing, and hunting. As much as anyone, I'm interested in a clean river and lakes for myself and for our community's future generations.
I have been following the PCB issue as long as it's been a public concern. Now, I think all the folks that have been working on this project, the GW partners, the Environmental Protection Agency, the Department of Natural Resources, have gained a wealth of data and actual experience that makes them most expert in my

22 opinion, more expert as a result of the new data.
23 And I have no reason not to believe them.
24 These experts have devised a revised plan
25 based on these new facts, this actual experience,
1 that they call the OU-1 optimized remedy. This
2 plan, first and foremost, meets the original cleanup
3 standards. Furthermore, it's more efficient, it
4 occurs quicker to completion, and it's going to be
5 far less costly. And it's all down on paper for
6 everybody to understand. The OU-1 optimized remedy
7 is the better way, and we should all be for it.

Agencies Response

Thank you for your comment.

8 SUSAN PASTOR: Okay. Who has number four?
9 MOE BOHRER: My name is Moe Bohrer,
10 B-o-h-r-e-r. I'm with Michels Materials, Division
11 of Michels Corporation. I'm here to comment on the
12 sand and armor stone being used for the Little Lake
13 Butte des Morts Fox River remediation. Michels
14 Materials is the leading sand, gravel, and crushed
15 stone supplier in the state of Wisconsin, one of the
16 largest in the nation. In fact, we operate over one
17 hundred pits and quarries in the state of Wisconsin.
18 We also operate one of the largest quality control
19 departments in the Midwest. We have three permanent
20 and five mobile aggregate testing laboratories. All
21 of the materials we produce are strictly tested to
22 meet the requirements of the construction industry.
23 We are a crude supplier to the U.S. Department of
24 Transportation, the Departments of Transportation
25 for the state of Wisconsin and Illinois. And our
1 armor stone is one of the few armor producers that
2 are approved by the U.S. Army Corps of Engineers.
3 We at Michels Materials are confident of
4 our ability to produce not only the quantity but the
5 quality of the sand and armor stone needed to meet
6 the strict requirements of this remediation project,
7 and we are confident it can be done. Thank you.

Agencies Response

Thank you for your comment.

8 SUSAN PASTOR: Okay. Who has number five?
9 JESSIE ROSE: My name is Jessie Rose, and
10 I'm project manager for Fredrickson Trucking. My
11 responsibilities for the last four years since the
12 project started is to safely -- when the trucks are
13 loaded and settled, decontaminate the trucks and see
14 that these vehicles make their journey to the
15 landfill and dump off safely, where the trucks are
16 decontaminated again and then returned back to the

site. It has been an honor to work on this project. I've been involved with a lot of people through the agencies. We've learned a lot of information, as a gentleman has stated, about doing things better. There's just been countless hours going into protect the safety not only on the roads, the people involved, the truck drivers. My responsibility is 24/7 on this situation, and it's been an ongoing trust that we continue to work through this and find out better ways.
Right now we've had just many, many truckloads in the last four years, and I can tell you figures that would be very staggering and I won't go into that. But my trust has been with these folks working and actually been on the dredge, seeing what's going on in the situation, and I feel that this new aspect with capping is a good aspect. I know they got just about everything out that they possibly can. I think with the movement of the river and being involved with actually the placement of the new materials and how this is going to be worked out, I am very confident that this is the way to go.
You are talking about minute amounts that are still out there in a deep part of the river, and I know that Mr. Hartman would gladly invite people to further investigate and see how these things are placed and take a good look at that to have a better understanding. Thank you.

Agencies Response

Thank you for your comment.

SUSAN PASTOR: Thank you. Number 6.
DON HAYFORD: My name is Don Hayford, H-a-y-f-o-r-d. I'm here as a private citizen, but I'm a retired chemist and I enjoy a pension from one of the responsible seven. I have had some experience with PCB's. I'm sure my fat has more PCB's than anybody else in this room. But what I wanted to say is that I think the agencies could do a better job of selling the concept of capping if they would go more into the background of the record of decision. People get the idea that the Fox River is the biggest source of PCB's into Lake Michigan. That's not true. The atmosphere is and will continue to be whether Lake Butte des Morts is dredged, capped, or nothing is done.
People have the idea that there is an innate human risk from PCB's in the river. The only risk is if you eat fish over the advisory limit. And the limits were set not on human epidemiology or statistics, they were set on animal studies and extrapolated linearly with a safety factor thrown in. So, if you eat according to the advisories,

18 even pregnant women, in my opinion, are not at risk.
19 People have the idea that okay, dredge the
20 river, get it out, and it's out of our life. That's
21 not true, because there's part of the PCB on any
22 leaf you touch. Anytime there is a forest fire,
23 PCB's and tetraforum (phonetic) dioxins are being
24 produced. Risk is part of life. Beer causes birth
25 defects. Sunshine causes cancer. You got to
1 moderate them. The same with fishing. Also, if not
2 now, pretty soon mercury will be the biggest
3 contaminant in fish, and that will continue as long
4 as we have coal-burning power plants without any
5 treatment. Thank you very much.

Agencies Response

Thank you for your comment.

6 SUSAN PASTOR: Okay. Seven. Number
7 seven?
8 UNIDENTIFIED AUDIENCE MEMBER: She had to
9 leave.
10 SUSAN PASTOR: Number 8.
11 VICTOR MAGAR: Victor Magar, M-a-g-a-r.
12 And I'm with Environment International Corporation
13 on behalf of Glatfelter. And I have a Ph.D. in
14 environmental civil engineering and have been
15 working in the environmental industry for well over
16 20 years. And I specialize in contaminated sediment
17 remediation and risk management. In addition to my
18 experience as a sediment engineer, I participated in
19 a U.S. EPA and Army Corps of Engineers course on
20 management and remediation of contaminated
21 sediments. And that, of course, also includes
22 information on sediment capping design effectiveness
23 and monitoring management.
24 Sediment capping is a proven technology.
25 It's a remedy that is widely accepted and employed
1 in the industry increasingly. It's been used around
2 the county. A very good example of a sediment cap
3 is the Wykoff (phonetic) Eagle Harbor study.
4 Another cap that -- it's a cap that covered
5 hydrophobic organic contaminants, much like the
6 contaminants we see here. At this site there were
7 fish liver lesions before the cap was put in place.
8 The fish liver lesions have substantially declined
9 with work that was demonstrated by fish and wildlife
10 systems in that state.
11 And capping, as was described by the EPA,
12 provides a rapid and very effective and permanent
13 reduction of risk that can be used to enhance out
14 the dredging that's also being implemented at this
15 site. So, in short, I support the remedy that's
16 proposed by the State EPA and GW partners as a
17 cost-effective and, most importantly, an
18 ecologically effective and appropriate remedy for

19 this site. Thank you.

Agencies Response

Thank you for your comment.

20 SUSAN PASTOR: Okay. Number 9.
21 STEVE LASZEWSKI: Hello. My name is Steve
22 Laszewski, L-a-s-z-e-w-s-k-i. I have a Ph.D. in
23 environmental toxicology from Madison. I'm a
24 scientist with Foth, F-o-t-h, and I've been working
25 on this project since 2004.
1 My company serves as an engineering
2 contractor for the project. We have been here since
3 2004 working on the project to identify the areas
4 that need to be remediated and then we come back and
5 we verify that the remediation has been done
6 properly.
7 Since 2004, this project, the sediment
8 areas, have been dredged one specific area at a time
9 very carefully. In a perfect world it would be
10 great if we could just remove all the sediment. But
11 the science, the engineering, and the reality tells
12 us that's not possible. There are some areas that
13 just cannot be dredged, or we have areas that have
14 very low levels of PCB's still clinging on to the
15 sediment. Having been on the team with EPA and
16 Wisconsin DNR that have developed the engineering
17 and science for this plan, I would comment that the
18 principles of science and engineering for this river
19 in this specific location have been applied to make
20 sure that this plan is a safe plan to human health
21 and the environment.
22 I have also had the privilege of working
23 with the agencies and their experts in the past 10
24 years on this project. And I would assure you that
25 these folks are very much committed to protecting
1 human health and the environment and would not do
2 anything to harm the environment. As has been
3 mentioned, it's a combination of dredging, armored
4 engineered caps, and sand cover as the best way to
5 remediate and complete the remediation for this part
6 of the river.
7 This team has already removed 70 percent
8 of the PCB's from the river, and, as importantly, in
9 the last four years tens of thousands of man hours
10 have been on this project, and we understand the
11 water and sediment and the chemistry of this area
12 very, very well.
13 We have heard the comments, of course,
14 that this plan will be nothing but a cover-up. And,
15 with all due respect, our firm of scientists and
16 engineers of other firms know this part of the river
17 like the back of our hand. And what we have done is
18 we've used individual PCB data, not average PCB
19 data, but individual PCB data, to identify where the

high concentrations of PCB's are, to remove those high concentrations, and then in areas where we have lower concentration of PCB's that cannot be removed by dredging, or we have low levels still clinging to some of the sediments, those are the areas proposed for capping, and, as has been mentioned, only in areas where it's stable to cap. Furthermore, those areas are going to be monitored.
So, in closing, I would just say that this is a very well studied plan, it's been developed by experts across the country, and it deserves your support.

Agencies Response

Thank you for your comment.

SUSAN PASTOR: Next number is 10.
REBECCA KADERS: I'm Rebecca Kaders, Director of the Clean Water Action Council of Northeast Wisconsin.
I'd like to say, first of all, I am disturbed that we are limited to only three minutes to allow time for all the contractors and consultants on this project and the industries involved on this project to use citizen testimony time to reiterate what they've already been saying all along. These people have had access to you agenciesagencies people for ten years behind closed doors; whereas, this is our only opportunity to have access to you. Those people should have waited graciously to the very end of tonight to speak to allow actual citizens to get up and give testimony so we don't have to listen to their propaganda before we can get up. We should be allowed more time to testify also on such a complicated matter. To be given only three minutes is an insult.
I'd just like everyone to recognize that this plan has been weakened several times. This isn't the only time it's been weakened. The original plan in the nineties was to dredge down to .05 parts per million. Then in 2001 it was .25 parts per million. Then in 2003 one part per million. Now they are going to leave five parts per million and just cover it with sand.
And we find out two days ago in the paper in Green Bay that Renard Island is being used as a bargaining chip with the corporations to get them to pony up the money to finish the Fox River cleanup.
As a Brown County taxpayer, I am disgusted to hear that. All these people talking about how this is based on science. Bullshit. This is about money and politics.
Renard Island is a huge repository of PCB's. Some calculations show that it holds up to 30,000 pounds of PCB's. Somebody else was talking

about PCB quantities. If you want to talk PCB quantities, look at Renard Island. That sediment in that artificial island came from the Fox River. It is the same argument, the same issue. The Fox River polluters are responsible for Renard Island.
As a Brown County taxpayer, I do not, as a property owner, want to have to pay taxes to cover what is their responsibility to cover, so that you will have a bargaining chip so that they will voluntarily provide the money for this cleanup.
How about a little enforcement of the law to protect public health?
Where are politicians on this issue? Why do I have to sit here and talk to agency people?
It's the politicians that are making it happen this way. Where is Governor Doyle on this? He's the one controlling the DNR. Where is George W. Bush? He's the one controlling the EPA. It's the politicians that are keeping our agencies from enforcing the law and forcing them to grovel for crumbs of financial support from these corporations that have caused hundreds of millions of dollars of damage. Over a billion dollars of damage if you really total all the different factors that have been affected by the PCB's in the system.
And now we are learning you are bargaining with people's lives and tax dollars down in Green Bay in order to get a deal. You already bargained out the bay. You are not looking at the bay at all. You are not looking at Renard Isle. You bargained that away. It's always something in order get these guys to play nice.

