

**WHITE PAPER NO. 19 – ESTIMATES OF PCB MASS, SEDIMENT VOLUME, AND  
SURFACE SEDIMENT CONCENTRATIONS IN OPERABLE UNIT 5, GREEN BAY USING  
AN ALTERNATIVE APPROACH**

*Response to Comments on the*

**REMEDIAL INVESTIGATION FOR THE LOWER FOX RIVER AND  
GREEN BAY, WISCONSIN,  
FEASIBILITY STUDY FOR THE LOWER FOX RIVER AND GREEN BAY, WISCONSIN,  
PROPOSED REMEDIAL ACTION PLAN FOR THE  
LOWER FOX RIVER AND GREEN BAY, AND  
RECORD OF DECISION FOR OPERABLE UNIT 1 AND OPERABLE UNIT 2**

*This Document has been Prepared by the*  
Wisconsin Department of Natural Resources  
Madison, Wisconsin

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# WHITE PAPER NO. 19 – ESTIMATES OF PCB MASS, SEDIMENT VOLUME, AND SURFACE SEDIMENT CONCENTRATIONS IN OPERABLE UNIT 5, GREEN BAY USING AN ALTERNATIVE APPROACH

## ABSTRACT

The paper addresses concerns raised during the public comment period for the *Final Remedial Investigation for the Lower Fox River and Green Bay, Wisconsin* (RI) (RETEC, 2002a), the *Final Feasibility Study for the Lower Fox River and Green Bay, Wisconsin* (FS) (RETEC, 2002b), and the *Proposed Remedial Action Plan, Lower Fox River and Green Bay* (Proposed Plan) (WDNR and EPA, 2001), on the relative lack of polychlorinated biphenyl (PCB) sediment data in southern Green Bay. Specifically, concerns were raised regarding the overall mass and volume estimates in Green Bay as well as areas of the Bay where elevated surface concentrations may exist in historic open-water navigational dredge disposal sites in Green Bay. To address these concerns, the Wisconsin Department of Natural Resources (WDNR) and United States Environmental Protection Agency (EPA) collected additional data from areas identified as potential open-water disposal areas in July 2002. This white paper presents the results of that sampling effort, as well as incorporation of these additional sediment data, and data submitted during the public comment period into new bed maps for Green Bay following the methods outlined in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* (WDNR, 2003). Revised PCB mass, contaminated sediment volumes, and surface-weighted average PCB concentrations are presented for Operable Unit (OU) 5, Green Bay.

## 1 INTRODUCTION AND BACKGROUND

The navigational channel of the Lower Fox River and Green Bay has been dredged for many years. Prior to operation and construction of the dredge material management facilities such as the Renard Island confined disposal facility (CDF) operated by the United States Army Corps of Engineers (USACE) and the Bayport facility operated and managed by Brown County, open-water disposal of navigational dredged materials occurred. Historically, several locations in Green Bay were used as disposal sites, and in particular southern Green Bay (Figure 1). The volume and exact location of sediment generated by navigational dredging disposed of in this manner is unknown. However, since open-water disposal was in practice at the same time PCBs were being discharged into the Lower Fox River, it is likely these dredged materials also carried PCBs.

The pattern and distribution of PCBs within Green Bay is significantly influenced by the disposition of the PCB-contaminated sediment load from the Lower Fox River. Wind and wave forces and the general counterclockwise circulation pattern in Green Bay are the principal dispersal mechanisms. Manchester-Neesvig et al. (1996) documented the results of these dispersal forces during the Green Bay Mass Balance Study (GBMBS) as PCB-contaminated sediment accumulation along the eastern shore of Green Bay.

During the public comment period following the release of the Proposed Plan (WDNR and EPA, 2001) concerns were raised about potential elevated levels of PCBs in Green Bay, particularly in the southern Bay. Previous PCB mapping did indicate several areas with elevated PCB levels (Manchester-Neesvig et al., 1996). Regrettably, there were few data points in the southern end of Green Bay and thus some of these areas of potentially elevated concentrations were mapped on the basis of only a single data point. In December 2001, the Fox River Group (FRG) collected a series of sediment samples in the southern end of Green Bay in an attempt to address this lack of data. This data was presented in the public comments (FRG, 2002) and has already been incorporated into the bed map as part of *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*. However, the open-water disposal sites were not adequately sampled to determine if elevated levels of PCBs were still associated with the historic open-water disposal sites. As a result of the paucity of data, WDNR and EPA decided to conduct additional sampling in southern Green Bay.

## **2 2002 GREEN BAY SAMPLING**

WDNR and EPA contracted The RETEC Group, Inc. (RETEC) to conduct a limited sediment survey of Green Bay. There were two principal objectives for the additional Green Bay sediment analyses:

- To more thoroughly characterize areas of Green Bay associated with historic open-water dredge disposal areas and navigation channel side casts.
- To provide additional sediment characterization of the southern end of Green Bay.

### **Sample Collection and Analyses**

Sediment cores were collected from Green Bay between July 22 and 24, 2002 (RETEC, 2002c). Sample locations and results are presented on Figure 2 and in Appendix A. A total of 99 samples were collected at 36 core locations. Samples were not obtained at only one station (GB02-35, Figure 1) due to shallow water depths. All samples were analyzed for PCBs (Aroclor), total organic carbon (TOC), and bulk density. PCB concentrations ranged from non-detectable to 30 milligrams per kilogram (mg/kg) (parts per million [ppm]; Station GB02-33). The high concentrations found at Station GB02-33 reconfirmed concentrations found at this location in 1995 and are associated with sediments adjacent to the navigation channel at the River mouth, not in Green Bay proper. Surface concentrations found in Green Bay samples (all stations except GB02-33) were less than 0.3 ppm (300 micrograms per kilogram [ $\mu\text{g}/\text{kg}$ ], parts per billion [ppb]) with subsurface concentrations at a single location (GB02-34) only as high as 1.4 ppm (1,400 ppb).

### **3 PROCEDURES TO INCORPORATE THE GREEN BAY SEDIMENT SAMPLE RESULTS INTO THE BAY MASS, VOLUME, AND SURFACE CONCENTRATION ESTIMATES**

Upon completion of the sampling and analyses, the data were incorporated into the Green Bay PCB bed maps. PCB isopach maps, the mass and volumes of PCB-contaminated sediments were generated and are reported. This was accomplished by incorporating the results of the Bay sampling in the database and then following the alternative methods developed by WDNR and presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* with three necessary modifications:

1. Inclusion of the results from the July 2002 data collection.
2. Revised data projection.
3. Revised depth of analysis grid resulting from including the July 2002 data.

Included in Appendix B of this white paper is a data directory list and a CD containing the data.

#### **3.1 2002 Data Collection**

As referred to in Section 2, data from the 2002 Green Bay sampling effort was incorporated into the database used for this white paper. Figure 2 graphically presents PCB data.

#### **3.2 Data Projection**

PCB bed generation followed the methods described in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*. The data used by WDNR for this white paper was obtained and combined with the data collected by RETEC in 2002. The WDNR data were geographically referenced using the customized Universal Transverse Mercator projection in 1927 North American Datum (commonly referred to as Wisconsin Transverse Mercator [WTM] 1927). The RETEC 2002 data were projected in Wisconsin State Plane Coordinates, 1983 North American Datum. All data were re-projected into the engineering standard set for the Lower Fox River using the 1983 custom Universal Transverse Mercator coordinate system (WTM 1983). Locational re-projections were done using *Project Wizard*<sup>®</sup>, a tool included with ArcGIS 8<sup>®</sup>.

While WDNR used WTM 1927 and ArcGIS 3.2<sup>®</sup>, re-projecting the data and creating the bed maps in WTM 1983 and ArcGIS 8<sup>®</sup> resulted in minor (less than 1 percent) differences in subsequent mass and volume estimations.

#### **3.3 Depth of Analysis**

As described in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*, the depth of sediment included in the interpolations contributes significantly to the calculation of PCB mass and contaminated sediment volume. As presented in the

alternate method included in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*, the July 2002 data was included in the delineation of the depth of analysis GIS coverage. As a result of including the July 2002 data, the depth of analysis coverage increased slightly from the *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* depth of analysis coverage. The depth range of the coverage in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* was 0.03 to 0.845 meter while after the addition of the July 2002 data the depth ranged from 0.03 to 0.863 meter.

## 4 INTERPOLATION RESULTS INCORPORATING THE 2002 GREEN BAY DATA

### 4.1 Estimates of PCB Mass and Contaminated Sediment Volume

PCB mass estimates are presented by Green Bay Zone (Table 1) and by sediment layer (Table 2) using the alternative method presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* and including the July 2002 data. In total, the mass estimate decreased by less than 1 percent (39 kilograms [kg]) when compared to the estimates presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*. This minimal total difference does not reflect the differences observed within each Green Bay Zone. Within Green Bay, PCB mass estimates are lower in Zone 2 by 433 kg, while mass estimates increased in zones 3A and 3B by 269 and 115 kg, respectively. These differences resulted from the combined effects of reduced spatial influence of historic data points near the River mouth and new concentrations at depth resulting in a slightly larger depth of analysis layer in the northern portions of Zone 2 which also influenced the southern end of zones 3A and 3B.

