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**EVALUATION OF FLOODPLAIN  
AREA 6 SOIL REMOVAL WITH  
RESPECT TO THE 10-POINT CRITERIA**

**KOHLER COMPANY  
KOHLER, WISCONSIN**

**PREPARED FOR:**

Kohler Company  
444 Highland Drive  
Kohler, Wisconsin 53044

**PREPARED BY:**

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20900 Swenson Drive, Suite 150  
Waukesha, Wisconsin 53186

June 23, 2005  
GZA File No. 20.0151123.00

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GZA  
GeoEnvironmental, Inc.

Engineers and  
Scientists

June 23, 2005  
File No. 20.0151123.00

Kohler Company  
444 Highland Drive  
Kohler, Wisconsin 53044



Attention: Mr. Dick Pfarrer

Re: Evaluation of Floodplain Area 6 Soil Removal  
With Respect to the 10-Point Criteria  
Kohler Company  
Kohler, Wisconsin

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Dear Mr. Pfarrer:

GZA GeoEnvironmental, Inc. (GZA) is pleased to present this Evaluation of Floodplain Area 6 Soil Removal With Respect to the 10-Point Criteria at the Kohler Company in Kohler, Wisconsin.

Please feel free to contact the undersigned with any questions.

Very truly yours,

GZA GeoEnvironmental, Inc.

A handwritten signature in black ink, appearing to read "Frank A. Jones". The signature is written in a cursive style with a large, sweeping "F" and "J".

Frank A. Jones, Ph.D., DABT  
Senior Toxicologist

A handwritten signature in black ink, appearing to read "John Osborne". The signature is written in a cursive style with a large, looping "J" and "O".

John Osborne, PG  
Principal  
District Office Manager

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Attachments

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EVALUATION OF FLOODPLAIN AREA 6 SOIL REMOVAL  
WITH RESPECT TO THE 10-POINT CRITERIA  
KOHLER COMPANY  
KOHLER, WISCONSIN

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## 1.0 INTRODUCTION

Floodplain Area 6 (Site) is located along the Sheboygan River in Kohler, Wisconsin. It is one of seven Floodplain Areas that were considered for evaluation in the Feasibility Study (FS) Report (BBI, 1998) for the Sheboygan River and Harbor site. Other Floodplain Areas that had been evaluated along the Sheboygan River were not evaluated because the polychlorinated biphenyl (PCB) concentrations in all soil samples were below 7 milligrams per kilogram (mg/kg).



A Statement of Work was prepared for the Remedial Design and Remedial Action for the Upper River Sediment, Floodplain Soil and Tecumseh Products Company Plant site for the Sheboygan River and Harbor Superfund Site (URSOW) (U.S. DOJ, 2003). The URSOW set forth the requirements for implementation of the remedial action set forth in the Record of Decision (ROD). In the section on Floodplain Soil Removal, 10 criteria were listed with the expressed purpose to "balance the remediation of PCB-contaminated soil with maintaining existing high quality ecological habitat." The 10 criteria that were to be used to select areas for soil remediation included, but were not limited to, the following:

1. The magnitude of the PCB concentrations observed;
2. The size of the area containing greater than 10 parts per million (ppm) PCBs;
3. The degree to which the area-averaged PCB concentration exceeds 10 ppm;
4. The quality and value of existing habitat;
5. The extent and duration of habitat disruption that would be associated with remediation, including potential aesthetic impacts;
6. Potential impacts on river bank stability;
7. The accessibility of the area, including consideration of the potential ecological impacts associated with creating access;
8. Implementability considerations;

9. The incremental risk reduction from remediation of an area relative to the incremental effort needed to address that areas; and
10. Any other relevant factors raised by the recharacterization.



Removal of the soils at Floodplain Area 6, where sample concentrations were reported above 10 mg/kg would require removal of a mature riparian and floodplain forest, and following soil removal, replanting of sapling trees. In the FS (BBL, 1998) it was estimated that "it is would likely require tens of years before these areas would provide the type of habitat which they provide in their current state." An evaluation has not been made that balances the destruction of a forest ecosystem that would require decades to restore, to the risk reduction associated with soil removal at Floodplain Area 6. This report provides an initial identification and evaluation of some of the issues relevant to the impact/ benefit analysis.

## 2.0 FLOODPLAIN AREA 6 CHARACTERIZATION

Floodplain Area 6 is located above the Riverbend Dam, on the southern side of the Sheboygan River. It is situated at the beginning of a bend of the river that encompasses the Riverbend Club property. The Floodplain Area 6 is part of the River Wildlife Preserve which is privately owned and access is restricted to club members.

Across the Sheboygan River to the west is the Riverbend Club main building. This historic structure was a former Governor's Mansion, and is currently a private club. Floodplain Area 6 is within view of the Riverbend Club building.

In the FS (BBL, 1998) and the Draft Terrestrial Ecological Risk Assessment (TERA) (United States Environmental Protection Agency [USEPA], 1999) Floodplain Area 6 is described as encompassing an area of 416,537 square feet ( $\text{ft}^2$ ), or approximately 9.6 acres. However, in the Field Report for the Critical Habitat Reconnaissance, Sheboygan River (URS, 2004), the Floodplain Area 6 areal extent is defined as 3.85 acres or 167,706  $\text{ft}^2$ . Based on discussions with Kohler Company personnel and observation of URS maps (URS, 2005) depicting Floodplain Area 6 sampling locations, it is concluded that the areal extent of 3.85 acres is a more accurate representation of Floodplain Area 6.

As part of the critical habitat reconnaissance (URS, 2004) that was conducted to determine if threatened or endangered species were located at any of the floodplain areas, a study was made of the floral and faunal species present at Floodplain Area 6. Floodplain Area 6 was characterized as a floodplain forest composed of mature black willow, box maple, bur oak



and several other deciduous species of trees. No threatened or endangered species were observed at the site during the reconnaissance. A Wildlife Habitat Appraisal Procedure (WHAP) evaluation that was conducted by URS (2004) concluded that Floodplain Area 6 had a moderately high habitat quality score of 73 out of 100. Floodplain Area 6 is a mature floodplain forest of moderately habitat quality.

It should be noted that Floodplain Areas 3, 4 and 5, which have large areas of meadow or grassed areas, had WHAP habitat quality scores ranging from 41 to 44.5. This relatively poor quality habitat is indicative of the post-soil removal habitat at Floodplain Area 6 if the area is seeded with grass and planted with small saplings.

