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February 16, 1988

Ms. Bonnie Eleder
Remedial Project Manager
U.S. Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, IL 60604

Re: Sheboygan River and Harbor
Remedial Investigation -
January 1988 Status Report

File: 176.02 #2

Dear Bonnie:

Phase II of the Remedial Investigation field activities in this investigation took place in September, 1987 and consisted of collecting River sediment samples from numerous locations, as well as soil samples from the banks of the Sheboygan River and borings(to a maximum sediment/soil depth of 20 feet) within Sheboygan Harbor. This program was performed in accordance with the EPA/WDNR-approved Work Plan, (and associated documents) with the exception of field revisions made with your concurrence. The intent of this second phase of sampling and analysis was to further characterize the River and Harbor sediments and to develop a data base necessary to evaluate potential remedial alternatives that may be required. This letter summarizes the data developed during the Phase II investigation that we have received from the analytical laboratory to date. Since this data is incomplete, and we have yet to perform an extensive review, we have presented this material in preliminary form. A full description of this work effort and final results will be submitted as part of the draft Remedial Investigation/Enhanced Screening (RI/ES) Report.

The remainder of this status report will present and discuss analytical results obtained from the sediment and soil samples in the following format:

I. Presentation of Data
   A. River Sediment Data
   B. Harbor Sediment Data
   C. Soil Data
   D. Quality Assurance Data

II. Discussion of Analysis Results

III. Summary and Recommendations

I. PRESENTATION OF DATA

A. River Sediment Data

River sediment sampling locations and the resultant data are shown on Figure 1 and in Table 1. Please note that the "raw" data (chromatograms, calibration runs, instrument tuning data, etc.) and other backup data will be provided separately. Note also that PCB and metals data results for River sediment samples R-1, R-9, R-20, R-34, R-45, R-54, R-65, R-75, R-87, and R-96 are included in Table 1 for completeness. These sediment samples were the ten "key" River sediment samples obtained during Phase I of the Remedial Investigation.

During the September sampling activities (Phase II of the Remedial Investigation), 89 River sediment cores were collected. The average sediment depth in the upper part of the River ranges from 1.0 - 1.5 feet while the sediment depths near the Pennsylvania Avenue bridge ranged from 6 - 12 feet. These samples were analyzed for PCBs and targeted metals. A description of the analytical results is provided below.

1. PCBs

As shown in Table 1, the majority of PCB concentrations ranged from below the detection limit (0.025 ppm) to 280 ppm (dry weight). This data is consistent with both the Phase I findings and previous investigations by others. In addition, three areas of elevated PCB concentrations were identified; two were immediately downstream of the Tecumseh Products Company plant in Sheboygan Falls, and one was immediately downstream of the first Kohler Dam (River Bend). These particular test data are as follows:

Sample Location	PCB Concentration (ppm, dry wt.)
R4 (downstream of Tecumseh)	4300
R7 (downstream of Tecumseh)	4500
R23 (downstream of River Bend Dam)	890

PCBs, in all cases, were reported as Aroclors 1242, 1248, 1254 and combinations thereof. It should be noted that a large number of samples were quantified as Aroclor 1242, reinforcing our understanding that PCB dechlorination is occurring in the Sheboygan River Harbor system. The PCB concentration of the background sample (above the Sheboygan Falls Dam) was 0.067 ppm.

2. Targeted Metals

The results for the eight targeted metals analyses in River sediments (As, Cd, Cr, Cu, Pb, Ni, Zn, Hg) are presented in Table 1. In general, the targeted metals occurred at relatively low concentrations in the upstream sediments and increased in the downstream sediments, approaching the Sheboygan Harbor.

Targeted metals analysis (excluding Mercury) was accomplished by Inductively-coupled Plasma Arc (ICP) spectroscopy. Originally, it was proposed that if the results for arsenic and lead were below the detection limit achieved using ICP, the samples would be analyzed for those constituents a second time using the Atomic Adsorption (AA) Furnace method. However, we have noted that ICP is sufficiently sensitive to determine environmentally significant levels of arsenic and lead. Specifically, the ICP detection limit for arsenic (2.5 ppm) is well below the Wisconsin Department of Natural Resources (WDNR) draft criterion (NR 347) for "clean" sediments (10 ppm arsenic). Similarly, the ICP detection limit for lead (10 ppm) is well below the WDNR sediment criterion of lead (50 ppm). Thus, it is our opinion that the results of the AA Furnace analysis would provide no further insight to the arsenic and lead contamination in the sediments. We therefore recommend that the ICP data for these two metals be considered adequate for all soils and sediment samples.

B. Harbor Sediment Data

During the sampling efforts of September, 1987 (Phase II of the RI), 20 sediment cores were collected in the Sheboygan Harbor, including the outer and inner Harbor. Each core was extended below the sediment/water interface to native material or to a maximum depth of 20 feet. Harbor sediment sampling locations and the resultant data are shown on Figure 2 and in Table 2 and is described below.

1. PCBs

The results of PCB analysis of Harbor sediments are shown on Figure 2 and in Table 2. Generally, the PCB concentrations were higher in Harbor sediment samples collected in the inner Harbor, relative to those collected from the outer Harbor. All samples collected in the outer Harbor (sample numbers H1 to H9) had total PCB concentrations less than 8 ppm; and in many samples PCBs were undetectable (less than 0.025 ppm). All of the samples collected in the northern portion of the outer Harbor (H4-H9), had PCB concentrations below 0.1 ppm.

PCB concentrations of 50 ppm and above were found in six Harbor cores. It is important to note that the Harbor sediment samples having the highest PCB concentrations (greater than 50 ppm) occurred in the inner Harbor well below the sediment/water

interface. The uppermost sediment sample with a concentration of greater than 50 ppm PCBs occurred at a sediment depth interval of 2' to 4' in samples H16 and H19. Other occurrences were below 4 feet. Harbor sediments that are in direct contact with the water all had PCB concentrations below 6 ppm.

2. Targeted Metals

Analytical results for the eight targeted metals in Harbor sediments are shown in Table 2. Although all of the metals data has not been reported to date, generally the following is shown:

Arsenic was not detected in most of the samples, or if detected, the levels were close to the detection limit;

Cadmium, chromium, copper, lead, nickel and zinc were detected at significant concentrations in the inner Harbor. Generally, levels were low in the outer Harbor.

Mercury was not detected in the majority of the outer Harbor samples, and was detected in low levels in the inner Harbor.

As with the River sediment samples, the seven targeted metals other than Hg were analyzed using ICP.

3. Dioxin/Dibenzofuran

As required, one Harbor sediment sample was analyzed for 2,3,7,8-TCDD (dioxin) and 2,3,7,8-TCDF (dibenzofuran). The sample selected for this analysis was the 6' - 8' depth sample from sampling location H12. Although the Work Plan specified the analysis of only these two isomers, the selected Harbor sample was subject to an entire dioxin/dibenzofuran analysis. Both classes were reported as non-detected.

4. Hazardous Substance List (HSL) Analysis

The results of the Harbor sediments analyzed for HSL constituents are shown in Table 4. Sediment samples from a depth of 2' to 4' from five different locations were selected based on visual characterizations, and were used for the HSL analysis. The results of this analysis are described below.

4.1. PCBs/Pesticides

PCB results have been presented above. No pesticides were detected in the five HSL samples.

4.2. HSL Metals

An ICP metals analysis was performed for each of the five sediment locations. However, only the results of the targeted metals have been reported by the analytical laboratory to date. These results, presented in Table 4, show the following:

a) Chromium, copper, lead and zinc generally showed the highest levels at locations H10 (on the border between the inner and outer Harbors) and H20 (the inner most Harbor boring, near the Pennsylvania Avenue Bridge);

b) The highest concentration of nickel was detected at location H10 and generally the levels decreased as the samples were taken from the outer Harbor toward the inner Harbor;

c) The remaining HSL metals have not yet been reported to date. These metals are noted at the bottom of Table 4.

4.3. Volatile Organics

The five Harbor sediment samples were each analyzed for 35 volatile organic compounds. Of these compounds, a total of seven were detected. The data are presented in Table 4 and are summarized below.

Compound	Range of Detected Sediment Concentrations (ppb, dry wt.)	Sample Locations*	Method Blank Concentration (ppb, dry wt.)
Methylene chloride	20 - 120	a	9 - 22
Acetone	51 - 330	a	11 - 16
Benzene	35	b	not detected
Methyl ethyl ketone	50	b	not detected
Toluene	3 - 23	c	not detected
Ethylbenzene	370	b	not detected
Xylenes	130	b	not detected

* Sample locations
a = H1, H10, H12, H15, H20
b = H20
c = H10, H15

The highest concentrations of methylene chloride and acetone occurred in sample H20. In addition, H20 is the only location where benzene, methyl ethyl ketone, ethylbenzene and xylenes were detected. It should be noted that methylene chloride and acetone were detected in the method blanks at the levels shown above.

4.4. Polynuclear Aromatics

Individual compounds from this class of organics were identified using gas chromatography/mass spectrometry (GS/MS) analysis of the base-neutral/acid fraction of each

sample. Many of the results reported by Hazleton Laboratories were provided with the "J" notation, meaning that each concentration was an estimated value which fell below the Contract Laboratory Program (CLP) detection limit, but above the laboratory detection limit. Since these compounds are commonly treated as a single group, we have summed the individual components above the lab's detection limit to obtain "total estimated PNAs". These totals are summarized in Table 4. Note that the total concentrations were at, or below, 1.8 ppm for all but one sample (H20), which had a value of 63. ppm.

4.5. Phthalate Esters

Phthalate esters are plasticizer compounds which are commonly detected as laboratory contaminants. Two of these compounds, di-n-butyl phthalate and bis-(2-ethyl hexyl)-phthalate were detected in both the sediments, and two of the internal laboratory blanks. You may recall that these same contaminants were detected in almost all of the HSL River sediment samples.

Di-n-butyl phthalate was detected in the method blanks at levels similar to those found in the samples, while bis-(2-ethylhexyl)-phthalate was detected in one method blank at a higher order of magnitude.

The presence of these compounds in the blanks at the same or a greater magnitude as those reported for the samples suggests that the data are probably not truly representative of field conditions. In any case, the low concentrations of the compounds detected suggests that they are relatively insignificant.

4.6. Other HSL Compounds

Several compounds were "tentatively identified" in the base-neutral and acid fractions. These constituents were detected at low concentrations in most of the samples but detected in somewhat higher concentrations in sample H20. Data reports can be provided as necessary.

4.7 Other Parameters

The five Harbor sediment samples were also analyzed for Total Organic Carbon (TOC), moisture content, and particle size distribution. In addition, a physical description of each sample was noted in the field by the sampling personnel. These results are presented in Table 4.

C. Soils Data

Twenty "soil" samples, taken from areas of high water along the Sheboygan River, were collected during Phase II of the Remedial Investigation. These samples were obtained from island soils or soil on stream banks that may be subject to spring flooding. Soil sampling locations and the resultant data are shown on Figure 1 and in Table 2. The soils data is summarized below.

1. PCBs

As shown on Figure 1 and in Table 3, total PCB concentrations ranged from non-detected (less than 0.025 ppm) to 71 ppm. The soil sample (S2) with the concentration of 71 ppm was located on an island downstream of Rochester Park in Sheboygan Falls. Another soil sample (S3) had a level of 30 ppm PCBs, and was located on the River bank, downstream of the first Kohler Dam. All of the remaining soil samples had PCB concentrations of less than 10 ppm.

2. Targeted Metals

The results of the eight targeted metals analyzed in the soil samples are provided in Table 3. Generally, the metal concentrations increased as the soil samples were collected further downstream along the Sheboygan River. The arsenic concentrations are the only exception to this trend, with almost all of those results below the detection limit. These arsenic results have been characteristic of the majority of samples analyzed in this Phase of the Remedial Investigation. Additionally, the metal results of the soil samples have generally been of the same order of magnitude as the River sediment samples in the same area.

D. Quality Assurance Data

An extensive set of quality assurance (QA) data was generated during the analysis of samples. Matrix spike and duplicate analyses for PCBs and metals are summarized in Tables 5 and 6, respectively. Information regarding the HSL inorganics analysis has not been received to date.

A brief description of the QA program for Phase II of the Remedial Investigation is as follows. Five pre-selected samples from the Harbor were analyzed for HSL constituents. One of these samples (H20, 2'-4') was run as a matrix spike/matrix spike duplicate. Three laboratory blanks were also run as part of the HSL analyses. These blanks consisted of distilled water from the laboratory which was analyzed in conjunction with the Harbor sediment samples. Additionally, approximately 10 percent of the River sediment, Harbor sediment and soil samples collected were chosen for duplicate and matrix spike analyses. A field blank was collected for TCDD/TCDF analysis in conjunction with the Harbor sample (H12, 6'-8').