**TABLE 1 GREEN BAY PCB MASS ESTIMATES BY GREEN BAY ZONE INCORPORATING THE JULY 2002 DATA**

Source		PCB Mass (kg)
July 2002 Data Incorporated	Zone 2	3,898
	Zone 3A	3,696
	Zone 3B	5,811
	Zone 4	1,160
	<b>TOTAL</b>	<b>14,565</b>
<i>White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay</i> , Table 4 (WDNR alternative method)	Zone 2	4,331
	Zone 3A	3,427
	Zone 3B	5,696
	Zone 4	1,150
	<b>TOTAL</b>	<b>14,604</b>

**TABLE 2 GREEN BAY PCB MASS ESTIMATES BY SEDIMENT LAYER AND GREEN BAY ZONE INCORPORATING THE JULY 2002 DATA**

Depth	Zone 2	Zone 3A	Zone 3B	Zone 4	Total
0–2 cm	279	570	894	304	<b>2,047</b>
2–4 cm	278	670	1,210	258	<b>2,416</b>
4–6 cm	283	743	1,168	262	<b>2,456</b>
6–10 cm	562	1,064	1,670	308	<b>3,604</b>
>10 cm	2,496	649	869	28	<b>4,042</b>
<b>Total</b>	<b>3,898</b>	<b>3,696</b>	<b>5,811</b>	<b>1,160</b>	<b>14,565</b>

Table 3 summarizes PCB-contaminated sediment volume for each zone in Green Bay using the alternative method presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* and including the July 2002 data. In total, the volume estimate increased by approximately 10 percent (24 million cubic meters) when compared to the estimates presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*. This total difference reflects observed increases in Green Bay zones 2 and 3. Within Green Bay, contaminated sediment volume estimates are higher by approximately 5, 12, and 7 million cubic meters in zones 2, 3A, and 3B, respectively. This minimal percent total increase is the result of increased depth of analysis coverage in these zones.

**TABLE 3 CONTAMINATED SEDIMENT VOLUME BY SEDIMENT LAYER AND GREEN BAY ZONE INCORPORATING THE JULY 2002 DATA**

Source		Contaminated Sediment Volume (cubic meters)
July 2002 Data Incorporated	Zone 2	33,644,658
	Zone 3A	76,367,063
	Zone 3B	90,081,683
	Zone 4	66,134,492
	<b>All Zones Combined</b>	<b>266,227,896</b>
<i>White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay, Table 6</i> (WDNR alternative method)	Zone 2	28,710,478
	Zone 3A	64,487,652
	Zone 3B	83,151,447
	Zone 4	66,193,726
	<b>All Zones Combined</b>	<b>242,543,303</b>

#### 4.2 PCB Surface Concentration

Figure 3 is a map of Green Bay depicting the interpolated results of PCB concentrations in the top layer (0 to 2 centimeters [cm]) of sediment. Compared to the PCB concentration maps presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*, Figure 8, the revised concentration distribution differs only slightly in Zone 2 where the additional 2002 data were included. In the northern portion

of Green Bay (zones 3A, 3B, and 4), concentration patterns and magnitudes remain nearly identical to those presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*. Table 4 is a summary of average PCB concentrations for each zone of Green Bay compared to the results presented in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay*.

**TABLE 4 AVERAGE GREEN BAY PCB SURFACE CONCENTRATIONS (0 TO 2 CM) INCORPORATING THE JULY 2002 DATA**

Source		Average PCB Surface Concentration (ppb)
July 2002 Data Incorporated	Zone 2	262
	Zone 3A	363
	Zone 3B	672
	Zone 4	82
	<b>All Zones Combined</b>	<b>246</b>
<i>White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay, Table 8</i> (WDNR alternative method)	Zone 2	320
	Zone 3A	370
	Zone 3B	690
	Zone 4	80
	<b>All Zones Combined</b>	<b>353</b>

### 4.3 Bulk Density and TOC

The 2002 Green Bay data collection also generated bulk density and total organic carbon data for each of the samples collected. Appendix A contains a full listing of these results and Figures 4 and 5 incorporate the 2002 results into new bulk density and TOC bed maps, respectively.