Soil samples were collected from Floodplain Area 6 at 18 locations to define the areas with PCB concentrations above 10 mg/kg (URS, 2005). PCB concentrations above 10 mg/kg were only detected in samples shallower than 1.5 feet. Table 1 lists the concentrations detected in the soil samples, the mean, and the 95 percent upper confidence limit (UCL) on the arithmetic mean. The mean concentration in the 0 to 0.5-foot soil samples was 14 mg/kg, and the 95 percent UCL was 20 mg/kg. Soil samples from 0.5 to 1.5 feet had a mean of 18 mg/kg and a 95 percent UCL of 34 mg/kg. It is estimated that 2,930 cubic yards (yd<sup>3</sup>) of soil would need to be removed, if all soils at or above 10 mg/kg of PCBs are removed based on the results of the 18 samples (URS, 2005).

### 3.0 HUMAN HEALTH RISKS

Human health risks associated with the floodplain soils has been characterized in the Remedial Investigation/Enhanced Screening Report, Endangerment Assessment (EA) (BBL, 1990), the baseline risk assessment prepared as part of the USEPA's Assessment and Remediation of Contaminated Sediments (ARCS) program (USEPA, 1993) and a human health probabilistic risk assessment (ENVIRON, 1995). In all three of these risk assessments, it was concluded that the human health risks associated with floodplain soils were below or within the USEPA acceptable risk guidelines of excess lifetime cancer risks within or below  $10^{-4}$  to  $10^{-6}$ , and non-carcinogenic hazard indices of less than one.

Access to Floodplain Area 6 is restricted because it is part of a private wildlife refuge that is routinely patrolled. The most likely receptor population at the floodplain area would be River Wildlife Club member hikers. There are no established hiking trails or rest areas in the Floodplain Area 6, and during the late spring to early fall, the vegetation would impede easy hiking through the area.



An estimate of the human health risks specific to Floodplain Area 6 can be estimated by assuming that a hiker were to be exposed to Floodplain Area 6 soils via soil ingestion and dermal contact of face, hands and forearms. It is estimated that the hiker would access the site 30 times per year (average of once a week from late spring to early fall). Assuming that the soil concentrations measured in the URS soil samples are used as the floodplain soil concentrations, the exposure period is somewhat limited due to the nature of the site. As discussed in the FS (BBL, 1998), the modeling of the river flow and deposition indicates that the floodplain areas generally receive more river sediments than they lose to scouring. As a result, following remediation of the upper river sediments in 2005, the average concentrations of PCB being deposited will be less than historic deposits. Therefore, average surface soil concentration of PCBs will be lowered by the deposition of new sediments. Although the upper river sediments are scheduled for remediation in 2005, as a conservative estimate, it is assumed that the PCB concentrations measured by URS (2005) are representative of surficial floodplain soil concentrations for 10 years.

The equation and parameters used to calculate the soil ingestion exposure pathway and risks are shown in Table 2. Dermal contact exposure pathway equation, parameters and risks are shown in Table 3. Human health risks associated with the Floodplain Area 6 are the sum total of the hazard quotient (HQ) and excess lifetime cancer risk (ELCR) values listed in Tables 2 and 3. The resulting total soil ELCR of  $1 \times 10^{-6}$ , and HI of 0.17 are within the USEPA range for acceptable risks. As concluded in all of the previous human health risk assessments, the potential risks to human health are within acceptable levels for the floodplain soils.

#### 4.0 ECOLOGICAL RISKS

The section of the Endangerment Assessment (BBL, 1990) assessing potential environmental effects stated that in evaluating potential terrestrial exposure "...the principal concern related to impacts on non-aquatic organisms is the consumption of contaminated food from the Sheboygan River and Harbor." Potential terrestrial populations that were evaluated were fish-eating birds and mink, which also have fish as a high percentage of the diet. Floodplain soils would not be a significant factor in the exposure of fish eating birds and mammals species.

Small  
mammal  
data  
C. G. G. G.  
data

The USEPA Draft TERA (1999) evaluated the floodplain soils at the Sheboygan River and Harbor Site. The focus of the TERA was on potential reproductive impacts to vermivorous (worm-eating) bird species. Reproductive effects in vermivorous birds were considered to be a sensitive endpoint, population and pathway for assessing potential terrestrial



ecosystem risks. An assessment of American Robin (*Turdus migratorius*) risks were evaluated for nestling and fledging foraging exposure.

Using the robin exposure model, preliminary remedial goals for floodplain soils were calculated in Appendix E of the TERA (USEPA). The model utilizes PCB concentrations in eggs to model concentrations in soils that would not exceed an egg concentration that has no observable adverse effect (NOAEC) or the lowest observable adverse effect (LOAEC). Preliminary Remedial Goal (PRG) modeling using a chicken egg LOAEC of 24 mg/kg wet weight (w.w.) resulted in a soil concentration of 3.06 mg/kg. The report stated that removal of Floodplain Area 6 soils at or above 10 mg/kg would result in a surface weighted average concentration (SWAC) of 1.62 mg/kg (see Table 10 of the TERA [USEPA, 1999]). A slight refinement of this assessment would indicate that removal of Floodplain Area 6 soils at or above 18.9 mg/kg would result in the SWAC of 3.06 mg/kg.

Unfortunately the NOAEC and LOAEC egg concentrations used in TERA were based on chickens, and as discussed in the TERA Uncertainty section "...the sensitivity of robins, or other likely vermivorous species at Sheboygan relative to chicken is unknown, but presumably less than for chickens." An additional problem with the chicken egg concentration data was that the study design dosed the chickens with naturally contaminated Saginaw Bay carp. Thus, the chickens were dosed with contaminants other than PCBs, such as metals and dioxins.

The Housatonic River is located in western Massachusetts and is another superfund site as a result of the release of PCBs to a river. The ecological risk assessment for the Housatonic River floodplain soils included an assessment of American robin productivity in the Housatonic River watershed (Arcadis, 2002). A total of 106 active robin nests (44 reference and 62 target nests) were located and monitored during the 2001 breeding season. Viable eggs and nestlings were collected and analyzed for PCB concentrations and various measures of reproductive and rearing success were monitored throughout the 2001 season. The conclusions of this study were that the robin populations exposed to PCBs demonstrated no reduction or impairment of reproductive success. In fact the robin population exposed to PCBs had slightly better reproductive statistics than the reference population (Arcadis, 2002).

Measured robin egg PCB concentrations from the Housatonic River study ranged from 5.04 to 170 mg/kg (w.w) (Arcadis, 2002). Using the robin egg concentration NOAEC of 170 mg/kg in the robin PRG model in Appendix E of the TERA (USEPA, 1999) results in a floodplain soil concentration of 27.5 mg/kg. To generate a PCB SWAC of 27.5 mg/kg at Floodplain Area 6 would require removal of floodplain soils at or above 170 mg/kg. The

SWAC/LOAEC?





highest concentration detected in the 0 to 0.5-foot soil sample was 46 mg/kg. Of the 48 soil samples collected by URS (2005), only five samples had PCB concentrations above the 27.5 mg/kg.