There was no PCB or pesticide contamination evident in any of the blanks analyzed. Methylene chloride and acetone were found in volatile scans of two of the three method blanks. These two compounds are common laboratory contaminants as previously discussed. Additionally, three phthalate esters were detected in the laboratory blanks; these compounds are also common in-lab contaminants. In general, the types of contaminants found, and the levels of contamination are not unusual, nor are they cause for concern.

As shown in Table 5, the recovery of most of the PCBs and metals fell within the recommended control limits for the River and Harbor sediment samples. PCB and metal recoveries for soil samples all fell within the acceptable limits. Overall, the matrix spike results indicate that the vast majority of the PCB and metals is acceptable. Some of the values will be flagged (J) to indicate that they are estimates. A small portion of the mercury data may not be useable due to poor recovery in one of the matrix spikes.

Table 6 provides a summary of the duplicate analyses performed on the River sediment, Harbor sediment and soil samples. Duplicate analyses provided to date indicate a reasonably good level of reproducibility. In most cases, the relative percent differences (RPD) for the metals analyses were less than 10%, with few occurrences above 20%. For duplicate PCB analyses, RPDs were generally less than 35%.

In conclusion, the QA data demonstrate that the vast majority of the analytical data is valid and acceptable.

II. DISCUSSION OF ANALYTICAL RESULTS

A. PCBs

The three areas of elevated PCB concentrations (samples R-4, R-7 and R-23) were identified between the Sheboygan Falls Dam and the first Kohler Dam (River Bend). These are located downstream of the Tecumseh Products Company manufacturing facility located in Sheboygan Falls. The presence of these elevated PCB concentrations provides an explanation for the water column PCB concentrations observed in this section of the River during the initial field investigations conducted in the Spring of 1987.

For the Harbor sampling locations, the sediments at the water/sediment interface have significantly lower PCB concentrations than occur at lower depths. As a result, the Harbor sediments at the water/sediment interface do not appear to be contributing significantly to the water column, as evidenced by the May, 1987 water column data.

B. Metals

As previously presented, analyses of the eight targeted metals indicate that the concentrations within the River sediments generally increase as one proceeds downstream from Sheboygan Falls to the Sheboygan Harbor. This data very closely resembles the data collected in May/June 1987, with no substantial deviations. Since none of the targeted metals detected during these activities are substantially higher than previously detected in the initial sampling, we do not anticipate any increased concern related to the presence of metals in River and Harbor sediments than was previously known.

C. Other Harbor Contaminants (HSL)

1. Dioxin/Dibenzofuran
As presented earlier, the analyses for dioxin and dibenzofuran were reported as undetected. This information further indicates that these two classes of contaminants are not of specific concern in the River and Harbor study.

2. Volatile Organics
Several volatile organics were detected in the Harbor sediments analyzed for HSL, and were presented previously in this text. Generally, the compounds were detected in low concentrations. The highest concentrations of volatile organics detected were in boring H20, however, all concentrations were less than 1. ppm.

3. Polynuclear Aromatics
Generally, the polynuclear aromatics detected in the Harbor sediments were reported in low concentrations. Many of the results were reported in concentrations below the CLP detection limit, but above the analytical lab's detection limit. Except for one sample (H20) having a concentration of 63 ppm, the remainder of the samples were at, or below, 1.8 ppm. This PNA concentration may be due to coal or cinder deposits which were possibly collected with the samples. Coal or cinder deposits were not visually identified in the field logs; however, if present they could cause the higher levels seen in H20 as compared to the other samples.

4. Phthalate Esters
Two phthalate esters were detected in the Harbor sediments and two internal blanks. Phthalate esters are common laboratory contaminants, and their detection in the blanks indicates that the data may not be representative of field conditions.

5. Other Compounds
Several other organic compounds were tentatively identified in the base-neutral/acid extractable fraction. These compounds were detected at low levels in most samples, but higher concentrations

(31 ppm) detected in H20 were closely related to the positively identified PNAs discussed above. As above, coal or cinder deposits could account for these compounds.

IV. SUMMARY AND RECOMMENDATIONS

This status report and attachments present the analytical results obtained to date for the Remedial Investigation activities undertaken during September, 1987 on the Sheboygan River and Harbor project. All organic analyses (PCB, VOA, base-neutral/acid fraction) have been completed and reported. Metals data are still incomplete. Since all analytical data has not been received to date, a limited summary is presented below:

A. River Sediment Samples

1. PCBs
The majority of sediment PCB concentrations ranged from undetected to 280 ppm. Three areas of elevated PCB concentrations were identified immediately downstream of Tecumseh Products Company plant and the first Kohler Dam (River Bend). A total of 89 sediment cores were obtained during the September field efforts. The depth of sediment in the upper portion of the River averaged 1.0-1.5 feet and the sediments near the Pennsylvania Avenue bridge ranged from 6-12 feet deep.

2. Metals
Generally, the concentrations of the eight targeted metals increased as the sediment samples were collected further downstream.

B. Soil Samples

1. PCBs
Twenty "soil" samples, taken from high water areas along the length of the Sheboygan River, represent island soils or soil on stream banks that may be flooded in the spring. The PCB concentrations for these soils ranged between non-detected to 71 ppm. The soil sample exhibiting a PCB concentration of 71 ppm was located on an island downstream of Rochester Park in Sheboygan Falls. Another soil sample located downstream of the first Kohler Dam (river bank) had a level of 30 ppm. All remaining soil samples had PCB concentrations of less than 10 ppm.

2. Metals
Generally, the concentrations of the eight targeted metals increased as the soil samples were collected further downstream.

C. Harbor Samples

1. PCBs
In general, PCB concentrations increased as samples were collected toward the Pennsylvania Avenue Bridge from the outer Harbor area. Concentrations ranged from undetected to 220 ppm. Additionally, the highest PCB concentrations occur at lower sample depths, while the Harbor sediments at the water/sediment interface have much lower PCB concentrations.

2. Metals
Metals concentrations generally increased as the sediment samples were collected from the outer Harbor toward the inner Harbor.

3. Dioxin/Dibenzofuran
Neither 2,3,7,8-TCDD nor 2,3,7,8-TCDF were detected in the dioxin/dibenzofuran analyses conducted on a sample taken from location H12 at a depth of 6 to 8 feet. It should be noted that this same sampling location contained PCBs at 180 ppm.

4. Non-targeted Metals
These results have not been reported to date.

5. Volatile Organics
Seven volatile organics were detected in the five samples analyzed; however, all samples had concentrations less than 1 ppm.

6. Polynuclear Aromatics
Polynuclear aromatic concentrations were less than 2 ppm for all but one sample, H20, (located near the Pennsylvania Avenue bridge) which had a concentration of 63 ppm positively identified compounds and 31 ppm tentatively identified compounds. This location probably contains coal or cinder deposits which could account for these relatively high PNA levels.

7. Phthalate Esters
Phthalate esters were detected in the method blanks as well as the samples, most likely indicating laboratory contamination.

8. Other Compounds
Several other organic compounds were tentatively identified in the base-neutral/acid extractable fraction. These compounds were detected at low levels in most samples. Higher levels found in H20 are discussed above.

9. Other Parameters
HSL samples were analyzed for TOC, moisture content, particle size distribution, and a physical description was noted in the field.

Recommendations

As you may recall, upon review of the initial sampling results obtained in May, 1987, we recommended that the Onion River water column sampling location be included at the low flow condition as opposed to monitoring this location only under the high flow regime. Since the discovery of the three areas of elevated PCB concentrations, it has become increasingly important to understand the transport mechanisms within the River system and the impact of these sediments on the water column. We are, therefore, suggesting that additional water column monitoring be conducted in this area this spring. It is intended that this additional monitoring include additional rounds of sampling at various flow rates. It is believed, upon review of recent USGS flow data for the Sheboygan River that a fairly wide range of flows are normally observed during the spring months (March and April) as a result of snow melt and spring rainfall events. Therefore, we would recommend these additional rounds of water column samples be collected while collecting the previously required "high flow" water column samples. These additional water column samples would be analyzed for PCBs.

To summarize, the following items constitute the proposed changes recommended for the current program:

1. Additional water column sampling be conducted while obtaining "high water" water column samples in March/April 1988. These samples will be analyzed for PCBs.

2. Elimination of AA Furnace analyses of sediments for arsenic and lead since the ICP analysis is adequate for the purposes of understanding metals contamination.

Further, it is our intention to continue work on the Remedial Investigation/Enhanced Screening (RI/ES) Report over the next two months. We plan to issue a draft report to the USEPA and WDNR on April 15, 1988 (even while collecting the proposed additional data). We plan to assess the problems associated with the presence of the three areas of elevated PCB concentrations and to propose the appropriate remedial action, if any, over the course of preparing the RI/ES Report.

We will keep in close contact with you, the WDNR and the public during this time. We recommend this approach for the following reasons:

1) It will maintain the current schedule for the project, and

2) It will allow for identification and implementation (if necessary) of the appropriate solution to the River and Harbor situation in a timely fashion.

We anticipate that the data that has not yet been collected (ie. water column sampling) will provide further confirmation of the conclusions presented in the RI/ES Report. Any modifications required to this RI/ES Report as a result of further water column sampling activities, will be made to the report by issuing an addendum.

We suggest a meeting or conference call be arranged to discuss the contents of this letter as it pertains to the RI/ES program. Also attached, please find the status report form that is normally provided on a monthly basis.

Very truly yours,

BLASLAND & BOUCK ENGINEERS, P.C.

William H Bouck/DSF

William H. Bouck, P.E.
Executive Vice President

WHB/jla

Attachments

cc: Mr. Mark Giesfeldt, Wisconsin Department of Natural Resources, with attachments
Mark A. Thimke, Esq., Foley & Lardner, with attachments
Mr. Bruce Cutright, Geraghty & Miller, with attachments
Mr. Robert K. Goldman, P.E., Blasland & Bouck Engineers, P.C., with attachments
Ms. Dawn S. Foster, P.E., Blasland & Bouck Engineers, P.C., with attachments

PRELIMINARY

Sheboygan River and Harbor
Remedial Investigation-Phase I and Phase II

TABLE 1

RIVER SEDIMENT DATA SUMMARY

Sample[1] No.	Recovered Sediment Depth (feet)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight)[2] As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
R-1/HSL1	2.0	<0.51	1.2	<0.51	1.2	10.0	1.1	16.1	17.7	17.7	8.2	51.6	0.116
R-2	3.2	.067	<.026	<.026	.067	<4.4	1.1	17.6	17.4	17.8	9.1	51.7	0.088
R-3	1.1	<.025	<.025	<.025	<.025	3.4	1.5	29.0	57.9	<12.6	27.7	25.8	0.055
R-4	1.0	<250	4300	<250	4300	<3.5	<0.7	8.2	4.2	17.8	<5.5	52.0	0.044
R-5	1.5	45	<2.6	14	59	<5.2	1.9	36.6	29.7	<20.9	27.8	94.8	0.055
R-6	1.3	12	<0.5	3.5	15.5	<3.5	<0.7	15.7	4.8	18.3	<5.6	35.4	0.029
R-7	0.8	4500	<370	<370	4500	<4.8	1.0	39.8	26.1	31.9	18.7	87.1	0.084
R-8	2.3	0.4	<.25	<.25	0.4	<3.2	<0.6	6.7	3.3	<12.9	6.0	13.5	<0.025
R-9/HSL2	1.0	16	<10	12	28	2.0	<0.6	6.4	3.6	5.2	5.5	8.5	<0.030
R-10	0.9	280	<250	<250	280	<3.9	0.9	13.5	15.4	18.4	7.8	43.6	0.060
R-11	3.5	11	<1.5	<1.5	11	<3.3	0.9	10.0	5.4	<13.1	6.6	17.0	0.031
R-12	1.0	120	<10	36	156	<3.4	<0.7	8.7	8.0	<13.4	<5.4	28.4	0.036
R-13	1.2	22	<5.2	<5.2	22	<5.0	<1.0	37.5	21.8	27.7	14.4	84.2	0.108
R-14	2.0	7.6	<2.0	<2.0	7.6								
R-15	1.1	7.4	<1.5	4.1	11.5	<3.6	0.9	81.4	11.9	<14.2	6.8	35.3	0.037
R-16	2.4	21	<1.5	3.3	24.3	<3.6	<0.7	18.3	14.5	<14.5	7.4	41.0	0.068
R-17	1.3	40	<7.5	10	50	<3.8	<0.8	15.8	11.7	<15.0	8.3	299.0	0.047
R-18	1.8	1.8	<1.5	<1.5	1.8	<3.3	<0.7	8.5	8.8	<13.1	6.0	30.7	0.032
R-19	1.0	250	<77	<77	250	<5.1	1.4	23.1	23.1	30.6	13.7	69.0	0.090
R-20/HSL3	2.2	2.8	<2.1	<2.1	2.8	7.8	0.9	21.8	18.2	23.6	<7.3	61.8	0.116
R-21	1.8	<3.0	5.4	<3.0	5.4	<4.1	<0.8	22.1	14.8	<16.3	9.9	47.3	0.084
R-22	1.3	92	<.5	0.87	93	<4.4	<0.9	20.4	17.2	30.1	14.5	60.6	0.071
R-23	0.6	890	<300	<300	890	<3.4	<0.7	7.1	9.1	<13.6	<5.4	20.8	<0.05
R-24	0.3	<1.5	12.	<1.5	12	<3.3	<0.7	4.8	3.4	<13.3	<5.3	16.1	<0.05
R-25	1.0	140	<50	<50	140	<3.8	<0.8	4.8	8.9	<15.4	8.6	26.3	0.072
R-26	1.2	8.3	<1.5	3.2	11.5	<4.8	<1.0	8.5	14.7	21.7	11.4	40.0	0.082
R-27	1.0	6.8	<1.0	<1.0	6.8	<3.7	<0.7	29.4	18.9	22.5	12.7	49.3	0.138
R-28	1.2	12	<5.0	5.1	17	<3.8	<0.8	10.2	11.9	17.6	7.3	34.8	0.068
R-29	1.4	2.2	<.25	1.2	3.4	<3.0	<0.6	4.0	<3.0	<12.2	<4.9	49.3	<0.05
R-30	1.2	1.4	<1.0	<1.0	1.4	<3.4	<0.7	52.3	29.4	81.4	7.9	100.0	0.117
R-31	1.2	<0.1	<0.1	<0.1	<0.1								
R-32	2.0	13	<1.5	<1.5	13								
R-33	1.1	110	<27	<27	110	<6.4	<1.3	56.7	35.4	56.2	16.5	109.0	0.179
R-34/HSL11	1.7	110*	<41	<41	110	4.8	<1.0	62.5	25.0	50.0	<8.3	89.6	0.158
R-36	1.5	260	<82	<82	260	<3.3	<0.7	<1.3	<3.3	<13.2	8.2	10.4	<0.05
R-36 (dup)	—	210	<82	<82	210	<3.3	<0.7	1.8	<3.3	<13.2	<5.2	10.8	<0.05