Agencies Response

Renard Island is not part of the river segment covered under this ROD Amendment and is not relevant to the Proposed Plan or Amended Remedy.

SUSAN PASTOR: Thank you. Number 11.
ROGER KANITZ: My name is Roger Kanitz from up in Menasha. K-a-n-i-t-z.
Just a few comments. I've lived in the Menasha area, Fox Valley area for about seven years now. I'm not a professional speaker, by the way.
Seven years in the area. I do live on the river in the Menasha area and do appreciate the water and all that it brings to the area, the visual rights, thinking about the fact that it's going to be used more in the future.
I guess, also, I am an engineer by trade, so I understand a lot of the concepts that are being talked about here. But, in the same sense, thinking about wanting to live here the rest of my life, I'm also thinking about the sustainability of the long-term actions, whatever we do here.
I guess I would argue or at least plead

that the fact that, you know, you look at the safety statistics and whatever else in that window, I would always urge us to go toward maximizing the cleanup potential, minimizing the covering. I can understand if you can't get it off you can't get it off, and that is going to be part of the covering process anyway. But maximize the removal, because that just minimizes the overall the risk everywhere. I'm thinking long-term for myself, the rest of the population in the area, hopefully to make this a good place to live in perpetuity. Part of the things that I think I've heard was if you minimize funding, as far as dredging requirements would be less, would be found to have dredged more. So my same concern that I raised earlier about the funds or whatever else coming up. I do note the Nation is going to be economically challenged in the future. You know, Katrina. There is going to be other things, global warming. I believe in that type of thing. That's going to have an impact on the availability you folks have to use money to remediate if we do find things in the future. So that's why I'm urging, do it now while we have a chance. Like one man was saying, do it right the first time, because by the time you get around to it the next time, there may be a whole bunch of other catastrophes we are dealing with. And I'd like to maximize the removal. Thank you.

Agencies Response

Responses to these comments are addressed in Section 1, Agencies Response to Comment 1, page 7, above.

SUSAN PASTOR: Thank you. Number 12.
GEORGE DEARBORN: My name is George Dearborn, D-e-a-r-b-o-r-n. I'm Director of Community Development for the Town of Menasha. The majority of this project has occurred within the town of Menasha, so I'm familiar with the project from its initiation. I've worked with the project managers with this activity. I'm aware of the original proposal to remove a substantial amount of the PCB's.
With the additional analysis that has occurred, it is clear that, based -- from my understanding, it's clear from what I have seen from the analysis that when you reach a level of a very limited amount of PCB's, that the ability and the efficiency with the present technology to remove all those PCB's is going to be not very feasible. And the cost and the extension of the period of time to do that would extend this project well into the future.
One of the issues we have to look at is the impact on the surrounding area if this project

were to continue on with a limited effectiveness to remove those PCB's. So, clearly, this alternative with the capping, which certainly is a technique that's used, has clearly been used in these situations and we also see these techniques used to monitor and cap other types of pollutants. It's common practice for landfills where they are monitored for long periods of time. So this technology is well established and monitoring can be done very effectively.
With that in mind, I think that, clearly, this alternative is an effective way to do it. The ultimate results will be as effective as the original proposal. And, in addition, it seems clear that continuing to dredge the areas with a limited amount of PCB's in my opinion would have the potential of disturbing additional areas and potentially could introduce more PCB's into the water to flow downstream.
Clearly, in talking with the experts that have been working on this, the technology is very good; however, there are limitations to the present technology. So leaving it in place by an effective capping to me would be the more effective way to do it. If it turns out in the future as it's monitored that we still see PCB's in the environment, technology certainly will improve in the future, and if that's necessary to do additional, more effective techniques can be utilized.

Agencies Response

Thank you for your comment.

SUSAN PASTOR: Okay. Thank you. Who has number 13?
GREG SMITH: Good evening. My name is Greg Smith, and I'm with G.F. Brennan, the primary remediation contractor on the Little Lake cleanup. My company is a nationally recognized environmental dredging firm. We have been dredging for over 50 years. I have been involved with the project for several years now. I know the project's goals, its achievements. I would like to talk a little bit about that tonight.
G.F. Brennan is located in LaCrosse, Wisconsin. We have been on the project since 2004. By mid-2008 we will have removed close to four hundred thousand cubic yards of contaminated sediment. This will make the remediation of OU-1 one of the largest environmental dredging projects in the United States.
During this time, we used the most sophisticated dredging technology that there is out there. We have done this to remove the contaminated sediment as accurately as we possibly can. We are

22 pursuing several patents on PCB equipment and
23 technology that we have developed to minimize the
24 amount of PCB's that are left behind after dredging.
25 Even with the best technology and all of our
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1 innovations, it is impossible to remove all the
2 PCB's by dredging from the project, in an entire
3 project.
4 The combination of dredging, capping, and
5 sand cover is very commonly used to remediate the
6 contaminated sediment projects. Earlier this year
7 we demonstrated that we could accurately place sand
8 cover and capping materials over soft sediments
9 without disturbing them. We are prepared to
10 complete the dredging activities and begin sand
11 cover and capping operations next season. We can
12 complete the underwater portion of the optimized
13 remedy much sooner than we can using the existing
14 RAD remedy, which will take several additional years
15 to complete. With what has already been
16 accomplished, we feel that the agencies's plans, which
17 includes dredging, capping, and sand cover, makes
18 perfect sense because it utilizes proven
19 technologies, the latest science, and availability
20 of resources to reach the project's goal in a
21 shorter period of time. Thank you for your time.

Agencies Response

Thank you for your comment.

22 SUSAN PASTOR: Fourteen.
23 KATHLEEN MEYERS: My name is Kathleen
24 Meyers. Are you all ready for a real chill? We
25 were discussing 362 identified toxic substances
1 here, 209 different chemical compounds. The
2 patterns are variable. These are the biocumulative
3 AH receptor hormone mimic neurotoxicity. There is
4 wasting or loss due to the thymic atrophy, immune
5 suppression. The eyes are affected, cardiac birth
6 defects, immune dysfunction, cancers throughout the
7 body. We are talking about the glands. Pituitary
8 problems, absorbing nutrition, skin irritations,
9 rashes, nodes, lungs affected, central nervous
10 system affected. Cancers including the liver,
11 kidney, and brain. Animals have had liver and
12 kidney damage, some with thyroid gland injuries,
13 anemia, skin damage, reproductive organ effects.
14 All studies prove auto-immune system
15 involvement. They have found people to have PCB's
16 stored in the body fat. Likewise, seals and the
17 wales. Our fatty tissue, if you lose weight, the
18 PCB's are released back into your bloodstream.
19 PCB's can be absorbed through the skin when a person
20 handles the chemical or contaminated soil, when they
21 are breathing the vapors or air containing the PCB's

or the dust particles. They change the liver functions in animals and humans, causing our cancers. The central nervous system and endocrine systems, as well as reproductive, are also affected. The neurotoxins may slow, accelerate, or modify the process, sequence of cells moving into the correct spot. Synapsis form neuroceptors refined and neurotransmitters and their receptors grow but are out of order when the PCB's enter you. They mess with your wiring process noted by Dr. Phillip Lannigan of New York, Mount Sinai School of Medicine. Imagine being reduced to a vegetative state wherein the PCB's impair learning and memory. And I can give you a glimpse of the medical discoveries that are affecting your entire body piece by piece by other toxic materials such as the sysnium 37, stromium 90, uranium (inaudible) stromium 230 --

SUSAN PASTOR: Our court reporter is having a hard time keeping up with you.

KATHLEEN MEYERS: I have to talk fast because we are listing some serious issues. Your liver, spleen, kidneys, bone, gum tissues, throat cancers, pneumonia produce infections, damage to the internal organs, heart, hemorrhages, depleted bone marrow, congestion to the brain, loss of red blood cells, lack of white blood cells to fight infections, extreme fatigue, change in their small intestines, bacteria flooding into the bloodstream and killing off the REM cells that make up the epithelial layer of your small and large intestinal tract.

I have more noted on the other side. Increases the body heat, spasms in your throat, burning sensations on your lips, nausea, dizziness, headaches, increase of weight, shortness of breath, discomfort in your bowels, irritable bowel syndrome, growths in your mouth, on your bones, cysts developing, tumors developing, create the moth-eaten appearance over time. All these deadly chemicals produce heart attacks, strokes, anemia, blurred vision, swollen ankles, thymus gland is affected, adrenal gland shrinks, jaundice, lymphomas and bone (inaudible) induce swollen eyelids, easy bruising. Bleeding of the mouth, sensitivity to tissues, and can produce the gastric ulcers. And none of the above health issues have ever been discussed with the public when they started this whirlwind of let's dredge up the PCB's and see what happens.

I will remind you that back in the late nineties, the profits for the HMO's were at some 250 billion dollars. That was a long time ago. Imagine what they are like now. If you have the money to do the extra testing that needs to be done because our medical profession will not open this one up to the public, you can then find your alternative doctors to do the serious testing, which will cost you some

serious cash. Do any of you remember the $105 million cover-up on the inside story of the Wisconsin Energy when it leaked out Prussian blue, the oxide toxic waste that burned like battery acid? Fifty-two million pounds of cyanide back in 1992 were found wet with sulphur, and it generates a pH that can burn like battery acid. This acid hit the groundwater. The raw gas contained hydrogen sulfide, cyanide, arsenic, and coal tars. Twenty-six thousand tons were uncovered in West Allis. Hydrogen cyanide gas kills in minutes by replacing the hemoglobin molecules and suffocating. All of this cyanide went into the groundwater. The negotiations were a mere hundred and five million, the equal earnings of the power company in one year back then. Of course, now we all have more energy costs to consider around the corner in 2008. Anyway, this was in the Milwaukee magazine article for those of you who are looking for any of the follow-ups other than the PCB's. That's if we didn't have enough to contend with already. Anyway, PCB's magnify the effect of pork, fish, chicken. And, other than what I discussed before about the scientists, the PCB's break down slowly and then they can be carried long distances into the atmosphere, rivers, lakes, and oceans. By the way, I have lupis, (inaudible) syndrome, scleroderma, fibromyalgia, rheumatoid arthritis, osteoporosis, and just got out of five years of surgery, ten years fighting with the state to dig up the 87 billion on the profits for (inaudible) a hundred and thirty-seven billion for EDS and a hundred fifty-seven billion for waiver grant money, and all of that is hush hush to the politicians behind the cover-up for the elderly people who are washed aside for the next profit that took up the MA profit that goes inside the politician's back pocketbook when I questioned it all the way through. Over the years it's been an interesting education, and I think God kept me alive to see more and then discuss to the public and find out how much cancer we do have in this state of Wisconsin, which we highly pride ourselves in living in one of the most highly toxic states, the most in the USA. Isn't that incredible? What pride do we have when

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we will kill our people at the cost of a dollar. It is disgusting. And my family is worth millions and they are disgusting. And you are supposed to think that these over-educated people are going to give you a deal for your buck. Oh, no, they are not. They are going to give you a bank. And when you bury your loved ones, you can remember me, I hope, or remember Rebecca up here, because she has not been able to get through.