As stated in the Floodplain Area 6 Characterization, the URS Critical Habitat Reconnaissance report (URS, 2004) and URS Floodplain Maps (2005) indicate an areal extent for Floodplain Area 6 of 3.85 acres, while the TERA was assessed for a floodplain area of 9.56 acres. Using the 9.56-acre areal size, it was stated in the TERA that the number of potential nestling foraging areas and fledging foraging areas were 26 and 5, respectively. These estimates are based on a nestling foraging range of 15,876 ft<sup>2</sup> and a fledgling foraging area of 87,025 ft<sup>2</sup>. Using the more recent and accurate areal size of 3.85 acres (167,706 ft<sup>2</sup>) from the URS reports and maps, the potential number of nestling foraging areas is 10, and the potential number of fledgling foraging areas is only 2. Thus, in addition to the likelihood that robins are not sensitive to PCBs at the concentrations reported for chickens in the TERA, the potential population of robins exposed at Floodplain Area 6 is 2.5 times less than determined in the TERA. Potential risks to vermivorous species at Floodplain Area 6, as represented by robin foodchain exposure are acceptable or marginal at worst.

## 5.0 IMPACTS/BENEFITS OF AREA-WIDE SOIL REMOVAL

Floodplain Area 6 soil removal would entail the clearing of the site prior to soil removal. All trees and vegetation would be cut down and 2,930 yd<sup>3</sup> of soil would be excavated down to an estimated depth of 2.5 feet in some areas. All flora and fauna within the 3.85-acre site would be destroyed or displaced. Following excavation, clean fill will be added and the site will be seeded with grass and planted with saplings. As discussed in the ecological risk section, the resultant ecosystem would be of poor quality and definitely of far poorer quality than the WHAP score of 73 out of 100 that URS (2004) scored for the existing mature floodplain forest. As stated in the FS (BBL, 1998), tens of years would be required before the ecosystem at Floodplain Area 6 would be restored to the existing mature floodplain forest.

In addition to the impacts on the flora and fauna currently utilizing the site, potential impacts to humans would result from the proposed site clearing and soil removal. Floodplain Area 6 is part of the River Wildlife Preserve and members utilize the site for hiking and nature watching along the Sheboygan River. Clearing of Floodplain Area 6 would replace a moderately high quality mature riparian and floodplain forest with 3.85 acres of grass field with young saplings, which would be of very little intrinsic value for nature watching.



As stated in the 10 balancing criteria, one of the factors to be considered is potential aesthetic impacts. Floodplain Area 6 is located directly east of the Riverbend Club and within view of the Club's main building. Clearing a mature forest and replacing it with grass and sapling trees will undoubtedly impact the scenic view and natural beauty of the river front forest directly across from the Riverbend Club. Floodplain Area 7 is also located directly west of the Riverbend Club. Clearing of the mature riparian forests east and west of the Riverbend Club would be devastating to the scenic beauty of the site. In GZA's opinion, seeding with grass and planting saplings could not possibly come close to replacing the nature beauty that would be lost. Aesthetically, the Riverbend Club would be severely impacted by the proposed clearing of Floodplain Areas 6 and 7.

Benefits associated with removal of Floodplain Area 6 soils with PCB concentrations greater than 10 mg/kg include reduced exposure for soil organisms and species feeding upon soil dwelling organisms, such as the robins evaluated in the TERA (USEPA, 1999). Using the TERA assessment information, leaving PCB concentrations of greater than 50 mg/kg (essentially all surficial soils 0 to 0.5 feet were below 50 mg/kg, so this would be comparable to no action), would result in impacts associated with 4 nestling-stage foraging areas. If the Floodplain Area 6 areal extent is 3.85 acres as opposed to 9.56 acres, the number of nests could be reduced to less than two robin nests impacted by PCB concentrations. Potential risks to two robin nests would be addressed if PCB at or greater than 10 mg/kg were removed according to the model results in the TERA (USEPA, 1999). Using the robin egg concentration data from the Housatonic River site, the concentrations in the Floodplain Area 6 soils are not a potential risk to the robins and there is no benefit from removal of soils with 10 mg/kg or greater.

Potential exposure and risks for direct contact human exposure pathways are already within acceptable ranges according to the human health risk assessments conducted and the information presented in Section 3.0 of this report. Therefore, no benefit for direct contact human exposure would be gained from removal of floodplain soils at or below 10 mg/kg.

As discussed in Section 5.5.1 of the FS (BBL, 1998) floodplain/bank soils if not remediated are a potential source of PCBs to the Sheboygan River and Harbor. However, further discussion in the FS Section 5.5.1 states that "...the HEC-2 modeling (BBL, 1990) has indicated that due to the existing vegetative cover in most of the floodplain areas, scoured floodplain soil likely is not a significant potential PCB source to the River." Thus, removal of PCBs at or above 10 mg/kg is a potential benefit in removing a future potential source of PCBs to the River, but that benefit is limited because modeling has indicated that resuspension and scouring of floodplain soils is unlikely to be a significant source.



In summation, removal of Floodplain Area 6 soils would eliminate or displace the existing flora and fauna, replace a relatively high quality habitat with a low quality habitat, adversely impact the quality of nature watching at the River Wildlife Preserve and negatively impact the aesthetics of a scenic view from the Riverbend Club. Benefits of soil removal would be eliminating or reducing potential risks to vermivorous species, as represented by potential risks at two to four robin nestling stage foraging areas and eliminating or reducing the already low potential for PCBs in soils to be resuspended and transported to the river.

## **6.0 LOW-IMPACT REMEDIAL ALTERNATIVE**

Previous studies and GZA's assessment does not indicate aggressive remedial soil removal is necessary at Floodplain Area 6. However, should some level of action be deemed necessary, other low-impact methods that do not destroy mature forested areas should be evaluated against the existing soil removal plan.

A potential remedial alternative for Floodplain Area 6 that could address risks with minimal negative impacts would be to assess areas of the site susceptible to soil scouring or resuspension, and install temporary impediments to floodwater flow and resuspension. Simple barriers, such as hay bales (which would be used during soil removal operations), geotextiles, or bioengineered controls could be used at locations within the floodplain area to reduce the potential for loss of floodplain soils back to the river, and increase the potential for deposition of entrained sediments from the river with lower PCB concentrations to deposit in Floodplain Area 6. Especially after the river sediments are remediated, the residual PCB concentrations in river sediments should have PCB concentrations that would not pose significant risks to terrestrial vermivorous species, or be a concern for future resuspension to the river. These control measures would not result in the destruction of the mature riparian and floodplain forests, would not eliminate or destroy the existing flora and fauna and would not impact the quality of nature watching or the aesthetic beauty of the mature riparian forest.