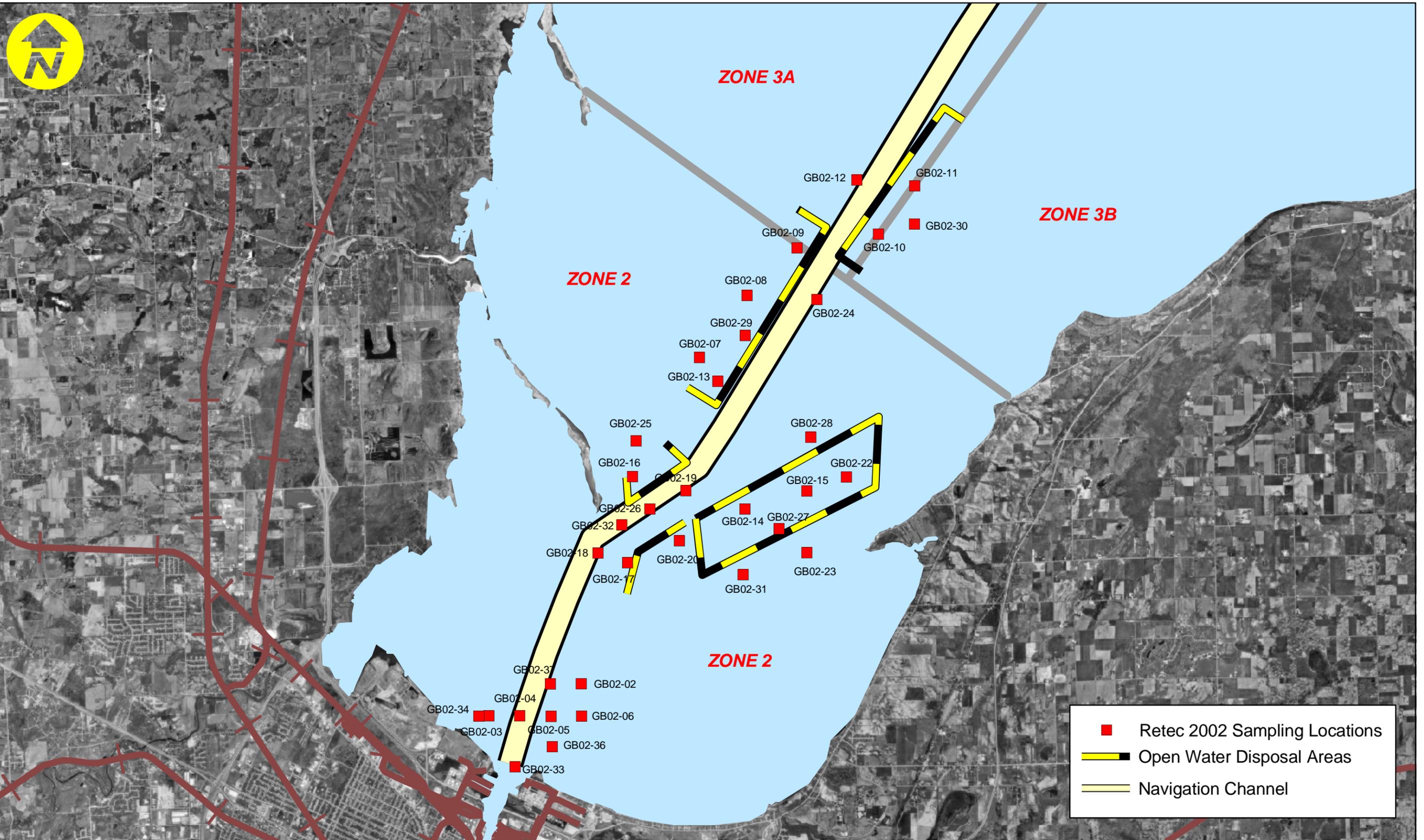
## 5 CONCLUSIONS

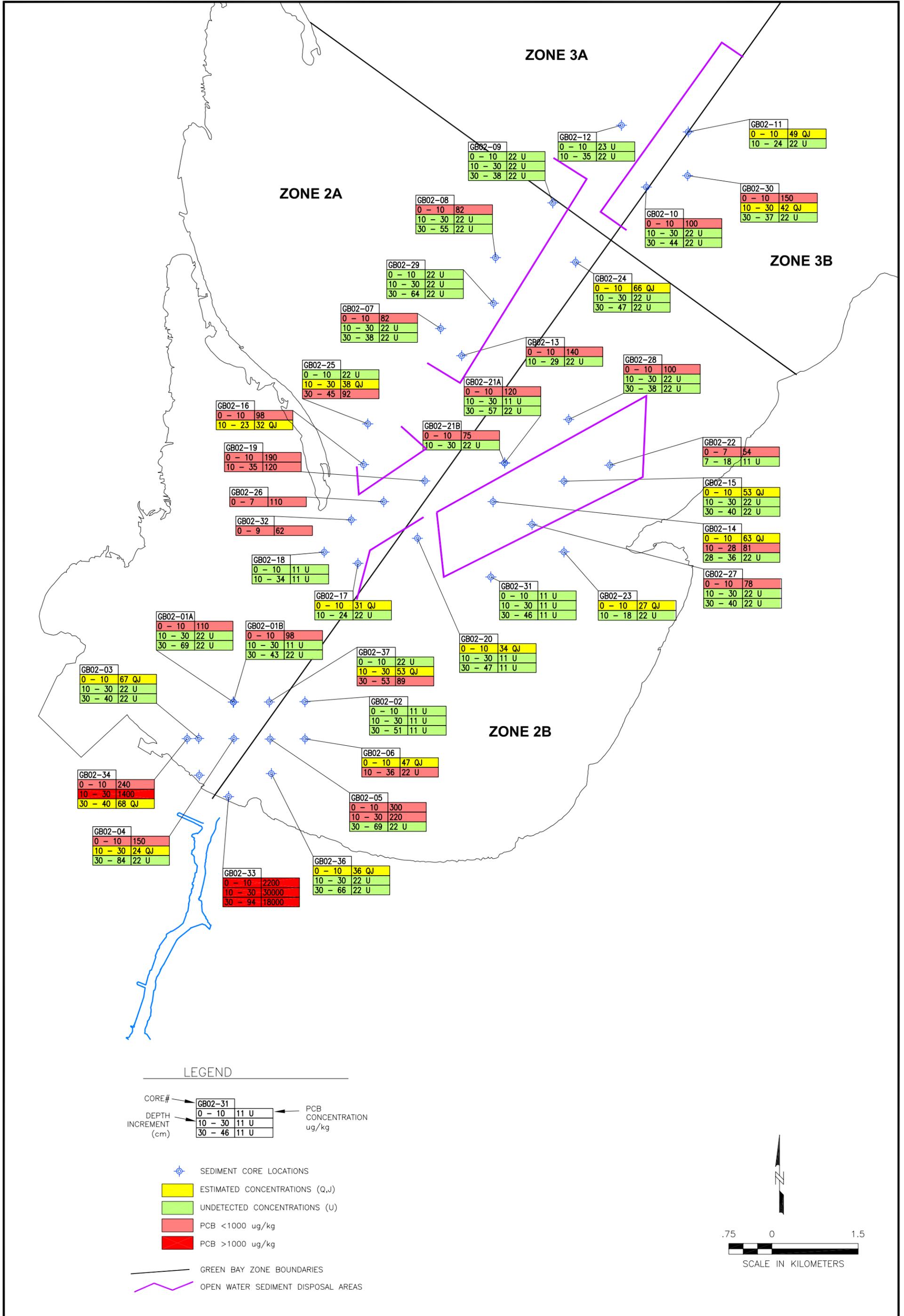
- The results of the bay sampling did not reveal any excessively high concentrations of PCBs in areas sampled where the former open-water disposal activities took place. Furthermore, when the data was included in generating more current bed maps, no new areas of elevated surface concentrations were found.
- Bed maps generated using the method described in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* reveal there is not a significant change in PCB mass or contaminated sediment volume with the July 2002 data included.
- Bed maps generated using the method described in *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay* reveal there is not a

significant change in PCB surface sediment concentrations with the July 2002 data included.

## 6 REFERENCES

- FRG, 2002. *Exhibit 24: Lower Fox River and Green Bay Database Report Version 6.0. Comments of the Fox River Group on the Wisconsin Department of Natural Resources' Draft Remedial Investigation, Draft Feasibility Study, Baseline Human Health and Ecological Risk Assessment, and Proposed Remedial Action Plan.*
- Manchester-Neesvig, Jon B., Anders W. Andren, and David N. Edgington, 1996. Patterns of mass sedimentation and deposition of sediment contaminated by PCBs in Green Bay. *Journal of Great Lakes Research*. 22(2):444–462.
- RETEC, 2002a. *Final Remedial Investigation for the Lower Fox River and Green Bay, Wisconsin.* Prepared for Wisconsin Department of Natural Resources by The RETEC Group, Inc., St. Paul, Minnesota. December.
- RETEC, 2002b. *Final Feasibility Study for the Lower Fox River and Green Bay, Wisconsin.* Prepared for Wisconsin Department of Natural Resources by The RETEC Group, Inc., Seattle, Washington. December.
- RETEC, 2002c. *Green Bay Sediment Results from July 2002 Survey, Green Bay, Wisconsin.* Prepared for Wisconsin Department of Natural Resources by The RETEC Group, Inc., Madison, Wisconsin. Available at Wisconsin Department of Natural Resources website: <http://www.dnr.state.wi.us/org/water/wm/lowerfox/reports.html>.
- WDNR, 2003. *White Paper No. 18 – Evaluation of an Alternative Approach of Calculating Mass, Sediment Volume, and Surface Concentrations in Operable Unit 5, Green Bay.* Wisconsin Department of Natural Resources, Madison, Wisconsin. June.
- WDNR and EPA, 2001. *Proposed Remedial Action Plan, Lower Fox River and Green Bay.* Wisconsin Department of Natural Resources, Madison and Green Bay, Wisconsin and United States Environmental Protection Agency, Region 5, Chicago, Illinois. October.