I was in and out of surgery for five years, so I had to take a break for a while. And I can tell you that when you find the attorneys, it's all been handshakes under the table also. You are on your own. Sell your house, dig up the cash. They stand to make a ton of money and throw you in the street when they are done with you. You don't play their game right. It's all about who? In the last final finale, I suggest you all take a look at the book by Christopher Carol on Lab 257, the ultimate player on the big scale, which has a lot more to do with the germ warfare projects that are going on to kill us off a little quicker. That author has been silenced since his book came out. It's interesting. That's a chill, by the way. If any of you are out for a real chill, that's a real chill read. It's a brilliant book.

The man didn't need any more money. He had a lot of it. He put it out and he interviewed the scientists that were dying, and they didn't really care what the federal government did with their lives to get the truth out to the public on a larger scale. I have a lot of knowledge from it all.

But I have short-term memory loss because it's part of the deal with PCB's. The weight gain is horrific. And all I can tell you is, if you go for the doctors in the valley, they will keep you moving all day long. So I suggest you do your research outside the medical profession inside the state. That is alternative methods of doctors who will give you the truth, which has not been released to the public at all, while we were busy digging up that first $68 million and the billions that the taxpayers are going to have to pay. These diseases are no fun to live with. There are no cures, and you can keep paying until you have no money left and no life left, and they don't care.

And I've also had to dig up -- the profits off the State facilities in health care are horrific, and I have had to witness death along the way. It is unthinkable in this country that we can literally get away with murder in the name of tax money by the profits into the multi-millions at the state level of government. It's horrific.

I am one angry woman, and I have seen a lot of life. And believe you me, what you are about to encounter around the corner when they dig up some more dredging projects and then dump the stuff in Wisconsin on this side of DePere, which they don't want you to know about, while they are busy telling you they are dumping it up in Michigan, it really doesn't matter, because I did all the research on the environmental issues and, believe you me, you are in for a real surprise also when God has His say and what's coming with global warming around the corner quick. And if you were doing anything

serious as scientists or -- you know, your degrees don't impress me. My ex-boyfriend had three of them. I can tell you that we are about to embark upon a horrific venue from all the germ warfare projects going on behind the public's back up in New York on our agriculture baby up there that generates a ton of money off tax dollars while we are busy experimenting with mad cow disease and other horrendous diseases that we have mutated with

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the human. I suggest you read. I suggest you research. And these players are of no impressive anything to the public. When your loved ones are buried six feet under, that is serious, when you have cancers that you never heard of before. I had a woman in my building develop tumors in her legs within 24 hours that she never -- nobody knew how to tell her where they came from, because it was rare.
SUSAN PASTOR: Could you wrap up, please. No. 15 is waving at me.
KATHLEEN MEYERS: I will wrap up. God is in control. You people are worthless that are players for the dollar. My family is worthless. They are worth millions. They own a lot of lots. They're worthless. Your empty houses are going to rot. When your loved ones are buried, you can think about what you have done to reap the benefits for the multi-billions of dollars. George Bush has a flare for oil. Check the author out. Find out where the multi-trillions have been laundered in off-shore banking over the last ten years while they've been playing war. This is not a democracy. Democracy will bring the world down in due time. You watch.

Agencies Response

The Agencies agree that PCBS present a risk to human health and the environment. This Amended Remedy will address those risks by either removing by dredging or capping or covering the PCB contaminants.

SUSAN PASTOR: Thank you. Fifteen.
JEFF DIETZ: Jeff Dietz, Appleton, Wisconsin. D-i-e-t-z. I'm confused by the last person's comments. I don't know if she was for, against, or neutral on cleaning yp the PCB's at all.
KATHLEEN MEYERS: Am I neutral? They've already done the damage. I am neutral because they never did the research to begin with.
JEFF DIETZ: Do you want to clean up the PCB's or do you want to leave them in place?
KATHLEEN MEYERS: Right now it really doesn't matter, because when they take it to the next level you're going to see some horrific cancers that you have never seen before. I'll just leave

you with that thought.
JEFF DIETZ: I'm done.

Agencies Response

Thank you for your comment.

SUSAN PASTOR: Sixteen.
SKIP MISSIMER: Good evening. My name is Skip Missimer. I'm Global Director of Environmental Affairs at Glatfelter Company. Glatfelter supports the optimized remedy's revised cleanup plan for LIttle Lake Buttes des Morts for OU-1 because it is the best remedy to address the contamination in Little Lake Buttes des Morts based on the data and information that we have today.
In the intervening five years since the original remedy was proposed in 2002, the agencies and GW partners have assembled a lot of new information and, just as important, four years of experience. It is this information and experience that has led to the development of the revised cleanup plan. Today we have over ten times more data on the distribution and concentration of PCB's in Little Lake Butte des Morts than we had in 2002. These data indicate clearly that in the past four years we have removed the hot spots where PCB concentrations were relatively high. The same data and information indicate that the remaining PCB's are of relatively low concentration. In the past four years, we have learned that dredging, very precise and accurate dredging, is relatively effective at removing hot spots but not effective at remediating lower PCB concentrations.
We have completed two capping trials that have demonstrated that capping is a more effective remediation tool for sediments with low PCB concentrations. Accordingly, the optimized remedy relies not only on dredging to remove the hot spots but also on capping and sand covering to remediate the sediments with lower concentrations of PCB's.
Most importantly, the data collected since the original remedy was proposed in 2002 indicate clearly that if the 2002 remedy were implemented as dredging alone, the original cleanup goal of 0.25 ppm would not be met. We support the revised cleanup plan because it will allow the original cleanup goal to be met.

Agencies Response

Thank you for your comment.

SUSAN PASTOR: Seventeen.
PENNY BERNARD SCHABER: I'm Penny Bernard

Schaber. B-e-r-n-a-r-d, S-c-h-a-b-e-r. I'm with the Fox Valley Sierra group. And the Fox River is a very important part of our community. It is what's brought people to this area. It was the working lifeline of the community and is once again becoming the lifeline for the community. There is a huge interest in going back to the river. People want to be on the river, people want to be part of the river.

Rarely in our lives do we have a chance to fix, to correct a wrong. Many of us wish we probably could correct a wrong that we have had in our lives. We have that opportunity now. Our river has been wronged. It has been polluted and it is polluted. We need to fix it. We need to fix it the best way that we can. We need to maximize the removal of the PCB's from the river. I believe our previous speaker had some very good points. There has not been a good epidemiological study of this area. When you read the papers and you look at the obituaries, there are a lot of people who die in this area from unknown causes and from very young cancers that are very, very aggressive. So we do need to look at the health problems in this river, or from this river. We cannot continue to ignore that.

It's very important to clean up this river as best as we can. My concern is that the proposed capping plan does not do this. The capping plan continues to cover up the problem. It does not correct the problem. I feel like I'm talking against a stacked deck here. I think, in counting my numbers here, there have been ten representatives from industry who spoke, and I'm the fourth person who is not representing industry who has been speaking. Or the fifth person. Excuse me.

I noticed as I looked at Mr. Hahnenberg's maps on the river and the Power Point that the capping plan is proposed for the area where the river narrows. And, if I remember my physics correctly, as you look at a body of water where the river starts to narrow, the flow increases. So that concerns me that we are putting the cap in an area where the flow will be increased.

We have a responsibility to this community. We need to make sure that, if wrong, the pollution of the Fox River is corrected in the most complete and maximized way possible. An analysis and modeling tells us a lot of things that should not happen. Did we not learn anything from the recent failings of the environmental plans that we've seen in the past, such as the failure of the levies in New Orleans? We need to plan and to do the right thing so that we don't have to correct it another time.

Agencies Response

The Agencies agree that PCBs present a risk to human health and the environment. This Amended Remedy addresses those risks. Regarding the effectiveness of capping, the Agencies address this in responses in Comment 1, Section 1, page 6, above. The concern regarding flow velocities for all of OU 1, including the portion of the river referenced where the river narrows, was evaluated in a detailed study of potential flow velocities in the river. The cap design considers these velocities in an appropriately conservative analysis.

SUSAN PASTOR: Eighteen.
FRED STEENIS: Fred Steenis. I'm Fred Steenis, Town of Menasha. S-t-e-e-n-i-s. My only comment that I'd really like to make is the fact that I remember the project when it first started, and the original plan was to set up incinerators on the shoreline and burn all the PCB's. The PCB's will be gone. Then it got watered down to dredging. Now it's down to capping. Then the parts per million went up and then the number of times you dredge. But you know what, the PCB's are all in tact yet. They are just in a different location. They moved them to a different spot. In my time, I wouldn't be a bit surprised if where they are dumping them that pretty soon they will have groundwater contaminants, be it PCB's in people's water and so forth. The project does not -- the cleaning up the Fox River, well, we didn't clean up the PCB's. They are somewhere else over by Chilton.
SUSAN PASTOR: Number 19.
GARY WAGER: My name is Gary Wager. I live in the town of Mishicot. W-a-g-e-r. I'm president of the Kalamazoo River Cleanup Coalition. We're a group that formed in response to an EPA plan to remove PCB sediments dredged from the Kalamazoo River at a mill paper site after 30 years of studying. Finally got the project going and where did they decide to dump the PCB's? In my back yard, literally. Some of the members of our group, their yards back up to the former Allied Paper Mill site, where there are concentrations of PCB's that are existing that are off the charts too. Some of them are a thousand parts per million. So it's a hot spot of its own.
Why I came here tonight is to find out a little bit of what's going on over here on the Fox River project. And I am struck by some of the similarities. One thing, your project seems to be further along. For our project, they spent 30 years studying and only the past year began dredging. Apparently you started dredging a number of years ago in order to get a good start on removing the PCB's from the Fox River, so you don't have to verify what's going on.
But I'm also struck by some of the

similarities in that we have a retired paper mill chemist that claims that PCB's, if you sprinkle them on your cereal, it wouldn't hurt you, too. Maybe it's the similarity in the fact that, again, the potentially responsible parties are paper mills. And it's not that hard to find retired chemists, perhaps, that feel that PCB's are harmless.
My expertise starts from May of this past year. So I don't think I'm an expert on any of this stuff. But what I have found is that we as citizens have to rely on expert opinions, and some of the experts have given their opinions here tonight. The EPA has some grants for some nonprofit groups that also you can hire your own expert. Part of the help that we are looking for in Kalamazoo is because some of us, most of us anyway, in our group are citizens pretty much like yourselves, although we do have an advantage in Kalamazoo. We have the Paper Institute, and there are some scientists there that understand the PCB's and the scientist issues.
One of the activists in our group has I think kind of summed it up. He said that, while there's technical aspects to this issue, the solution will be found through a political solution. In other words, it's the job of concerned citizens like yourselves and our folks in Kalamazoo to educate ourselves as best we can and then move ahead with the best possible solution. I think that's what everyone is looking for.
And the other similarity that I see here is sort of an adversarial relationship between the citizens and the EPA and also the potentially responsible parties. And what I have tried to stress with our group is the EPA is not the enemy. The EPA is the federal agency that's charged with cleaning this mess up in a way that's protective of environmental and human health. The potentially responsible parties aren't the enemy, they are the people with the money. They are the people that caused the problem in the first place, but they are also the people with the money and the expertise to help remediate the problem.
To me, this is only my opinion, to me the enemy is us, our political will or lack of it. The only way this is going to get cleaned up is if people pay attention to what's going on, educate yourselves, as I am trying to educate myself for our situation in Kalamazoo, and help the PRP's and the EPA do the right thing. The biggest fault that I have seen, which again is a similarity that I have seen, I have seen here between the Fox River project and the Kalamazoo project, is the tendency for secrecy. Our group is working very diligently. We really surprised the EPA by being successful in having the EPA change -- Region 5 Administrator Mary Dane (phonetic) announced that they changed their minds. They had gone back to the potentially