## **7.0 CONCLUSIONS**

In accordance with the URSOW, the purpose of floodplain soil removal is to balance remediation of PCB-contaminated soil with maintaining existing high quality ecological habitat. Floodplain Area 6 is a mature riparian and floodplain forest is located on the River Wildlife Preserve that offers an existing high quality habitat, high quality nature watching activities, and scenic natural beauty.



Based on previous studies and our assessment, there is no significant risk to human health associated with potential exposure to unremediated soil at the Floodplain Area 6. The USEPA TERA has identified vermivorous species as potentially at risk, and assessed potential risks to foraging robins as representative of sensitive species for ecological risks. Utilizing toxicity data from chickens, the TERA model concluded that remediating soil with PCB concentrations at or above 10 mg/kg would be protective of up to four robin nests that might otherwise be at risk. Utilizing the same TERA model but inputting robin toxicity data from the Housatonic River site indicates that the PCB concentrations in the Floodplain Area 6 soils do not pose a significant reproductive risk to robins nesting and foraging at the site.

Potential impacts associated with soil removal at Floodplain Area 6 include elimination and displacement of all flora and fauna at the site, replacement of a relatively high quality mature forest habitat with a low quality grass and sapling tree habitat, loss of a quality nature watching area, and loss of scenic natural beauty along the river. The potential benefits include reduction or elimination of potential exposure of two to four robins using the site for nestling-stage foraging and reduction of a potential source of PCB resuspension to the river.

A low-impact remedial alternative that would address the potential risks without significant negative impacts would be to evaluate flow conditions across the site, and then impede the flow of floodwaters to reduce the potential for scouring and resuspension and increase deposition of sediments from the river with lower PCB concentrations. This alternative would utilize a natural process (river flooding) to deposit sediments across the surface of the site with PCB concentrations that should be protective of vermivorous species without requiring the destruction of the existing habitat.

## 8.0 REFERENCES

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2. Blasland Bouck & Lee (BBL), 1990. Remedial Investigation/ Enhanced Screening Report, Sheboygan River and Harbor. Prepared for Foley & Lardner and Tecumseh Products Company. May 1990.



3. Blasland Bouck & Lee (BBL), 1998. Feasibility Study Report, Sheboygan River and Harbor Site, Sheboygan, Wisconsin. Prepared for Tecumseh Products Company. April 1998.
4. ENVIRON, 1995. Risk Assessment for the Sheboygan River, Sheboygan County, Wisconsin. Prepared for Tecumseh Products Company. August 1995.
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6. URS, 2005. Floodplains 5 & 6 PCB Concentrations, Sample Location Map (8-B); Aerial Photo Plan, Sheboygan River and Harbor Superfund Project, Kohler, Wisconsin. January 2005.
7. U.S. Department of Justice (U.S. DOJ), 2003. Statement of Work for the Remedial Design and Remedial Action for the Upper River Sediment and Floodplain Soil, and Tecumseh Products Company Plant Site at the Sheboygan River and Harbor Superfund Site. Appendix B of the Consent Decree for the Upper River Work On the Sheboygan River. Civil Action No. 03-C-0401. US Attorney General's Office, May 7, 2003.
8. U. S. EPA, 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A). Interim Final. Office of Emergency and Remedial Response, Washington, DC. EPA/540/1-89/002.
9. U.S. EPA, 1993. Baseline Human Health Risks Resulting from PCB Contamination at the Sheboygan River, Wisconsin, Area of Concern. Assessment of Contaminated Sediments (ARCS) Program. Prepared by ASCI Corporation, Athens, Georgia. EPA 905-R-93-001.
10. U.S. EPA, 1999. Draft Terrestrial Ecological Risk Assessment Sheboygan River and Harbor Superfund Site, Sheboygan, Wisconsin. U.S. EPA Region 5, Chicago, IL. April 1999.



**TABLES**

**TABLE 1**  
**SOIL PCB CONCENTRATIONS**  
 Floodplain Area 6  
 Kohler, Wisconsin

Sample Number	Soil PCB Concentrations				
	0-0.5 (feet)	0.5-1.5 (feet)	1.5-2.5 (feet)	2.5-3.5 (feet)	3.5-4.5 (feet)
FP-1	0.82				
FP-2	0.26				
FP-3	25	5.4	2		
FP-4	23	2.6			
FP-5	20	1.6			
FP-6	12				
FP-7	1.8				
FP-8	2.6				
FP-9	26	87	10	5.4	
FP-10	22	5.6	0.83		
FP-11	35	1.9	0.42	0.23	
FP-12	20	1.1	0.16	0.13	
FP-13	46	41	4.1	3.8	0.97
FP-14	10	86	9.9	3.3	2.2
FP-15	0.94	0.27	0.021	0.029	
FP-16	5	2.3			
FP-17	0.87	0.15	0.05		
FP-18	0.17	0.079			
Mean	14	18	3.1	2.1	1.6
95 percent UCL	20	34	5.6	4.0	

**Notes:**

1. All concentrations reported in milligrams per kilogram (mg/kg).  
 Date source: URS, 2005.

**TABLE 2**  
**HIKER SOIL INGESTION EXPOSURE PATHWAY AND RISKS**  
 Floodplain Area 6  
 Kohler, Wisconsin

Noncancer

$$HQ_0 = \frac{Cs \times IR \times EF \times ED \times CF}{BW \times AT \times RfD}$$

Cancer

$$ELCR_0 = \frac{Cs \times IR \times EF \times ED \times CF \times SF}{BW \times AT}$$

Exposure Parameters		Units	Value
AT	Averaging Time	days	3,650 (noncancer)
			25,550 (cancer)
BW	Body Weight	kg	70
CF	Conversion Factor	kg/mg	1/1000000
Cs	Concentration in Soil	mg/kg	20
EF	Exposure Frequency	days/yr	30
ED	Exposure Duration	yrs	10
ELCR <sub>0</sub>	Excess Lifetime Cancer Risk - oral		3.4E-07
HQ <sub>0</sub>	Hazard Quotient - oral		0.059
IR	Ingestion Rate	mg/day	50
RfD <sub>0</sub>	Reference Dose	mg/kg-day	2.00E-05
SF	Slope Factor	kg-day/mg	2

Equations and parameters based on U.S. EPA, 1989.



