



# Allied Paper, Inc./Portage Creek/Kalamazoo River

Operable Unit 5

Area 1 Feasibility Study

December 11, 2014

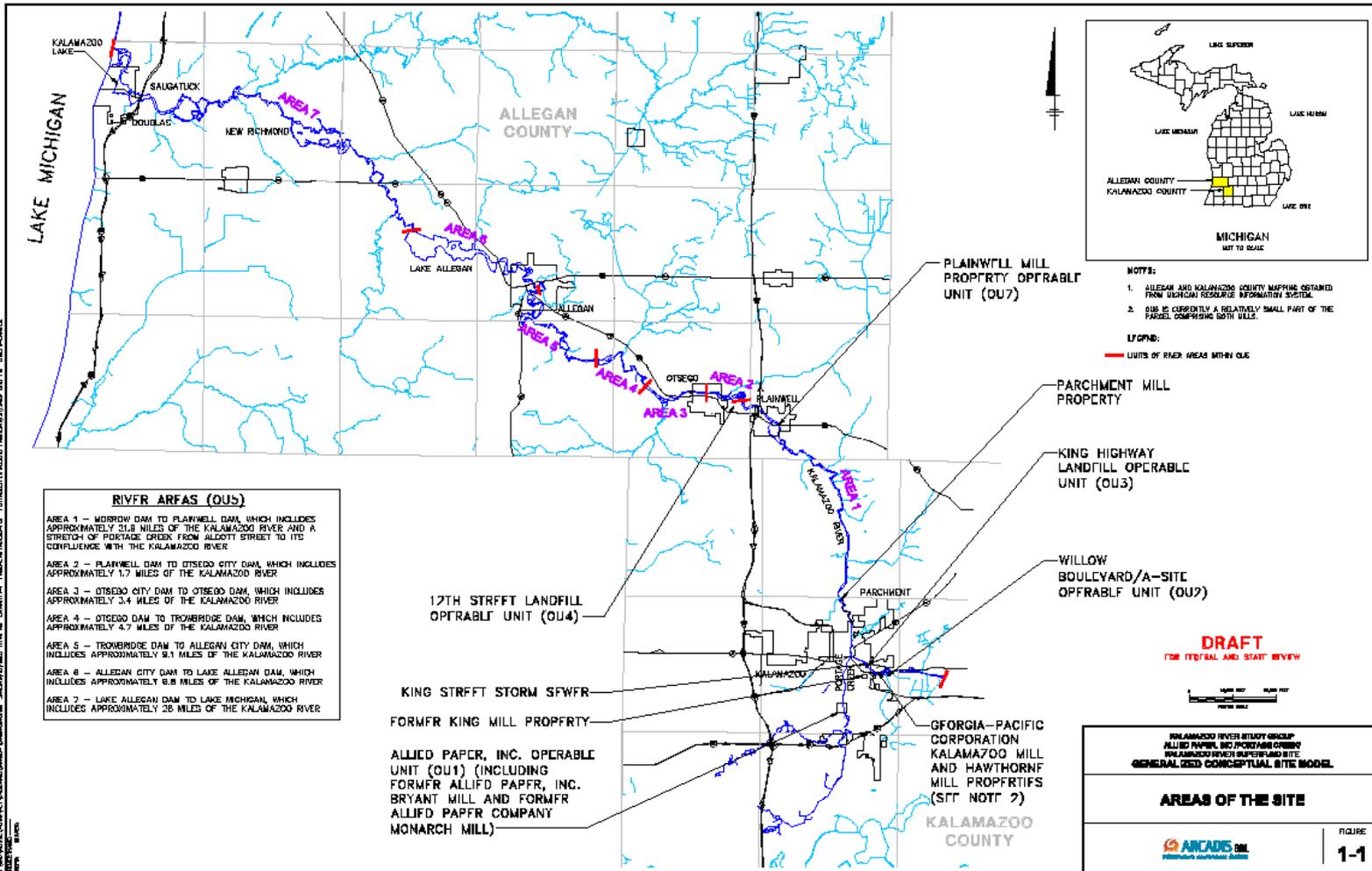


# Objectives



- **Review the Superfund Remedial Process**
- **Provide a brief history of the Allied Paper/Portage Creek/Kalamazoo River Site**
- **Overview of Removal Actions Completed in Area 1**
- **Discuss key elements of the Feasibility Study**
- **Present the array of Area 1 remedial alternatives**
- **Next Steps**