16 responsible parties, modified the dumping plan, and
17 they are no longer bringing the PCB dredge materials
18 to a site that already has PCB dredge materials,
19 mind you, because of the political opposition to
20 that.
21 What they were forced to do -- I say
22 "forced." That may be a little strong. What they
23 decided to do is to take the PCB sediments that are
24 over 50 parts per million, class 3 I think it is, to
25 a landfill over by Detroit. Someone mentiond that
1 they were bringing it over to Michigan. It's a
2 little longer haul for you. For us it's about a
3 two-and-a-half hour, three-hour drive from our site.
4 So the material over 50 parts per million is being
5 taken to that landfill. The material that's less
6 than 50 parts per million is taken to a
7 papermill-owned landfill, if you will, but not in
8 Kalamazoo.
9 So being able to actually affect the plan
10 through political action. And, again, with the
11 political leaders. It wasn't just me waving my
12 sign, it was about 300 people who waved signs and
13 went to meetings. They wrote letters. It was our
14 political representatives, the ones that saw which
15 way the wind was blowing, they went ahead and went
16 back to the PRP's and modified what the plan was.
17 Again, you are looking at a modified plan here. And
18 it's going to take the political will of the people
19 to have an impact on that plan.
20 So thanks for the opportunity of learning
21 what's going on here in the Fox River. If you have
22 any questions and would like to speak with someone
23 about what's going on in Kalamazoo, I'd be glad to
24 speak with someone here, maybe after the meeting.

Agencies Response

Thank you for your comment.

25 SUSAN PASTOR: Who has 20?
1 RAYANNEN BENTLEY: Rayannen Bentley,
2 R-a-y-a-n-n-e-n, B-e-n-t-l-e-y, and I am
3 representing the University of Wisconsin Fox Valley
4 Student Association and the Campus Activities Board.
5 I would just like us to consider the
6 definition of "contamination." I think that
7 maintaining PCB levels and the cap along with sand
8 cover every five years isn't going to do anything to
9 reach these issues. We've been talking all evening
10 about constant maintenance and just looking at the
11 cap and making sure that everything is still fine.
12 When we go down to every five years, that's hardly
13 constant maintenance.
14 Also, we are told that this is going to be
15 a permanent structure with indefinite maintenance by
16 those -- paid for by those who are deemed

17 responsible. But covering up contaminants does not
18 remove them, and this is going to result in the
19 eventual -- probably result in the eventual removal
20 of the sand cover caps, and it leaves the problem
21 for our children and our grandchildren to deal with.
22 As far as the latest science is concerned,
23 it's surely not restricted to discovering the
24 problems and covering them up. It's not our only
25 option. Menasha town representative had stated that
1 he supports the revised plan under current
2 technology standards and that he would be willing to
3 revisit it in the future if other options come up.
4 Capping and sand covering shouldn't be considered as
5 a good enough for now option.
6 What I would like to hear from several
7 scientists that are present is the prospective
8 options using PCB-consuming bacteria. And, even if
9 we are not ready right now to utilize such a method
10 within our body of water, we implement such
11 procedures within our landfills. And the EPA could
12 surely help secure funding of grants to promote
13 viable solutions such as this. That's it. Thanks.

Agencies Response

Responses to these comments are addressed in Section 1, Agencies Response to Comment 1, page 7, above. Regarding monitoring of the cap, experience on many other capping projects, that the frequency of monitoring is sufficient, particularly considering that “trigger” events would result in more frequent monitoring.

14 SUSAN PASTOR: Okay. Thank you. 37.
15 Anything past those numbers. Okay. Well, then I
16 guess we will thank you for coming. We have lots of
17 people who would be happy to stick around and talk
18 with you a little longer. Posters, a model of the
19 cap, all kind of things. If you want to give us
20 your comments in writing, we can take them from you
21 tonight. You can use the mailer in the middle, you
22 can fax, you can e-mail, you can write it on a
23 regular piece of paper. You have till January 31 to
24 get those to us. If you have any questions in the
25 meantime, be sure to contact us. Thanks for
1 coming.
2 (The meeting concluded at 8:43 p.m.)
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12
Transcript of Little Lake Butte des Morts Proposed Plan Meeting 12/13/2007

1 C E R T I F I C A T E
2 STATE OF WISCONSIN)
3)
4 COUNTY OF KEWAUNEE)
56

I, Nancy M. Baux, Certified Professional
7 Reporter, hereby certify that the foregoing is a true and
8 accurate transcript of the proceedings had and testimony
9 taken in the aforementioned matter.
10 Dated this 21st day of December 2007.
11
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18 _____
19 Nancy M. Baux
20 Certified Professional Reporter
21
22
23

Attachment 1. Summary of Contaminated Sediment Capping Projects

Sediment Project	Chemicals of Concern	Site Conditions	Design Thickness (feet)	Cap Material	Year Constructed	Performance Results	Comments
Great Lakes Region							
Sheboygan River/Harbor Wisconsin	PCBs		Composite of geotextile on fabric, 6" aggregate, geotextile, 6" cobble, with the perimeter anchored with gabions	armored stone composite	1989–1990	• Undetermined cap effectiveness • Some erosion of fine-grained material • WDNR/EPA order cap removal in ROD	Demonstration bench-scale project. Composite armored cap required as sediments were located in high-energy river environment. Gabions placed around the corners for anchoring. Additional course material placed into voids/gaps.
Wausau Steel Site Wisconsin	lead, zinc, mercury	Oxbow on the Big Rib River, nearshore cap	2	composites and over geotextile	1997	• Chemical isolation failed • Cap not physically stable	Methane gas trapped under the geotextile forced cap to rise in the center, pulling away geotextile from the edge. Sand erosion also occurred in the nearshore areas.
Manistique Capping Project Michigan (pilot)	PCBs		40-mil (0.1')	HDPE	1993	• Physical inspection of the temporary cap approximately 1 year after installation showed cap was physically intact and most anchors still in place, but was methane-filled	A 240' by 100' HDPE temporary cap was anchored by 38 2-ton concrete blocks placed around the perimeter of the cap. This temporary cap was installed to prevent erosion of contaminated sediments within a river hotspot with elevated surface concentrations.
Hamilton Harbor Ontario, Canada	PAHs		1.6	sand (2.5 acres) (in situ)	1995	• Chemical isolation effective • No erosion of cap	Cap monitoring in porewater ongoing.
Puget Sound Region							
Duwamish Waterway Seattle, Washington	heavy metals, PCBs		1–3	sand (4,000 cy)	1984	• Chemical isolation effective • No erosion of cap	Monitoring as recent as 1996 showed cap remains effective and stable. Split-hull dump barge placed sand over relocated sediments (CAD site) in 70' water.

Sediment Project	Chemicals of Concern	Site Conditions	Design Thickness (feet)	Cap Material	Year Constructed	Performance Results	Comments
One Tree Island Olympia, Washington	heavy metals, PAHs		4	sand	1987	• Chemical isolation effective • No erosion of cap	Last monitoring occurred in 1989 showed that sediment contaminants were contained.
St. Paul Waterway Tacoma, Washington	phenols, PAHs, dioxins		2–12	coarse sand	1988	• Chemical isolation effective • Cap within specifications	Some redistribution of cap materials has occurred, but overall remains >1.5 m (4.9'). C. californieus found in sediments, but never >1 m (3.3').
Pier 51 Ferry Terminal Seattle, Washington	mercury, PAHs, PCBs		1.5	coarse sand (4 acres) (in situ)	1989	• Chemical isolation effective • Cap within specifications • Recolonization observed	As recent as 1994, cap thickness remained within design specifications. While benthic infauna have recolonized the cap, there is no indication of cap breach due to bioturbation.
Denny Way CSO Seattle, Washington	heavy metals, PAHs, PCBs	water depth 18'–50'	2–3	sand (3 acres)	1990	• Chemical isolation effective • Cap within specifications • Recolonization observed	Cores taken in 1996 show that while cap surface chemistry shows signs of recontamination, there is no migration of isolated chemicals through the cap.
Piers 53–55 CSO Seattle, Washington	heavy metals, PAHs		1.3–2.6	sand (4.5 acres) (in situ)	1992	• Chemical isolation effective • Cap stable, and increased by 15 cm (6") of new deposition	Pre-cap infaunal communities were destroyed in the rapid burial associated with cap construction, but had recovered by 1996. The initial community established in the sand over time shifted as fine-grained material was redeposited on the cap.
Pier 64 Seattle, Washington	heavy metals, PAHs, phthalates, dibenzofuran		0.5–1.5	sand	1994	• Some loss of cap thickness • Reduction in surface chemical concentrations	Thin-layer capping was used to enhance natural recovery and to reduce resuspension of contaminants during pile driving.
GP lagoon Bellingham, Washington (in situ)	mercury	Shallow intertidal lagoon	3	sand	2001	• Chemical isolation effective at 3-months • Cap successfully placed	Ongoing monitoring.
East Eagle Harbor/Wyckoff Bainbridge Island, Washington	mercury, PAHs		1–3	sand (275,000 cy)	1994	• Chemical isolation effective • Cap erosion in ferry lanes • Some recontamination observed due to off-site sources	Cap erosion measured within first year of monitoring only in area proximal to heavily-used Washington ferry lane. Chemicals also observed in sediment traps. Ongoing monitoring.