**TABLE 3**  
**IIKER SOIL DERMAL CONTACT EXPOSURE PATHWAY AND RISKS**  
**Floodplain Area 6**  
**Kohler, Wisconsin**

Noncancer

$$HQd = \frac{Cs \times SA \times SAR \times ABS \times EF \times ED \times CF}{BW \times AT \times RfDd}$$

Cancer

$$ELCRd = \frac{Cs \times SA \times SAR \times ABS \times EF \times ED \times CF \times SF}{BW \times AT}$$

Exposure Parameters		Units	Value
ABS	Absorption Factor		0.14
AT	Averaging Time	days	3,650 (noncancer)
			25,550 (cancer)
BW	Body Weight	kg	70
Cs	Concentration in Soil	mg/kg	20
CF	Conversion Factor	kg/mg	1/1000000
EF	Exposure Frequency	days/yr	30
ED	Exposure Duration	yrs	10
ELCRd	Excess Lifetime Cancer Risk - dermal		6.2E-07
HQd	Hazard Quotient - dermal		0.11
RfDd	Reference Dose	mg/kg-day	2.00E-05
SA	Skin Surface Area	cm <sup>2</sup>	3300
SAR	Soil Adherence Rate	mg/cm <sup>2</sup> /dy	0.2
SF <sub>d</sub>	Slope Factor	kg/mg-day	2

Equations and parameters based on U.S. EPA 1989.

