

REPORT

2000 Interim Monitoring Program Annual Report Sheboygan River and Harbor

DEPARTMENT OF
NATURAL RESOURCES
SED
2001 SEP -5 AM 8:24

**Prepared by BBL, Inc. on Behalf of
Tecumseh Products Company**

August 2001

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

*2000 Interim
Monitoring Program Annual Report
Sheboygan River and Harbor*

**Prepared by BBL, Inc. on Behalf of
Tecumseh Products Company**

August 2001

Table of Contents

Section 1. Interim Monitoring Program.....	1-1
Section 2. Resident Fish Monitoring.....	2-1
2.1 Field Sampling Activities	2-1
2.2 Analytical Results	2-1
Section 3. Caged Fish Study	3-1
3.1 Field Sampling Activities	3-1
3.2 Analytical Results	3-1

Tables

Table 1	2000 Smallmouth Bass Monitoring Results
Table 2	Summary of Smallmouth Bass Monitoring Results
Table 3	2000 White Sucker Monitoring Results
Table 4	Summary of White Sucker Monitoring Results
Table 5	2000 Caged Fish Monitoring Results
Table 6	Summary of Caged Fish Monitoring Results

Figures

Figure 1	Smallmouth Bass Mean Total PCB Concentrations (1990-1996, 1998-2000)
Figure 2	Smallmouth Bass Mean Lipid – Normalized PCB Concentrations (1990-1996, 1998-2000)
Figure 3	White Suckers Mean Total PCB Concentrations (1994-1996, 1998, 2000)
Figure 4	White Suckers Mean Lipid-Normalized PCB Concentrations (1994-1996, 1998, 2000)
Figure 5	Caged Fish Mean Total PCB Concentrations (1994-2000)
Figure 6	Caged Fish Mean Lipid – Normalized PCB Concentrations (1994-2000)

1. Interim Monitoring Program

This report presents a summary of the resident fish monitoring and the caged fish study completed as part of the Interim Monitoring Program (IMP) for the Sheboygan River and Harbor (the Site). These activities were completed in accordance with the IMP Work Plan/QAPP (BBL, 1996), which was developed in consultation with the U.S. Environmental Protection Agency (USEPA) and Wisconsin Department of Natural Resources (WDNR).

The stated objectives of the IMP are to:

1. provide data to evaluate the effectiveness of remediation;
2. generate data to allow for periodic re-evaluation of potential human exposure and associated risks; and
3. establish baseline data to be used in conjunction with the data from the long-term monitoring program that will be established following implementation of the selected remedy to evaluate the overall effectiveness of remediation.

A description of the IMP biota sampling activities completed in 2000 and a summary of the results are presented in the following sections.

2. Resident Fish Monitoring

2.1 Field Sampling Activities

Consistent with previous IMP resident fish sampling efforts, resident fish were collected in 2000 from three reaches of the Sheboygan River, including: 1) in the vicinity of Rochester Park, 2) between Kohler's River Bend dam and Waelderhaus dam, and 3) in the vicinity of Kiwanis Park. Target species for each reach were twelve smallmouth bass (*Micropterus dolomieu*) and twenty-five composite samples (n = 2 fish per composite) of juvenile white suckers (*Catostomus commersoni*).

Adult smallmouth bass were collected from each location using electrofishing equipment on September 11 and September 18, 2000. Juvenile white suckers were collected on September 19 and 21, 2000. Thirty-eight juvenile white suckers (n= 19 composite samples) were collected in the vicinity of Kiwanis Park. Despite intensive collection efforts with boat-mounted and stream-side electrofishing units, juvenile white suckers were not found between the Kohler dams, and only one juvenile white sucker was collected in the vicinity of Rochester Park. A summary of smallmouth bass and juvenile white sucker analytical results is presented in the following sections.

2.2 Analytical Results

Smallmouth Bass

The 2000 smallmouth bass PCB data are presented in Tables 1 and 2. Mean total PCB concentrations in Rochester Park smallmouth bass (7.1 mg/kg) are not statistically significantly lower than concentrations reported in 1999 (7.6 mg/kg), or in any of the previous ASRI or IMP sampling events (ANOVA, Scheffe, $p < 0.05$). While mean total PCB concentrations in smallmouth bass from between the Kohler dams (4.2 mg/kg) appear to be elevated relative to other years, the apparent difference in concentrations is not statistically significant (ANOVA, Scheffe, $p < 0.05$). The seemingly higher PCB concentration of 4.2 mg/kg in 2000 is likely attributed to one fish that was reported to have 11 mg/kg PCB. PCB concentrations in the other eleven fish collected from this location had PCB concentrations ranging from 1.2 to 6.9 mg/kg. At Kiwanis Park, mean total PCB concentrations (1.3 mg/kg) are similar to mean total PCB concentrations reported in 1999 (2.0 mg/kg), and are statistically significantly lower than concentrations reported in 1991 and 1993 (3.7 mg/kg and 3.0 mg/kg, respectively) (ANOVA, Scheffe, $p < 0.05$). Smallmouth bass lipid-normalized PCB data follow the same general trend as described for total PCBs.

Figures 1 and 2 graphically depict temporal trends in mean total PCB and mean lipid-normalized PCB concentrations in smallmouth bass. Smallmouth bass collected in the vicinity of Rochester Park show no apparent temporal trend in total PCB and lipid-normalized PCB concentrations. Figure 1 shows an apparent decreasing trend in smallmouth bass total PCB concentrations between the Kohler dams and in the vicinity of Kiwanis Park. The trend associated with lipid-normalized PCB concentrations in these two areas is less evident (Figure 2).

White Sucker

White sucker PCB data are presented in Tables 3 and 4. Only one white sucker was collected and analyzed from the Rochester Park location. Because only one fish was collected, this sample was not included in the

statistical analyses. Total PCB in this one sample measured 8.4 mg/kg, and is lower than the mean total PCB concentration reported in white suckers in 1998 and is similar to mean total PCB concentrations reported in 1994 through 1996. No white suckers were obtained between the Kohler Dams. Mean total PCB concentrations in white suckers collected from Kiwanis Park in 2000 (2.2 mg/kg) are statistically significantly higher than the concentrations reported in 1998 (1.3 mg/kg), but are not different than concentrations reported in 1996 (1.9 mg/kg) (ANOVA, Scheffe, $p < 0.05$), and are statistically significantly lower than concentrations reported in 1994 and 1995 (3.9 mg/kg and 3.4 mg/kg, respectively) (ANOVA, Scheffe, $p < 0.05$).

Temporal trends in juvenile white sucker PCB concentrations are graphically presented in Figures 3 and 4. Figures 3 and 4 show no apparent trend in mean total PCB and mean lipid-normalized PCB concentrations in white suckers collected from the vicinity of Rochester Park and between the Kohler Dams. There may, however, be a decreasing trend in mean total PCB and lipid-normalized PCB concentrations in white suckers collected in the vicinity of Kiwanis Park.

3. Caged Fish Study

3.1 Field Sampling Activities

The IMP caged fish studies were conducted as described in the IMP Work Plan (BBL, 1996). The caged fish studies were implemented at the request of USEPA/WDNR and are designed to provide a relative indicator of PCB bioavailability. These study results do not provide information that is directly useful for evaluating potential risks to human health.

The 2000 caged fish studies were consistent with previous IMP caged fish studies and include the following five monitoring locations.