* WEATHERED

Notes:

1. River sediment samples are, in general, ordered from upstream to downstream.
2. Blanks indicate that data has not been reported to date.

2/12/88

PRELIMINARY

TABLE 1 (Cont.)

RIVER SEDIMENT DATA SUMMARY

Sample[1] No.	Recovered Sediment Depth (feet)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight)[2] As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
R-102	1.8	6.2	<.51	<.51	6.2	<3.9	<0.8	6.9	8.6	<15.7	<6.3	20.8	<0.05
R-103	1.2	64	<1.7	8.1	72	<4.8	<1.0	31.0	22.7	32.6	<7.8	72.7	0.148
R-104	1.0	4.8	<.50	<.50	4.8	<3.4	<0.7	9.8	10.0	<13.6	<5.4	33.2	0.071
R-104 (dup)	—	6.1	<.50	<.50	6.1	<3.4	<0.7	9.2	9.8	<13.6	<5.4	32.5	0.074
R-105	1.5	10	<1.5	<1.5	10								
R-35	0.8	2.0	<.5	<.5	2.0	<3.6	<0.7	14.4	16.9	<14.4	13.2	32.4	<0.05
R-37	1.7	<1.5	<1.5	<0.5	<1.5	<3.5	1.0	10.2	11.2	<14.0	12.3	23.9	<0.05
R-38	0.0		ABANDONED										
R-39	0.0		ABANDONED										
R-40	0.0		ABANDONED										
R-41	0.0		ABANDONED										
R-42	0.3	0.058	<.025	.094	.152	<3.0	<0.6	2.9	<3.0	21.6	<4.8	8.0	<0.05
R-43	0.3	0.31	<.13	0.29	0.60	<3.0	<0.6	45.6	62.2	<12.0	<4.8	53.5	<0.05
R-44	0.8	<.05	<.05	<.025	<.05	<3.0	<0.6	6.9	10.0	<12.2	<4.9	13.7	<0.05
R-45/HSL5	0.8	<.02	<.02	.071	0.07	2.1	<0.6	7.8	3.1	4.5	<5.0	9.6	<0.031
R-46	1.0	4.8	<.05	2.3	7.1								
R-47	1.2	0.74	<.25	0.26	1.0	<2.9	<0.6	4.5	9.3	<11.6	<4.6	16.4	<0.05
R-48	0.3	0.58	<.10	0.35	0.93	<3.0	<0.6	6.9	51.3	<11.8	<4.7	40.8	<0.05
R-49	2.2	4.3	<1.5	<1.5	4.3	<3.2	<0.6	4.7	35.0	<12.6	<5.0	27.6	<0.05
R-50	0.7	2.1	<0.5	0.73	2.8	<3.3	<0.7	5.0	48.3	<13.2	<5.3	43.6	<0.05
R-51	0.9	0.80	<0.3	<0.3	0.8	<2.8	<0.6	4.7	15.0	<11.0	<4.4	19.6	<0.05
R-52	0.0		ABANDONED										
R-53	0.3	<0.25	0.70	0.64	1.3	<3.1	<0.6	3.7	11.2	32.2	7.0	14.6	<0.05
R-54/HSL6	2.7	8.8	<2.0	<2.0	8.8	7.5	<0.8	53.3	60.0	26.7	6.7	73.3	0.12
R-106	1.3	<0.5	1.8	1.0	2.8	<3.1	<0.6	5.2	19.4	27.4	<5.0	21.5	<0.05
R-55	1.0	<.025	.036	.024	0.06	<2.7	<2.5	6.9	13.8	<10.9	7.5	22.1	<0.05
R-56	2.0	<.025	.027	<.025	.03	<2.9	<0.6	15.9	21.1	<11.7	8.8	26.3	<0.05
R-57	1.3	2.7	<1.5	1.5	4.2	<3.4	0.9	8.0	43.8	<13.6	7.3	48.6	<0.05
R-57 (dup)	—	2.8	<1.5	<1.5	2.8	<3.4	<0.7	8.3	75.2	<13.6	<5.4	39.8	<0.05
R-58	0.7	<.025	<.025	<.025	<.025	<3.0	0.8	5.0	9.9	<12.2	5.9	12.5	<0.05
R-59	1.0	0.64	<0.3	0.50	1.22	<3.3	<0.6	7.4	19.7	<13.2	<5.3	24.3	<0.05
R-59 (dup)	—	1.1	<0.3	0.64	1.74	<3.3	0.6	9.1	22.1	<13.2	<5.3	24.3	<0.05
R-60	0.5	<.025	<.025	<.025	<.025	<3.3	1.2	12.8	30.5	<13.1	22.8	39.6	<0.05
R-61	1.0	.050	<.025	.052	0.10	<3.3	2.6	20.6	32.8	<13.3	29.5	46.4	<0.05
R-62	0.0		ABANDONED										
R-63	0.8	.070	<.05	0.10	0.17	<3.2	1.3	18.0	29.5	<13.0	24.9	39.4	<0.05
R-64	0.8	0.55	<0.30	0.50	1.05	<3.2	0.6	10.2	31.8	24.2	5.6	39.6	0.059
R-65/HSL7	2.4	<1.0	2.6	1.4	4.0	2.1	<0.7	13.7	32.9	32.9	5.5	43.8	0.40
R-66	0.9	0.26	<.05	0.19	0.45	<2.9	<0.6	13.7	27.6	29.8	8.1	27.4	<0.05
R-67	0.7	5.6	<1.5	2.8	8.4	<3.3	<0.7	5.2	64.0	15.9	13.2	69.2	<0.05
R-68	0.5	1.8	<.05	1.4	3.2	<3.8	1.0	14.0	37.8	29.0	8.8	51.2	<0.05
R-69	1.3	0.12	<.05	0.14	0.26	<3.2	<0.6	6.7	17.9	18.5	7.2	34.0	<0.05
R-70	1.3	0.57	<0.30	0.48	1.05	<3.4	1.6	18.2	30.9	24.1	12.2	39.2	<0.05

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PRELIMINARY

TABLE 1 (Cont.)

RIVER SEDIMENT DATA SUMMARY

Sample[1] No.	Recovered Sediment Depth (feet)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight)[2] As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
R-71	1.2	0.49	<0.30	0.54	1.03	<3.3	<0.6	11.5	33.6	33.8	3.7	42.2	<0.05
R-72	0.9	1.7	<0.75	1.6	3.3	<3.7	0.7	6.8	39.9	43.4	6.9	49.5	0.055
R-73	3.0	3.7	<1.5	2.9	6.6	<3.9	1.2	139	159	618	67.1	230	0.187
R-73 (dup)	—	3.9	<1.5	2.2	6.1	<3.9	2.2	130	126	598	63.7	220	0.226
R-74	1.8	3.7	<.08	1.8	5.5	<5.9	<1.2	23.0	51.6	56.6	20.8	93.1	0.103
R-75/HSL8	0.8	<0.2	0.81	0.51	1.3	2.6	0.6	14.8	35.8	25.9	<4.9	46.9	0.031
R-76	2.0	1.7	<0.3	<0.3	1.7								
R-77	0.4	2.8	<0.75	1.6	4.4	<5.8	<1.2	19.1	28.4	37.4	17.0	66.7	0.097
R-78	1.2	0.094	<0.025	0.076	0.18	<3.5	<0.7	20.3	25.8	61.7	11.8	88.4	0.086
R-79	1.8	11	<1.5	3.4	14.4	<4.5	<0.9	67.0	98.6	321	40.0	201	0.129
R-80	1.0	5.6	<1.5	5.1	10.7	<3.4	<0.7	20.7	37.9	45.1	12.4	57.1	0.054
R-81	1.5	<.025	.062	.030	.092	<3.3	<0.6	11.8	25.8	48.4	<5.2	57.3	0.102
R-82	2.8	.076	<.025	.068	.144	<3.2	<0.6	21.1	21.0	68.7	<5.1	52.5	0.055
R-83	3.4	.095	<.025	.076	.171	<3.2	<0.6	8.1	12.9	<12.8	<5.1	24.3	<0.05
R-84	1.2	12	<1.5	4.6	16.6	<3.5	<0.7	22.5	48.9	58.8	<5.6	69.9	0.106
R-85	2.3	0.17	<.051	0.15	0.32	<2.9	<0.6	9.4	19.3	18.9	<4.6	26.4	<0.05
R-86	4.0	.026	<.025	.038	.064	<3.0	<0.6	10.0	9.9	<11.9	8.1	42.5	<0.05
R-87/HSL9	2.9	<0.51	2.6	2.0	4.6	5.3	1.2	54.2	40.7	86.4	32.2	120.3	0.092
R-88	2.6	2.8	<.51	1.4	4.2	<3.0	<0.6	15.3	20.4	41.2	11.4	40.3	<0.05
R-88(dup)	—	3.1	<.51	1.1	4.2	<3.0	<0.6	16.7	15.3	48.2	9.7	39.4	<0.05
R-89	0.0	ABANDONED											
R-90	2.0	8.7	<1.5	<1.5	8.7	<2.7	<0.5	77.4	68.4	214	26.0	106	0.086
R-91	1.4	1.3	<0.31	0.58	1.9	<3.8	<0.8	93.2	62.8	192	43.1	144	0.062
R-92	2.2	0.63	<0.30	0.51	1.3	<3.0	1.0	15.8	12.6	37.1	11.3	41.0	<0.05
R-93	1.7	1.2	<.075	0.45	1.65	<3.1	<0.6	13.4	12.6	42.8	12.5	<1.2	<0.05
R-94	1.9	8.1	<1.5	2.9	11.0	5.9	1.7	143	158	716	90.4	255	0.216
R-95	4.1	<.52	<.52	<.52	<.52	<3.9	0.8	37.2	43.2	146	15.0	183	0.416
R-96/HSL10	2.0	7.3	<0.52	1.6	8.9	12.0	3.1	96.3	101.9	292.6	63.0	207.4	0.283
R-97	2.8	1.2	<.082	0.77	1.97	<3.9	2.2	74.6	27.1	53.7	14.7	96.9	0.291
R-97 (dup)	—	1.2	<.082	0.81	2.01	<3.9	1.2	69.2	25.5	46.7	13.3	93.8	0.305
R-98	0-2	1.3	<.077	0.96	2.26								
	2-4	2.1	<0.51	<0.51	2.1								
	4-6	<1.5	<1.5	<1.5	<1.5								
	6-8	<1.5	<1.5	<1.5	<1.5								
	8-12	.031	<.025	<.025	.031								
R-99	0-4	0.86	<.076	0.61	1.47								
R-100	0-2	3.2	<0.52	2.5	5.7	<4.9	<1	37.5	58.5	96	17.4	158	0.162
	2-4	59	<7.7	7.7	67	<5.4	2.6	74.4	105	328	59.3	220	0.268
	4-6	3.2	<0.76	<0.76	3.2	<2.9	<0.6	29.6	10.4	27.7	4.7	34.5	0.066
	6-8	<0.51	<0.51	<0.51	<0.51	<3.0	<0.6	5.9	4.6	<11.9	<4.8	27.7	<0.05
	8-12	<.076	<.076	<.076	<.076	<3.0	<0.6	14.7	9.1	<11.8	9.4	20	<0.05
R-101	0-4	0.45	<.076	0.47	0.92	<4.0	<0.8	15.7	27	20.1	14.6	50.6	0.055