# SHEBOYGAN RIVER & HARBOR

## WDNR & KOHLER CO.

### MEETING AGENDA

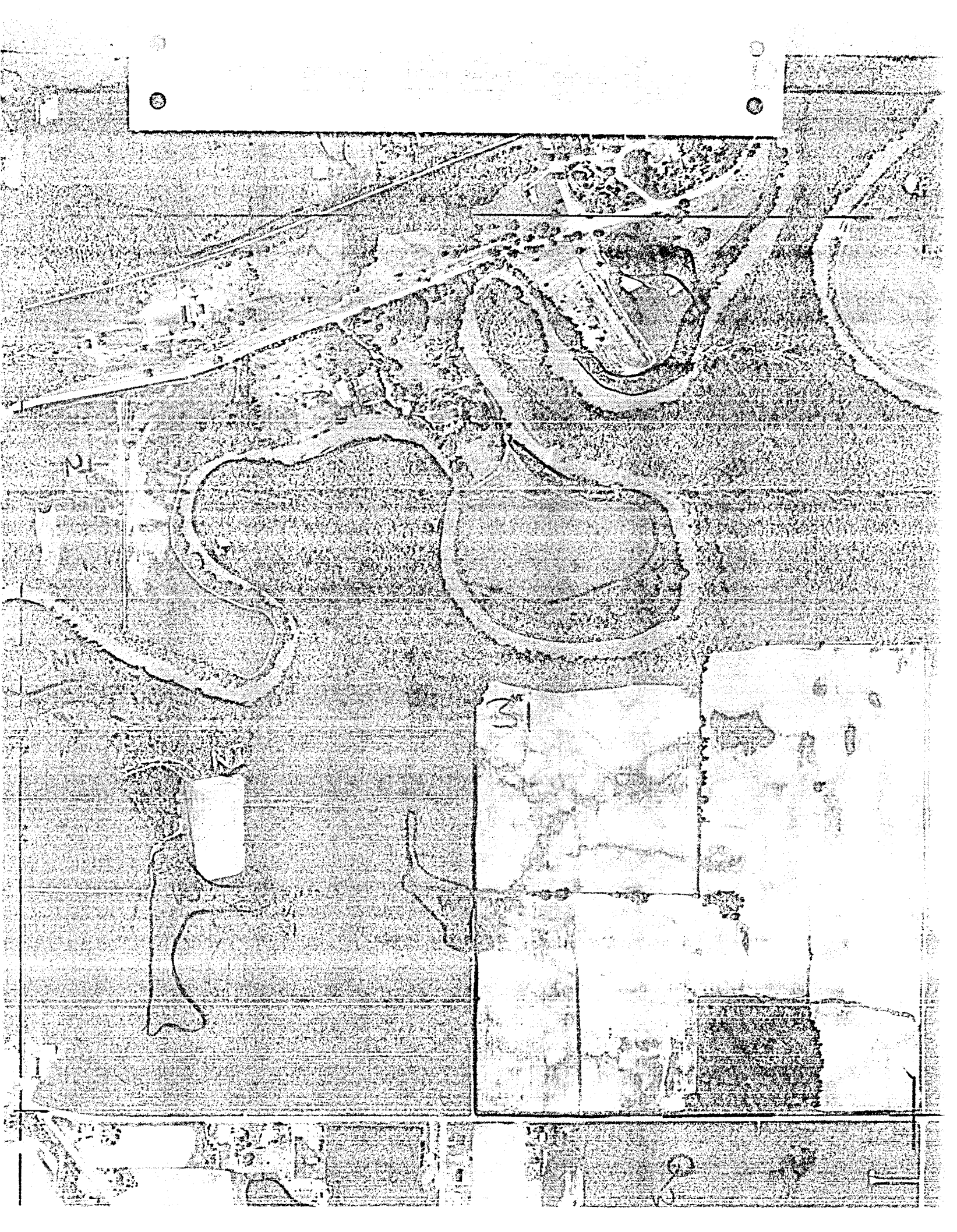
October 2, 1998

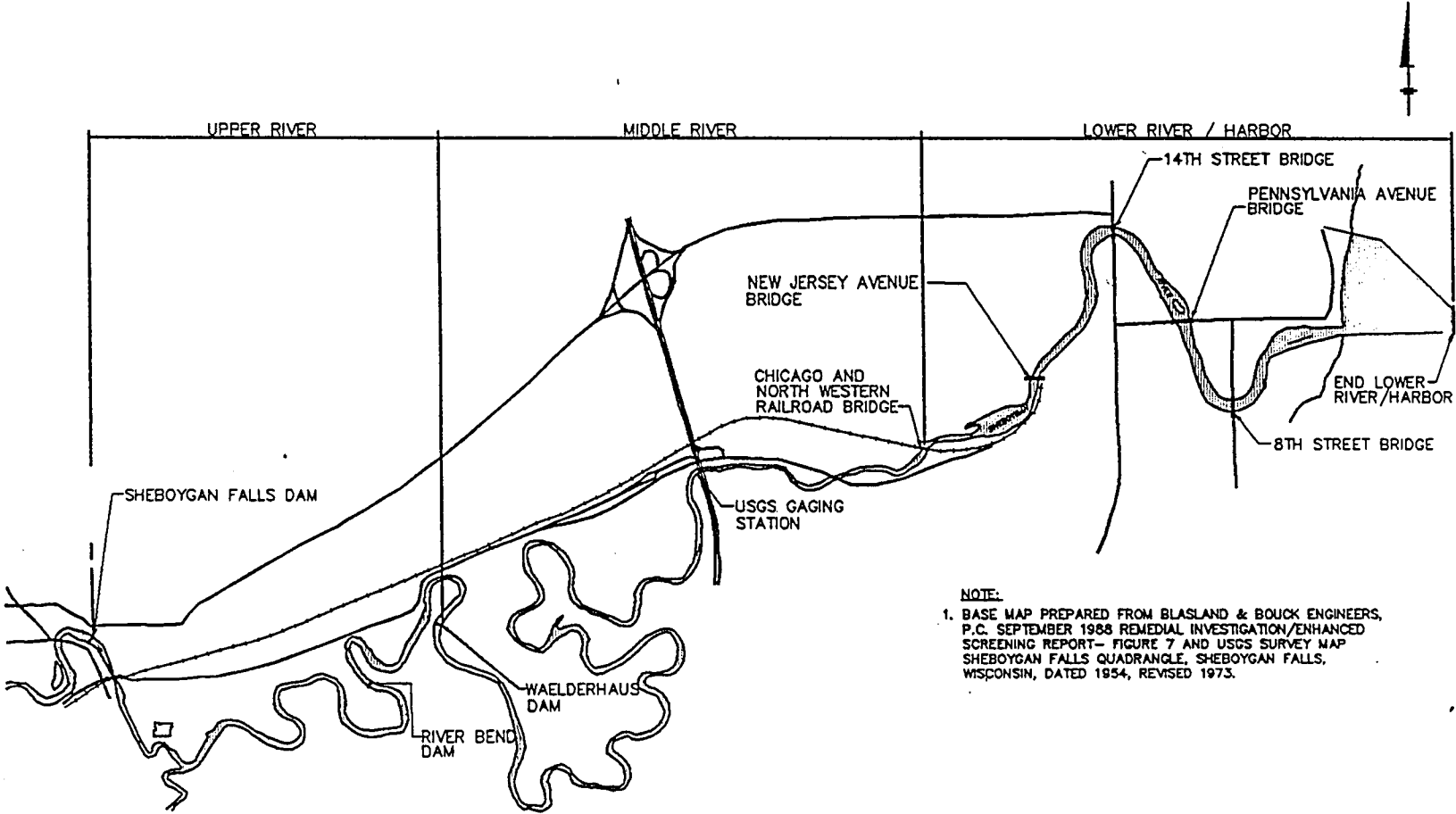
- I. Introductions
- II. Kohler Co. Property
  - A. River Bend Property – Restoration
  - B. River Wildlife
  - C. Team Building Course
  - D. Kohler Co. Stables
  - C. Blackwolf Run Golf Course
- III. Remedial Objectives
  - A. Human Health Risk
  - B. Ecological Risk
- IV. Remedial Options
- V. Property Impact & Restoration
  - A. Access Points
  - B. River Bed
  - C. Flood Plains
- VI. Project Timing & Scope
- VII. Lower River & Harbor
- VIII. Questions & Answers
- IX. Tour

→ ROD - after Jan.

→ Timing not before  
2000.