# Allied Paper/Kalamazoo River Site



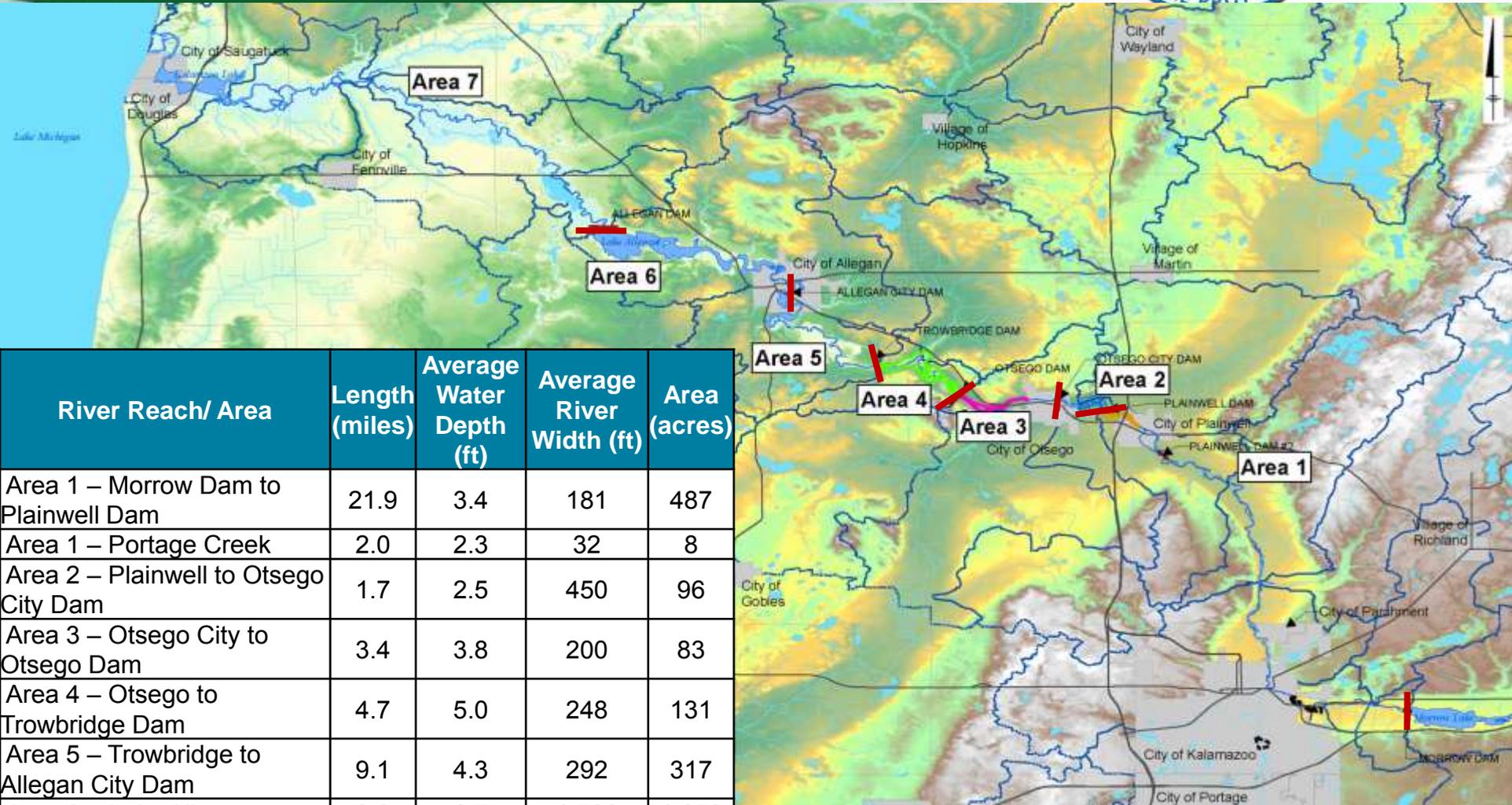
PREPARED BY: ARCADIS ENVIRONMENTAL GROUP, INC. (ARCADES) FOR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA) AND THE KALAMAZOO RIVER BAYOU GROUP (KRBG). DATE: 08/2007. PROJECT: KALAMAZOO RIVER BAYOU GROUP (KRBG) AND PORTAGE CREEK (PC) GENERALIZED CONCEPTUAL SITE MODEL.