2/12/88

PRELIMINARY

Sheboygan River and Harbor
Remedial Investigation - Phase II

TABLE 2

HARBOR SEDIMENT DATA SUMMARY

Sample No.	Depth Interval (feet)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight) As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
H1	0-.5	<.025	.09	.15	0.24	<4.1	<0.8	11.2	12.7	16.8	<6.6	32.3	<0.05
	.5-2	<.025	.032	.039	.071	<3.1	<0.6	5.4	6.8	<12.4	<5.0	17.7	<0.05
	2-4	0.17	<.025	0.17	0.34	<3.5	<0.7	33.2	17.6	24.6	6.0	49.0	0.141
	4-6	<.051	0.21	<.051	0.21	<3.2	<0.6	22.0	12.4	28.2	<5.1	33.8	<0.05
	6-8	<.025	<.025	<.025	<.025	<3.4	<0.7	18.5	14.0	<13.5	<5.4	24.7	<0.05
	8-12	<.025	<.025	<.025	<.025	<3.5	<0.7	12.1	15.3	<13.9	9.2	23.2	<0.05
	8-12(dup)	<.025	<.025	<.025	<.025	<3.5	<0.7	14.2	16.4	<13.9	8.2	25.7	<0.05
	12-16	<.025	<.025	<.025	<.025	<3.7	<0.7	13.9	18.1	<15.0	6.0	23.6	<0.05
	16-20	<.025	<.025	<.025	<.025	<3.5	<0.7	13.6	10.1	<14.2	7.5	24.7	<0.05
H2	0-.5	0.31	<.031	0.35	0.72	<3.8	<0.8	10.6	14.5	<15.1	7.7	46.5	<0.05
	.5-2	0.19	<0.05	0.12	0.31	<3.4	1.2	9.0	10.3	<13.8	5.5	36.0	<0.05
	2-4	0.44	<.05	0.46	0.90								
	2-4(dup)	0.32	<0.31	0.33	0.65	<4.1	1.0	20.4	27.1	27.3	<6.6	68.4	0.066
	4-6	1.6	<0.51	1.1	2.7								
	6-8	5.2	<0.51	2.1	7.3								
	8-12	1.5	<0.51	0.77	2.27	<3.7	1.3	117	44.3	162	23.3	107	0.162
H3	0-.5	0.24	<.12	0.23	0.47	<3.6	<0.7	10.9	13.0	<14.3	<5.7	31.6	<0.05
	.5-2	0.24	<.05	0.20	0.44	<3.6	<0.7	14.8	15.9	<14.6	<5.8	42.8	0.05
	2-4	<0.52	0.98	<0.52	0.98	<3.8	0.9	32.6	22.6	33.0	8.6	53.6	<0.05
	2-4(dup)	<0.52	0.82	<0.52	0.82	<3.8	0.8	35.0	23.2	35.4	11.2	55.6	<0.05
	4-6	0.22	<.05	0.18	0.40	<3.4	<0.7	22.2	16.0	23.0	6.8	33.2	<0.05
	6-8	<0.5	1.1	<0.5	1.1	<3.3	0.7	27.7	16.4	32.2	<5.3	35.0	0.058
	8-12	<.025	<.025	<.025	<.025	<3.4	<0.7	12.8	14.5	<13.6	7.1	18.3	<0.05
	12-16	<.025	<.025	<.025	<.025	<3.5	<0.7	12.9	13.4	<14.0	8.0	21.1	<0.05
	12-16(dup)	<.025	<.025	<.025	<.025	<3.5	<0.7	13.4	15.9	<14.0	7.0	24.0	<0.05
	16-20	<.025	<.025	<.025	<.025	<3.5	1.7	11.9	14.7	<14.0	<5.6	18.4	<0.05
H4	0-.5	.097	<.025	.087	0.18	<3.3	<0.7	8.5	<3.3	<13.3	<5.3	12.7	<0.05
	.5-2	<.025	<.025	<.025	<.025	<3.3	<0.7	4.4	4.2	<13.2	<5.3	9.4	<0.05
	.5-2(dup)	<.025	<.025	<.025	<.025	<3.3	1.1	3.7	<3.3	<13.2	<5.3	7.3	<0.05
	2-4	<.025	<.025	<.025	<.025	<3.0	<0.6	3.5	<3.0	<12.2	<4.9	<2.4	<0.05
	4-6	<.025	<.025	<.025	<.025	<3.1	<0.6	3.3	<3.1	<12.3	<4.9	<2.5	<0.05
	6-8	<.025	<.025	<.025	<.025	<3.5	<0.7	19.7	17.1	<14.0	11.2	27.3	<0.05
	8-12	<.025	<.025	<.025	<.025	<3.8	<0.8	15.1	17.5	<15.1	13.0	9.3	<0.05
H5	0-.5	<.025	<.025	<.025	<.025	<3.1	0.7	2.9	<3.1	<12.5	<5.0	<2.5	<0.05
	.5-2	<.025	<.025	<.025	<.025	<3.1	<0.6	3.0	3.7	<12.4	<5.0	<2.5	<0.05
	2-4	<.025	<.025	<.025	<.025	<3.6	<0.7	13.2	15.4	<14.6	<5.8	21.1	<0.05
	4-6	<.025	<.025	<.025	<.025	<3.6	1.3	13.8	17.0	<14.3	14.4	21.7	<0.05

Notes:
1. Blanks indicate data has not been reported to date.

2/12/88

PRELIMINARY

TABLE 2 (Cont.)

HARBOR SEDIMENT DATA SUMMARY

Sample No.	Depth Interval (feet)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight) As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
H6	0-.5	<.025	<.025	.026	.026	<3.0	<0.6	4.0	4.5	<12.2	<4.9	10.1	<0.05
	0-.5(dup)	.047	<.025	.036	.083	<3.0	<0.6	4.0	4.4	<12.2	<4.9	9.8	<0.05
	.5-2	<.025	<.025	<.025	<.025	<3.0	<0.6	2.7	<3.0	<12.1	<4.8	2.5	<0.05
	2-4	<.025	<.025	<.025	<.025	<3.0	<0.6	3.0	3.2	<11.9	<4.8	2.5	<0.05
	4-6	<.025	<.025	<.025	<.025	<3.0	<0.6	4.3	5.8	<12.1	<4.8	2.6	<0.05
	6-8	<.025	<.025	<.025	<.025	<2.8	<0.6	4.8	5.5	<11.4	<4.6	4.2	<0.05
	8-12	<.025	<.025	<.025	<.025	<3.1	1.2	10.8	9.3	<12.4	10.1	15.8	<0.05
H7	0-.5	<.025	<.025	<.025	<.025	<3.1	1.2	4.1	<3.1	<12.5	<5.0	11.1	<0.05
	.5-2	<.025	<.025	<.025	<.025	<3.1	<0.6	2.2	3.6	<12.4	<5.0	<2.5	<0.05
	2-4	<.025	<.025	<.025	<.025	<3.0	1.0	4.0	4.0	<12.2	<4.9	5.1	<0.05
	4-6	<.025	<.025	<.025	<.025	<3.1	<0.6	3.6	<3.1	<12.5	<5.0	<2.5	<0.05
	6-8	<.025	<.025	<.025	<.025	<3.4	0.8	13.6	17.2	<12.2	<13.4	11.3	<0.05
	6-8(dup)	<.025	<.025	<.025	<.025	<3.4	0.8	13.4	17.5	<13.4	5.8	18.1	<0.05
H8	0-.5	<.030	<.025	<.025	<.030	<3.2	<0.6	3.7	<3.2	<12.8	<5.1	6.0	<0.05
	.5-2	.026	<.025	.049	.075	<3.0	<0.6	5.2	6.4	<12.2	<4.9	7.9	<0.05
	2-4	<.025	<.025	<.025	<.025	<3.0	<0.6	2.9	5.4	<12.2	<4.9	<2.4	<0.05
	4-6	<.025	<.025	<.025	<.025	<3.1	<0.6	2.5	4.1	<12.4	<5.0	<2.5	<0.05
	6-8	<.025	<.025	<.025	<.025	<4.1	<0.8	8.1	16.0	<16.5	12.4	19.3	<0.05
H9	0-.5	<.025	<.025	<.025	<.025	<3.1	<0.6	5.0	<3.1	<12.3	<4.9	14.4	<0.05
	.5-2	.027	<.027	.030	.057	<3.0	0.8	6.2	<3.0	12.3	<4.9	3.9	<0.05
	2-4	<.025	<.025	<.025	<.025	<3.0	<0.6	5.8	<3.0	<12.0	<4.8	<2.4	<0.05
	4-6	<.025	<.025	<.025	<.025	<3.1	<0.6	3.3	3.6	<12.2	<4.9	2.4	<0.05
	6-8	<.025	<.025	<.025	<.025	<3.1	<0.6	2.7	<3.1	<12.4	<5.0	<2.5	<0.05
	6-8(dup)	<.025	<.025	<.025	<.025								<0.05
	8-12	<.025	<.025	<.025	<.025								<0.05
H10	0-.5	0.09	<.025	.08	0.17	<3.4	<0.7	5.2	<3.4	<13.4	<5.4	26.4	0.013
	.5-2	15	<4.5	6.1	21	<3.9	0.9	56.9	36.2	108	19.8	91.7	0.072
	2-4	24	<7.6	14	38	4.2	0.7	115	70.8	254	33.4	168	0.167
	4-6	<.025	.053	<.025	0.05	<3.4	<0.7	19.7	22.5	<13.6	18.7	36.2	0.030
H11	0-.5	4.8	<1.6	<1.6	4.8	<6.0	1.7	42.3	52.9	94.7	12.9	148.2	0.167
	.5-2	4.3	<1.6	2.8	7.1								
	2-4	2.2	<1.5	1.3	3.5								
	4-6	4.0	<1.6	2.5	6.5								
	6-8	4.4	<1.5	3.2	7.6								
	8-12	19	<1.5	6.7	26								
	12-16	34	<5.1	12	46								
	16-20	35	<5.2	5.3	40								

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TABLE 2 (Cont.)

HARBOR SEDIMENT DATA SUMMARY

Sample No.	Depth Interval (feet)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight) As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
H12	0-.5	1.1	<0.5	1.3	2.4	<6.7	<1.3	30.6	47.2	48.5	11.8	129	0.211
	.5-2	1.6	<0.32	1.2	2.8	<6.1	<1.2	31.1	51.5	61.5	<9.8	126	0.121
	.5-2(dup)	1.1	<.54	1.3	2.4	<6.1	<1.2	33.3	51.2	43.1	24.3	125	0.162
	2-4	1.7	<.52	1.6	3.3								
	4-6	20	<8.0	11	31								
	6-8	150	<16	30	180	<5.3	2.3	194	124	364	76.7	280	0.360
	8-12	51	<15	20	71	5.3	2.0	280	139	783	64.6	307	0.502
	12-16	37	<15	<15	37	4.3	<0.8	250	135	717	48.4	309	0.568
H13	0-.5	2.8	<1.0	1.5	4.3								
	.5-2	2.2	<0.77	1.2	3.4								
	.5-2(dup)	2.2	<0.50	1.3	3.5	5.8	2.0	46.2	56.2	74.8	31.2	172	0.155
	2-4	5.5	<1.5	3.0	8.5								
	4-6	14	<3.1	3.9	18								
	6-8	7.2	<4.6	5.1	12.3								
	8-12	39	<15	16	55								
	12-16	19	<1.5	<1.5	19								
	16-20	32	<15	<15	32								
H14	0-.5	4.1	<1.5	1.7	5.8	<5.2	<1.0	41.9	61.6	115	24.8	140	0.150
	.5-2	3.7	<1.5	2.3	6.0	<4.8	1.9	52.1	60.9	160	21.9	218	0.141
	2-4	8.1	<0.3	3.6	11.7	<4.2	1.0	42.8	90.4	178	22.2	127	0.095
	4-6	7.1	<0.5	2.6	9.7	<3.8	<0.8	44.7	49.8	111	15.2	89.6	0.264
	6-8	2.5	<0.51	0.72	3.2	<3.4	<0.7	26.0	40.2	127	18.4	64.1	<0.05
	8-12	2.2	<0.31	0.99	3.2								
	8-12(dup)	2.8	<0.31	1.2	4.0								
	12-16	<.025	0.32	<.025	0.32								
H15	0-.5	2.2	<1.5	1.8	4.0	<5.8	<1.2	28.0	48.1	60.3	16.1	122	0.102
	.5-2	2.3	<1.5	1.9	4.2	<5.1	1.6	30.9	48.6	69.3	14.0	106	0.056
	2-4	2.0	<1.5	2.2	4.2	<5.6	2.0	44.3	64.4	121	24.9	164	0.144
	4-6	21	<3.0	6.1	27.1	<4.3	<0.8	66.3	96.2	31.8	36.6	147	0.136
	6-8	63	<15	25	88	<5.0	<1.0	74.8	91.6	190	47.3	174	0.172
	8-12	220	<47	<47	220	<5.0	2.6	116	118	463	66.9	216	0.234
	12-16	65	<7.5	15	80	<4.5	2.2	146	115	628	59.0	268	0.253
H16	0-.5	1.5	<.15	1.4	2.9	<5.4	<1.1	35.6	50.2	89.9	23.3	134	0.087
	.5-2	5.4	<1.5	3.7	9.1	<5.0	2.0	53.4	62.7	126	24.8	170	0.125
	2-4	99	<23	<23	99	<5.1	<1.0	92.0	88.3	219	59.3	199	0.164
	4-6	2.7	<.51	<.51	2.7	<3.7	1.5	165	96.6	379	354	200	0.160
	4-6(dup)	2.9	<.51	<.51	2.9	<5.1	3.7	101	100	266	69.5	217	0.163
	6-8	<0.5	<0.5	<0.5	<0.5	<3.6	1.9	16.7	18.7	20.0	7.5	35.9	<0.05
	8-12	0.29	<.025	.034	0.32	<3.4	<0.7	11.6	12.7	<13.5	10.2	19.7	<0.05

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TABLE 2 (Cont.)