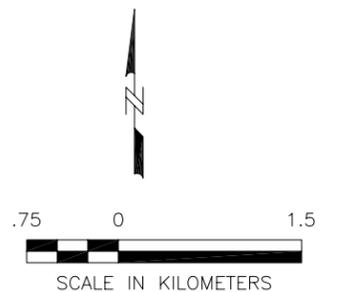


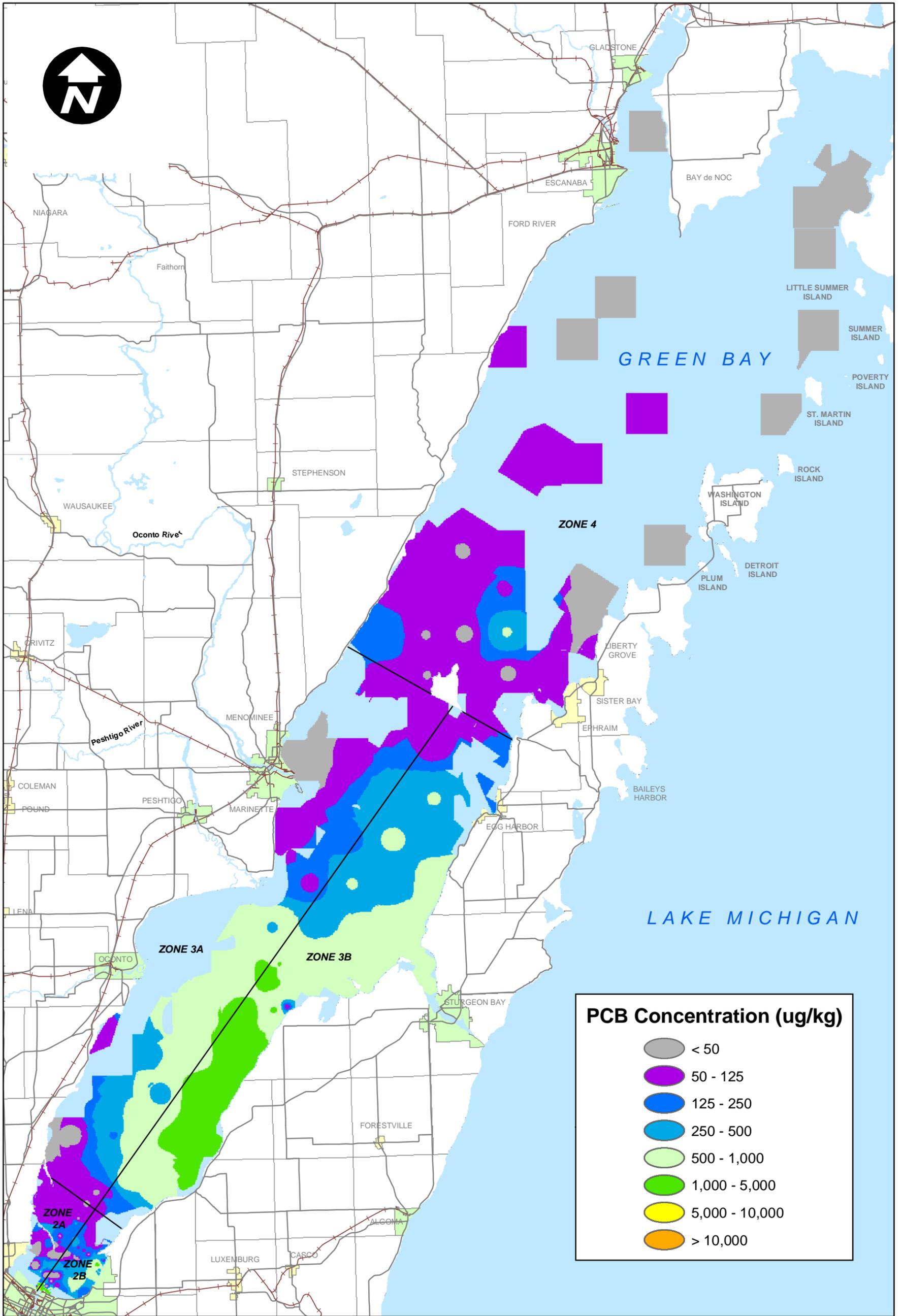


LEGEND

CORE#	GB02-31	PCB CONCENTRATION ug/kg
DEPTH INCREMENT (cm)	0 - 10 11 U	
	10 - 30 11 U	
	30 - 46 11 U	

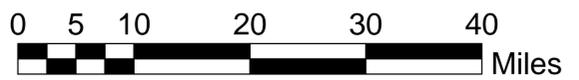
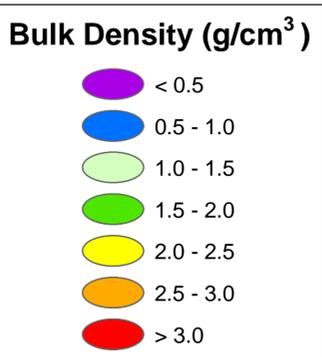
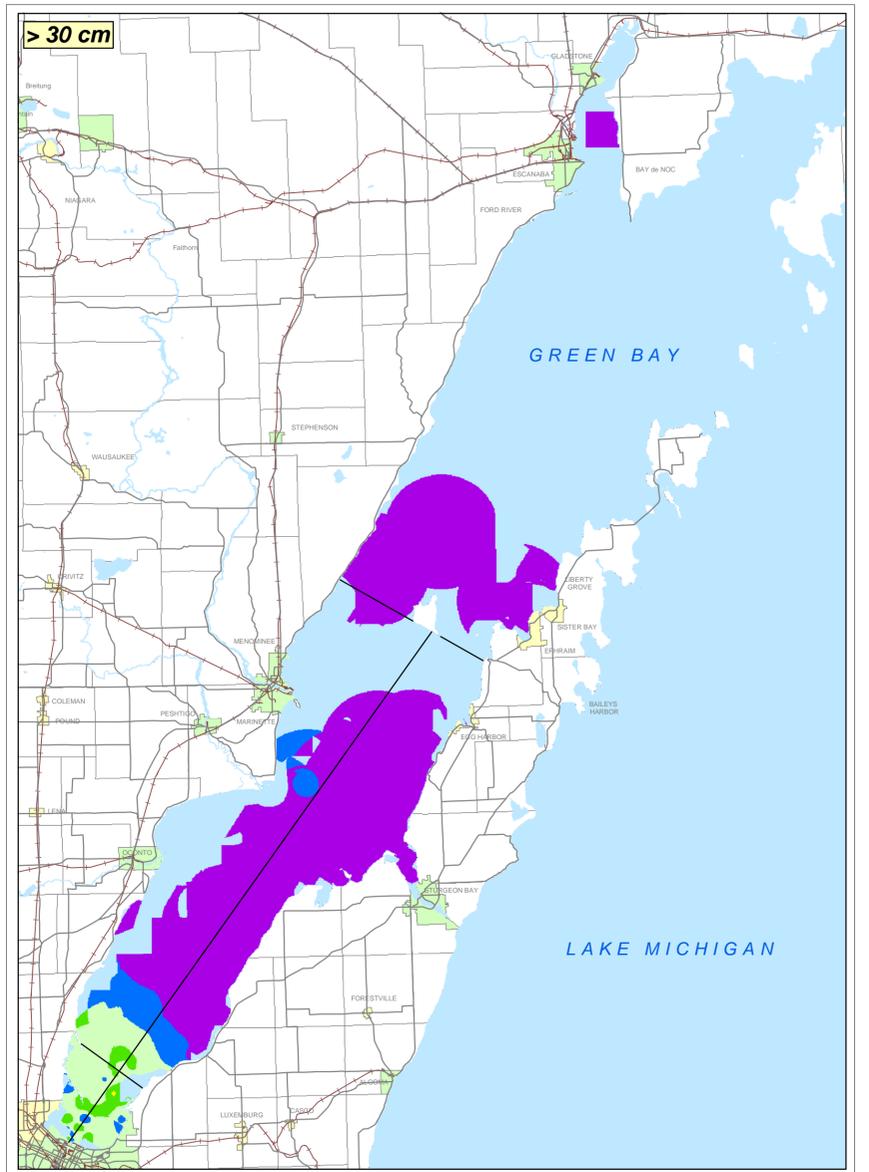