# Allied Paper, Inc./Portage Creek/ Kalamazoo River Superfund Site



- **Operable Unit 1: Allied Paper Landfill**
- **Operable Unit 2: Willow Boulevard and A-Site Landfill**
- **Operable Unit 3: King Highway Landfill**
- **Operable Unit 4: 12<sup>th</sup> Street Landfill**
- **Operable Unit 5: Portage Creek and 80 miles of Kalamazoo River**
- **Operable Unit 7: Plainwell Mill Property**

# The Seven Areas of Operable Unit 5 (The Kalamazoo River and Portage Creek)

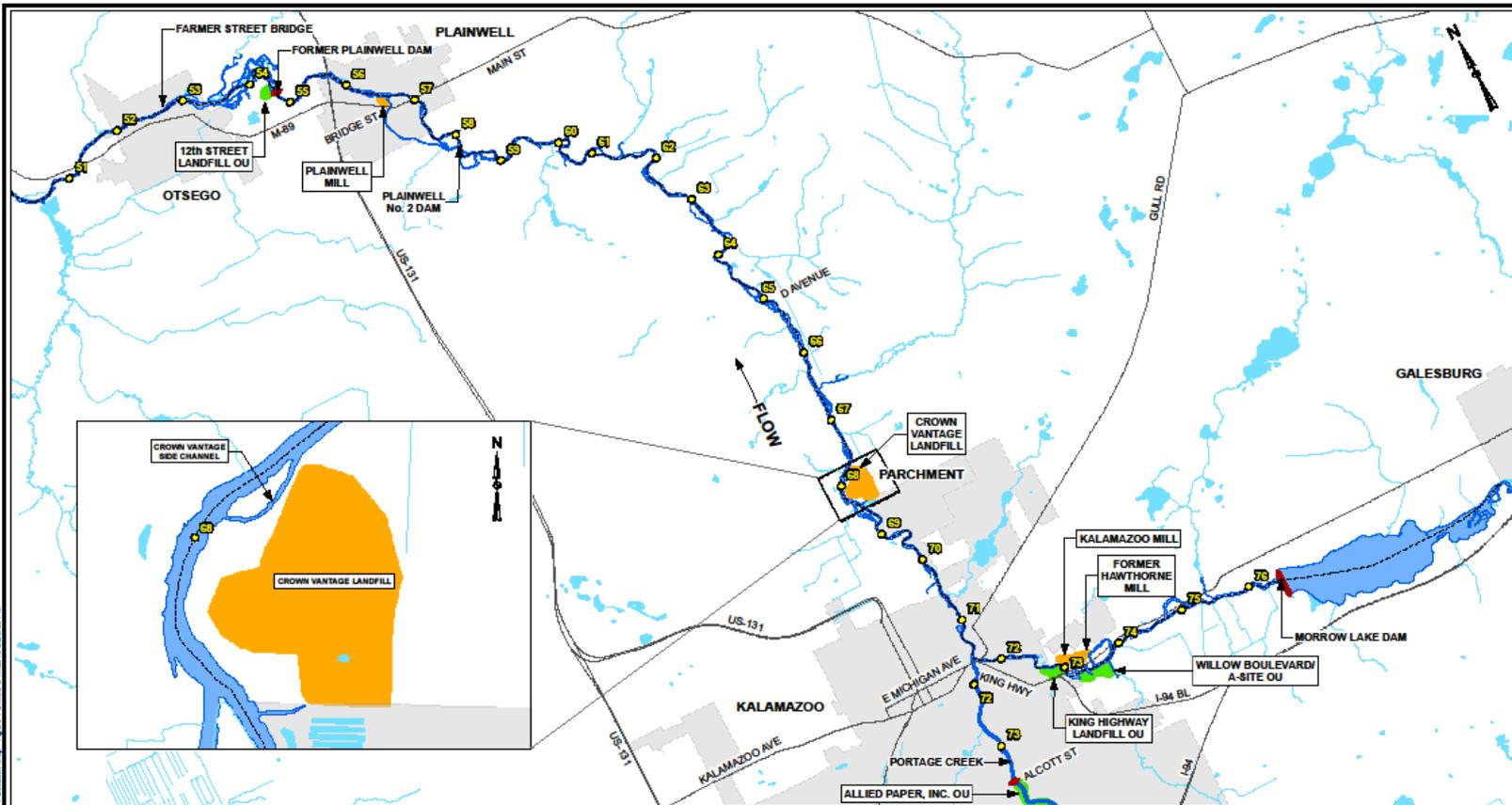


River Reach/ Area	Length (miles)	Average Water Depth (ft)	Average River Width (ft)	Area (acres)
Area 1 – Morrow Dam to Plainwell Dam	21.9	3.4	181	487
Area 1 – Portage Creek	2.0	2.3	32	8
Area 2 – Plainwell to Otsego City Dam	1.7	2.5	450	96
Area 3 – Otsego City to Otsego Dam	3.4	3.8	200	83
Area 4 – Otsego to Trowbridge Dam	4.7	5.0	248	131
Area 5 – Trowbridge to Allegan City Dam	9.1	4.3	292	317
Area 6 – Lake Allegan	9.8	6.7	1,500	1,650
Area 7 – Allegan Dam to Lake Michigan	26	5.5	212	670

# Area 1 of Operable Unit 5 (The Kalamazoo River and Portage Creek)



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- LEGEND:**
- RIVER MILE MARKER
  - KALAMAZOO RIVER
  - RIVER CENTERLINE
  - WATER BODIES
  - AREA 1 STUDY AREA BOUNDARY
  - OPERABLE UNIT
  - ROAD
  - INCORPORATED AREA



**NOTES:**

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GEORGIA-PACIFIC LLC  
ALLIED PAPER, INC./PORTAGE CREEK/  
KALAMAZOO RIVER SUPERFUND SITE  
AREA 1 FEASIBILITY STUDY REPORT -  
MORROW DAM TO FORMER PLAINWELL DAM  
**AREA 1 - MORROW LAKE  
DAM TO PLAINWELL DAM**

Prepared by Date:  
JMP 08/10/13  
Checked by Date:  