Sediment Project	Chemicals of Concern	Site Conditions	Design Thickness (feet)	Cap Material	Year Constructed	Performance Results	Comments
West Eagle Harbor/Wyckoff Bainbridge Island, Washington (in situ)	mercury, PAHs	500-acre site	Thin cap 0.5' over 6 acres and thick cap 3' over 0.6 acre	sand (22,600 tons for thin cap and 7,400 tons for thick cap)	partial dredge and cap 1997	• Chemical isolation effective	To date, post-verification surface sediment samples have met the cleanup criteria established for the project. Ongoing monitoring.
<u>California and Oregon</u>							
PSWH Los Angeles, California	heavy metals, PAHs	15		sand	1995	• No data to date	Overall effective cap was >15'. This was not a function of design, but rather a function of the low contaminated-to-clean sediment volume.
Convair Lagoon San Diego, California	PCBs	5.7-acre cap in 10-acre site; water depth 10'–18'	2' of sand over 1' rock	sand over crushed rock	1998	• Chemical isolation effective • Cap was successfully placed • Some chemicals observed in cap	Ongoing monitoring for 20 to 50 years including diver inspection, cap coring, biological monitoring.
McCormick and Baxter Portland, Oregon	heavy metals, PAHs	15 acres of nearshore sediments and soils	NA	sand	planned, but not constructed	• No data to date	Long-term monitoring, OMMP, and institutional controls were also specified.
<u>New England/New York</u>							
Stamford-New Haven-N New Haven, Connecticut	metals, PAHs		1.6	sand	1978	• Chemical isolation effective	Cores collected in 1990.
Stamford-New Haven-S New Haven, Connecticut	metals, PAHs		1.6	silt	1978	• Chemical isolation effective	Cores collected in 1990.
New York Mud Dump Disposal Site New York	metals (from multiple harbor sources)		unknown	sand (12 million cy)	1980	• Chemical isolation effective	Cores taken in 1993 (3.5 years later) showed cap integrity over relocated sediments in 80' of water.

Sediment Project	Chemicals of Concern	Site Conditions	Design Thickness (feet)	Cap Material	Year Constructed	Performance Results	Comments
Mill-Quinniapiac River Connecticut	metals, PAHs		1.6	silt	1981	• Required additional cap	Cores collected in 1991.
Norwalk, Connecticut	metals, PAHs		1.6	silt	1981	• No problems	Routine monitoring.
Central Long Island Sound Disposal Site (CLIS) New York	multiple harbor sources		unknown	sand	1979–1983	• Some cores uniform structure with low-level chemicals • Some cores chemical isolation effective • Some slumping	Extensive coring study at multiple mounds showed cap stable at many locations. Poor recolonization in many areas.
Cap Site 1 Connecticut	metals, PAHs		1.6	silt	1983	• Chemical isolation effective	Cores collected in 1990.
Cap Site 2 Connecticut	metals, PAHs		1.6	sand	1983	• Required additional cap	Cores collected in 1990.
Experimental Mud Dam New York	metals, PAHs		3.3	sand	1983	• Chemical isolation effective	Cores collected in 1990.
New Haven Harbor New Haven, Connecticut	metals, PAHs		1.6	silt	1993	• Chemical isolation effective	Extensive coring study.
Port Newark/Elizabeth New York	metals, PAHs		5.3	sand	1993	• Chemical isolation effective	Extensive coring study.
52 Smaller Projects New England	metals, PAHs		1.6	silt	1980–1995	• Chemical isolation effective	Routine monitoring.

Sediment Project	Chemicals of Concern	Site Conditions	Design Thickness (feet)	Cap Material	Year Constructed	Performance Results	Comments
Other North American Projects							
Soda Lake, Wyoming	oil refinery residuals	soft, unconsolidated sediments	3	sand	2000	• Chemical isolation effective	Demonstration project that showed successful placement over soft sediments and isolation of PAHs and metals in refinery residuals.
International Projects							
Rotterdam Harbor Netherlands	oils	water depth5 to 12 m	2–3	silt/clay sediments	1984	• No available monitoring data	As pollution of groundwater was a potential concern, the site was lined with clay prior to sediment disposal and capping.
Hiroshima Bay Japan		Waterdepth 21 m	5.3	sand	1983	• No available data	

Appendix B

Administrative Record Index

VOLUME GUIDE

LOWER FOX RIVER NRDA/PCB RELEASES SITE

ADMINISTRATIVE RECORD

DOCUMENTS BY VOLUME

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VOLUME #3.....DOCUMENTS #33 - #36

VOLUME #4.....DOCUMENTS #37 - #42

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VOLUME #7.....DOCUMENTS #43

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U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD
FOR
LOWER FOX RIVER NRDA/PCB RELEASES SITE
GREEN BAY, BROWN COUNTY, WISCONSIN

ORIGINAL
SEPTEMBER 28, 2001

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	00/00/00	U.S. DOI/ U.S. Fish & Wildlife Service	Public	Pamphlet: Beyond Cleanup-- Restoring America's Natural Heritage	8
2	00/00/00	U.S. EPA/ GLNPO	Public	Environmental Fact Sheet re: Contaminated Sediments	4
3	00/00/00	U.S. EPA/ WDNR	Public	Blank Questionnaire re: Lower Fox River and Green Bay Environment	4
4	00/00/00	U.S. EPA	Public	Fact Sheet: Fox River and Green Bay Natural Resource Damage Assessment	1
5	00/00/00	U.S. EPA	Public	Fact Sheet: Polychlorinated Biphenyls (PCBs)	2
6	00/00/00	U.S. EPA	Public	Fact Sheet: NPL Listing of the Lower Fox River- Questions and Answers About Providing Public Comments	1
7	00/00/00	U.S. EPA	File	Maps/Photographs/Tables: Change in the Lower Fox River True Elevation 1995-2000 w/ Summary of Field Analysis	23
8	00/00/00	WDNR	Public	Pamphlet: Fox River Deposit N Removal	8
9	00/00/00	WDNR	Public	Informational Bulletin: Frequently Asked Questions Concerning the Fox River	4
10	00/00/66	U.S. Geological Survey	File	Surface Water Features Map for Escanaba, WI Quadrangle	1
11	03/00/76	U.S. EPA/ OTS	U.S. EPA	Conference Proceedings: National Conference on Polychlorinated Biphenyls	5

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
12	09/21/76	Kleinert, S., WDNR	WDNR	Report: The PCB Problem in Wisconsin	24
13	02/25/77	Versar, Inc.	U.S. EPA	Report: PCBs Involvement in the Pulp and Paper Industry	113
14	04/15/77	Easty, D., Institute of Paper Chemistry	Ross, O., Bergstrom Paper Company	Letter re: Report on the Polychlorinated Biphenyls Obtained for the Influent and Effluent Samples Collected at the Bergstrom Paper Company	83
15	06/20/78	Mueller, G., Wisconsin Tissue Mills, Inc.	Asmuth, J., Wisconsin Tissue Mills, Inc.	Letter Forwarding Copy of WPDES Permit Application	18
16	06/23/78	Fort Howard Paper Company	WDNR	WPDES Permit Renewal Application for the Fort Howard Paper Company	27
17	06/28/78	WDNR	American Can Company	Wastewater Discharge Permit Application for the American Can Company	30
18	09/00/78	U.S. EPA/ GLNPO	U.S. EPA/ WDNR	Report: Investigation of Chlorinated and Nonchlorinated Compounds in the Lower Fox River Watershed	242
19	00/00/82	U.S. Geological Survey	File	Surface Water Features Map for Sturgeon Bay/ Shawano, WI Quadrangles	1
20	06/07/82	Shah, B., Wisconsin Tissue Mills, Inc.	Mueller, G., Wisconsin Tissue Mills, Inc.	Memorandum re: Effluent PCB Data Since 1973	4
21	11/03/82	Larsen, M., Wisconsin Tissue Mills, Inc.	Mueller, G., Wisconsin Tissue Mills, Inc.	Memorandum re: PCB Levels vs. Pounds Per Day Suspended Soils	2

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
22	00/00/84	U.S. Geological Survey	File	Quadrangle Map for Appleton, WI	1
23	00/00/84	U.S. Geological Survey	File	Topographic Map for Appleton, WI	1
24	00/00/84	U.S. Geological Survey	File	Topographic Map for Shawano, WI	1
25	10/26/84	Federal Register	Public	Rules and Regulations: Appendix B to Part 136 (Definitions and Procedures for the Determination of the Method Deduction Limit and Appendix C (Inductively Coupled Plasma-Atomic Emission Spectrometric Method for Trace Element Analysis of Water and Wastes Method)	7
26	07/03/86	WDNR	File	Map: Wisconsin Wetlands Inventory-Brown County	1
27	07/05/86	WDNR	File	Map: Wisconsin Wetlands Inventory-Winnebago County	1
28	09/00/86	WDNR	File	Method 8080: Organo-chlorine Pesticides and PCBs	27
29	03/11/88	Swackhammer, D., University of Minnesota	U.S. EPA/ GLNPO	Quality Assurance Project Plan for the Green Bay Mass Balance Study	24
30	06/00/88	WDNR	File	Report: Lower Fox River and Green Bay Harbor PCB Sediment Sampling Data	36
31	00/00/90	WDNR	File	Tables: PCB Discharge Outfall 001 (1976-1990) and PCB Discharge Combi-nation Outfall for the Fort Howard Corporation	2

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
32	12/14/90	Federal Register	Public	Hazard Ranking System-Final Rule (40 CFR Part 300)	184
33	04/24/91	Call, D., et al.; University of Wisconsin	U.S. EPA	Memorandum re: Submission of Congener-Specific PCB Reports for the Dissolved and Particulate Fractions of Water Samples Collected by EPA GLNPO (June 1989, Cruise #3)	135
34	04/25/91	Behrens, R., WDNR	Acierto, L., U.S. EPA	Letter re: List of Facilities Believed to have Discharged PCBs into the Fox River and Estimates of PCB Discharges to Green Bay and Lake Michigan	4
35	06/03/91	Getty, K., Ecology and Environment, Inc.	Staff	Memorandum re: New Superfund Chemical Data Matrix for HRS Preparation w/ Attachments	193
36	07/17/91	Call, D., et al.; University of Wisconsin	U.S. EPA	Memorandum re: Submission of Congener-Specific PCB Reports for the Dissolved and Particulate Fractions of Water Samples Collected by EPA (July 1989, Cruise #4)	247
37	08/14/91	Call, D., et al.; University of Wisconsin	U.S. EPA	Memorandum re: Submission of Congener-Specific PCB Reports for the Dissolved and Particulate Fractions of Water Samples Collected by EPA (September 1989, Cruise #5)	410
38	00/00/92	U.S. Geological Survey	File	Quadrangle Map for Neenah, WI	1
39	00/00/92	DeLorme Mapping Company		Photocopies of Topographical Maps from Wisconsin Atlas & Gazetteer	16
40	08/05/92	WDNR	File	Map: Wisconsin Wetlands Inventory-Brown County (Revised)	1