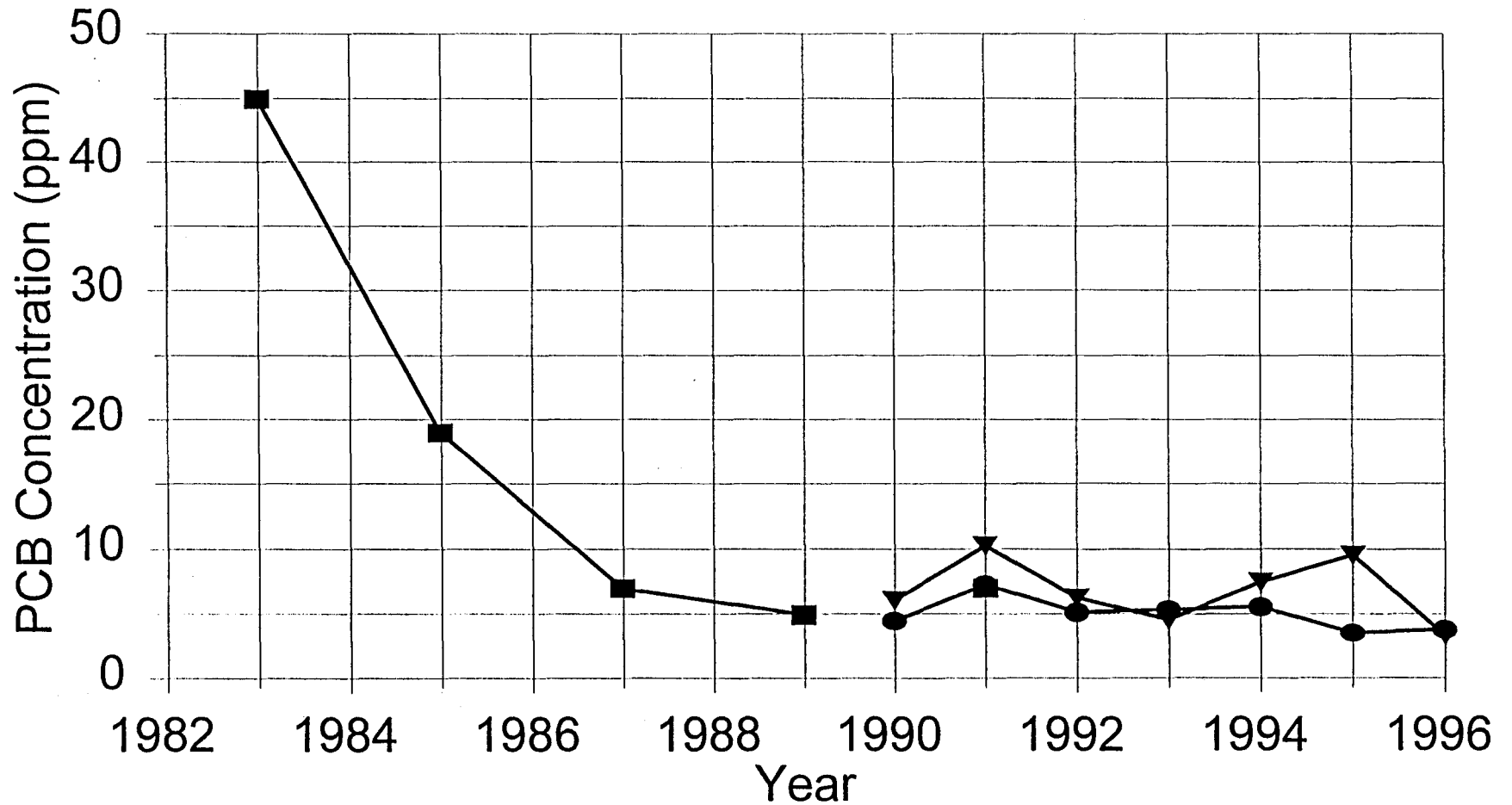
→ NR 200 - floodplain soil





NOTE:  
1. BASE MAP PREPARED FROM BLASLAND & BOUCK ENGINEERS, P.C. SEPTEMBER 1968 REMEDIAL INVESTIGATION/ENHANCED SCREENING REPORT- FIGURE 7 AND USGS SURVEY MAP SHEBOYGAN FALLS QUADRANGLE, SHEBOYGAN FALLS, WISCONSIN, DATED 1954, REVISED 1973.

# PCB Concentration in Small Mouth Bass



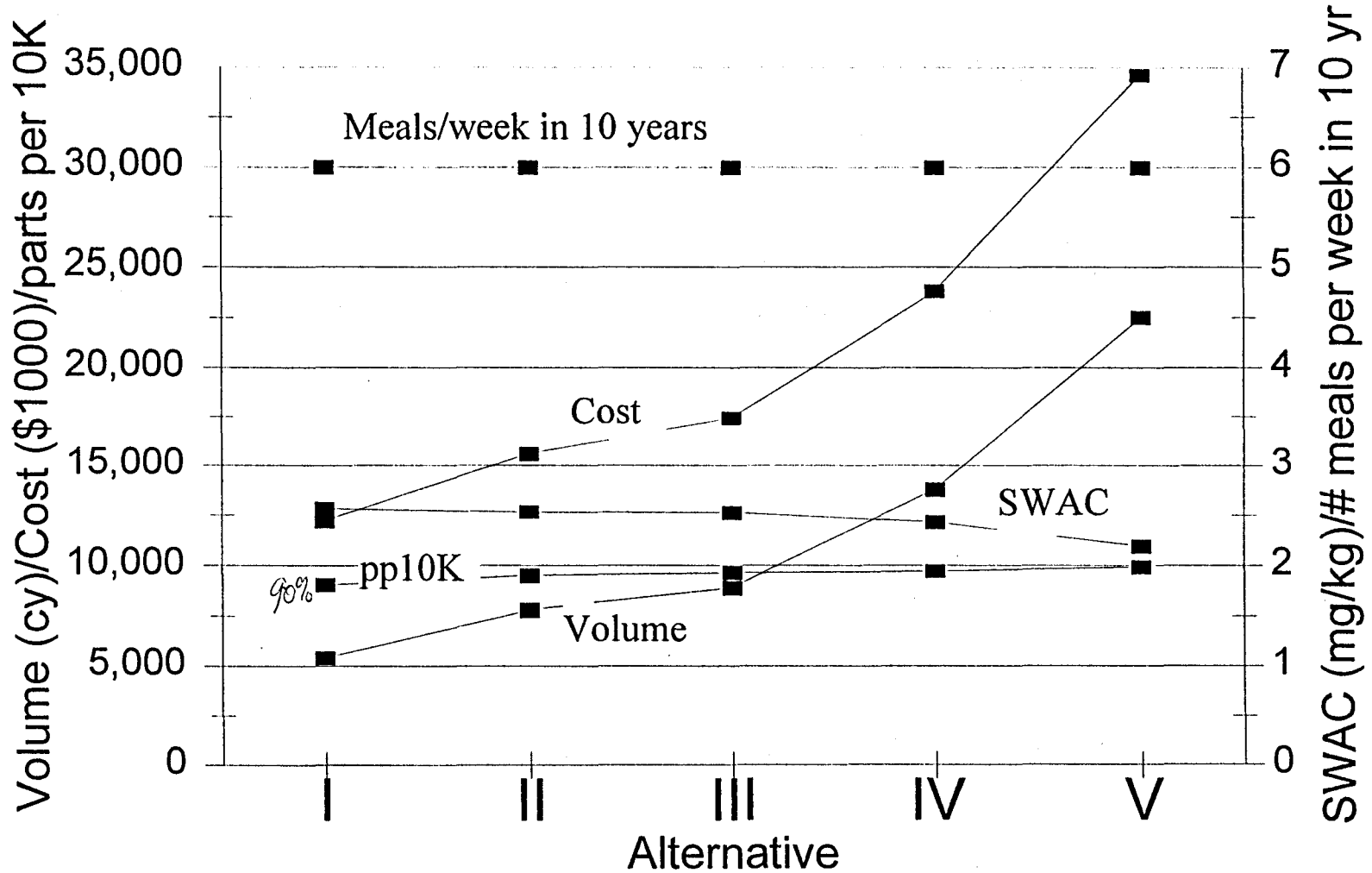
—■— Sheboygan River (1)  
—●— Between Kohler Dams (2)

—▼— Rochester Park (2)

(1) Wisconsin Department of Health and Social Services,  
Public Health Assessment, April 29, 1994.  
(2) Blasland, Bouchk & Lee, Inc., Draft Feasibility Study  
Report, September 1997.