1. A background location above Sheboygan Falls dam corresponding to water-column monitoring location W-1 (first of two previous ASRI caged fish sampling locations - IMP Station 1).
2. Immediately downstream of sediment Area 19 and near water-column monitoring location W-13B (the second of the two previous ASRI caged fish sampling locations - IMP Station 2).
3. Immediately upstream of Riverbend dam near water-column monitoring location W-3, and immediately downstream of sediment Areas 28 and 31 (IMP Station 3).
4. Immediately upstream of Waelderhaus dam, near water-column monitoring location W-4, and immediately downstream of sediment Areas 45 and 46 (IMP Station 4).
5. In the vicinity of the I-43 bridge and the USGS gaging station, near water-column monitoring location W-5 (IMP Station 5).

Fish cages (two cages per location) were placed in the River on September 20, 2000. Each cage contained approximately 250 fathead minnows (*Pimephales promelas*). Prior to placing minnows into cages, two pre-exposure minnow samples were obtained and submitted to EnChem Laboratory, Madison, Wisconsin for analyses of PCB/lipid content to confirm that the study population was free of PCBs.

Three-week exposure samples were obtained on October 10, 2000, and 6-week exposure samples were taken on November 1, 2000. During each sampling event, two composite samples were obtained from each cage, for a total of four samples per location.

3.2 Analytical Results

The results of PCB and lipid analyses for the 2000 caged fish study are presented in Table 5. Total mean PCB concentrations at the four downstream locations (Stations 2-5) ranged from 0.44 mg/kg to 0.86 mg/kg for the 3-week samples, and mean lipid-normalized concentrations ranged from 17 mg/kg to 50 mg/kg lipid. Total mean PCB concentrations at the four downstream locations for the 6-week samples ranged from 0.92 mg/kg to 1.93 mg/kg, and lipid-normalized mean concentrations ranged from 42 mg/kg to 60 mg/kg lipid.

Table 6 presents a summary of all the 6-week caged fish results, including historic ASRI data (i.e., data for ASRI monitoring Stations 1 and 2 which are included in the IMP). At Station 2 (the only caged fish location

continually monitored since 1989), the 2000 PCB mean total and lipid-normalized PCB concentrations are significantly less than 1989 baseline concentrations (ANOVA, Scheffe, $p < 0.05$). At Stations 2, 3, 4, the 2000 6-week caged fish data are statistically significantly less than concentrations reported in 1998 and 1999 (ANOVA, Scheffe, $p < 0.05$). At Station 5, the mean PCB concentration reported in 2000 is similar to the concentration reported in 1999, and is statistically significantly lower than mean PCB concentrations reported in 1998. Figures 5 and 6 support the statistical analyses and show no clear temporal trends in the overall IMP caged fish data set (1994-2000).

Table 1
 Sheboygan River and Harbor
 Interim Monitoring Program
 2000 Smallmouth Bass Monitoring Results (1)
 September 2000

Location	Sample ID	Length (cm)	Weight (g)	Lipid (%)	Total PCB (2) (mg/kg)	Lipid-Normalized PCB (2) (mg/kg-lipid)	
Rochester Park	FB-355	39.4	900	1.12	2.7	241	
	FB-368	37.6	840	1.72	1.8	104	
	FB-369	34.8	540	0.68	16.7	2458	
	FB-370	38.6	980	1.22	0.34	28	
	FB-371	34.0	680	0.62	5.5	887	
	FB-372	31.2	440	1.03	4.6	447	
	FB-373	38.3	860	0.77	9.3	1208	
	FB-374	34.9	760	3.78	0.35	9	
	FB-375	37.0	700	1.51	12.1	801	
	FB-376	34.0	640	2.00	8.0	400	
	FB-377	30.7	460	1.32	8.6	652	
	FB-378	30.4	440	1.41	18.9	1340	
	FB-379	32.9	580	1.58	3.0	190	
	Mean (3)		34.9	685	1.44	7.1	674
Standard Deviation		3.1	192	0.81	6.0	689	
Between Kohler Dams	FB-356	30.5	410	1.07	11.0	1028	
	FB-357	29.4	380	0.88	2.4	269	
	FB-358	32.0	400	0.34	1.2	350	
	FB-359	34.2	660	1.68	4.0	238	
	FB-360	33.8	580	0.93	3.5	376	
	FB-361	38.2	680	0.64	3.9	602	
	FB-362	36.8	760	1.13	6.9	611	
	FB-363	29.2	400	0.76	2.7	355	
	FB-364	35.0	640	0.92	3.3	359	
	FB-365	30.4	400	1.12	3.1	277	
	FB-366	35.6	660	1.36	4.0	294	
	FB-367	29.6	380	0.56	4.2	750	
	Mean (3)		32.9	529	0.95	4.2	458
	Standard Deviation		3.1	146	0.36	2.5	241
Kiwanis Park	FB-343	32.3	480	1.08	1.2	108	
	FB-344	32.3	500	1.04	0.89	86	
	FB-345	35.6	610	1.23	2.9	236	
	FB-346	36.1	700	1.37	1.3	94	
	FB-347	35.1	650	1.12	0.59	53	
	FB-348	30.2	440	0.74	1.1	143	
	FB-349	31.8	500	0.61	1.1	174	
	FB-350	32.0	520	0.86	1.4	149	
	FB-351	31.0	460	0.89	1.1	126	
	FB-352	35.6	720	1.19	1.1	91	
	FB-353	30.5	400	0.93	0.97	104	
	FB-354	29.7	420	0.49	1.9	388	
	Mean (3)		32.7	533	0.97	1.3	146
	Standard Deviation		2.3	110	0.26	0.60	90

Notes:

(1) Smallmouth bass samples prepared as skin-on, scales-off fillet.

(2) PCB concentrations reported on a wet-weight basis.

(3) Arithmetic mean.

mg/kg= milligrams per kilogram

Table 2
 Sheboygan River and Harbor
 Interim Monitoring Program

Summary of Smallmouth Bass Monitoring Results (1,2,3)
 (1990 - 1996, 1998-2000)

Location/Species	Year	Mean Total PCB (mg/kg) (4)	Mean Lipid-Normalized PCB (mg/kg-lipid) (4)
Rochester Park	1990	6.2 (a)	916 (a)
	1991	10.3 (a)	969 (a)
	1992	6.3 (a)	600 (a)
	1993	4.6 (a)	450 (a)
	1994	7.5 (a)	875 (a)
	1995	9.6 (a)	854 (a)
	1996	3.4 (a)	341 (a)
	1998	10.7 (a)	1294 (a)
	1999	7.6 (a)	1153 (a)
	2000	7.1 (a)	674 (a)
Between Kohler Dams	1990	4.7 (bd)	571 (ab)
	1991	7.3 (ba)	848 (a)
	1992	5.2 (bd)	417 (b)
	1993	5.4 (bd)	562 (ab)
	1994	5.6 (eb)	523 (ab)
	1995	3.6 (ce)	335 (b)
	1996	3.9 (ce)	361 (b)
	1998	3.1 (cf)	416 (b)
	1999	2 (cf)	322 (b)
	2000	4.2 (ce)	459 (ab)
Kiwanis Park	1990	2.3 (ab)	217 (a)
	1991	3.7 (a)	355 (a)
	1992	2.4 (a)	283 (a)
	1993	3 (a)	733 (b)
	1994	2.5 (a)	219 (a)
	1995	2 (a)	163 (a)
	1996	2.3 (a)	249 (a)
	1998	1.9 (a)	186 (a)
	1999	2 (a)	248 (a)
	2000	1.3 (ac)	146 (a)

Notes:

(1) Smallmouth bass samples prepared as skin-on, scales-off fillets.

(2) Arithmetic Mean.