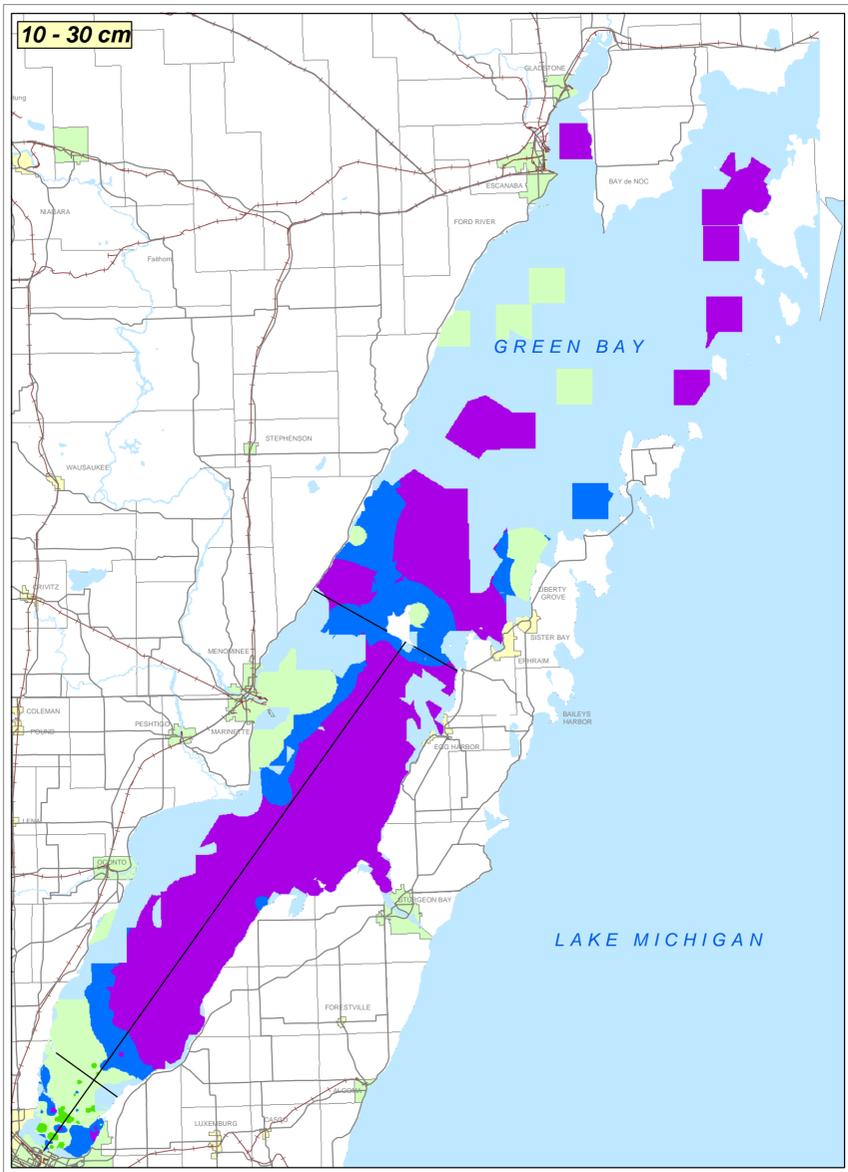
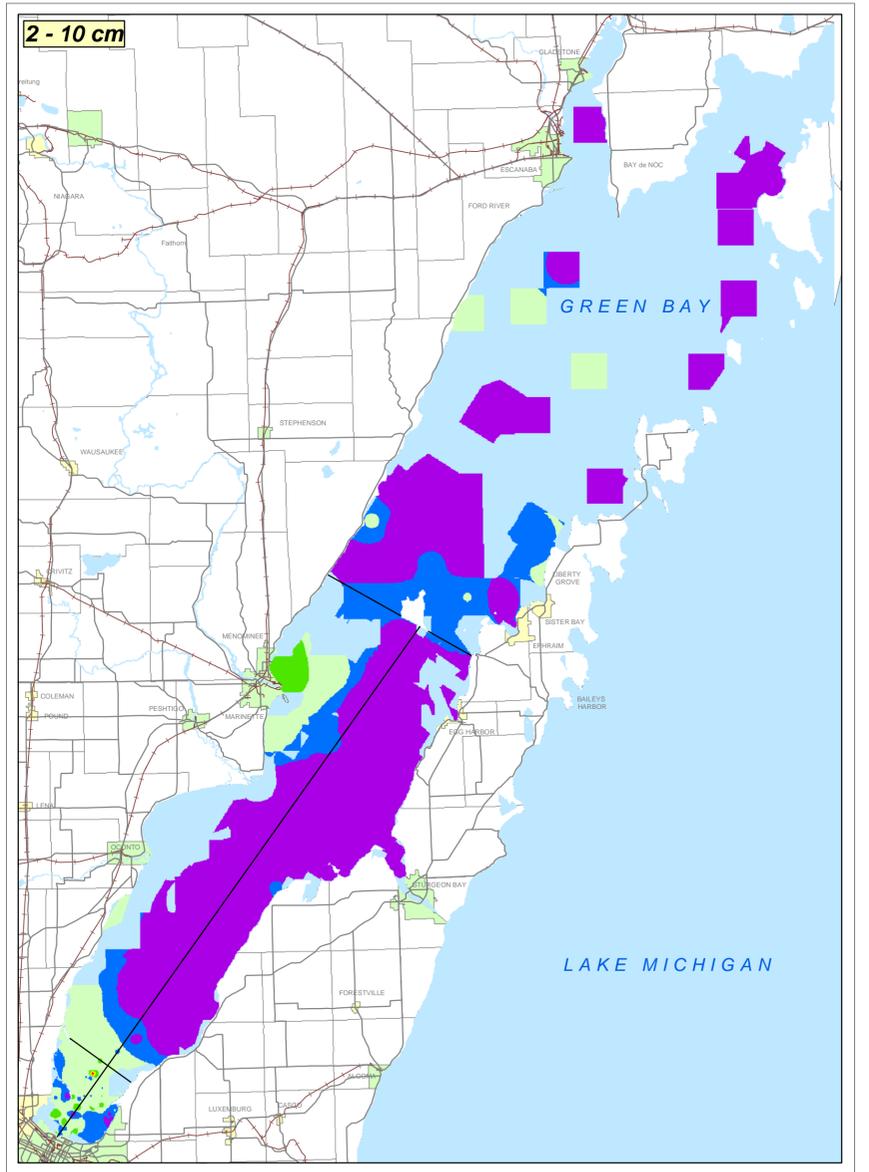
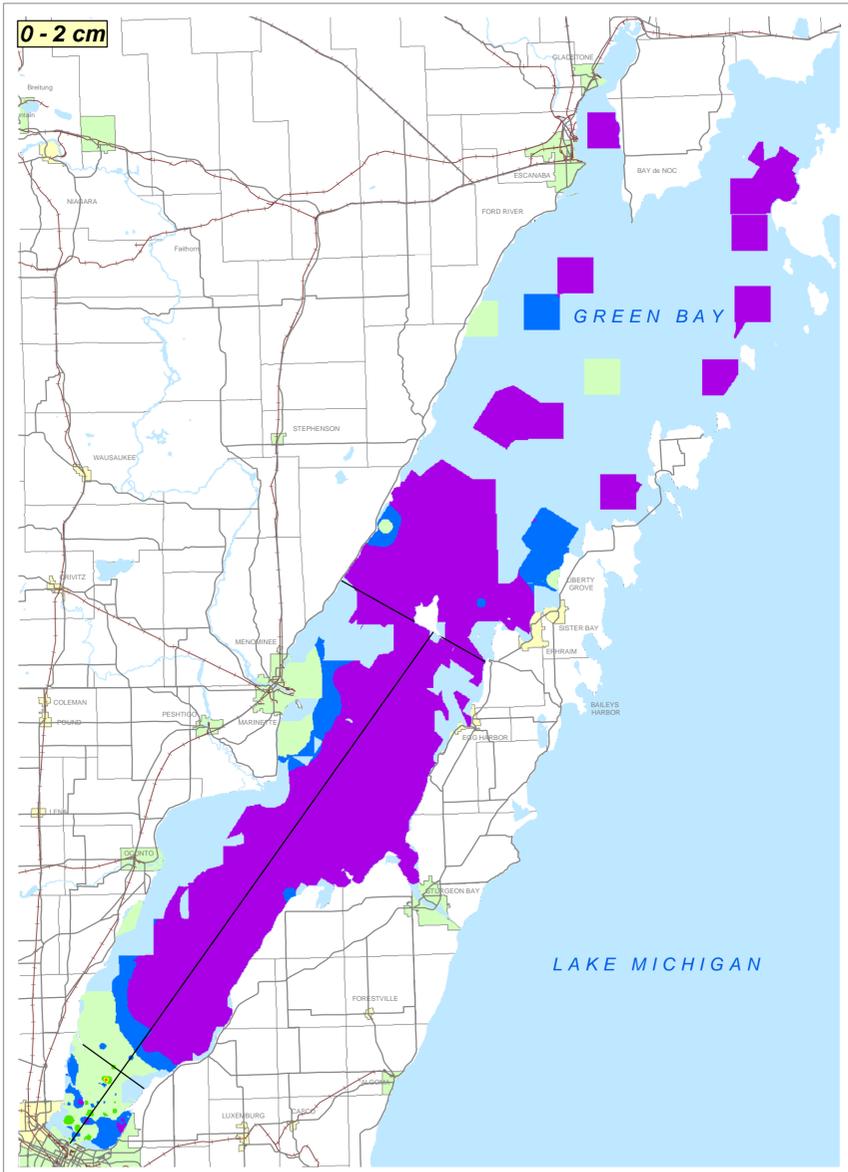
- SEDIMENT CORE LOCATIONS
- ESTIMATED CONCENTRATIONS (Q,J)
- UNDETECTED CONCENTRATIONS (U)
- PCB <1000 ug/kg
- PCB >1000 ug/kg
- GREEN BAY ZONE BOUNDARIES
- OPEN WATER SEDIMENT DISPOSAL AREAS