HARBOR SEDIMENT DATA SUMMARY

Sample No.	Depth Interval (feet)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight) As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
H17	0-.5	0.88	<0.52	1.6	2.5	<5.1	1.2	32.8	55.7	77.9	11.7	145	0.133
	.5-2	0.85	<0.52	1.3	2.15	<5.5	1.1	14.2	62.3	<22.2	13.5	183	0.202
	2-4	3.2	<1.5	3.4	6.6	<4.6	2.6	86.3	128	318	77.4	248	0.236
	4-6	120	<16	<16	120	<5.1	2.0	97.4	149	550	78.8	275	0.271
	6-8	20	<4.5	5.4	25	<3.2	<0.6	41.1	50.2	258	28.5	114	<0.05
	6-8(dup)	28	<4.5	5.3	33								
	8-12	4.8	<1.5	1.9	6.7								
	12-16	1.1	<0.50	<0.50	1.1								
H18	0-.5	1.4	<0.39	1.1	2.5								
	.5-2	8.3	<1.5	4.2	12.5	<4.9	1.8	114	81.1	178	58.4	218	0.233
	2-4	89	<9.4	19	108	<4.7	2.1	102	140	324	87.5	260	0.255
	4-6	12	<4.6	7.9	20	<3.8	<0.8	56	84.4	676	24	275	0.220
	6-8	13	<3.0	<3.0	13								
	8-12	17	<4.5	<4.5	17	<3.4	0.9	106	100	500	41.8	201	0.120
	12-16	2.2	<0.5	<0.5	2.2	<3.4	1.0	93.2	73.8	148	41.8	117	0.107
	16-20	0.39	<.075	<.075	0.39								
	16-20(dup)	0.44	<.075	<.075	0.44								
H19	0-.5	2.0	<0.32	1.3	3.3								
	.5-2	53	<1.6	2.0	7.3	<4.8	1.2	44.3	64.5	260	24.1	369	0.173
	2-4	0.15	<.025	.033	0.18								
	4-6	0.79	<.05	0.52	1.3								
	6-8	INADEQUATE SAMPLE											
	8-12	0.10	<.025	.032	0.13								
H20	0-.5	0.87	<0.31	0.81	1.68	<4.3	1.2	21.7	40.1	60.6	16.5	88.9	0.097
	.5-2	5.7	<1.5	4.6	10.3	<4.2	2.0	67.9	60.9	129	33.4	151	0.141
	2-4	0.71	<.076	0.26	0.97								
	2-4(dup)	0.66	<.076	0.30	0.96								
	4-6	0.20	<.051	<.051	0.20	<3.1	<0.6	24.2	14.6	38.8	8.6	53.8	0.068
	6-8	0.26	<.051	<.051	<.051	<3.0	<0.6	29.4	11.3	20.7	5.2	57.9	0.073
	8-12	0.13	<.051	<.051	0.13	<3.2	<0.6	31.1	17.2	29.2	10.0	46.6	0.128

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Sheboygan River and Harbor
Remedial Investigation - Phase II

TABLE 3

SOILS DATA SUMMARY

Sample[1]	PCBs (ppm, dry weight)				Metals (ppm, dry weight)[2]							
No.	1242	1248	1254	Total	As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
S1	<0.5	3.3	3.0	6.3	<3.4	<0.7	5.4	12.2	<13.4	8.8	27.7	0.056
S2	71	<15	<15	71	<4.1	<0.8	12.9	10.6	33.3	14.9	43.9	0.083
S3	<10	30	<10	30	<4.0	<0.8	67.6	10.5	16.7	9.1	36.2	0.057
S4	<.25	1.25	0.8	2.05								
S5	<.025	0.09	0.15	0.16	<3.3	<0.6	8.2	42.4	<13.1	5.6	42.0	<0.05
S6	1.3	<.14	1.1	2.4								
S7	<0.91	3.5	5.3	8.8	<2.5	1.3	14.0	20.2	23.6	5.7	46.9	0.261
S8	<0.80	2.6	3.7	6.3	<2.5	<0.5	13.5	18.2	18.5	8.0	42.9	0.160
S9	0.61	<.25	0.51	1.1	<3.1	<0.6	5.4	29.3	<12.3	<4.9	28.4	<0.05
S10	0.084	<.025	0.074	0.16	<3.2	0.6	10.3	19.0	<12.9	12.0	26.7	<0.05
S10 (dup)	0.10	<.025	.093	0.19	<3.2	<0.6	10.8	19.0	<12.9	14.7	28.6	<0.05
S11	<1.5	<1.5	5.2	5.2	<3.3	<0.6	15.9	29.6	14.2	14.5	45.3	0.072
S12	0.31	<.05	0.26	0.57	<2.9	<0.6	1.4	8.4	<11.8	5.2	17.1	<0.05
S13	0.87	<0.3	0.80	1.7	<3.4	<0.7	8.5	27.0	<13.5	7.3	30.1	<0.05
S14	<.025	<.025	<.025	<.025	<2.6	<0.5	5.4	12.1	<10.5	8.0	42.2	<0.05
S15	1.3	<0.51	1.9	3.2	<4.4	<0.9	8.5	43.0	<17.4	9.8	77.7	0.065
S16	<.076	1.0	1.0	2.0	<3.1	1.4	13.4	26.6	38.0	10.8	41.5	<0.05
S17	0.49	<0.78	0.83	1.32	4.1	3.4	21.4	30.2	32.5	12.7	68.0	0.101
S18	2.0	<.032	1.5	3.5	<4.7	0.9	26.7	44.1	52.8	13.1	82.8	0.130
S18 (dup)	1.9	<.031	1.2	3.1	<4.7	1.7	26.1	40.7	57.8	12.7	82.2	0.109
S19	<.078	1.0	0.96	2.0	<3.8	2.1	19.0	31.8	34.5	12.3	64.4	0.055
S20	2.7	<0.32	2.8	5.5	<6.2	2.2	40.1	50.7	92.1	30.9	132	0.215

Notes:

1. All samples were collected between 0 and 3" of depth.
2. Blanks indicate that data has not been reported to date.

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Sheboygan River and Harbor
Remedial Investigation Program
Table 4

SHEBOYGAN HARBOR SEDIMENTS - HSL DATA

Location No. / Depth	H1 2'-4'	H10 2'-4'	H12 2'-4'	H15 2'-4'	H20 2'-4'
Constituents[1]					
a. PCBs (Total), ppm	0.34	38	3.3	4.2	0.96*
Aroclor 1242	0.17	24	1.7	2.0	0.68*
Aroclor 1248	LT .02	LT 7.6	LT 0.52	LT 1.5	LT .08*
Aroclor 1254	0.17	14	1.6	2.2	0.28*
b. Metals, ppm[2]					
Arsenic	LT 3.6	4.4	LT 5.2	LT 5.6	4.0*
Cadmium	LT 0.7	0.8	LT 1.0	2.0	1.1*
Chromium	35	122	40	44	193*
Copper	19	75	54	64	89*
Lead	26	267	69	120	250*
Nickel	6.2	34	25	24	16*
Zinc	51	176	71	164	250
c. Volatile Organics, ppb[3]					
Methylene chloride	22 B(9)	34	20 B(9)	36 B(9)	120 B(22)**
Acetone	51 B(11)	110	98 B(11)	240 B(11)	330 B(16)**
Benzene	---	---	---	---	35
Methyl ethyl ketone	---	---	---	---	50
Toluene	---	23	---	3	---**
Ethylbenzene	---	---	---	---	370**
Xylenes	---	---	---	---	130**
d. Polynuclear Aromatics (estimated total), ppm[4]	1.8	1.6	0	0.95	63.3**
e. Phthalate Esters, ppm					
di-n-butyl-	1.0 B(2.2)	---	0.3 B(0.1)	---	0.4**
bis (2-ethylhexyl)-	0.34 B(5.2)	1.0	0.37	1.6	---**
f. Physical Data					
1. Description	Sandy clay Silty clay	Dark brown/ grey silt, org. matter with sand lenses	Clayey silt, org. matter (worm trails)	Clayey silt, sand lenses & org. matter	Coarse sand with fines. Dark plastic clay & black silt. Oil saturated layers below 3.8'.
2. TOC, %	1.4	3.4	4.2	4.6	4.2
3. Moisture content, %	31	36	52	55	30
4. Particle size, % less than .075 mm	51	62	98	83	40

Symbols:

*Average of 2 analyses.

**Average of 3 analyses.

LT=Less than.

B=Detected in blank at concentration shown in parentheses.

Notes:

[1]All constituents reported on a dry weight basis.

[2]Metals not reported to date are: Vanadium, iron, magnesium, manganese, potassium, sodium, calcium, thallium, cobalt, antimony, barium, mercury, selenium, silver, aluminum and beryllium.

[3]Undetected volatile organics are not shown.

[4]PNAs were estimated by summing individual concentrations of these compounds.

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Sheboygan River and Harbor
Remedial Investigation Program

TABLE 5

SUMMARY OF MATRIX SPIKE RESULTS

Matrix Spike - % Recovery

I. River Sediments	PCBs[1]	As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
R-36	(2)	89	90	97	111	92[3]	92	100[3]	109[3]
R-104	73	98	96[3]	102	111	141[3]	104	142[3]	141[3]
R-57	98	96	74[3]	97	100[3]	113	97		98[3]
R-59	79[3]	94	100[3]	91[3]	120[3]	106[3]	107	93[3]	27[3]
R-73	138	96	60	73	84	70	87	65	89[3]
R-88	115	98	86	95	89	121	107	88	68[3]
R-97	67	100	94	94	99	94	102	101	165[3]
II. Soil Samples									
S-10	86	93	98	92	114	101	98		84
S-18	95	98	92	92	85	100	102	94	98
III. Harbor Sediments									
Sample / Depth Interval (ft)									
H1 8-12	107	95	98	97	103	103	93	96[3]	102
H2 2-4	96	96	100[3]	94	105	97	89	83	76
H3 2-4	110	93	76[3]	95	109	102	95	107	88
12-16	90	96	84[3]	93	114	104	87	98	102
H4 0.5-2	90	95	98[3]	94	90	97	106	85	94[3]
H6 0-0.5	83	94	80	91	108	97	95	85[3]	62
H7 6-8	74	91	88[3]	86	93	89	87	84	80
H9 6-8	92	96	62	99	103	101	102[3]	91	111
H12 0.5-2	103	96	102	102	88	110	117	102[3]	96
H13 0.5-2	66[3]	107	106[3]	85	96[3]	102	100	39[3]	110[3]
H14 8-12	132	99	116[3]	100	136	96	94	139[3]	61
H16 4-6	70[3]	94	80[3]	91	108[3]	97[3]	95	85	98
H17 6-8	140	98	112	100	133	74	93	90	109
H18 16-20	78								
H20 2-4	126								
Acceptable limits (%)	70-130	75-125	85-115	85-115	85-115	75-125	85-115	85-115	75-125

Notes:

(1) PCB - Aroclor 1242

(2) Spike diluted out.