(3) Samples were not collected in 1997. Scientific Collectors Permit Application was not approved.

(4) PCB concentrations reported on a wet-weight basis.

The letters in parentheses denoting statistical differences (for each analysis) apply to the data presented in each column

for each location. Within each location, means with different letters are significantly different (ANOVA, Scheffe, 95% Confidence).

Table 3

Sheboygan River and Harbor
Interim Monitoring Program

2000 White Sucker Monitoring Results(1)
September 2000

Location	Sample	Length #1 (cm)	Length #2 (cm)	Weight #1 (g)	Weight #2 (g)	Total Sample Weight (g)	Lipid (%)	Total PCB (2) (mg/kg)	Lipid-Normalized PCB (2) (mg/kg-lipid)
Rochester Park	FK-296	9.0	NA	6.8	NA	6.8	1.06	8.4	792
Mean (3)		NA	NA	NA	NA	NA	NA	NA	NA
Standard Deviation		NA	NA	NA	NA	NA	NA	NA	NA
Kiwānis Park	FK-297	12.2	11.4	19.5	14.9	34.4	2.48	2.2	90
	FK-298	10.0	10.6	9.1	12.5	21.6	2.37	3.0	127
	FK-299	12.0	11.7	18.3	15.6	33.9	2.29	3.1	135
	FK-300	11.7	10.9	16.2	12.8	29.0	1.67	2.5	150
	FK-301	13.0	12.1	24.2	18.8	43.0	2.38	2.3	97
	FK-302	11.8	11.7	16.3	15.9	32.2	2.11	2.6	123
	FK-303	11.3	11.7	13.6	15.7	29.3	2.08	2.3	111
	FK-304	11.1	10.5	13.3	10.8	24.1	2.61	3.0	115
	FK-305	11.7	11.0	16.7	12.0	28.7	2.01	1.7	85
	FK-306	11.3	10.7	14.4	11.3	25.7	1.25	1.3	104
	FK-307	10.8	11.0	11.6	13.1	24.7	1.43	1.5	105
	FK-308	10.7	10.6	11.6	11.6	23.2	2.23	2.2	99
	FK-309	10.3	9.6	10.5	9.5	20.0	1.77	1.6	90
	FK-310	10.0	9.8	9.5	9.4	18.9	2.03	2.4	118
	FK-311	9.9	9.7	9.6	9.9	19.5	2.26	2.1	93
FK-312	10.1	10.0	10.2	10.1	20.3	1.73	2.4	139	
FK-313	9.7	9.1	7.9	8.1	16.0	1.27	1.4	110	
FK-314	9.3	8.3	7.7	5.8	13.5	1.72	3.4	198	
FK-315	8.9	8.5	6.8	6.5	13.3	1.48	1.4	95	
Mean (3)		10.8	10.5	13.0	11.8	24.8	1.96	2.2	115
Standard Deviation		1.1	1.1	4.6	3.4	7.7	0.41	0.63	27

Notes:

(1) White sucker samples prepared as whole-body composites consisting of two fish per composite sample.

(2) PCB concentrations reported on a wet-weight basis.

(3) Arithmetic mean.

mg/kg= milligrams per kilogram

NA= Not available. Only one sample collected.

Table 4
 Sheboygan River and Harbor
 Interim Monitoring Program

Summary of White Sucker Monitoring Results (1)
 (1994 - 1996, 1998-2000) (2)

Location	Year	Mean Total PCB (mg/kg) (3,4)	Mean Lipid-Normalized PCB (mg/kg-lipid) (3,4)
Rochester Park	1994	7.9 (b)	409 (b)
	1995	7.4 (b)	375 (b)
	1996	8.1 (b)	354 (b)
	1998	18.3 (a)	1091 (a)
	1999	NA	NA
	2000	8.4*	792*
Between Kohler Dams	1994	8.7 (a)	437 (a)
	1995	6.2 (a)	330 (a)
	1996	6.1 (a)	242 (a)
	1998	6.8 (a)	349 (a)
	1999	NA	NA
	2000	NA	NA
Kiwanis Park	1994	3.9 (a)	208 (a)
	1995	3.4 (a)	197 (a)
	1996	1.9 (b)	74 (c)
	1998	1.3 (c)	53 (c)
	1999	NA	NA
	2000	2.2 (b)	115 (b)

Notes:

(1) White sucker samples prepared as whole-body composites consisting of two fish per composite.

(2) Samples were not collected in 1997. Scientific Collectors Permit Application was not approved.

(3) Arithmetic Mean.

(4) PCB concentrations reported on a wet-weight basis.

* Only one composite sample collected. Sample is not included in the statistical analysis.

NA = not available. No samples collected.

The letters in parentheses denoting statistical differences (for each analysis) apply to the data presented in each column for each location. Within each location, means with different letters are significantly different (ANOVA, Scheffe, 95% Confidence).

Table 5

Sheboygan River and Harbor
Interim Monitoring Program2000 Caged Fish Monitoring Results (1,2)
(9/20/00-11/1/00)

Location	Cage No.	Lipid (%)	3-Week Exposure		6-Week Exposure		
			Total PCB (3) (mg/kg)	Lipid-Normalized PCB (3) (mg/kg-lipid)	Lipid (%)	Total PCB (3) (mg/kg)	Lipid-Normalized PCB (3) (mg/kg-lipid)
Station 1	1A	3.08	0.12	4	1.95	0.099	5
Upstream of Sheboygan Falls dam (W-1)	1A	2.62	0.095	4	2.00	0.10	5
	1B	2.74	0.14	5	1.96	0.08	4
	1B	2.72	0.11	4	1.71	0.093	5
Mean (4)		2.79	0.12	4	1.91	0.093	5
Standard Deviation		0.20	0.019	1	0.13	0.0092	1
Station 2	2A	2.33	0.52	22	2.20	1.1	50
Downstream of ASRI capping/armoring and removal areas (W-13B)	2A	2.68	0.45	17	1.95	1.1	56
	2B	2.94	0.37	13	2.45	0.77	31
	2B	2.50	0.41	16	2.32	0.72	31
Mean (4)		2.61	0.44	17	2.23	0.92	42
Standard Deviation		0.26	0.084	4	0.21	0.21	13
Station 3	3A	2.92	0.49	17	1.79	0.73	41
Upstream of Riverbend dam (W-3)	3A	3.22	0.54	17	1.90	0.69	36
	3B	2.34	0.5	22	1.84	1.1	60
	3B	2.52	0.61	24	1.94	1.2	62
Mean (4)		2.75	0.54	20	1.87	0.93	50
Standard Deviation		0.40	0.05	4	0.07	0.26	13
Station 4	4A	2.57	0.61	24	2.25	1.5	67
Upstream of Waelderhaus dam (W-4)	4A	2.88	0.6	22	1.93	1.2	62
	4B	3.10	1.00	32	1.94	1.1	57
	4B	2.64	0.88	33	1.99	1.1	55
Mean (4)		2.80	0.78	28	2.03	1.2	60
Standard Deviation		0.24	0.19	6	0.15	0.19	5
Station 5	5A	2.57	0.92	36	3.45	1.8	52
Downstream of USGS Gaging Station (W-5)	5A	2.55	0.94	37	3.93	1.9	48
	5B	2.68	0.88	33	3.78	2.1	56
	5B	0.72	0.68	94	3.83	1.9	50
Mean (4)		2.13	0.86	50	3.75	1.93	51
Standard Deviation		0.94	0.12	30	0.21	0.13	3

Notes:

- (1) Whole-body fathead minnow composite samples.
- (2) Two samples of the pre-exposure minnow population were collected and analyzed for PCBs. PCBs were not detected at levels above Aroclor-specific method detection limit (0.05 mg/kg). Lipid content of the samples was 4.58 % and 5.79 %.
- (3) PCB concentrations reported on a wet-weight basis.
- (4) Arithmetic mean.