0 3.5 7 14  
1" = 7 Miles

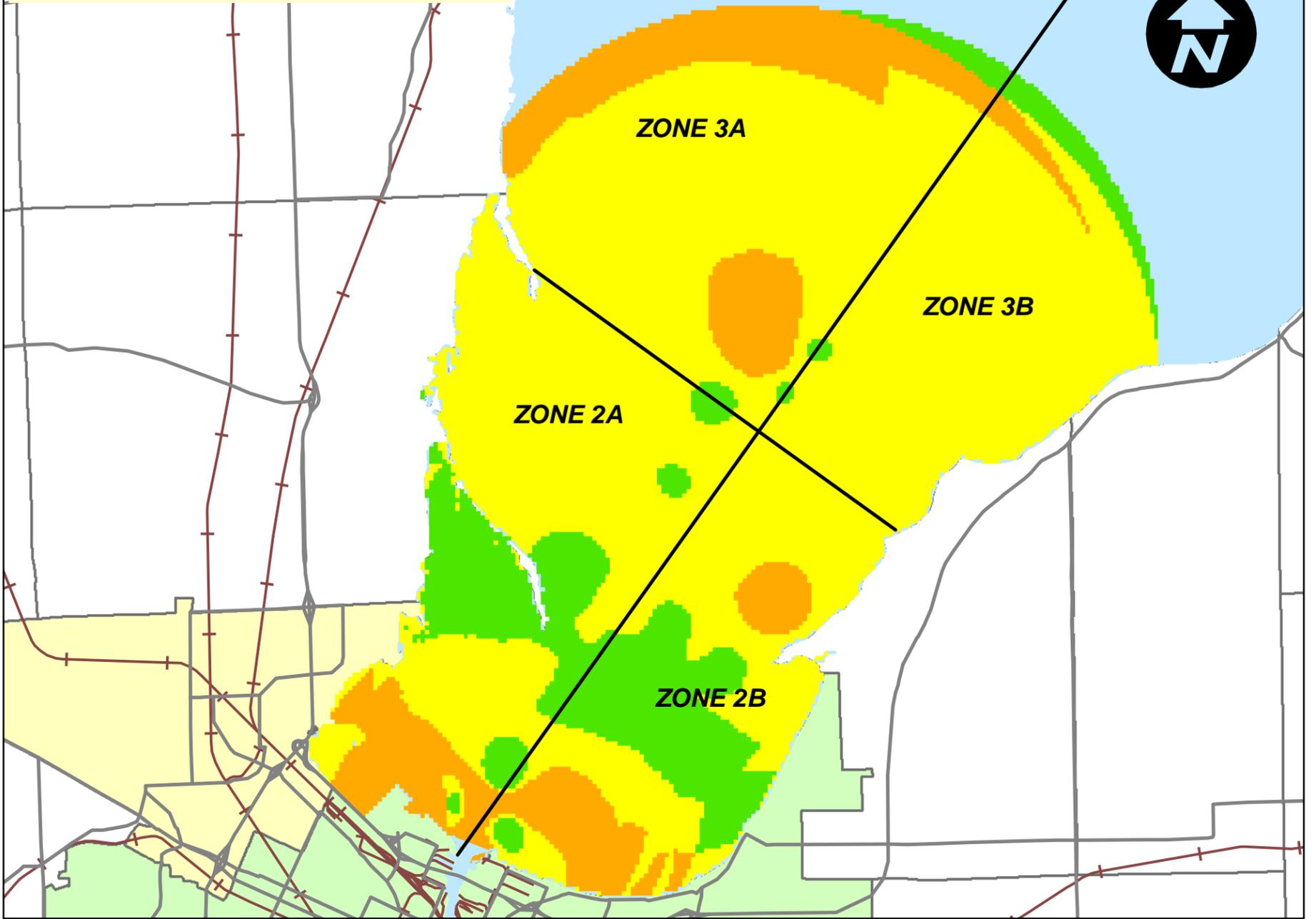




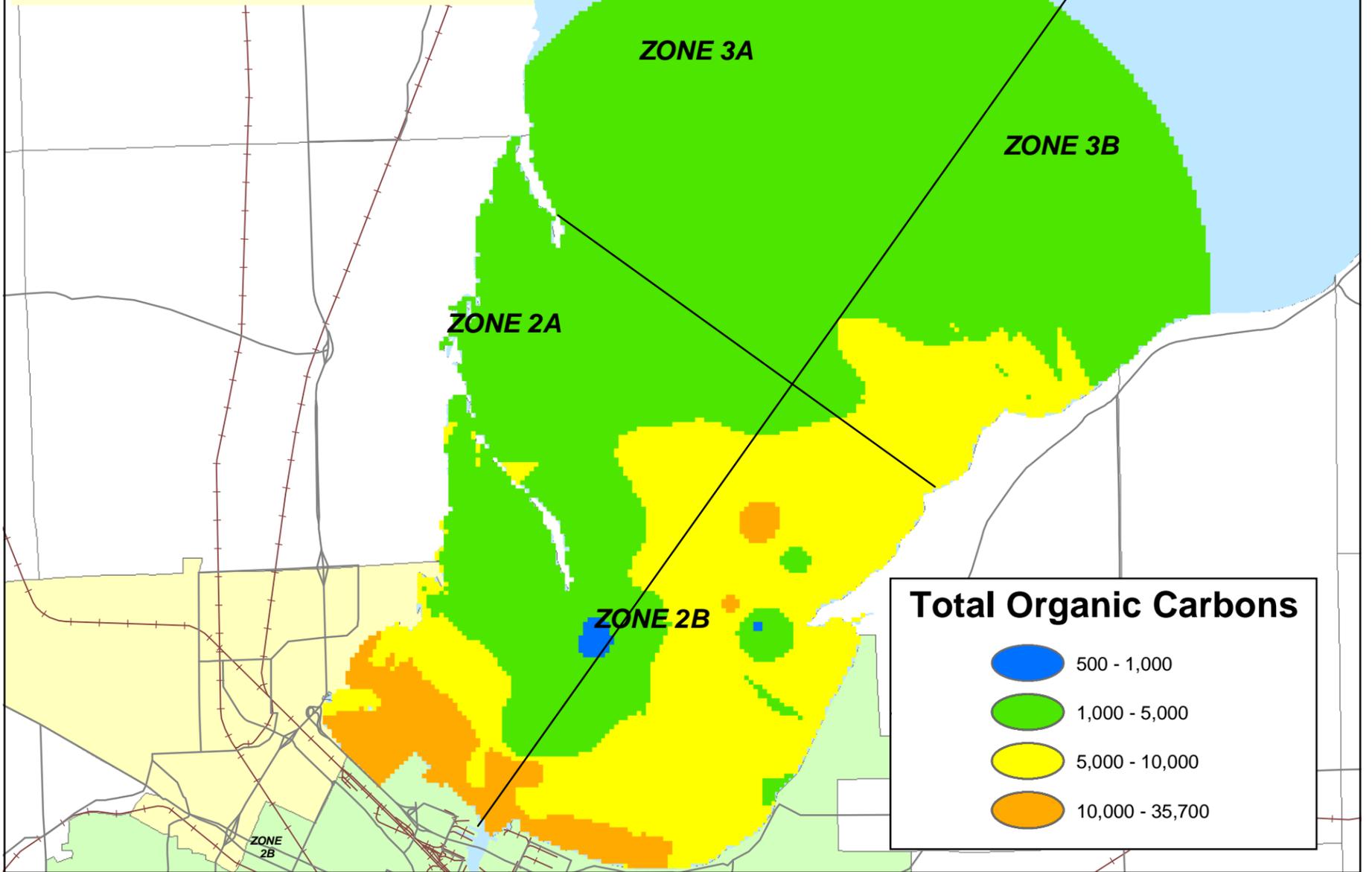
GREEN BAY  
WISCN-16394-601

**BULK DENSITY IN SEDIMENTS:  
GREEN BAY**

**Total Organic Carbons < 10 cm**



**Total Organic Carbons > 10 cm**



0 5,000 10,000 20,000  
 1" = 10,000 Feet



**APPENDIX A**  
**SEDIMENT DATA SUMMARY TABLES**

**Table 1 Green Bay Sediment Sampling Stations, July 2002**

Station ID	Sample Date	Sample Time	Station Location (WTM NAD 83)				Water Depth (ft)
			Planned		Actual		
			Easting (ft)	Northing (ft)	Easting (ft)	Northing (ft)	
GB02-01	07/23/02	1030	2489528	269513	2489523	269512	6.5
GB02-02	07/24/02	1015	2493628	269514	2493606	269534	2.0
GB02-03	07/22/02	1115	2487530	267414	2487544	267433	3.4
GB02-04	07/22/02	1140	2489527	267414	2489548	267423	7.8
GB02-05	07/22/02	1630	2491630	267414	2491618	267399	10.4
GB02-06	07/23/02	0930	2493627	267414	2493610	267408	8.2
GB02-07	07/24/02	1530	2501347	290889	2501347	290880	18.5
GB02-08	07/24/02	1610	2504478	294935	2504478	294937	23.0
GB02-09	07/24/02	1650	2507739	298067	2507745	298068	21.0
GB02-10	07/24/02	1710	2513089	298980	2513083	298970	21.8
GB02-11	07/22/02	1410	2515437	302112	2515476	302129	22.0
GB02-12	07/22/02	1330	2511653	302503	2511665	302509	21.5
GB02-13	07/24/02	1515	2504739	289193	2502549	289325	20.0
GB02-14	07/24/02	1220	2504349	280973	2504341	280975	13.5
GB02-15	07/24/02	1305	2508394	282147	2508386	282145	16.5
GB02-16	07/22/02	1510	2496911	283060	2496950	283097	14.0
GB02-17	07/23/02	1225	2496651	277449	2496629	277446	8.4
GB02-18	07/23/02	1205	2494693	278101	2494704	278088	8.7
GB02-19	07/24/02	0925	2499651	282668	2500443	282165	19.1
GB02-20	07/24/02	0950	2500043	278884	2500025	278884	16.0
GB02-21	07/24/02	1235	2505001	283191	2504998	283191	15.8
GB02-22	07/24/02	1325	2511003	283061	2510999	283064	14.5
GB02-23	07/24/02	1150	2508394	278102	2508387	278105	4.0
GB02-24	07/24/02	1630	2509044	294674	2509047	294678	21.0
GB02-25	07/22/02	1445	2497172	285408	2497190	285427	13.0
GB02-26	07/24/02	0857	2498085	280972	2498097	280976	19.0
GB02-27	07/24/02	1205	2506567	279668	2506564	279676	12.5
GB02-28	07/24/02	1340	2508654	285671	2508654	285679	14.2
GB02-29	07/24/02	1550	2504397	292325	2504360	292327	18.5
GB02-30	07/24/02	1720	2515438	299633	2515438	299627	21.5
GB02-31	07/24/02	1130	2504219	276667	2504213	276668	7.5
GB02-32	07/24/02	0835	2496259	279928	2496250	279937	16.1
GB02-33	07/22/02	1015	2489257	264102	2489249	264101	9.2
GB02-34	07/22/02	1100	2486862	267413	2486885	267420	3.4
GB02-35	07/22/02	1040	2487582	265314	2487576	265327	2.0
GB02-36	07/22/02	1605	2491682	265413	2491688	265422	3.2
GB02-37	07/23/02	0955	2491577	269513	2491573	269516	3.2