(3) Outside acceptable limits.

(4) Blanks indicate data has not been reported to date.

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Sheboygan River and Harbor
Remedial Investigation Program

TABLE 6

SUMMARY OF DUPLICATE ANALYSIS RESULTS

	PCBs (ppm, dry weight)				Metals (ppm, dry weight) (1)							
I. River Sediments	1242	1248	1254	Total	As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
R-36	260	<82	<82	260	<3.3	<0.7	<1.3	<3.3	<13.2	8.2	10.4	<0.05
R-36 (dup)	210	<82	<82	210	<3.3	<0.7	1.8	<3.3	<13.2	<5.2	10.8	<0.05
RPD, %	22	—	—	22	—	—	—	—	—	—	3.8	—
R-104	4.8	<.50	<.50	4.8	<3.4	<0.7	9.8	10	<13.6	<5.4	33.2	0.071
R-104 (dup)	6.1	<.50	<.50	6.1	<3.4	<0.7	9.2	9.8	<13.6	<5.4	32.5	0.074
RPD, %	24	—	—	24	—	—	6.3	2.0	—	—	2.1	4.1
R-57	2.7	<1.5	1.5	4.2	<3.4	0.9	8.0	43.8	<13.6	7.3	48.6	<0.05
R-57 (dup)	2.8	<1.5	<1.5	2.8	<3.4	<0.7	8.3	75.2	<13.6	<5.4	39.8	<0.05
RPD, %	3.6	—	—	40	—	—	3.7	53	—	—	20	—
R-59	0.64	<0.3	0.64	1.22	<3.3	<0.6	7.4	19.7	<13.2	<5.3	24.3	<0.05
R-59 (dup)	1.1	<0.3	0.64	1.74	<3.3	<0.6	9.1	22.1	<13.2	<5.3	24.3	<0.05
RPD, %	5.3	—	0	3.5	—	—	21	11	—	—	0	—
R-73	3.71	<1.5	2.9	6.6	<3.9	1.2	139	159	618	67.1	230	0.187
R-73 (dup)	3.9	<1.5	2.2	6.1	<3.9	2.2	130	126	598	63.7	220	0.226
RPD, %	5.3	—	27	7.9	—	59	6.7	23	3.3	5.2	4.4	19
R-88	2.8	<.51	1.4	4.2	<3.0	<0.6	15.3	20.4	41.2	11.4	40.3	<0.05
R-88 (dup)	3.1	<.51	1.1	4.2	<3.0	<0.6	16.7	15.3	48.2	9.7	39.4	<0.05
RPD, %	10	—	24	0	—	—	8.7	28	16	16	2.3	—
R-97	1.2	<.082	0.77	1.97	<3.9	2.2	74.6	27.1	53.7	14.7	96.9	0.291
R-97 (dup)	1.2	<.082	0.81	2.01	<3.9	1.2	69.2	25.5	46.7	13.3	93.8	0.305
RPD, %	0	—	5.1	2.0	—	59	7.5	6.1	14	10	3.2	4.7
II. Soil Samples												
S10	0.084	<.025	0.074	0.16	<3.2	0.6	10.3	19.0	<12.9	12.0	26.7	<0.05
S10 (dup)	0.10	<.025	0.093	0.19	<3.2	<0.6	10.8	19.0	<12.9	14.7	28.6	<0.05
RPD, %	17	—	23	17	—	—	4.7	0	—	20	6.9	—
S18	2.0	<.032	1.5	3.5	<4.7	0.9	26.7	44.1	52.8	13.1	82.8	0.130
S18 (dup)	1.9	<.031	1.2	3.1	<4.7	1.7	26.1	40.7	57.8	12.7	82.2	0.109
RPD, %	5.1	—	22	12	—	61	2.3	8.0	9.0	3.1	0.7	18

Notes:
(1) Blanks indicate that data has not been reported to date.

2/12/88

PRELIMINARY

TABLE 6 (Cont.)

SUMMARY OF DUPLICATE ANALYSIS RESULTS

III. Harbor Sediments

Samples	Depth Interval (ft)	PCBs (ppm, dry weight) 1242	1248	1254	Total	Metals (ppm, dry weight)(1) As	Cd	Cr	Cu	Pb	Ni	Zn	Hg
H1	8-12	<.025	<.025	<.025	<.025	<3.5	<0.7	12.1	15.3	<13.9	9.2	23.2	<0.05
	8-12(dup)	<.025	<.025	<.025	<.025	<3.5	<0.7	14.2	16.4	<13.9	8.2	25.7	<0.05
	RPD, %	—	—	—	—	—	—	16	6.9	—	11	10	—
H2	2-4	0.44	<.05	0.46	0.90								
	2-4(dup)	0.32	<0.31	0.33	0.65	<4.1	1.0	20.4	27.1	27.3	<6.6	68.4	0.066
	RPD, %	32	33	32	—	—	—	—	—	—	—	—	—
H3	2-4	<0.52	0.98	<0.52	0.98	<3.8	0.9	32.6	22.6	33.0	8.6	53.6	<0.05
	2-4(dup)	<0.52	0.82	<0.52	0.82	<3.8	0.8	35.0	23.2	35.4	11.2	55.6	<0.05
	12-16	<.025	<.025	<.025	<.025	<3.5	<0.7	12.9	13.4	<14.0	8.0	21.1	<0.05
	12-16(dup)	<.025	<.025	<.025	<.025	<3.5	<0.7	13.4	15.9	<14.0	7.0	24.0	<0.05
	RPD, %	—	18	—	18	—	12	7.1	2.6	7.0	26	3.7	—
H4	.5-2	<.025	<.025	<.025	<.025	<3.3	<0.7	4.4	4.2	<13.2	<5.3	9.4	<0.05
	.5-2(dup)	<.025	<.025	<.025	<.025	<3.3	1.1	3.7	<3.3	<13.2	<5.3	7.3	<0.05
	RPD, %	—	—	—	—	—	—	17	—	—	—	25	—
H6	0-.5	<.025	<.025	.026	.026	<3.0	<0.6	4.0	4.5	<12.2	<4.9	10.1	<0.05
	0-.5(dup)	0.047	<.025	.036	.083	<3.0	<0.6	4.0	4.4	<12.2	<4.9	9.8	<0.05
	RPD, %	—	—	32	105	—	—	0	2.2	—	—	3.0	—
H7	6-8	<.025	<.025	<.025	<.025	<3.4	0.8	13.6	17.2	<12.2	<13.4	11.3	<0.05
	6-8(dup)	<.025	<.025	<.025	<.025	<3.4	0.8	13.4	17.5	<13.4	5.8	18.1	<0.05
	RPD, %	—	—	—	—	—	0	1.5	1.7	—	—	46	—
H9	6-8	<.025	<.025	<.025	<.025	<3.1	<0.6	2.7	<3.1	<12.4	<5.0	<2.5	<0.05
	6-8(dup)	<.025	<.025	<.025	<.025								
	RPD, %	—	—	—	—	—	—	—	—	—	—	—	—
H12	.5-2	1.6	<0.32	1.2	2.8	<6.1	<1.2	31.1	51.5	61.5	<9.8	126	0.121
	.5-2(dup)	1.1	<.54	1.3	2.4	<6.1	<1.2	33.3	51.2	43.1	24.3	125	0.162
	RPD, %	37	—	8.0	15	—	—	6.8	0.6	35	—	0.8	30
H13	.5-2	2.2	<0.77	1.2	3.4								
	.5-2(dup)	2.2	<0.50	1.3	3.5	5.8	2.0	46.2	56.2	74.8	31.2	172	0.155
	RPD, %	0	—	8.0	2.9	—	—	—	—	—	—	—	—
H14	8-12	2.2	<0.31	0.99	3.2								
	8-12(dup)	2.8	<0.31	1.2	4.0								
	RPD, %	24	—	19	22								
H16	4-6	2.7	<.51	<.51	2.7	<3.7	1.5	165	96.6	379	354	200	0.160
	4-6(dup)	2.9	<.51	<.51	2.9	<5.1	3.7	101	100	266	69.5	217	0.163
	RPD, %	7.1	—	—	7.1	—	85	48	3.0	35	134	8.1	1.9
H17	6-8	20	<4.5	5.4	25	<3.2	<0.6	41.1	50.2	258	28.5	114	<0.05
	6-8(dup)	28	<4.5	5.3	33								
	RPD, %	33	—	1.9	27								
H18	16-20	0.39	<.075	<0.75	0.39								
	16-20(dup)	0.44	<.075	<.075	0.44								
	RPD, %	12	—	—	12								
H20	2-4	0.71	<.076	0.26	0.97								
	2-4(dup)	0.66	<.076	0.30	0.96								
	RPD, %	7.3	—	14	1.0								

2/12/88

SHEBOYGAN RIVER AND HARBOR

MONTHLY STATUS REPORT

January, 1988

1. Actions Taken During This Time Period

Work activities during January included review of incoming data.

2. EPA Decisions

None

3. Results of Sampling and Tests

Partial data has been received to date and this data is presented in the accompanying letter. We expect the remaining data by the beginning of March and will forward in the February Status Report.

4. Anticipated Problems/Recommended Solutions

None

5. Problems Encountered/Resolved

None

6. Deliverables Submitted

Deliverable	Date Submitted
December Status Report	January 12, 1988

7. Upcoming Events/Activities Planned

Water sampling has been postponed until the Spring of 1988.

8. Key Personnel Changes

None

9. Schedule

Postponed water sampling until Spring of 1988.

BLASLAND & BOUCK ENGINEERS, P.C.
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White Plains, NY • Edison, NJ • Boca Raton, FL • 230 Park Avenue, NYC • Corning, NY • Columbus, OH

August 11, 1987

Ms. Bonnie Eleder
Remedial Project Manager
U.S. Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, IL 60604

Re: Sheboygan River and Harbor
Remedial Investigation

File: 176.02 #2

Dear Bonnie:

As you know, the initial field activities for the Sheboygan River and Harbor project began in late May and consisted of collecting ten (10) "key" River sediment samples and six (6) water column samples in accordance with the approved Project Operations Plans. The specific intent in obtaining these samples was to characterize the site with respect to the various contaminants present. Therefore, each sediment sample was analyzed for the entire Hazardous Substance List (HSL). The water column samples were analyzed for polychiorinated biphenyls (PCBs) and targeted metals.

The laboratory analyses have now been completed, and are presented herein. The final laboratory report was received yesterday, however, verbal reports and preliminary data has been received in partial form since late June, 1987. While we have yet to receive all of the detailed supporting documentation, we are comfortable now in presenting the data and documentation received to date. In terms of scheduling, Hazleton Laboratories recognizes their delay in completion of these samples, and attributes this delay to an unanticipated work volume associated with EPA analytical requirements under the Contract Laboratory Program. Hazleton has indicated that they do not expect a similar delay for the remainder of the program.

The purpose of this letter is to present the results of this sampling and analysis and review the sediment analytical results to determine whether contaminants identified by the initial analysis should be considered "contaminants of concern" to be analyzed during the remaining sediment sampling and analysis activities. The remainder of this letter report will present and discuss the analytical results obtained from the sediment and water column samples in the following format:

I. Presentation of Data
   A. Sediment Data
   B. Water Column Data
   C. Quality Assurance Data
II. Identification of Contaminants of Concern
III. Impact of Initial Data on Future Sampling Locations
IV. Summary and Recommendations

I. Presentation of Data

A. SEDIMENT DATA

Sediment sampling locations and resultant data obtained during this phase of the Remedial Investigation (RI) is summarized on Figure 1 and in the attached Table 1. In addition, original data reports received from Hazleton Laboratories America, Inc. and Thermo Analytical, Inc. appear in Appendices A-C. Please note that "raw" data reports, including chromatograms, etc., have not been attached, as it represents approximately 16 inches thickness of paper. The "raw" data and other backup data can be provided as appropriate. The analytical data for the 10 sediment samples is summarized below by main groups of contaminants.

1. PCBs/Pesticides

As shown in Table 1, PCB concentrations were found to range from 0.07 to 110 ppm (dry weight). The highest concentration was reported at sampling location HSL-11 (Figure 1), taken from behind the downstream dam ("Waelderhaus") in the Village of Kohler. Most other samples ranged between 1 and 10 ppm.

PCBs were reported as Aroclors 1242, 1248, 1254 and combinations thereof. Note that a PCB level of 1.2 ppm was found in the farthest upstream (i.e. "background") sample obtained upstream of the Sheboygan Falls dam.

Pesticides were not detected in any sample. See Appendix A for details.

2. HSL Metals

The 23 HSL metals were analyzed in each of the ten sediment samples. The results for these 23 metals are available in Appendix A. The results for the eight targeted metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) are presented in Table 1 and Figure 1. Several additional metals (Sb, Ba, Se, Ag) are also presented in Table 1. In general, the targeted metals occurred at relatively low concentrations in the upstream sediments and increased in the downstream sediment samples (HSL-9 and HSL-10). The remaining inorganics appeared at low levels throughout the River samples, including background.