Table 6

Sheboygan River and Harbor
Interim Monitoring ProgramSummary of Caged Fish Monitoring Results (1)
(6-Week Samples)

Location	YEAR	Mean Total PCB (mg/kg) (2,3)	Mean PCB/Lipid (mg/kg-lipid) (2,3)
Station 1 (W-1) Upstream of Sheboygan Falls dam	Phase 1 (9/8/89)	< 0.02	< 1.1
	Phase 2a (12/21/89)	< 0.035	< 1.5
	Phase 2b (10/31/90)	< 0.1	< 10
	Phase 3a (9/1/92)	< 0.03	< 1.2
	Phase 3b (10/13/92)	< 0.02	< 1.3
	Phase 4 (IMP) 1994	< 0.05	< 3.0
	Phase 5 (IMP) 1995	< 0.05	< 1.7
	Phase 6 (IMP) 1996	< 0.05	< 1.34
	Phase 7 (IMP) 1997	0.025	1.2
	Phase 8 (IMP) 1998	< 0.2	< 4.78
Phase 9 (IMP) 1999	< 0.05	< 1.8	
Phase 10 (IMP) 2000	0.083	5	
Station 2 (W-19B) Downstream of ASRI capping/armoring and removal areas	Phase 1 (9/8/89)	8.4 (a)	690 (a)
	Phase 2a (12/21/89)	2 (c)	104 (bc)
	Phase 2b (10/31/90)	3.23 (bc)	300 (b)
	Phase 3a (9/1/92)	7.55 (ab)	222 (bc)
	Phase 3b (10/13/92)	1.42 (c)	91 (bc)
	Phase 4 (IMP) 1994	1.1 (c)	67 (c)
	Phase 5 (IMP) 1995	2.2 (bc)	84 (bc)
	Phase 6 (IMP) 1996	1.8 (c)	94 (bc)
	Phase 7 (IMP) 1997	2.4 (bc)	112 (bc)
	Phase 8 (IMP) 1998	2 (c)	89 (bc)
Phase 9 (IMP) 1999	3 (bc)	111 (bc)	
Phase 10 (IMP) 2000	0.92 (c)	42 (c)	
Station 3 (W-3) Upstream of Riverbend dam	Phase 4 (IMP) 1994	1.4 (b)	69 (ab)
	Phase 5 (IMP) 1995	2.4 (a)	99 (ab)
	Phase 6 (IMP) 1996	1.2 (b)	68 (bc)
	Phase 7 (IMP) 1997	1.7 (ab)	81 (bc)
	Phase 8 (IMP) 1998	2.6 (a)	121 (a)
	Phase 9 (IMP) 1999	2.5 (a)	95 (ab)
Phase 10 (IMP) 2000	0.93 (b)	50 (c)	
Station 4 (W-4) Upstream of Waelderhaus dam	Phase 4 (IMP) 1994	1.6 (de)	103 (b)
	Phase 5 (IMP) 1995	2.7 (ab)	98 (b)
	Phase 6 (IMP) 1996	1.2 (e)	68 (b)
	Phase 7 (IMP) 1997	2 (cd)	99 (b)
	Phase 8 (IMP) 1998	3.3 (a)	163 (a)
	Phase 9 (IMP) 1999	2.5 (bc)	94 (b)
Phase 10 (IMP) 2000	1.2 (e)	60 (b)	
Station 5 (W-5) Downstream of USGS Gaging Station	Phase 4 (IMP) 1994	1.6 (cd)	83 (abc)
	Phase 5 (IMP) 1995	2.5 (ab)	102 (a)
	Phase 6 (IMP) 1996	1.8 (bcd)	85 (abc)
	Phase 7 (IMP) 1997	1.3 (d)	68 (cd)
	Phase 8 (IMP) 1998	3 (a)	97 (ab)
	Phase 9 (IMP) 1999	2.1 (bc)	80 (bc)
Phase 10 (IMP) 2000	1.9 (bcd)	51 (d)	

Notes:

1 Whole-body fathead minnow composite samples.

2 Arithmetic Mean

3 PCB concentrations reported on a wet-weight basis.

The letters in parentheses denoting statistical differences (for each analysis) apply to the data presented in each column for each location. Within each location, means with different letters are significantly different (ANOVA, Scheffé's, 95% Confidence.)

Phase 1 = pre ASRI activities.

Phase 2a, 2b = during ASRI activities (upstream of Station 2).

Phase 3a, 3b = post ASRI activities (work conducted upstream of Station 2 in November 1991).

Phase 4-9 = IMP (post-ARSI) activities.

1994 6-week samples collected 10/26/94.

1995 6-week samples collected 11/1/95.

1996 6-week samples collected 11/6/96.

1997 6-week samples collected 10/30/97.

1998 6-week samples collected 11/4/98.

1999 6-week samples collected 11/4/99.

2000 6-week samples collected 11/1/00.