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
41	11/02/92	WDNR	File	Map: Wisconsin Wetlands Inventory-Brown County (Revised)	1
42	12/00/92	U.S. EPA/ GLNPO	U.S. EPA	Green Bay/Fox River Mass Balance Study: Preliminary Management Summary	27
43	1993-2001	Various Newspapers	Public	Newspaper Clippings for the Period 1993 to 2001 re: Lower Fox River NRDA Site	2356
44	02/00/93	WDNR	File	Document for Development of Sediment Quality Objective Concentrations for PCBs in Deposit A, Little Lake Butte Des Morts	150
45	07/08/93	Baker, B., WDNR	Kopecky, M., WDNR	Memorandum re: Use of Point Source Discharge Data from the Green Bay Mass Balance Study	23
46	00/00/94	WDNR	Public	Fact Sheet: 1994 Update to Toxic Chemical Series for Polychlorinated Biphenyls (PCBs)	2
47	04/00/94	Agency for Toxic Substances and Disease Registry	Public	Fact Sheet re: ATSDR	2
48	08/00/94	U.S. EPA/ OERR	U.S. EPA	Fact Sheet: Common Chemicals Found at Superfund Sites	4
49	09/00/94	WDNR	File	Method 8081: Organochlorine Pesticides and PCBs as Aroclors by Gas Chromatography: Capillary Column Technique	75
50	00/00/95	U.S. Geological Survey	WDNR	Report: Distribution and Transport of Polychlorinated Biphenyls in Little Lake Butte Des Morts, Fox River, Wisconsin, April 1987 - October 1988	49

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51	00/00/95	U.S. Geological Survey	WDNR	Water Resources Data for Wisconsin-Water Year 1995	113
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3	A	1	366	2736	2/25/1999	RETEC	**Draft** Feasibility Study (Feb. 1999)
3	A	1	376	9847	October 2001	Prepared for: WDNR	**Draft Feasibility Study**; Lower Fox River and Green Bay, Wisconsin, Remedial Investigation **and Feasibility Study**, Volume I (1) - Sections 1 through 11
3	A	1	376.01	9848	October 2001	Prepared for: WDNR	**Draft Feasibility Study**; Lower Fox River and Green Bay, Wisconsin, Remedial Investigation **and Feasibility Study**, Volume II (2) - Appendices A through G
3	A	5	377	9838	September 25, 2001	Lynch, Ed	**Subject**: Data on Little Lake Butte des Morts; Attached are several items provided by WTMA **and** PH Glatfelter at a February 7, 2001 meeting with WDNR and USEPA representatives
4	A	1	400.01	4534	December 14, 2000		**Automated** License Issuance System (ALIS) County Approval Totals Report 1999 License **Year**, Sales as of 12-14-2000 (Statistics on Numbers of Fishing Licenses in Wisconsin by **County**, Provided by David Webb)
4	A	1	400.02	4536		USDHHS	**Toxicological** Profile for Polycholorinated Biphenyls (Update) September 1997
4	A	1	400.03	4537	June 15, 1998	RETEC	**Screening** Level Human Health and Ecological Risk Assessment Lower Fox River Site Wisconsin
4	A	1	420	9849	October 2001	Publication: Prepared for WDNR	**Draft** Baseline Human Health and Ecological Risk Assessment; Lower Fox River and Green **Bay**, Wisconsin, Remedial Investigation and Feasibility Study, Volume I (1) - Sections 1 **through** 8
4	A	1	420.01	9850	October 2001	Publication: Prepared for WDNR	**Draft** Baseline Human Health and Ecological Risk Assessment; Lower Fox River and Green **Bay**, Wisconsin, Remedial Investigation and Feasibility Study, Volume II (2) - Appendices A **through** 8
4	A	1	501	6213	1999 Pub Date: Febru	Publication: Prepared for Wisconsin Department of Natural Resources, Madison, WI.	**Baseline** Human Health and Ecological Risk Assessment: Lower Fox River, Wisconsin. **Report #**: ThermoRetec Project No.: 3-3584-435
4	B	1	400.26	4560		Cox, M.; Cantilli, B.	**RE**: Calculation of Consumption Weighted Percent Mean Lipid Value for Human Health Using **the** 1993 West Study
4	B	1	505	1132		USEPA, US Dept of H & H Services	**Report**: Draft only- Public Health Implications of Exposure to PCBs
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4	C	1	400.18	4552	February 2000	Sprenger, M. (ERT); Kracko, K. (Response Engineering and Analytical Contract/ERT)	**Focused** Ecological Risk Assessment for the Upper Green Bay Portion of the Fox River **Green** Bay, Wisconsin
4	C	1	400.19	4553		West, P.; Fly, J.; Marans, R.; Larkin, F.; Rosenblatt, D.	**1991**-92 Michigan Sport Anglers Fish Consumption Study, Final Report to the Michigan Great **Lakes** Protection Fund, Michigan Dept. of Natural Resources
4	C	1	400.2	4554		Water Quality Section, American Fisheries Society	**Recommendations** for the Second Federal-State Action Plan for Fish Consumption Advisories

4	C	1	400.21	4555	March 1, 1998	Environmental Health Sciences Group, Health and Environment Studies and Systems Division	Daily Average Per Capita Fish Consumption Estimates Based on the Combined USDA 1989, 1990, and 1991 Continuing Survey of Food Intakes by Individuals (CSFII), Volume I Uncooked Fish Consumption National Estimates
4	C	1	400.22	4556		Great Lakes Sport Fish Advisory Task Force	Protocol for a Uniform Great Lakes Sport Fish Consumption Advisory
4	C	1	400.23	4557		Fiore, B.; Anderson, MD, H.; Hanrahan, MS, L.; Olson, PhD, L. (Section of Environmental Health, WI Division of Health); Sonzogni, PhD, W.; Wisconsin Laboratory of Hygiene	Sport Fish Consumption and Body Burden Levels of Chlorinated Hydrocarbons: A Study of Wisconsin Anglers
4	C	1	400.25	4559		WI Department of Health and Social Services	WI Division of Health and the State Laboratory of Hygiene Study of Sport Fishing and Fish Consumption Habits and Body Burden Levels of PCBs, DDE, and Mercury of Wisconsin Anglers, Final Report to Study Participants
4	C	1	507	1149		Dykstra, C.J.R. (USFWS, Green Bay); Meyer, M. W. (WDNR, Rhinelander)	Interim report: Effects of Contaminants of Reproduction of Bald Eagles on Green Bay, Lake Michigan Feb. 1996
6	B	1	701.45	6989	April 14, 2000	American Geological Institute (AGI)	Peer Review of Models Predicting the Fate and Export of PCBs in the Lower Fox River Below DePere Dam. A Report of the Lower Fox River Fate and Transport of PCBs Peer Review Panel, Administered by the American Geological Institute (AGI)
6	B	1	726	9845	October 2001	Prepared for: WDNR	Draft Model Documentation Report; Lower Fox River and Green Bay, Wisconsin Remedial Investigation and Feasibility Study, Volume I (1)
6	B	1	726.01	9846	October 2001	Prepared for: WDNR	Draft Model Documentation Report; Lower Fox River and Green Bay, Wisconsin, Remedial Investigation and Feasibility Study, Volume II (2)
8	A	2	939	9842	September 28, 1998	Delacensarie, D.J.; Kuhlmann, W. ; on behalf of et al.	Natural Resource Damage Assessment (NRDA) Public Comments - RE: Fox River NRDA/ PCB Releases, TDD S05-9706-023
9	B	1	10279	2532	December 1997	Foth & Van Dyke and Assoc, Inc.	Dep N- Report; Final- Pre-Design Phase- Quality Assurance Project Plan (QAPP) December 1997
9	B	1	10280	2529		Foth & Van Dyke and Assoc, Inc.	Dep N- Report; Interim Project Report January 1999
9	C	1	10005	9856	September 2001	Prepared for: FRG and WDNR	Final Summary Report, Sediment Management Unit (SMU) 56/57 Demonstration Project, Fox River, Green Bay, Wisconsin, September 2001, Project No. 1242291/2082057.01470101
9	C	1	10404	2184		Montgomery Watson	56/57 WPDES Permit Application - Sediment Removal Demonstration Project- Fox River- Green Bay, Wisconsin July 1998
9	C	1	10450	2173		Montgomery Watson	56/57 Operational Monitoring Quality Assurance Project Plan- Sediment Removal Demonstration Project- Fox River- Green Bay, Wisconsin Aug. 1999
**	A	1	1160	6568	February 1994	Woodward-Clyde Consultants (WWC)	Estimate of PCB Losses During Remediation, Little Lake Butte Des Morts, Deposit A Winnebago County, Wisconsin; Project Number 15605-12
**	A	1	1162	2482		EWI Engineering Associates, Inc.	Dep A- Little Lake Butte Des Morts/ Remedial Investigation and Feasibility Study (Proposal) March 1991

**	A	1	1164	2491	Woodward-Clyde Consultants (WWC)	Dep A- Final Report: Little Lake Butte Des Morts Proposed Plan Sept. 1993
**	A	1	1164	2492	Woodward- Clyde Conultants	Dep A- Design Report/ Little Lake Butte Des Morts/ Deposit A/ Winnebago County, WI Oct 1994
**	A	1	1164	2493	Woodward-Clyde Consultants (WWC)	Dep A- Construction Plans for Environmental Cleanup (Map)
**	A	1	1166	2494	Woodward-Clyde Consultants (WWC)	Dep A- Little Lake Butte Des Morts/ Neenah Slough Sediment Contamination and Transport Analysis/ Neenah, Wisconsin Dec. 1994
**	A	1	1167	6439	November 1991	Task 3: Sediment Transport: Deposit A, Little Lake Butte des Morts Report #: Technical Memorandum Project No. 15605.00
**	B	1	1103	2201	September 24, 1996 GAS; SAIC	Appendices, Remedial Investigation Report for Contaminated Sediment Deposits on the Fox River (Little Lake Butte Des Morts to the De Pere Dam), September 24, 1996 (unbound copy)
**	B	1	1103	2202	September 24, 1996 GAS; SAIC	Remedial Investigation Report for Contaminated Sediment Deposits on the Fox River (Little Lake Butte Des Morts to the De Pere Dam), September 24, 1996 (unbound copy)
**	B	1	1104	2203	April 1997 GAS; SAIC	Feasibility Study Report for Deposits POG and N on the Fox River, Final Draft, April 1997 (unbound copy)
**	B	1	1105	2204	April 1997 GAS; SAIC	Feasibility Study Report for Deposits POG and N on the Fox River, Final Draft, April 1997 (bound copy)
D	N	R	1			RRB Comments and Region 5 Response
D	N	R	2			Peer Review Reports and Region 5 Response
D	N	R	3			FRG Peer Reviews
D	N	R	4			API Consent Order