# Sheboygan River Harbor FS

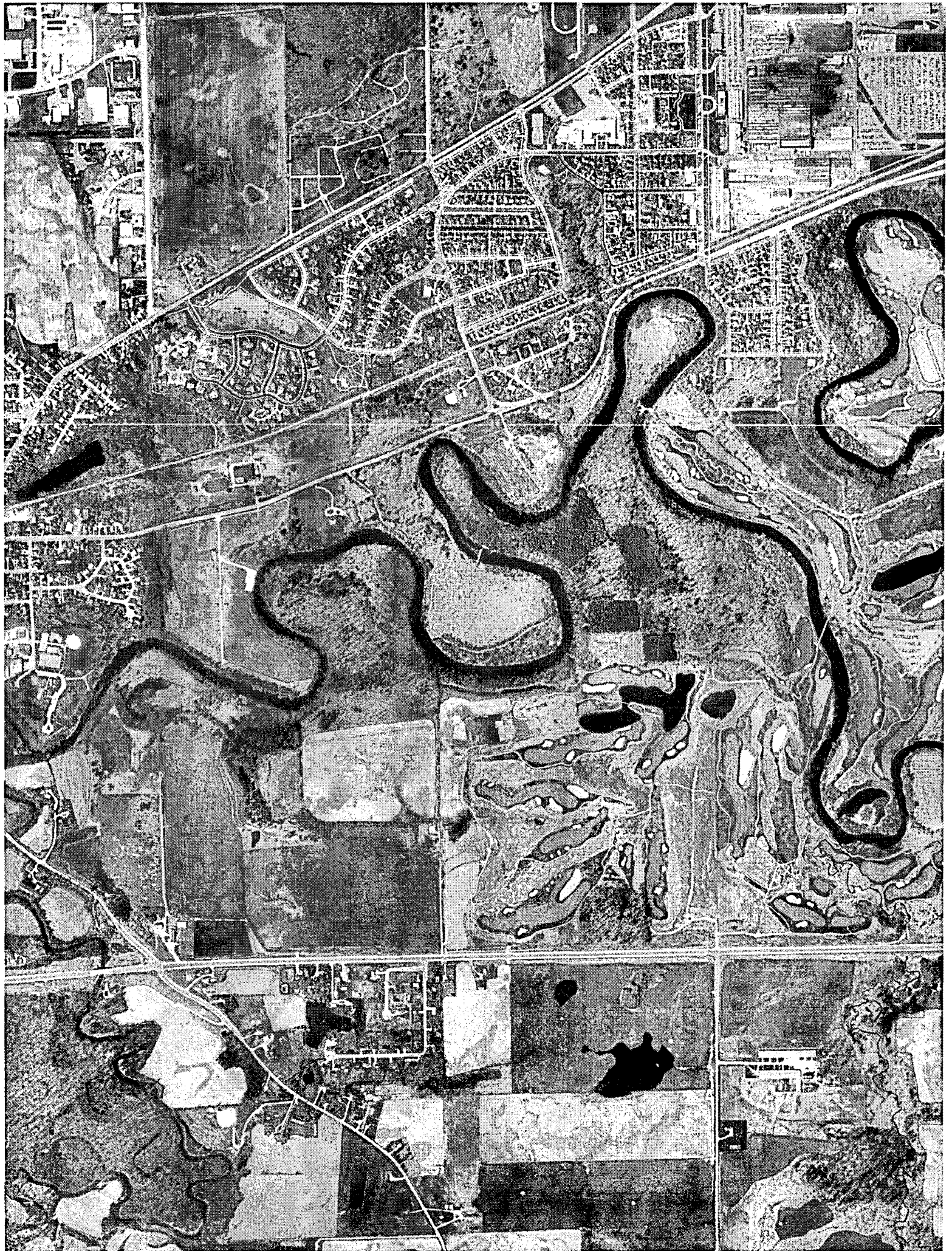
## Upper River Sediment Alternatives



## Alternatives Considered in the Revised Feasibility Study

Site Area	Potential Remedial Alternatives (cy indicates cubic yards)	# of Access Areas Required	Years to Implement Remedy
Upper River	I. No Further Action		
	II. Natural Recovery		
	III. Dredging 5,400 cy (90% of the PCB mass) <sup>+</sup>	2	2.5
	IV. Dredging 7,500 cy (95% of the PCB mass) <sup>* +</sup>	6	3
	V. Dredging 8,900 cy (96% of the PCB mass) <sup>+</sup>	7	3.5
	VI. Dredging 13,800 cy (97% of the PCB mass) <sup>+</sup>	8	5.5
	VII. Dredging 22,500 cy (99% of the PCB mass) <sup>+</sup>	9	9
Lower River & Harbor	I. No Action		
	II. Natural Recovery with monitoring*		
	III. Installing 35-acre Engineered Cap in Inner Harbor	Access to the Riverfront plus approx. 2-4 acres	3.5
	IV. Dredging 960,000 cy from Inner Harbor	Access to the Inner Harbor plus approx. 3 to 4 acres	9
Floodplain/ Bank Soils	I. No Action		
	II. Removal of 670 cy of Soil and Bank Soil Stabilization*	2—private property	1
	III. Removal of 2,600 cy of Soil (PCB Concentrations Greater than 50 ppm)	Several—private property	1
	IV. Removal of 10,800 cy of Soil (PCB Concentrations Greater than 10 ppm)	Numerous—private property	2.5
Facility Ground Water	I. No Action		
	II. Investigation/Natural Attenuation/Source Identification and Control*		1 (Investigation portion only)
	III. Collection Trench and Treatment		1 (Construction only)
	IV. Facility Perimeter Cut-Off Wall		2 (Construction only)
<sup>+</sup> PCB mass removal percentages are optimistic estimates based on theoretical removal capabilities and may not be achieved in practice. They may present particular difficulties for Upper River Alternative VII.			
<sup>*</sup> Indicates the recommended remedial alternative specified in the revised FS.			

top  
12" / re-fill  
vegetate it







## State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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September 1, 2005

EPA

Subject: URS Field Report for the Critical Habitat Reconnaissance, Sheboygan River

Dear

This report discussed the evaluation of habitat in the environmentally contaminated floodplains of the Upper River Segment of the Sheboygan River Superfund site. URS staff looked at 'critical habitat' as defined in the Endangered Species Act, and used a habitat assessment technique to evaluate the quality of the existing vegetative habitat of these floodplains.

The critical habitat evaluation based on the definition from The Endangered Species Act is satisfactory but there needs to be a better explanation of the Wildlife Habitat Appraisal Procedure. (The website given in the report had examples of its use in Texas but didn't have an explanation of the procedure itself). Department staff doesn't recall agreeing to the use of this specific procedure to evaluate habitat quality, and we had expected to be consulted during the field reconnaissance.

It would be helpful to have a better explanation of how each floodplain area was scored for each of the criterion. An example, is on what scale was the uniqueness and relative abundance evaluated – statewide, regionally, etc? Table 6 could be expanded to show scores for each floodplain for each criterion, and a summary of the features used to determine the scores.

Wildlife surveys that were conducted were too cursory to be of much value, and reference to past surveys and studies, other than the NHI review, were nonexistent. There was discussion of common bird species, and the apparent lack of suitable habitat for red-shouldered hawks and piping plovers. There was very little discussion about habitat or surveys for mammals, reptiles or amphibians.

A complete evaluation of high quality wildlife habitat should include some discussion of the wildlife species that would likely be found in those habitats. A comprehensive listing wouldn't be necessary but species that would likely be impacted by PCB contamination should be included. Previous reports and studies related to PCBs and wildlife in the Sheboygan River and Harbor include: small mammals, swallows, robins, mink, kingfishers, herons, woodcock, mallards, and shorebirds.