FIGURE 1A
Vicinity of
Rochester Park

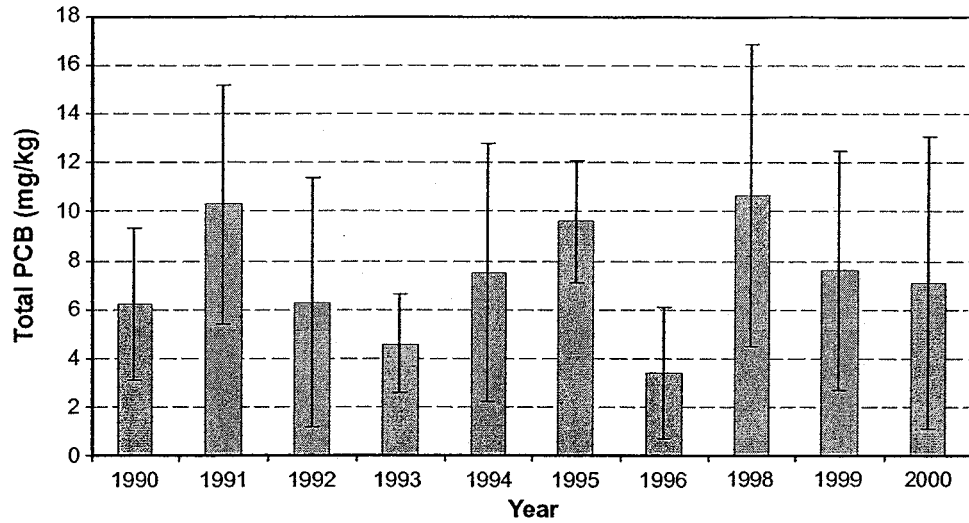


FIGURE 1B
Between the
Kohler Dams

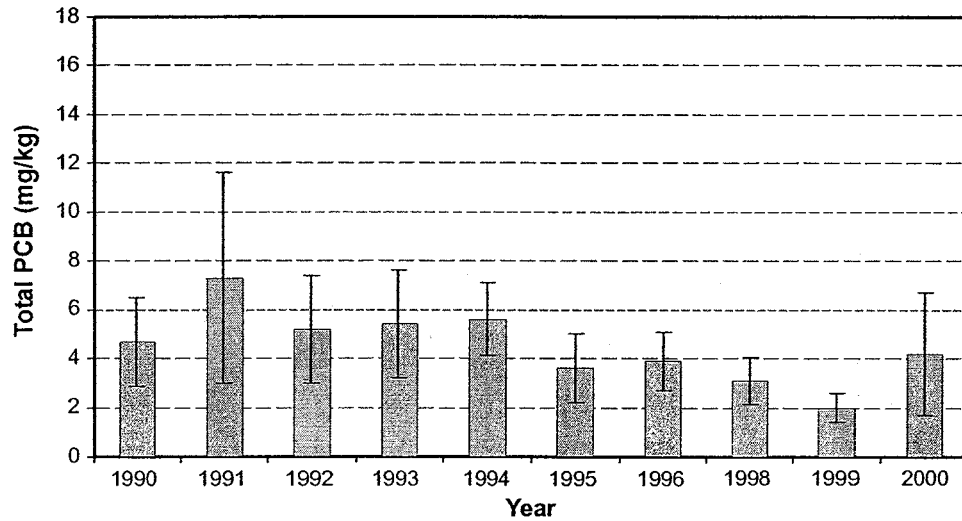
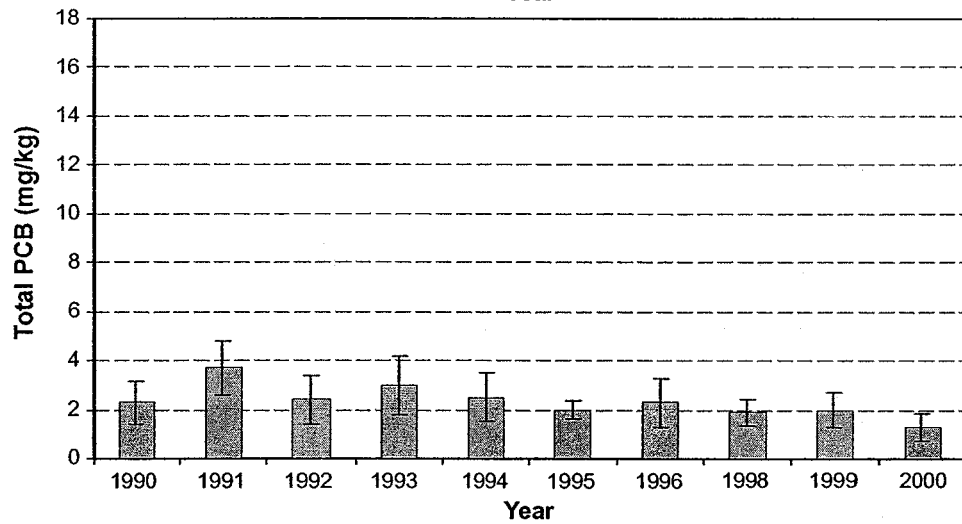


FIGURE 1C
Vicinity of
Kiwanis Park



I = Standard Deviation

**SHEBOYGAN RIVER AND HARBOR
INTERIM MONITORING PROGRAM**

**SMALLMOUTH BASS
MEAN TOTAL PCB CONCENTRATIONS (MG/KG)
(1990-1996, 1998-2000)**

BBL

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

**FIGURE
1**

FIGURE 2A
Vicinity of
Rochester Park

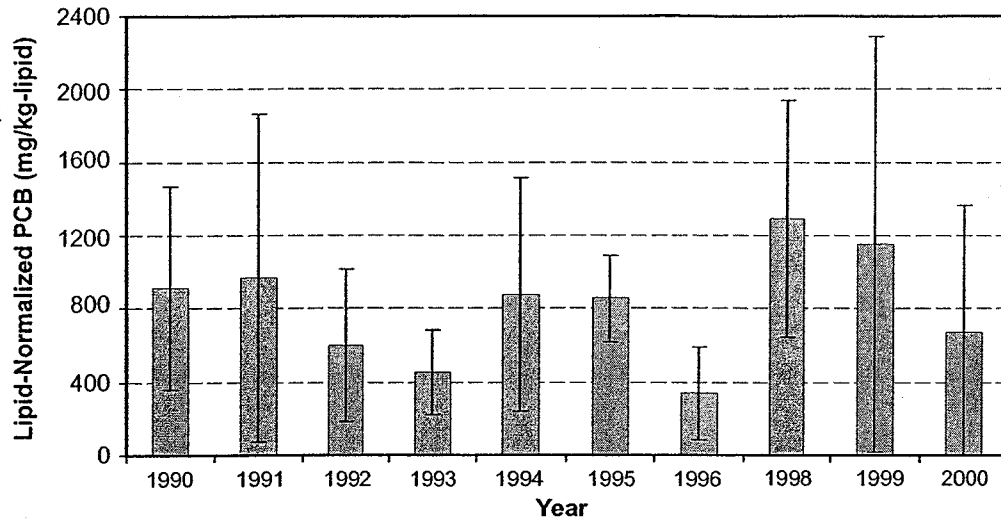


FIGURE 2B
Between the
Kohler Dams

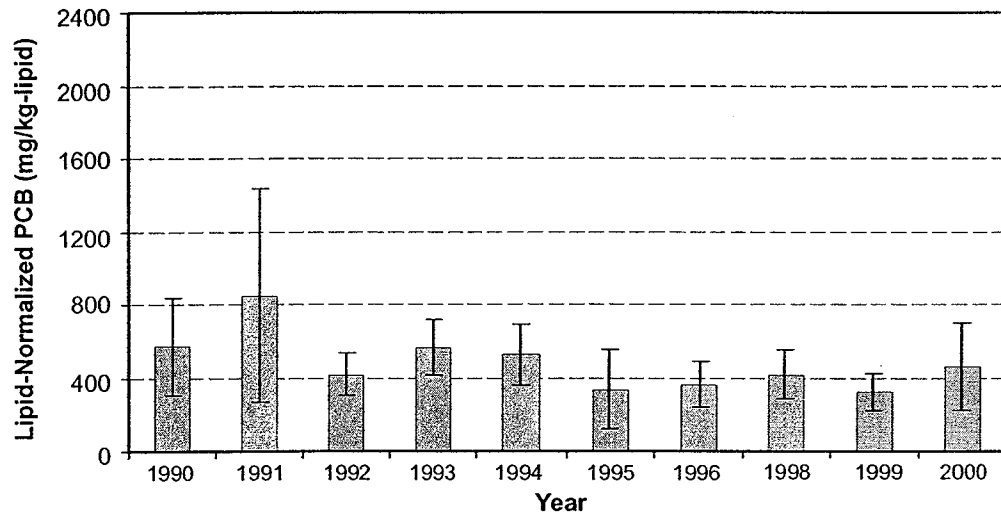
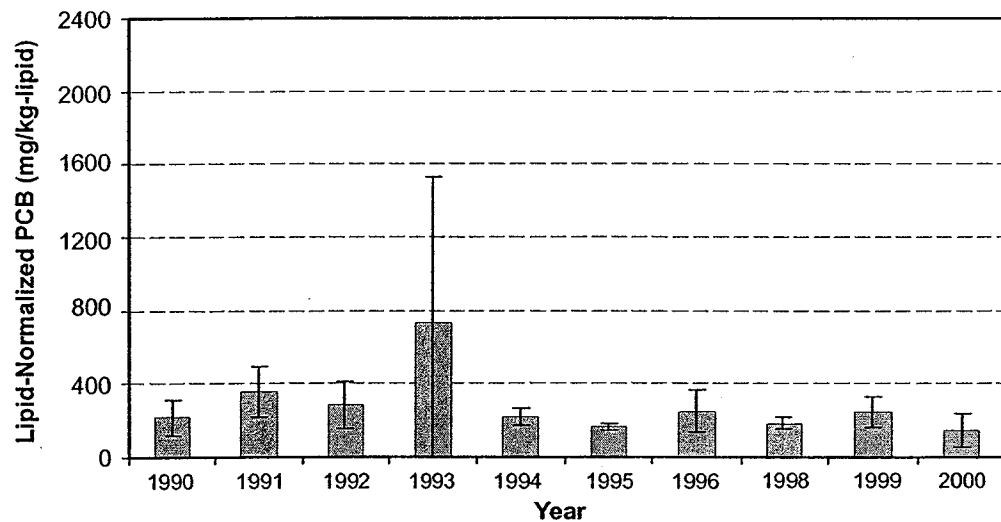