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
LOWER FOX RIVER NRDA/PCB SITE
GREEN BAY, BROWN COUNTY, WISCONSIN

UPDATE #1
NOVEMBER 7, 2006

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	06/07/04	Fort James Operating Company, Inc. & NCR Corporation	WDNR and U.S. EPA	Pre-Design Sampling Plan for the Lower Fox River Site Operable Units 2-5 w/Appendices	2499
2	06/07/04	Fort James Operating Company, Inc. & NCR Corporation	WDNR and U.S. EPA	Work Plan for the Remedial Design of Operable Units 2,3,4, and 5 for the Lower Fox River and Green Bay Site w/Appendices	202
3	06/08/04	Fort James Operating Company, Inc. & NCR Corporation	WDNR and U.S. EPA	Pre-Design Sediment Poling Plan for the Lower Fox River Site Operable Units 4 and 5 w/Appendices	86
4	06/16/06	Fort James Operating Company, Inc. & NCR Corporation	WDNR and U.S. EPA	Final Basis of Design Report for the Lower Fox River and Green Bay Site Volumes 1 and 2	926
5	06/16/06	Fort James Operating Company, Inc. & NCR Corporation	WDNR and U.S. EPA	Lower Fox River Baseline Monitoring Plan w/Appendices	1118
6	06/16/06	Fort James Operating Company, Inc. & NCR Corporation	WDNR and U.S. EPA	Supplemental Data and Memos for the Lower Fox River and Green Bay Site	494
7	11/00/06	U.S. EPA and WDNR	Public	ROD Amendment Proposed Plan for the Lower Fox River and Green Bay Site w/Supporting Technical Memorandum	22

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
LOWER FOX RIVER/GREEN BAY SITE
OPERABLE UNITS 2-5

UPDATE #2
JUNE 26, 2007

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	11/28/06-04/19/07	Various	U.S. EPA	Comments Received from Local Government Entities and Representatives re: Proposed Change in the Cleanup for Operable Units 2-5 at the Lower Fox River Site	32
2	11/13/06-01/11/07	Fox Valley Sierra Club	Gade, M., U.S. EPA	Pre-Printed Public Comment Post Cards re: Proposed Change in the Cleanup for Operable Units 2-5 at the Lower Fox River Site (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	232
3	12/01/06-01/18/07	Various	U.S. EPA	Comments Received from Local Business, Organizations and Associations re: Proposed Change in the Cleanup for Operable Units 2-5 at the Lower Fox River Site	114
4	11/13/06-01/11/07	Concerned Citizens	U.S. EPA	Comments Received from Concerned Citizens re: Proposed Change in the Cleanup for Operable Units 2-5 at the Lower Fox River Site (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	936
5	01/10/07	Georgia-Pacific	U.S. EPA	Signed Petition re: Revised Cleanup Plan for Operable Units 2-5 at the Lower Fox River Site (PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED)	64
6	06/26/07	U.S. EPA	Public	Responsiveness Summary for Operable Unit 2 (Deposit DD), Operable Unit 3, Operable Unit 4 and Operable Unit 5	216

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
7	06/26/07	U.S. EPA	Public	Record of Decision Amendment for Operable Unit 2 (Deposit DD), Operable Unit 3, Oper- Unit 4 and Operable Unit 5 (River Mouth)	51

G	C	S	FC	ID	EndDate	Author/Consultant	DocumentName
1	A	0	112	9772	August 14, 2001		United States of America and the State of Wisconsin vs. Appleton Papers Inc. and NCR Corporation; Complaint, Plaintiff's Notice of Lodging of Consent Decree, Consent Decree, $40 million agreement news release
1	A	0	114	64	February 23, 1998	Meyer, George E., Secretary	RE: Conditionally approving the contract, reiterating state has final approval authority
1	A	0	114	70	January 30, 1998	Meyer, George E., Secretary	RE: Deferring legal action in global settlement, continuing Agreement and requesting renewed commitment to negotiation process, sent to members of FRG
1	A	0	114	9781	June 24, 1998	Lynch, Ed	Subject: Fox River - Screening Level Risk Assessment Forwarding copy
1	A	0	114	9852	February 28, 2000	Travers, Mark A.	Subject: Peer Review of the Human Health and Ecological Risk Assessments, Lower Fox River, Wisconsin; Forwarding the letter of agreement between the FRG and AEHS for conducting the peer review, including the Statement of Work (Attachment 1)
1	A	0	114	9853	April 27 2000	Travers, M.	Subject: American Geological Institute Peer Review, Lower Fox River Wisconsin
1	F	1	156	234	September 10, 1999	RETEC	Supplemental Scope of Work and Budget Estimate to Complete the Lower Fox River RI/FS Data Management, Remedial Investigation/Feasibility Study, and Risk Assessment September 10, 1999. Attached cover letter dated September 29, 1999, to Jim Hahnenberg
1	F	1	156	235	March 10, 1998	RETEC	Draft Scope of Work and Budget Estimate, Data Management, Remedial Investigation Feasibility Study, and Risk Assessment for the Fox River Projects, March 10, 1998. Attached cover letter dated March 10, 1998, to Ed Lynch (WDNR) from Paul Putzier (RETEC)
2	A	0	200	960	August 11, 1998	Lynch, Ed	Subject: Fox River Hazard Ranking System (HRS) Scoring Package; Requesting review and comments on the scoring package
2	A	0	200	965	September 29, 1998	FRG	Comments of the Fox River Group on the United States Environmental Protection Agency's Hazard Ranking System Report for the "Fox River NRDA/PCB Releases" Site and the Proposal for Inclusion of the Site on the National Priorities List
2	A	2	43	932	April 23, 1991	WDNR/USEPA	Reference 39c - Summer 1989 Predator Fish Sampling, Summary of Results, Raw Data and Q
2	A	2	43	933	April 22, 1991	WDNR/USEPA	Reference 39d - Fall 1989 Predator Fish Sampling, Summary of Results, Raw Data and QA/Q
2	A	2	43	934		WDNR/USEPA	Reference 39e - 1989 Predator Fish PCB Fillet Sampling, Summary of Results, Raw Data and
2	A	3	3	863	December 14, 1990		Federal Register, Part II (2), Environmental Protection Agency (USEPA); 40 CFR Part 300 Hazard Ranking System; Final Rule - Reference 1 of Scoring Package
2	A	3	3	9829	June 29, 1998	USEPA	Federal Register, Part IV (4), Environmental Protection Agency (USEPA); 40 CFR Parts 750 and 761 Disposal of Polychlorinated Biphenyls (PCBs); Final Rule
3	A	0	378	9839	June 15, 2001	Hainsworth, G.; Topel, J.	RE: Cost Tables. RETEC has provided the current cost tables to WDNR These tables are not final, but changes have been made to the Fox River Feasibility Study cost tables since submittal of the Pre-Draft Feasibility Study
3	A	0	378	9840	January 31, 2001	Hainsworth, G.; Topel, J.	RE: Cost Tables (not final); Fox River Feasibility Study
3	A	0	378	9841	January 30, 2001	Johnson, Margarte W. (Peg)	Subject: DePere - Green Bay revision 2, Alternate C2 125 ppb action level; 2nd revised cost estimate for C2 with a 24 hour/day, 7 days/week operation
3	A	0	378	9843	September 27, 2000	Olsiewski, Bob	Subject: Intertek Testing Services; Attachments: E-mail with The Wall Street Journal article regarding the investigation of the Intertek Testing Services for potentially falsifying analytical results
3	A	0	378	9844	December 4, 2000	Tremaglio, Richard A.	RE: Field Duplicate Assessment Considerations

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
FOX RIVER NRDA/PCB RELEASES SITE
GREEN BAY, BROWN COUNTY, WISCONSIN

UPDATE #3
NOVEMBER 19, 2007

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	03/30/05	Jury, M., CH2M Hill	Hahnenberg, J., U.S. EPA & G. Hill, WDNR	Lower Fox River Operable Unit 1 Pre-Design-Basis of Design	7114
2	03/00/06	CH2M Hill	GW Partners, LLC	Final Report Lower Fox River Operable Unit 1 Remedial Action: 2004 Remedial Summary Report	617
3	00/00/07	National Academies Press	Public	Report: Sediment Dredging at Superfund Megasites: Assessing the Effectiveness	316
4	01/00/07	Foth & Van Dyke, STS Consultants & CH2M Hill	GW Partners, LLC	Lower Fox River Operable Unit 1 Remedial Action: 2005 Remedial Summary Report	508
5	05/00/07	Foth & Van Dyke, STS Consultants, CH2M Hill & Brennan	GW Partners, LLC	Lower Fox River Operable Unit 1 Remedial Action: 2006 Remedial Summary Report	768
6	11/00/07	Laszewski, S., Foth Infra-structure & Environment and M. Jury, CH2M Hill	Hahnenberg, G., U.S. EPA & G. Hill, WDNR	Lower Fox River Operable Unit 1: OU1 Design Supple-ment	221
7	11/00/07	U.S. EPA	Public	Fact Sheet: EPA Proposes Revisions to Cleanup Plan for Operable Unit 1 (Little Lake Butte des Mortes) at the Lower Fox River/Green Bay Site	8
8	11/19/07	GW Partners	U.S. EPA	Concept Paper: Optimized Remedy for the Lower Fox River Operable Unit 1 Site	24

Appendix C

SWAC Estimating Procedure

Lower Fox River RD/RA Oversight Support Services Project 87500
Boldt Oversight Team
January 29, 2008

SWAC Estimating Procedure

Introduction

The Record of Decisions, for the Lower Fox River and Green Bay Superfund Sites, require remediation of all contaminated sediment exceeding the 1.0 ppm PCB Remedial Action Level (RAL) in OU1, OU 2 (Deposit DD), OU 3, OU 4, and OU5 (River Mouth) either by the primary remedial approach or by one of the alternate remedial approaches discussed in the applicable Record of Decision (ROD). Each ROD establishes two standards that will be used to judge the completion of construction of the Remedy in each Operating Unit (OU): a RAL Performance Standard and a Surface Weighted Average Concentration (SWAC) goal.

Construction of the remedy in an OU will be deemed complete if the RAL Performance Standard has been met throughout the OU. If the RAL Performance Standard has not been met after employing the primary remedial approach and/or the alternate remedial approaches throughout the OU, then the remedy will be deemed complete if the SWAC, as determined by WDNR and USEPA, meets the SWAC goal for an OU. The construction of the remedy will not be deemed complete based on the SWAC goal unless and until all sediment exceeding the RAL has been remediated using the primary remedial approach and/or the alternate remedial approaches.

The current intention of the WDNR and USEPA is to utilize the SWAC estimating procedure as presented herein. However, as more information is collected and field experience gained for these remedial projects, this SWAC estimating procedure could be modified at the discretion of the WDNR and USEPA.

Procedure

Regulatory decision documents associated with the Fox River PCB Superfund Site require that the surface weighted average concentration (SWAC) of PCBs within each operable unit (OU) achieve certain targets after completion of planned remedial activities. However, no documents have rigorously defined the term nor have statistically valid computational procedures been described for estimating this quantity. The objective of this report is to propose a rigorous definition of the SWAC as well as to provide statistically valid estimation methods including procedures to quantify uncertainty.