**Table 2 PCB, TOC, and Percent Solids Results for Green Bay Sediment, July 2002**

Station ID	Start Depth (cm)	End Depth (cm)	Percent Solids	PCB Concentration (ug/kg)*								TOC (mg/kg)	
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total		
GB02-01A-0010	0	10	73.5	22 U	22 U	22 U	110	22 U	22 U	22 U	22 U	110	8,000 J
GB02-01A-1030	10	30	59.4	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	14,000 J
GB02-01A-3069	30	69	50.4	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	17,000
GB02-01B-0010	0	10	71.4	22 U	22 U	22 U	98	22 U	22 U	22 U	22 U	98	7,900 J
GB02-01B-1030	10	30	59.3	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	12,000 J
GB02-01B-3043	30	43	58	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	19,000
GB02-02-0010	0	10	82.7	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	1,800 J
GB02-02-1030	10	30	80.7	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	2,100 J
GB02-02-3051	30	51	82.1	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	1,300
GB02-03-0010	0	10	83.2	22 U	22 U	22 U	67 QJ	22 U	22 U	22 U	22 U	67 QJ	1,300 J
GB02-03-1030	10	30	81.6	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	3,300 J
GB02-03-3040	30	40	69.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	20,000
GB02-04-0010	0	10	51.2	23 U	23 U	23 U	150	23 U	23 U	23 U	23 U	150	24,000
GB02-04-1030	10	30	47.4	23 U	23 U	23 U	24 QJ	23 U	23 U	23 U	23 U	24 QJ	20,000 J
GB02-04-3084	30	84	80.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	3,000 J
GB02-05-0010	0	10	58.7	22 U	22 U	22 U	260	22 U	36 QJ	22 U	22 U	300	14,000
GB02-05-1030	10	30	59.1	22 U	22 U	22 U	200	22 U	24 QJ	22 U	22 U	220	13,000
GB02-05-3069	30	69	71	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	12,000
GB02-06-0010	0	10	71.2	22 U	22 U	22 U	47 QJ	22 U	22 U	22 U	22 U	47 QJ	14,000
GB02-06-1036	10	36	74	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	9,100 J
GB02-07-0010	0	10	59.8	22 U	22 U	22 U	82	22 U	22 U	22 U	22 U	82	9,100 J
GB02-07-1030	10	30	76.3	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	4,900
GB02-07-3038	30	38	75.1	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	7,400 J
GB02-08-0010	0	10	62.5	22 U	22 U	22 U	82	22 U	22 U	22 U	22 U	82	7,100
GB02-08-1030	10	30	78.3	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	1,500 J
GB02-08-3055	30	55	82.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	760 J

**Notes:**

J and Q - Estimated concentrations.

U – Undetected at listed limit of detection.

**Table 2 PCB, TOC, and Percent Solids Results for Green Bay Sediment, July 2002**

Station ID	Start Depth (cm)	End Depth (cm)	Percent Solids	PCB Concentration (ug/kg)*								TOC (mg/kg)
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total	
GB02-09-0010	0	10	79.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	2,000
GB02-09-1030	10	30	77	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	2,900 J
GB02-09-3038	30	38	77.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	5,000
GB02-10-0010	0	10	70	22 U	22 U	22 U	100	22 U	22 U	22 U	100	4,000 J
GB02-10-1030	10	30	80.4	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	2,700 J
GB02-10-3044	30	44	79	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	4,900
GB02-11-0010	0	10	68.8	22 U	22 U	22 U	49 QJ	22 U	22 U	22 U	49 QJ	3,500
GB02-11-1024	10	24	77.6	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	3,200
GB02-12-0010	0	10	57.6	23 U	23 U	23 U	23 U	23 U	23 U	23 U	23 U	24,000 J
GB02-12-1035	10	35	82	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	4,700
GB02-13-0010	0	10	65.2	22 U	22 U	22 U	110	22 U	27 QJ	22 U	140	6,200
GB02-13-1029	10	29	79.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	6,300
GB02-14-0010	0	10	78.8	22 U	22 U	22 U	63 QJ	22 U	22 U	22 U	63 QJ	2,700
GB02-14-1028	10	28	79.1	22 U	22 U	22 U	81	22 U	22 U	22 U	81	3,800 J
GB02-14-2836	28	36	82.6	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	17,000
GB02-15-0010	0	10	75.6	22 U	22 U	22 U	53 QJ	22 U	22 U	22 U	53 QJ	6,100
GB02-15-1030	10	30	76.7	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	8,600 J
GB02-15-3040	30	40	79.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	10,000
GB02-16-0010	0	10	66.8	22 U	22 U	22 U	98	22 U	22 U	22 U	98	4,500
GB02-16-1023	10	23	81.3	22 U	22 U	22 U	32 QJ	22 U	22 U	22 U	32 QJ	2,600
GB02-17-0010	0	10	81.8	22 U	22 U	22 U	31 QJ	22 U	22 U	22 U	31 QJ	3,000
GB02-17-1024	10	24	83.7	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	870
GB02-18-0010	0	10	76.7	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	6,100 J
GB02-18-1034	10	34	82.2	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	1,100
GB02-19-0010	0	10	67.6	11 U	11 U	11 U	170	11 U	19 QJ	11 U	190	8,200 J
GB02-19-1035	10	35	73.9	11 U	11 U	11 U	110	11 U	14 QJ	11 U	120	6,200 J

**Notes:**

J and Q - Estimated concentrations.

U – Undetected at listed limit of detection.

**Table 2 PCB, TOC, and Percent Solids Results for Green Bay Sediment, July 2002**

Station ID	Start Depth (cm)	End Depth (cm)	Percent Solids	PCB Concentration (ug/kg)*								TOC (mg/kg)
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total	
GB02-20-0010	0	10	82	11 U	11 U	11 U	34 QJ	11 U	11 U	11 U	34 QJ	1,200 J
GB02-20-1030	10	30	82.1	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	3,100 J
GB02-20-3047	30	47	82.3	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	2,200
GB02-21A-0010	0	10	67.5	11 U	11 U	11 U	100	11 U	21 QJ	11 U	120	12,000
GB02-21A-1030	10	30	78.2	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	14,000
GB02-21A-3057	30	57	81.3	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	11,000 J
GB02-21B-0010	0	10	73.6	22 U	22 U	22 U	75	22 U	22 U	22 U	75	10,000
GB02-21B-1030	10	30	77.5	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	9,500 J
GB02-22-0007	0	7	72.4	11 U	11 U	11 U	54	11 U	11 U	11 U	54	22,000 J
GB02-22-0718	7	18	78.4	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	3,800 J
GB02-23-0010	0	10	85	22 U	22 U	22 U	27 QJ	22 U	22 U	22 U	27 QJ	2,900 J
GB02-23-1018	10	18	85.5	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	420 QJ
GB02-24-0010	0	10	69.9	22 U	22 U	22 U	66 QJ	22 U	22 U	22 U	66 QJ	8,600 J
GB02-24-1030	10	30	74.6	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	3,700
GB02-24-3047	30	47	82.3	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	6,700
GB02-25-0010	0	10	76.8	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	2,000
GB02-25-1030	10	30	78	22 U	22 U	22 U	38 QJ	22 U	22 U	22 U	38 QJ	1,800
GB02-25-3045	30	45	69.5	22 U	22 U	22 U	92	22 U	22 U	22 U	92	3,600
GB02-26-0007	0	7	64.1	11 U	11 U	11 U	96	11 U	12 QJ	11 U	110	5,800
GB02-27-0010	0	10	77.7	22 U	22 U	22 U	78	22 U	22 U	22 U	78	5,300
GB02-27-1030	10	30	76.4	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	11,000
GB02-27-3040	30	40	78.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	13,000
GB02-28-0010	0	10	67	22 U	22 U	22 U	100	22 U	22 U	22 U	100	5,000
GB02-28-1030	10	30	75.4	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	15,000 J
GB02-28-3038	30	38	75.8	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	8,900
GB02-29-0010	0	10	82	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	3,200 J
GB02-29-1030	10	30	79.9	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	7,100
GB02-29-3064	30	64	82.5	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	5,500

**Notes:**

J and Q - Estimated concentrations.

U – Undetected at listed limit of detection.