3. Volatile Organics

The ten sediment samples were each analyzed for 35 volatile organic compounds (VOCs). Of these compounds, a total of five were found in the various samples at concentrations above 10 ppb (dry weight), which is the average detection limit. The resulting data are presented in Table 1, on Figure 1 and below:

Compound	Sediment Characteristics (ppb)	Method Blank (ppb)
Methylene Chloride	<10 - 30	2 - 10
Acetone	33 - 270	8 - 14
Chloroform	<10 - 20	1 - 2
Methyl Ethyl Ketone	<10 - 20	2
Toluene	<10 - 740	1

It should be noted that all of these compounds were also detected in the method blanks at the concentrations shown above. However, with the possible exception of methylene chloride, the contamination levels detected in the method blank are low enough to be regarded as insignificant background laboratory contamination.

In addition to the 35 Volatile Organic Compounds described above, the laboratory performed a search on unidentified mass spectra, as specified in the Contract Laboratory Program (CLP) procedures. This resulted in the "tentative" identification of five additional organic compounds. Hexane was found at a concentration of 30 ppb in one sample. An "unknown" was estimated at 13 ppb in another sample. All other "tentatively identified" compounds were at, or below, 10 ppb.

4. Polynuclear Aromatics

Individual compounds from this class of organics were identified using gas chromatograph/mass spectrometry (GC/MS) analysis of the base-neutral fraction of each sample. With a few exceptions, the quantities reported by Hazleton (see Appendix A) were noted with the "J" notation, meaning that each concentration was an estimated value which fell below the CLP detection limit. Since these compounds are commonly treated as a single group, we have summed the individual components to obtain "total estimated PNAs." These totals are summarized in Table 1 and Figure 1. Note that the total concentration was at, or below 0.3 ppm for all but the last 3 (most downstream) sediment samples.

5. Phthalate Esters

Phthalate esters are plasticizer compounds which are commonly detected as in-lab contaminants. Two of these types of compounds were detected in nearly every sediment sample: di-n-butyl phthalate and bis (2-ethyl hexyl) phthalate. The former was detected at a level of 790 ppb in the method

blank, indicating that laboratory contamination was indeed present. The latter did not appear in the blank, and except for HSL-10, did not exceed 400 ppb. Three additional phthalates were detected at low levels in sample HSL-8 only.

The presence of di-n-butyl phthalate in the method blank at levels which are of the same magnitude as those reported for the sediment samples precludes this data from being considered truly representative. Likewise, it casts suspicion on the detected phthalate compounds in the sediment sample which, although not detected in the method blank, could have resulted from the same sources in the laboratory. It is also possible that the latex gloves used by field workers could have been a source of these compounds. The low concentrations of the related compounds suggests that these compounds are insignificant, in any case.

6. Dioxin/Dibenzofuran

The dioxin isomer 2,3,7,8-TCDD and the dibenzofuran isomer 2,3,7,8-TCDF were analyzed for in sample HSL-11. Neither compound was detected. The detection limits were 0.12 ppb for 2,3,7,8-TCDD, and 0.07 ppb for 2,3,7,8-TCDF (wet weight).

7. Other HSL Compounds

The compound 4-methyl phenol (p-cresol) was detected at low levels (0.2 ppm and 0.06 ppm) in samples HSL-3 and HSL-7. In addition, a number of compounds were tentatively identified in the base-neutral and acid fractions. These compounds are presented for each sample in Appendix A.

8. Other Parameters

The ten sediment samples were also analyzed for Total Organic Carbon (TOC) and particle-size distribution. In addition, a physical description of each sediment core was noted in the field. TOC and particle-size data are available in Appendix A. TOC and the physical description are presented in Table 1.

B. WATER COLUMN DATA

Water column data are presented on Figure 1 and in Table 2. As with the sediments, "raw" data packages and other documentation is available as appropriate. The water column data are summarized on as follows:

1. PCBs

As shown on Figure 1 and in Table 2, total PCB concentrations ranged from non-detected (less than 0.05 ppb) to 0.267 ppb. Both the background water column sample (W1M) and the Harbor water column sample (W7M) had no detectable PCBs. In the remaining samples, unfiltered PCB concentrations ranged from 0.094 to 0.267 ppb, and filtered PCB concentrations ranged from 0.059 to 0.118 ppb. Generally, PCBs in the water column were reported as Aroclor 1242.

2. Targeted Metals

Results for these analyses of samples are presented on Figure 1 and in Table 2. As indicated, the elements mercury, nickel and cadmium were not detected in any sample, filtered or total. Copper, chromium, lead and arsenic were found at low levels throughout the samples. Zinc was detected in the blanks as well as in the samples. Therefore, the reported zinc concentrations are considered questionable.

3. Other Compounds

Results of total suspended solids, alkalinity, Total Kjeldahl Nitrogen (TKN), ammonia and hardness measurements are also shown in Figure 1 and Table 2.

C. QUALITY ASSURANCE DATA

Extensive quality assurance (QA) data were generated during the analysis of samples. A summary of QA data for the sediment samples is given in Appendix C. This summary presents surrogate recoveries, matrix spike/ matrix spike duplicate recoveries, method blanks and calibration data for the organics analysis. Information regarding inorganics analysis includes initial and continuing calibration verification, ICP interference check sample results, spike recovery, duplicates, instrument detection limits and other parameters.

A brief description of the QA program for the initial phase of the RI is as follows. The sediment sample HSL-7 was selected for duplicate and matrix spike analysis for HSL inorganics, and for matrix spike and matrix spike duplicate analysis for HSL organics. Sediment spike recovery data is summarized in Table 3. Water samples (both filtered and total) collected at locations 1 (upstream of Sheboygan Falls dam) and 7 (Harbor) were selected for duplicate analysis. Matrix spike analyses were carried out on the Harbor sample. A field blank for both total and filtered parameters was collected at location 5 (USGS gaging station). Trip blanks were carried with the samples and analyzed for PCBs, metals, TKN, TSS, ammonia, hardness and alkalinity. Also, bottle blanks (filtered and total) were prepared and analyzed in the laboratory. The results of all blank analyses are presented in Table 4.

As can be seen in Table 3, the recovery of seven of the eight targeted metals in sediments fell well within the required control limits. The eighth metal (zinc) was recovered somewhat above the recommended limit. PCB recovery in sediments was 94% and recoveries for spiked HSL organic compounds fell within the advisory limits with few exceptions. In no cases did both the matrix spike and the matrix spike duplicate for a given compound fall outside the limits. Recoveries for water column analyses all fell within the acceptable ranges specified in the QAPP.

Five water blanks were analyzed for the initial phase of the RI. These are as follows:

1. Bottle blank (total): Distilled water rinsed through sample bottles and analyzed by Hazleton Laboratories.
2. Bottle blank (filtered): Distilled water rinsed through sample bottles, filtered and analyzed by Hazleton Laboratories.
3. Trip blank: Distilled water packaged in sample bottles, sent to field and returned to Hazleton Laboratories with other water samples.
4. Field blank (total): Distilled water passed through sampling equipment in the field.
5. Field blank (filtered): Distilled water passed through sampling and filtering equipment in the field.

The results of water blank analyses are presented in Table 4. There was no PCB contamination evident in any of the five blanks analyzed. All targeted metals except zinc and copper were undetected in the trip and field blanks. Copper occurred at 1-2 ppb in the field blank, and was not detected in the trip blank. These levels are below sensitivity of 3.0 ppb specified in the QAPP, and are therefore insignificant. Zinc, on the other hand, was present in the trip blank at a level of 17 ppb, and at higher levels in the field blanks. Since these levels are comparable to those reported for the river water, it must be concluded that the set of water column data reported for zinc is of limited usefulness. All other metals, including copper, did not occur at significant concentrations in either the trip blank or the field blanks, and are therefore valid. The concentration of other parameters (suspended solids, alkalinity, hardness, nitrogen (TKN) and ammonia) were at or below the detection limit in the trip and field blanks.

Analysis of bottle blanks showed measurable levels of chromium, lead, zinc and ammonia. However, since all but zinc were detected in the trip and field blanks, this data should be disregarded. It is evident that the distilled water used by the laboratory to prepare bottle blanks is not the same as that which was used to prepare the trip or field blanks.

In conclusion, the results of the QA analyses and procedures demonstrate that all of the sediment and water column data is valid and acceptable, with the exception of zinc. Zinc matrix spike recovery was above the upper limit of 115%. Hence, zinc sediment data for these 10 samples should be "flagged." In addition, zinc was found in the trip blank and the two field blanks. Hence, water column data for zinc should also be "flagged."

II. IDENTIFICATION OF CONTAMINANTS OF CONCERN IN RIVER SEDIMENTS

Based on the HSL analysis of the 10 "key" sediment samples, as described above, this section discusses the implications with respect to the identification of contaminants of concern prior to initiating the remainder of the Remedial Investigation program.

1. PCBs/Pesticides

As described by the Project Operations Plans, PCBs will continue to be a contaminant of concern. Since pesticides were not detected in the key sediment samples, they will not be considered a contaminant of concern.

2. HSL Metals

The HSL inorganics include seven constituents (Al, Fe, Mg, Mn, K, Na, Ca) which are commonly found in natural sediments and which are generally of little environmental concern. All of the above, except sodium, were detected as anticipated in the Sheboygan River sediments.

The remaining HSL inorganics included the eight targeted metals (As, Cd, Cr, Ca, Ni, Pb, Hg, Zn) and eight non-targeted metals (Ba, Be, Co, Sb, Se, Ag, Tl, V). Since the eight targeted metals are slated for analyses during subsequent sampling efforts, they will not be discussed here. The non-targeted metals are discussed below, each in the order listed. For comparison purposes, we have also presented the available WDNR draft sediment characterization criteria for "clean" sediments which reportedly represent background concentrations of these materials in Lake Michigan.

Barium (Ba) - Concentrations ranged from 10 to 51 ppm. This is well below the WDNR draft sediment criterion of 500 ppm.

Beryllium (Be) - This element was not detected (at 0.5 ppm) in any sample.

Cobalt (Co) - This element was not detected (at 0.5 ppm) in any sample.

Antimony (Sb) - This element was reported to be less than detection (0.5 ppm) in all samples except HSL-2 and HSL-10, which contained 0.7 and 1.0 ppm, respectively. These levels are not considered significant, although no specific regulated criteria exist with which to compare this data. Both detected concentrations were, however, close to the detection limit.

Selenium (Se) - This element was not detected (at 1.0 ppm) in any sample. As a result, samples were below the WDNR draft sediment criterion of 1.0 ppm.

Silver (Ag) - Concentrations ranged from undetected (less than 0.1 ppm) to 0.39 ppm. These levels are not considered significant, although no specific regulated criteria exist with which to compare this data. The detected concentrations were, however, close to the detection limit.

Thallium (Tl) - Concentrations ranged from undetected (less than 0.5 ppm) to 1.7 ppm. These levels are not considered significant, although no specific regulated criteria exist with which to compare this data. The detected concentrations were, however, close to the detection limit.

Vanadium (V) - Concentration ranged from undetected (less than 5 ppm) to 8.3 ppm. These levels are not considered significant, although no specific regulated criteria exist with which to compare this data. The detected concentrations were, however, close to the detection limit.

3. Volatile Organics

Of the 35 compounds tested, five were found at levels above the average detection limit of 10 ppb (dry weight). Two of these five, acetone and toluene, appear at concentrations above 50 ppb. Unfortunately, there is very little other data for sediments with which to compare these concentrations. In addition, we have not found any sediment characterization criteria, official or otherwise, for use in interpretation of the data.

Each of these compounds was also detected in the upstream (background) sediment sample. On the basis of the low concentrations detected, and the presence of these materials in the background sample, we do not consider these parameters to be contaminants of concern with respect to sediments. However, the limited information which exists regarding the partitioning of toluene and acetone suggests that these compounds could be present at potentially higher concentrations in the water column. While this is unlikely, we recommend that the next round of water column samples (low flow) be analyzed for volatile organics.

4. Polynuclear Aromatics

Polynuclear aromatics (PNAs) were found to generally increase as one proceeded downstream. The highest estimated concentrations were found in the two most downstream locations: HSL 9 (2.0 ppm) and HSL 10 (4.0 ppm). These values were compared to data reported in the literature for other nearby locations. The Duluth-Superior Harbor was reported to have PNAs in the 0.2-3.0 ppm range, while Lake Michigan sediments were in the 0.2-6.4 ppm range. Neither of these areas is noted for abnormally high PNA deposition. In addition, one reference (Chapman P.M., Environ. Toxicol. Chem., 5:957-964, 1986) attempted to derive sediment quality criteria for several compounds, including PNAs, based on data from sediment chemistry, bio-assay and in-situ studies. His conclusion was that "combustion" PNAs (naphthalene, chlorinated naphthalenes and fluoranthene) should not exceed 3.8 ppm. These "combustion" PNAs do not exceed 1.0 ppm in the Sheboygan sediments. We therefore conclude that the PNA compounds, even in the most downstream location, are not excessive and should not be considered additional contaminants of concern.