FIGURE 2C
Vicinity of
Kiwanis Park



I = Standard Deviation

**SHEBOYGAN RIVER AND HARBOR
INTERIM MONITORING PROGRAM**

**SMALLMOUTH BASS MEAN
LIPID-NORMALIZED PCB CONCENTRATIONS
(MG/KG-LIPID) (1990-1996, 1998-2000)**

BBL[®]

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

**FIGURE
2**

FIGURE 3A
Vicinity of
Rochester Park

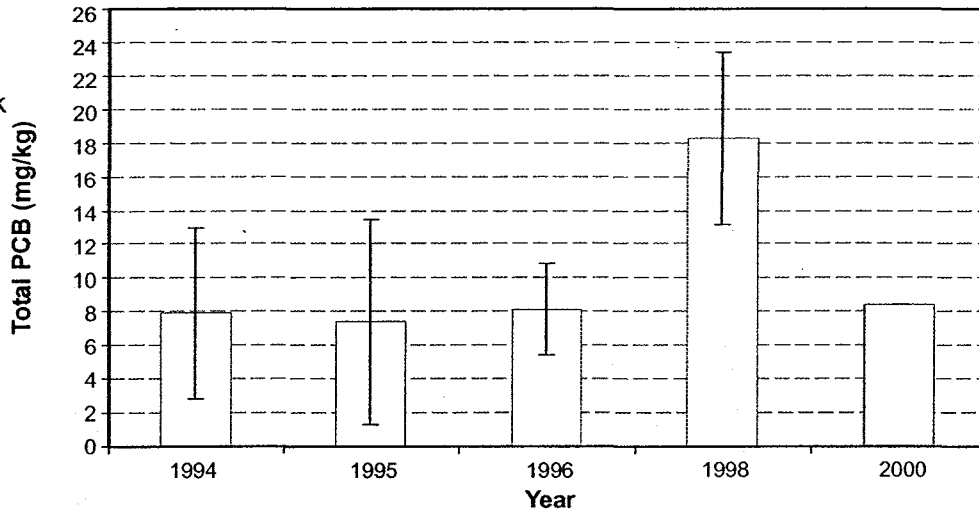


FIGURE 3B
Between the
Kohler Dams

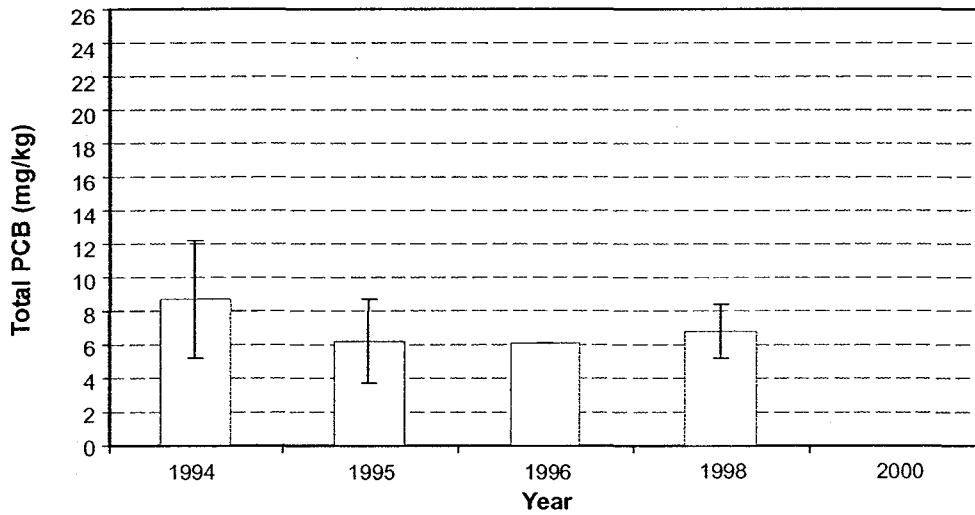
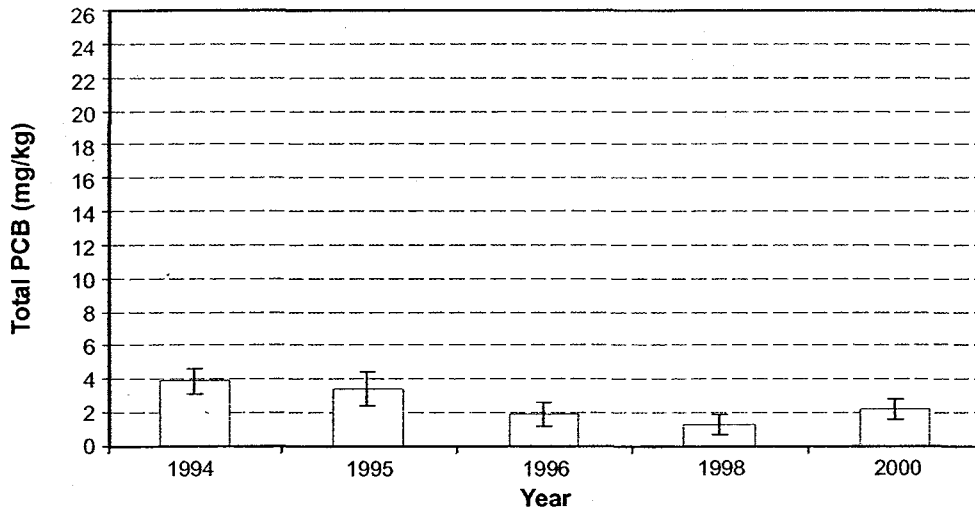


FIGURE 3C
Vicinity of
Kiwanis Park



I = Standard Deviation

SHEBOYGAN RIVER AND HARBOR
INTERIM MONITORING PROGRAM

WHITE SUCKER
MEAN TOTAL PCB CONCENTRATIONS (MG/KG)
(1994-1996, 1998, 2000)

BBL[®]