The SWAC could be estimated using a variety of sampling designs and corresponding analysis methods. This estimation procedure was motivated by the guiding principles to 1) develop an unbiased estimator, 2) develop an analysis method that would not require substantial additional field sampling beyond the certification data already proposed, 3) avoid model based estimators in order to minimize assumptions, and 4) develop a method for which uncertainty could be easily quantified. These principles lead to a design based approach that is common in environmental and ecological studies based on stratified random sampling designs.

It is anticipated that attainment of goals associated with SWAC will be based on these proposed methods and that uncertainty in estimates will be acknowledged and incorporated into the decision process.

The purpose for using SWAC as a measure of remedial success is motivated from the notion that risk to resources within aquatic systems is proportional to exposure to PCBs. Further it is thought that exposure is proportional to the concentrations within the biologically active layer of sediment. The thickness of the biologically active layer has not been conclusively defined for all species and process, but has often been referred to as the top 2 to 12 inches of sediment. For

purposes of this document it is assumed that the responsible parties and agencies will agree to a fixed depth representative of "surface" concentrations appropriate for quantifying exposure and subsequently risk. The important aspect is that if surface sediments are defined to be the top 6 inches of sediment, data used to estimate SWAC must be representative of the top 6 inches of sediment. The depth of sediment samples should ideally coincide or be strongly associated with the defined thickness of surface sediments.

SWAC Definition:

SWAC is the ratio of total PCB mass to total sediment mass on a dry weight basis within the surface sediments of a pre-specified area of interest. This can be restated as the average dry weight PCB concentration within the surface sediments of the pre-specified area of interest.

Estimation:

Because PCB and sediment mass are only known from an incomplete sample of the target population of interest, it is necessary to use statistics to estimate the true population parameter and to quantify the uncertainty in the estimate. Deterministic calculations can and have been used to estimate the population SWAC, however these methods are of limited value due to the failure to quantify uncertainty due to sampling error as well as the potential biases associated with deterministic models that require subjective modeling choices. The methods proposed in this document are unbiased to the population parameters and provide methods to describe uncertainty due to statistical sampling. Other potential uncertainties due to particular data handling techniques are also incorporated.

Error:

Uncertainty in the estimated SWAC can be broadly partitioned into components associated with sampling variation and bias due to certain assumptions necessary to fill data gaps or to accommodate negotiated agreements between the companies and agencies.

Sampling Variation:

Because the SWAC is estimated with sample data there is uncertainty in the estimate that can be attributed to chance errors due to sampling. This type of error can be made arbitrarily small by increasing the number of samples. In the extreme situation, if all of the surface sediment was removed and the PCBs separated from the remaining material and weighed, the sampling error would be reduced to zero. In spite of highly non-normally distributed PCB concentrations, for large sample sizes used to estimate SWAC within operable units, sampling variation of the SWAC can be expected to be approximately normally distributed. Confidence intervals will be used to quantify uncertainty due to sampling variation.

Bias:

Areas that have not been sampled may require imputation of values based on professional judgment and previous experience with other similar areas of the site or other sites. Failure to correctly "guess" concentrations in these areas may result in a bias in the overall estimated SWAC. Bias can be reduced through additional studies and sampling in areas that have not been previously investigated. The potential effects of bias will be quantified by considering a range of plausible situations. In general, the SWAC estimate and its' confidence interval shifts with varying bias.

Lower Fox River RD/RA Oversight Support Services Project 87500
Boldt Oversight Team
January 29, 2008

Stratified Sampling Design:

The SWAC estimation method described in this document is a design based estimator. Design based estimation procedures are directly linked to and determined by the sampling design. In this case sample data will be collected from a series of strata defined by varying treatment techniques. For example, all areas which are un-treated would define one stratum; areas that are sand covered would define another stratum and so forth. For the Fox River it is anticipated that there will be strata corresponding to:

1) no action (i.e., areas with soft sediment less than the RAL);
2) void areas (i.e., areas where sampling occurred but no soft sediments was recovered)
3) sand cover;
4) dredge only;
5) dredge and sand cover;
6) dredge and cap;
7) cap only; and
8) unsampled areas (no-action areas that have not been sampled).

The methods defined in this document are general and can accommodate any number of strata as needed.

It is assumed that sample data are collected within each stratum based on an un-biased sampling design. Qualifying sampling designs could include systematic grids or randomized designs. Sampling designs may vary among strata. For example one may implement a systematic design within the sand covered area and a simple random sampling design within the capped area. To account for varying designs and sample sizes, data are aggregated within strata and then combined appropriately across strata using standard stratified sampling formulas (Cochran 1977).

Definitions:

Suppose that there are $h=1,2,3\ldots,L$ distinct strata that have been sampled. Assume that each stratum has area A_h and that the total area given by the sum of the stratum areas is A. In the description above L would be 5. Within the h^{th} stratum, multiple surface sediment samples are collected from n_h locations using an unbiased statistically valid sampling design. Surface PCB concentrations (x_{hi} $i=1,2,\ldots n_h$) are measured at each location. In what follows these values are assumed to be individual samples. In practice these may be composite samples although for simplicity, the following formulas assume single samples. The equations that follow could be applied to composite samples, or if discrete and composites are to be combined these equations can be modified slightly to accommodate composite sampling.

Further assume that there may be $h=1,2,\ldots M$ strata with area B_h that have not been sampled but which have been assumed to have known average surficial PCB concentrations ($y_{h,}$ $h=1,2,\ldots,M$). Further assume that these strata have combined area given by the sum of the stratum areas B. In practice it is anticipated that there would be at most one stratum that would not have been sampled, but the more general case is illustrated here.

To estimate the overall SWAC for the collection of strata a weighted average of stratum averages is applied. Stratum means and sampling variances are first calculated as

$$\bar{x}_h = \frac{1}{n_h}\sum_{i=1}^{n_h} x_{hi}; \quad s_h^s = \frac{1}{n_h - 1}\sum_{i=1}^{n_h}\left(x_{hi} - \bar{x}_h\right)^2$$

These stratum specific estimates of the mean are combined across strata using the area weighted average

$$\bar{x}_{st} = \frac{\sum_{h=1}^{L}\left(A_h \times \bar{x}_h\right)}{\sum_{h=1}^{L} A_h} = \frac{\sum_{h=1}^{L}\left(A_h \times \bar{x}_h\right)}{A}$$

and the sampling variance of this weighted average is

$$\mathrm{var}\left(\bar{x}_{st}\right) = \frac{1}{A^2}\sum_{h=1}^{L} A_h^2 \times \frac{s_h^2}{n_h}$$

The M unsampled strata can be incorporated into the estimated average, however it would not be generally possible to estimate the precision of these areas due to the lack of sample data with which to estimate sample to sample variation and subsequently variance of the estimated mean. The stratified estimate of the unsampled areas is given by

$$\bar{y}_{st} = \frac{1}{B}\sum_{i=1}^{n_h}\left(B_h \times y_h\right).$$

Finally, the overall estimated SWAC is given by the weighted average of these two stratified sampling estimators

$$SWAC_{Estimate} = \frac{A \times \bar{x}_{st} + B \times \bar{y}_{st}}{A + B}.$$

Assuming that the variance of $\bar{y}_{st}$ is known or can be approximated the sampling variance of $SWAC_{estimate}$ is

$$\mathrm{var}\left(SWAC_{estimate}\right) = \frac{A^2\,\mathrm{var}\left(\bar{x}_{st}\right) + B^2\,\mathrm{var}\left(\bar{y}_{st}\right)}{\left(A+B\right)^2}.$$

If the values in the unsampled areas are truly thought to be known, then the variance of $\bar{y}_{st}$ would be zero and the variance of $SWAC_{estimate}$ simplifies to

$$\mathrm{var}\left(SWAC_{estimate}\right) = \frac{A^2\,\mathrm{var}\left(\bar{x}_{st}\right)}{\left(A+B\right)^2}.$$

Confidence Intervals

It is expected that each stratum will have relatively large numbers of confirmation samples. Because of these large sample sizes it is reasonable to estimate confidence limits based on the central limit theorem which states that for large sample sizes the mean is expected to have an approximately normal sampling distribution. Therefore approximate 100x(1-α)% confidence intervals are given by

$$SWAC_{estimate} \pm z_{1-\alpha/2} \times \sqrt{\mathrm{var}\left(SWAC_{estiamte}\right)}$$

where $z_{1-\alpha/2}$ is a critical value of the standard normal distribution. For example for 95% confidence limits $\alpha = 0.05$ and $z_{1-\alpha/2} = 1.96$.

Discussion

If unsampled areas are small or negligible, then this estimate is dominated by the stratified sampling estimator of the sampled strata. However, if the unsampled areas are large relative to sampled strata, then the estimated *SWAC* will be dominated by the assumptions associated with the unsampled areas and its' sampling variance will reduce to essentially zero. For example if all sand covered areas are assumed to take on a particular concentration, the estimated *SWAC* would be only slightly different from the assumed value of the sand cover area and the confidence intervals would be artificially narrow. Uncertainty in this estimate is a combination of the sampling variation due to sampled strata and the bias associated with misspecification of assumptions in unsampled areas. The sensitivity to these assumptions can be determined by varying the assumed values y_h and plotting the range of confidence limits associated with the range of plausible assumptions. It is preferred that all stratum estimates are based on actual sample data from unbiased sampling designs so that estimates are unbiased and uncertainty is fully captured by the confidence limits.

References

Cochran, W.G. 1977. *Sampling Techniques*, *Third Edition*. John Wiley and Sons, New York.

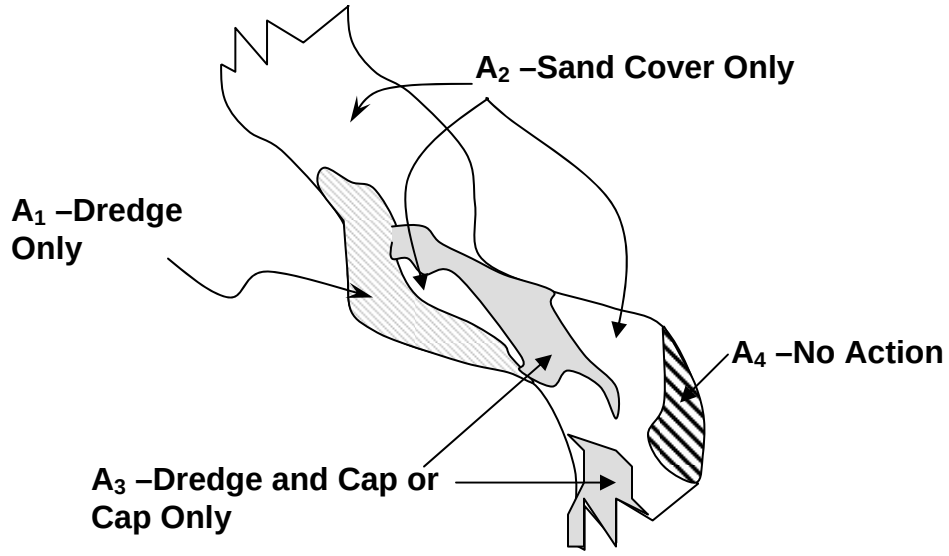

Figure 1. Schematic of strata associated with varying remedial activities.