5. Other HSL Compounds

As discussed above, the presence of several phthalate compounds is probably a result of contamination either from within the laboratory or from latex gloves utilized during sampling activities. Hence, these values are not considered representative of actual site conditions. The presence of low levels of 4-methyl phenol, a highly degradable substance, is not considered significant. The hexane found in one sample is most likely residue from decontamination procedures.

III. IMPACT OF INITIAL DATA ON FUTURE SAMPLING LOCATIONS

During the initial phase of the remedial investigation, it was noted that the amount of deposited sediments was minimal in one major segment of the River. This segment included the stretch of River between the second (downstream) Kohler dam and the recently constructed Taylor Drive bridge. It was, in fact, necessary to abandon one previously selected sample location (HSL-4), immediately downstream of the second Kohler dam (Waelderhaus), due to a lack of sediments. We, therefore, anticipate that it may not be possible to find sufficient sediment deposits for the purposes of sampling within this stretch of River. In additon, it can be seen from the data that the concentration of PCBs and metals reported in this section of the River are quite low.

Currently there are 35 locations slated to be sampled in this stretch of the River. We propose to reduce this number by approximately half, depending on the quantity of sediments that are actually found during the next phase of the project. By reducing the number of samples obtained in this River section, it will be possible to intensify sampling in other River stretches which may warrant such attention.

The PCB analysis results discussed above indicate that the presence of PCBs is predominantly upstream of the second Kohler dam. It may be beneficial to intensify the sampling effort in this area with respect to quantification of PCBs. It is therefore recommended that additional sediment samples be collected in this area, if sufficient sediment deposits are present, in lieu of the sampling between the downstream Kohler Dam and the Taylor Drive bridge. These samples would be analyzed for PCBs only. It is further recommended that an additional water column sample be collected in the Onion River to determine whether this is a potential source of PCBs. It may also be beneficial to increase the number of samples collected in the stretch of River between the Taylor Drive bridge and Pennsylvania Avenue to better characterize the sediment deposits there. These samples would be analyzed for both PCBs and targeted metals.

IV. SUMMARY AND RECOMMENDATIONS

This letter report and attachments present the data resulting from the initial field activities undertaken on the Sheboygan River and Harbor project. While it is difficult to summarize the extensiveness of the data developed by this initial sampling effort, we have provided a limited summary below:

A. Sediment Samples
   1. PCBs/Pesticides
      As anticipated, PCBs were detected in the sediment samples with concentrations ranging from 0.07 ppm to 110 ppm, including 1.2 ppm in the background sample.
   2. Metals
      Low level heavy metal concentrations were detected in most of the samples, and showed an increasing trend as one approached Sheboygan Harbor.

3. Volatile Organics
   A total of five organic contaminants (methylene chloride, acetone, chloroform, methyl-ethyl ketone, and toluene) were detected at low concentrations in various samples, including the background sample.
4. Dioxin/Dibenzofuran
   Neither of these compounds was detected.
5. Other Contaminants
   As anticipated, trace quantities of various other contaminants were detected.

B. Water Column Samples
   1. PCBs
      PCBs were detected in both filtered and unfiltered water column samples in four of the six sampling locations. No PCBs were detected in either the background sample, or the sample obtained at the point of river discharge to Lake Michigan.
   2. Metals
      Low level concentrations of several metals were detected in both filtered and unfiltered water column samples from all sampling locations including background and the point of river discharge to Lake Michigan.

As previously discussed, we have reviewed the data and made various recommendations based on this data and other information regarding the River system. These recommendations are summarized below for both the sediment and water column portions of the remedial investigation program.

Recommendations for the Sediment Program

A. Contaminants of Concern
   1. Metals - No change in scope is recommended.
   2. PCBs/Pesticides - No change in scope is recommended for PCBs. It is recommended that the pesticides not be considered containmants of concern since no detectable concentrations were found.
   3. Dioxin/Dibenzofurans - No change in scope is recommended.
   4. Volatiles/Dibenzofurans and Base/Neutral Acid Extractables - No change in scope is recommended, since the detected concentrations are not considered environmentally significant.

B. Impact of Initial Data on Future Sampling Locations

   Based on the findings to date, it is recommended that the selected sampling locations as well as the number of sediment samples be modified. From our previous sediment probing program, the recent field activities and resulting data, it is recommended that the sediment samples previously specified to be taken between the second Kohler Dam and the Taylor Drive bridge in the City of Sheboygan be reduced. This recommendation is based primarily on the fact that very little sediment exists in this stretch of River and additionally, because these sediments had relatively low concentrations of PCBs (0-10 ppm) and metals. We

recommend that the sample points in this section of the River be reduced by half and additional sediment samples be taken in the upper and lower River sections (if appropriate) to better quantify the sediments that are present in appreciable quantities.

Recommendations for the Water Column Program

A. Contaminants of Concern

Based on the findings of low but detectable levels of certain volatile organics in the sediments, it is recommended that the water samples collected at the next sampling round (low flow) be analyzed for volatile organics.

B. Impact of Initial Data on Future Sampling Locations

It is recommended that the Onion River sampling location be included at the low flow condition in addition to high flow condition, as previously specified by the Project Operations Plans. This will allow for further recognition of the water column PCB situation, and should either include or exclude this water course as potential source of PCBs.

We respectfully request that this material be promptly reviewed to allow for expedient start-up of the remainder of this program. Furthermore, we suggest a meeting or conference call be arranged between the necessary parties to discuss the contents of this letter either later this week or early the week of August 17th. It is imperative that the field efforts be initiated as soon as possible to avoid delays in the program.

Very truly yours,

BLASLAND & BOUCK ENGINEERS, P.C.

William H. Bouck /DSF

William H. Bouck, P.E.
Vice President

DSF/DJH/sq

Enclosures

cc: Mark A. Thimke, Esq., Foley & Lardner, w/enclosures
Mr. Mark Giesfeldt, WDNR, w/enclosures
Mr. Bruce Cutright, Geraghty & Miller, w/enclosures
Mr. Robert K. Goldman, P.E., Blasland & Bouck Engineers, P.E., w/enclosures

SHEBOYGAN RIVER AND HARBOR
Remedial Investigation Program

TABLE 1

SHEBOYGAN SEDIMENT DATA
(Samples Collected 5/27-5/30/87)

	HSL Sediment Station Number									
	1	2	3	11	5	6	7	8	9	10
Constituents[1]	Sheboygan Falls Dam	Downstream of Tecumseh	1st Kohler Dam (River Bend)	2nd Kohler Dam (Waelderhaus)	S. of Kohler Golf Course	Kohler WWTP	S. of Kohler Landfill	Halfway from Kohler to Harbor (Lumberyard)	Across from Kiwanis Park	Between 14th St. & Penn Ave.
PCBs (Total), ppm	1.2	28	2.8	110.	0.07	8.8	3.6	1.3	4.6	8.9
Aroclor(s) reported	1248	1242/1254	1242	1242	1254	1242	1248/1254	1248/1254	1248/1254	1242/1254
Metals, ppm[2]										
Antimony	LT 0.5	0.72	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	1.0
Arsenic	6.2	1.7	4.3	2.3	1.7	4.5	1.5	2.1	3.1	6.5
Barium	32	10	39.	42.	16	51	25	30	33	61
Cadmium	0.7	LT 0.5	0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	0.5	0.7	1.7
Chromium	10.	5.4	12.	30.	6.2	32.	10.	12.	32.	52.
Copper	11.	3.0	10.	12.	2.5	36.	24.	29.	24.	55.
Lead	11.	4.4	13.	24.	3.6	16.	24.	21.	51.	158
Mercury	0.072	LT .025	0.064	0.076	LT .025	0.072	0.029	LT .025	0.054	0.153
Nickel	5.1	4.6	LT 4.	LT 4.	LT 4.	4.0	4.0	LT 4.0	19.	34.
Selenium	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5	LT 0.5
Silver	0.39	LT 0.14	LT 0.15	LT 0.15	LT 0.1	LT 0.14	0.2	LT 0.1	0.24	0.29
Zinc	32.	7.1	34.	43.	7.7	44.	32.	38.	71.	112.
Volatile Organics, ppb[3]										
Methylene Chloride	27	13	30	23	12	25	LT 10	11	14	29
Acetone	270	76	98	79	42	93	73	33	160	130
Chloroform	12	LT 10	LT 10	12	LT 10	20	LT 10	LT 10	LT 10	LT 10
Methyl ethyl ketone	20	LT 10	LT 10	LT 10	LT 10	LT 10	LT 10	LT 10	16	10
Toluene	LT 10	400	740	LT 10	LT 10	LT 10	82	650	LT 10	LT 10
Polynuclear Aromatics (estimated total), ppm[4]	LT 0.1	0.1	0.3	0.2	LT 0.1	LT 0.1	0.2	0.7	2.0	4.0
Physical Data										
1. Descriptions: 0-1'	Soft sed. w/sand	Sand & gravel;silt	Loose silt & muck	Sandy silt w/organic matter	Coarse Sand	Fine Silt & organics	Sandy, silt organics	Sand & gravel	Very fine Silt	Fine silt w/organics
	—1.0'—	—1.0'—	—1.0'—	—1.7'—	—0.8'—	—1.0'—	—1.0'—	—0.8'—	—1.0'—	—1.0'—
1'-2'	Silty clay		Fine silt			Silt	Fine sandy silt		Fine silt w/organics	Fine organic silt
	—2.0'—		—2.0'—			—2.0'—	—2.0'—		—2.0'—	—2.0'—
2'-3'			Sand			Silt & then clay	Silt, sand, some gravel		Fine silt & sand	
			—2.2'—			—2.6'—	—2.4'—		—2.9'—	
2. TOC, percent	1.7	2.0	2.6	2.4	0.3	1.0	2.3	3.2	2.8	2.7
3. Moisture content, percent	38	16	45	52	20	40	27	19	41	46

es:

Bs, volatile organics and PNAs reported on a dry weight basis. Metals reported on wet weight basis.

t all metals analyzed are listed on this table. Cobalt was LT 5 ppm in all samples. Vanadium was in the 0-8.3 ppm range. Also not shown are aluminum, beryllium, on, magnesium, manganese, potassium, sodium, calcium and thallium. See detailed data sheets (Appendix A) for these other metals.

latile organics quantified at levels below the detection limit (10 ppb) are not shown. See detailed data sheets (Appendix A) for these compounds.

As were estimated by summing individual concentrations of these compounds. In most cases, each compound has an estimated value below the detection limit.

= Less Than

8/11/87

SHEBOYGAN RIVER AND HARBOR
Remedial Investigation Program

TABLE 2

SHEBOYGAN WATER COLUMN DATA
(Samples collected 5/31/87 - 6/2/87)

	W1M*		W3M		W4M		W5M		W6M		W7M*	
escription	Behind Sheboygan Falls Dam		50' Upstream of 1st Kohler Dam (River Bend)		150' Upstream of 2nd Kohler Dam (Waelderhaus)		USGS Gaging Station		14th St. Bridge		Harbor Near South Breakwall	
Constituents	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered	Unfiltered	Filtered
PCBs (total), ppb	LT .05	LT .05	0.267	0.118	0.150	0.078	0.094	0.081	0.159	0.059	LT .05	LT .05
Metals, ppb												
Arsenic	1	1	1	1	1	1	2	1	1	1	LT 1.	LT 1.
Cadmium	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.	LT 1.
Chromium	1	1	1	1	2	1	2	LT 1.	2	LT 1.	LT 1.	LT 1.
Copper	4	4	4	4	4	3	4	4	4	4	2	4
Lead	1.5	1	LT 1.	1	LT 1.	6	2	1	3	LT 1.	LT 1.	LT 1.
Mercury	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2	LT 0.2
Nickel	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.	LT 5.
Zinc**	25	41	22	41	22	33	28	44	34	50	23	41
TSS, mg/l	7	-	33	-	4	-	9	-	23	-	10	-
TKN, mg/l	1.5	-	-	-	-	-	1.5	-	-	-	LT 1.0	-
Ammonia, mg/l	0.4	-	-	-	-	-	0.09	-	-	-	0.06	-
Alkalinity, mg/l	305	-	-	-	-	-	299	-	-	-	133	-
Hardness, mg/l	343	-	-	-	-	-	343	-	-	-	160	-

TES:

= Less Than
alues for W1M and W7M are averages of duplicate analyses
Present in Trip Blank at 17 ppb

8/11/87