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
3

FIGURE 4A
Vicinity of
Rochester Park

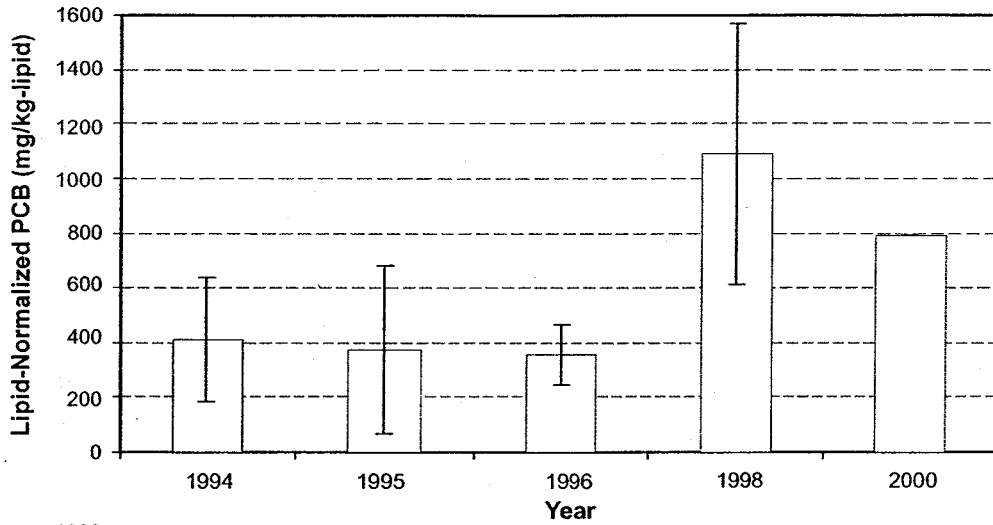


FIGURE 4B
Between the
Kohler Dams

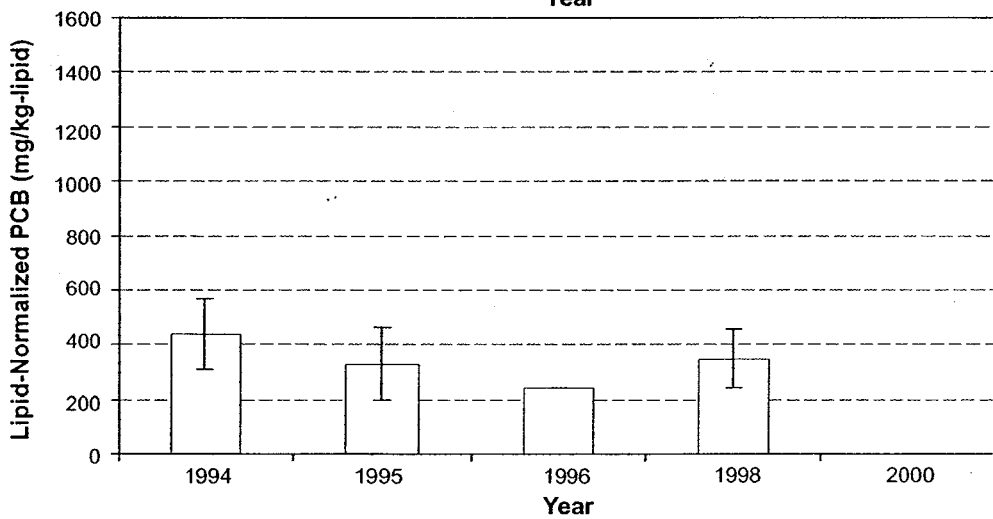
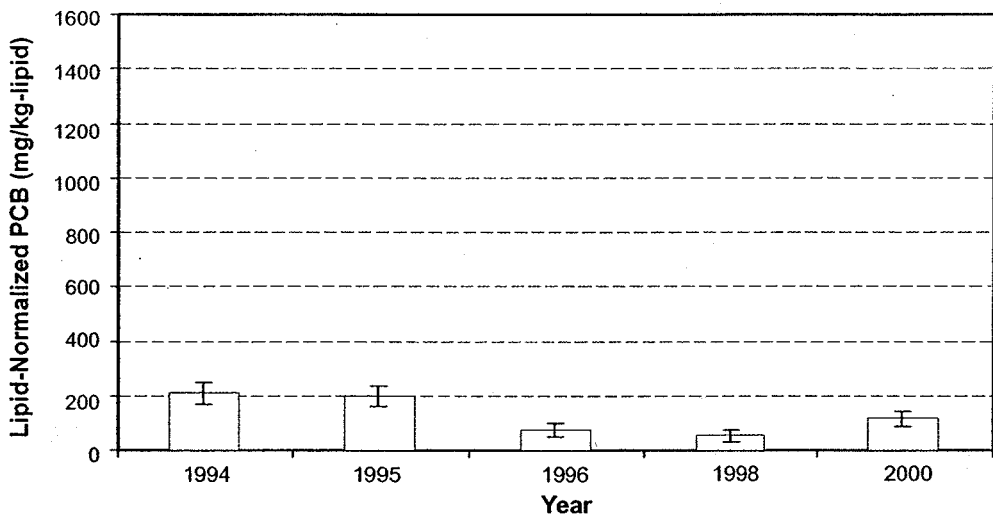


FIGURE 4C
Vicinity of
Kiwanis Park



I = Standard Deviation

SHEBOYGAN RIVER AND HARBOR INTERIM MONITORING PROGRAM	
WHITE SUCKER MEAN LIPID-NORMALIZED PCB CONCENTRATIONS (MG/KG-LIPID) (1990-1996, 1998, 2000)	
BBL ®	BLASLAND, BOUCK & LEE, INC. <i>engineers & scientists</i>
	FIGURE 4

FIGURE 5A
 Station 2 (W-13B)
 Downstream of
 ASRI Capped/Armoring
 and Removal Areas