**Table 2 PCB, TOC, and Percent Solids Results for Green Bay Sediment, July 2002**

Station ID	Start Depth (cm)	End Depth (cm)	Percent Solids	PCB Concentration (ug/kg)*								TOC (mg/kg)
				Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Total	
GB02-30-0010	0	10	59.5	22 U	22 U	22 U	120	22 U	27 QJ	22 U	150	7,500
GB02-30-1030	10	30	66.7	22 U	22 U	22 U	42 QJ	22 U	22 U	22 U	42 QJ	6,400
GB02-30-3037	30	37	75.2	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	10,000 J
GB02-31-0010	0	10	81.5	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	4,600 J
GB02-31-1030	10	30	81.4	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	9,000
GB02-31-3046	30	46	81.4	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	8,300 J
GB02-32-0009	0	9	77.3	11 U	11 U	11 U	62	11 U	11 U	11 U	62	2,800
GB02-33-0010	0	10	69.1	110 U	110 U	110 U	1,900	110 U	260 QJ	110 U	2,200	14,000
GB02-33-1030	10	30	40.3	2,300 U	2,300 U	2,300 U	30,000	2,300 U	2,300 U	2,300 U	30,000	30,000
GB02-33-3094	30	94	39.2	1,100 U	1,100 U	1,100 U	18,000	1,100 U	1,100 U	1,100 U	18,000	41,000
GB02-34-0010	0	10	57.4	22 U	22 U	22 U	210	22 U	29 QJ	22 U	240	16,000
GB02-34-1030	10	30	63.8	130 U	130 U	130 U	1,400	130 U	130 U	130 U	1,400	18,000
GB02-34-3040	30	40	71.8	22 U	22 U	22 U	68 QJ	22 U	22 U	22 U	68 QJ	7,100 J
GB02-36-0010	0	10	86.3	22 U	22 U	22 U	36 QJ	22 U	22 U	22 U	36 QJ	2,600 J
GB02-36-1030	10	30	84.4	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	2,500 J
GB02-36-3066	30	66	69	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	18,000
GB02-37-0010	0	10	83.1	22 U	22 U	22 U	22 U	22 U	22 U	22 U	22 U	1,100 J
GB02-37-1030	10	30	82.3	22 U	22 U	22 U	53 QJ	22 U	22 U	22 U	53 QJ	1,500
GB02-37-3053	30	53	81.8	22 U	22 U	22 U	89	22 U	22 U	22 U	89	1,300

**Notes:**

J and Q - Estimated concentrations.

U – Undetected at listed limit of detection.

**Table 3 Bulk Density Results for Green Bay Sediment, July 2002**

Station ID	Wet Density (lbs/cf)	Dry Weight Basis		Wet Weight Basis	
		% water	Dry Density (lbs/cf)	% water	Dry Density (lbs/cf)
GB02-01A-0010	97.3	37.2	70.9		
GB02-01A-1030	88.5	70	52		
GB02-01A-3069	90.3	142.8	37.2	58.8	56.9
GB02-01B-0010	113.8	39.9	81.4		
GB02-01B-1030	92.5	71.9	53.8		
GB02-01B-3043	100.7	70.5	59		
GB02-02-0010	98.4	23.7	79.6		
GB02-02-1030	131.4	24.1	106		
GB02-02-3051	133.9	21.9	109.8		
GB02-03-0010	114.2	22.4	93.4		
GB02-03-1030	128.6	30.3	98.7		
GB02-03-3040	131.5	42.8	92.1		
GB02-04-0010	67.7	95.3	34.7		
GB02-04-1030	76.8	120.1	34.9	54.6	49.7
GB02-04-3084	99.9	105.9	48.5	51.4	66
GB02-05-0010	72.2	81.1	39.9		
GB02-05-1030	101.8	71	59.5		
GB02-05-3069	118.1	43.9	82.1		
GB02-06-0010	98.7	41.2	69.9		
GB02-06-1036	103.9	38.2	75.2		
GB02-07-0010	93.4	53.6	60.8		
GB02-07-1030	108.1	35.1	80.1		
GB02-07-3038	104.8	32.4	79.2		
GB02-08-0010	97.7	48.9	65.6		
GB02-08-1030	128.5	25.9	102		
GB02-08-3055	115.5	24	93.2		
GB02-09-0010	125.9	25.4	100.4		
GB02-09-1030	116.2	28.2	90.7		
GB02-09-3038	126.4	30.1	97.2		
GB02-10-0010	116	36.9	84.7		
GB02-10-1030	120.6	23.8	97.5		
GB02-10-3044	104.5	25.8	83		
GB02-11-0010	76.7	36.4	56.3		
GB02-11-1024	50.8	29	39.4		
GB02-12-0010	110.9	36.6	81.2		
GB02-12-1035	126.3	21.8	103.7		
GB02-13-0010	105.7	48.2	71.3		
GB02-13-1029	132	26.2	104.6		
GB02-14-0010	105.6	27	83.1		
GB02-14-1028	98.9	25	79.1		
GB02-14-2836	137.1	25.4	109.3		
GB02-15-0010	126.7	32.8	95.4		
GB02-15-1030	137.2	29.1	106.2		
GB02-15-3040	118.5	26.2	93.9		
GB02-16-0010	113.3	41.2	80.2		
GB02-16-1023	133.3	24.3	107.4		
GB02-17-0010	145.1	22.9	118.1		
GB02-17-1024	116.1	22.9	95.1		
GB02-18-0010	95.9	24	77.3		
GB02-18-1034	112.9	18.9	94.6		
GB02-19-0010	90.1	48.9	60.5		
GB02-19-1035	112.6	36.9	82.2		

**Table 3 Bulk Density Results for Green Bay Sediment, July 2002**

Station ID	Wet Density (lbs/cf)	Dry Weight Basis		Wet Weight Basis	
		% water	Dry Density (lbs/cf)	% water	Dry Density (lbs/cf)
GB02-20-0010	107.8	22.4	88		
GB02-20-1030	129.6	22.5	105.8		
GB02-20-3047	142	22.4	116		
GB02-21A-0010	116.4	34	86.9		
GB02-21A-1030	110.4	30.7	84.4		
GB02-21A-3057	127	23.6	102.7		
GB02-21B-0010	117.4	39.1	84.4		
GB02-21B-1030	109.7	31.2	83.6		
GB02-22-0007	94	33.8	70.2		
GB02-22-0718	137	27.8	107.2		
GB02-23-0010	129.9	15.6	112.3		
GB02-23-1018	107.3	14.9	93.4		
GB02-24-0010	103.7	42.7	72.7		
GB02-24-1030	116.6	34.1	87		
GB02-24-3047	118.4	22.8	96.5		
GB02-25-0010	102.2	29.7	78.9		
GB02-25-1030	107.9	29.1	83.5		
GB02-25-3045	111	25.3	88.6		
GB02-26-0007	73.8	46.2	50.5		
GB02-27-0010	119.7	29.9	92.1		
GB02-27-1030	117.9	26.7	93		
GB02-27-3040	131	29.4	101.3		
GB02-28-0010	84.8	40.4	60.4		
GB02-28-1030	94	33.7	70.3		
GB02-28-3038	185.1	32.7	139.5		
GB02-29-0010	240.9	21	199.1		
GB02-29-1030	103.9	25.8	82.5		
GB02-29-3064	58.5	26.3	46.4		
GB02-30-0010	85.8	15	74.6		
GB02-30-1030	91.5	45.9	62.7		
GB02-30-3037	132.2	31.4	100.6		
GB02-31-0010	119.7	23.4	97		
GB02-31-1030	116.2	22.7	94.7		
GB02-31-3046	138.2	24.5	111		
GB02-32-0009	105	30.3	80.5		
GB02-33-0010	66.6	71.2	38.9		
GB02-33-1030	67.3	165.5	25.3	62.3	41.5
GB02-33-3094	78.8	150.9	31.4	60.1	49.2
GB02-34-0010	82.2	69.8	48.4		
GB02-34-1030	105.5	64.2	64.2		
GB02-34-3040	123.6	34.4	91.9		
GB02-36-0010	98.2	17.4	83.7		
GB02-36-1030	108.9	19.2	91.4		
GB02-36-3066	83.9	63.7	51.3		
GB02-37-0010	134.2	21.1	110.9		
GB02-37-1030	121.5	21.6	99.9		
GB02-37-3053	105.5	18.7	88.9		

**APPENDIX B**  
**CD DIRECTORY LIST AND DATA CD**

## CD DIRECTORY LIST

CD:\readme.txt

CD:\Shapefiles\greenbay.dbf  
CD:\Shapefiles\greenbay.prj  
CD:\Shapefiles\greenbay.sbn  
CD:\Shapefiles\greenbay.sbx  
CD:\Shapefiles\greenbay.shp  
CD:\Shapefiles\greenbay.shp.xml  
CD:\Shapefiles\greenbay.shx  
CD:\Shapefiles\southbay.dbf  
CD:\Shapefiles\southbay.prj  
CD:\Shapefiles\southbay.shp  
CD:\Shapefiles\southbay.shx  
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CD:\Shapefiles\zoneclip.prj  
CD:\Shapefiles\zoneclip.shp  
CD:\Shapefiles\zoneclip.shx

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