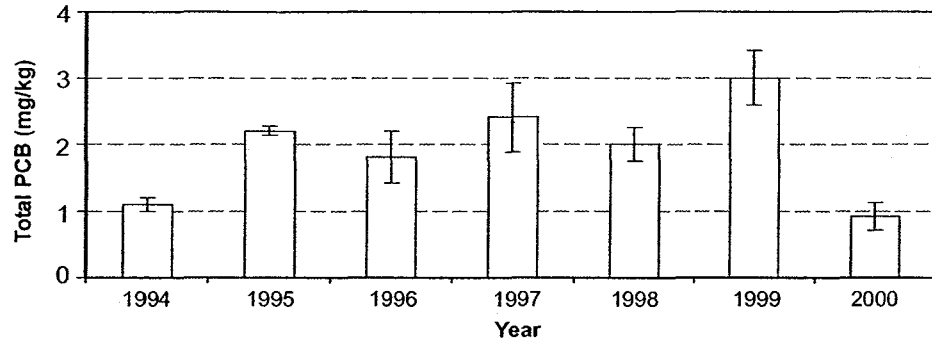


FIGURE 5B
 Station 3 (W-3)
 Upstream of River
 Bend Dam

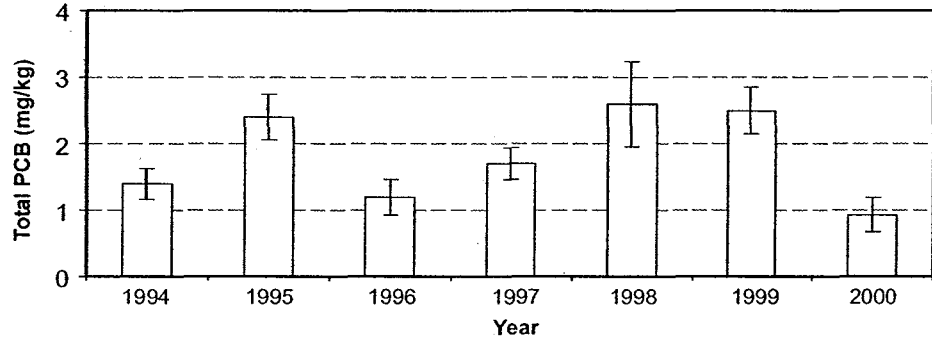


FIGURE 5C
 Station 4 (W-4)
 Upstream of
 Waelderhaus Dam

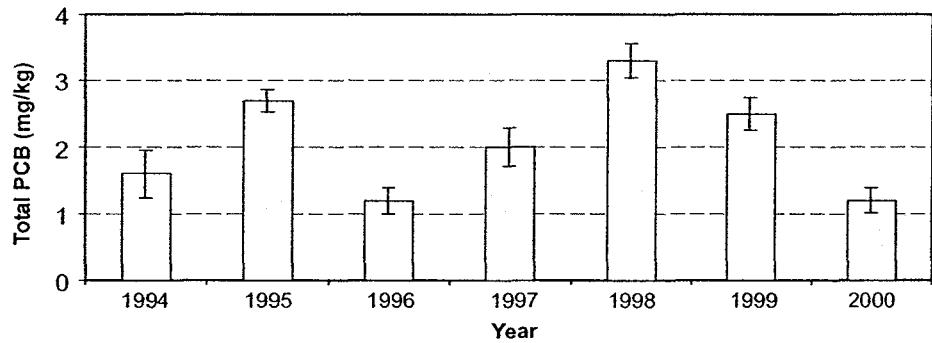
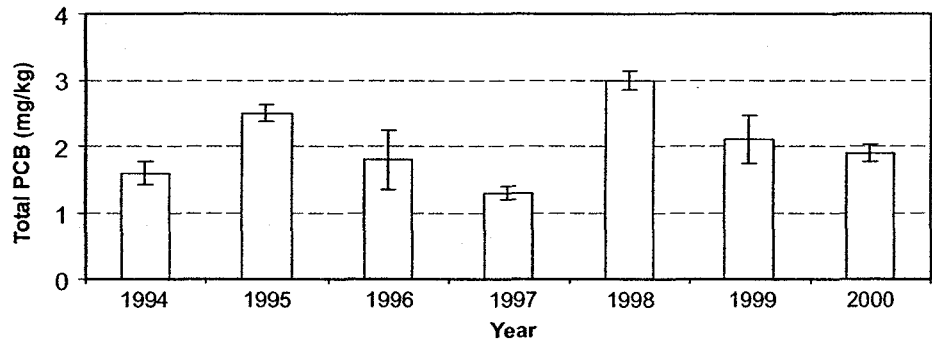


FIGURE 5D
 Station 5 (W-5)
 Downstream of
 USGS Gaging Station



I = Standard Deviation

SHEBOYGAN RIVER AND HARBOR
 INTERIM MONITORING PROGRAM

CAGED FISH MEAN TOTAL PCB
 CONCENTRATIONS (MG/KG)
 (1994 - 2000)

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

FIGURE
5

FIGURE 6A
 Station 2 (W-13B)
 Downstream of
 ASRI Capped/Armoring
 and Removal Areas

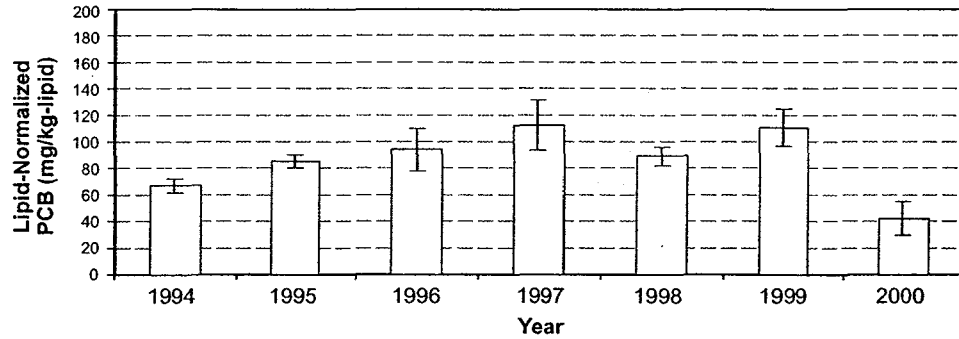


FIGURE 6B
 Station 3 (W-3)
 Upstream of River
 Bend Dam

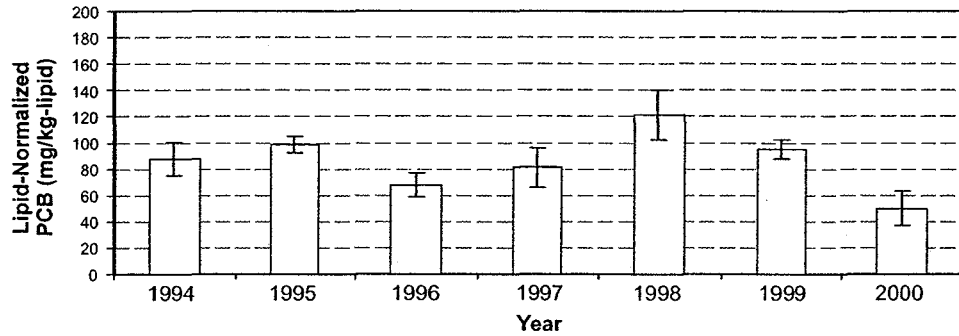


FIGURE 6C
 Station 4 (W-4)
 Upstream of
 Waelderhaus Dam

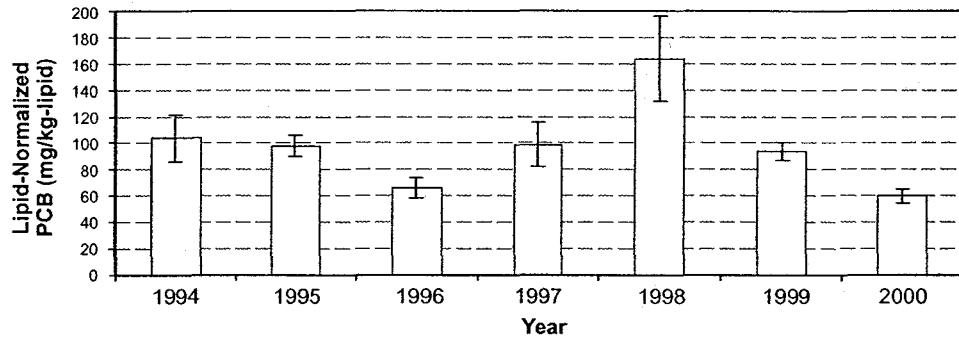
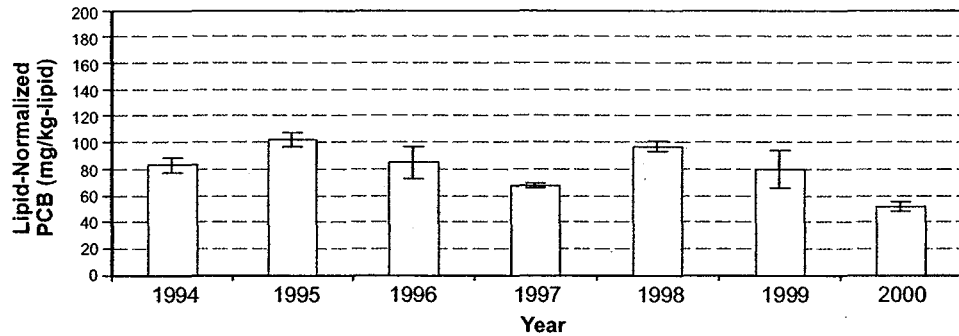


FIGURE 6D
 Station 5 (W-5)
 Downstream of
 USGS Gaging Station



I = Standard Deviation

**SHEBOYGAN RIVER AND HARBOR
 INTERIM MONITORING PROGRAM**

**CAGED FISH MEAN
 LIPID-NORMALIZED PCB CONCENTRATIONS
 (MG/KG-LIPID) (1994-2000)**

BBL®

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

**FIGURE
 6**