MPP 08/13/13  
Project Number:  
2009-0346



City of Otsego, MI. Created By: Zhifeng Wang. Last Modified By: jerryjones  
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 C:\Users\jerryjones\Documents\Area 1\Map\OTSEGO\Area 1\Location Map\Figure 1-2.mxd 9/10/2013 2:24:05 PM

# Remedial Process



- **EPA approved the Area 1 Feasibility Study on 11/4/14**
- **Final FS available on 12/19/14**
- **EPA evaluates the remedial alternatives and develops a Proposed Plan (Summer 2015)**
- **Proposed Plan meeting and public hearing with comment period**
- **EPA evaluates comments and finalizes remedy in a Record of Decision (Fall 2015)**

# Superfund Evaluation Criteria



## Threshold Criteria

- **Protection of human health and the environment**
- **Compliance with Applicable or Relevant and Appropriate Requirements (ARARS)**

## Balancing Criteria

- **Implementability**
- **Long-term effectiveness and permanence**
- **Short-term effectiveness**
- **Preference for treatment**
- **Cost effectiveness**

## Modifying Criteria

- **State acceptance**
- **Community acceptance**

# Conceptual Site Model



- **PCBs from recycling of carbonless copy paper 1950s-1970s**
- **Primary human health exposure pathway through fish consumption**
- **Ecological exposure pathway to exposed floodplain soils**
- **The ongoing, uncontrolled erosion of contaminated paper wastes and soils from the river banks is the most significant source of PCB loading to the Kalamazoo River.**

# Sources of PCBs



**paper waste on  
river banks**

**Residuals  
eroding  
into river**



Photos by MDEQ



# Time-Critical Removal Actions

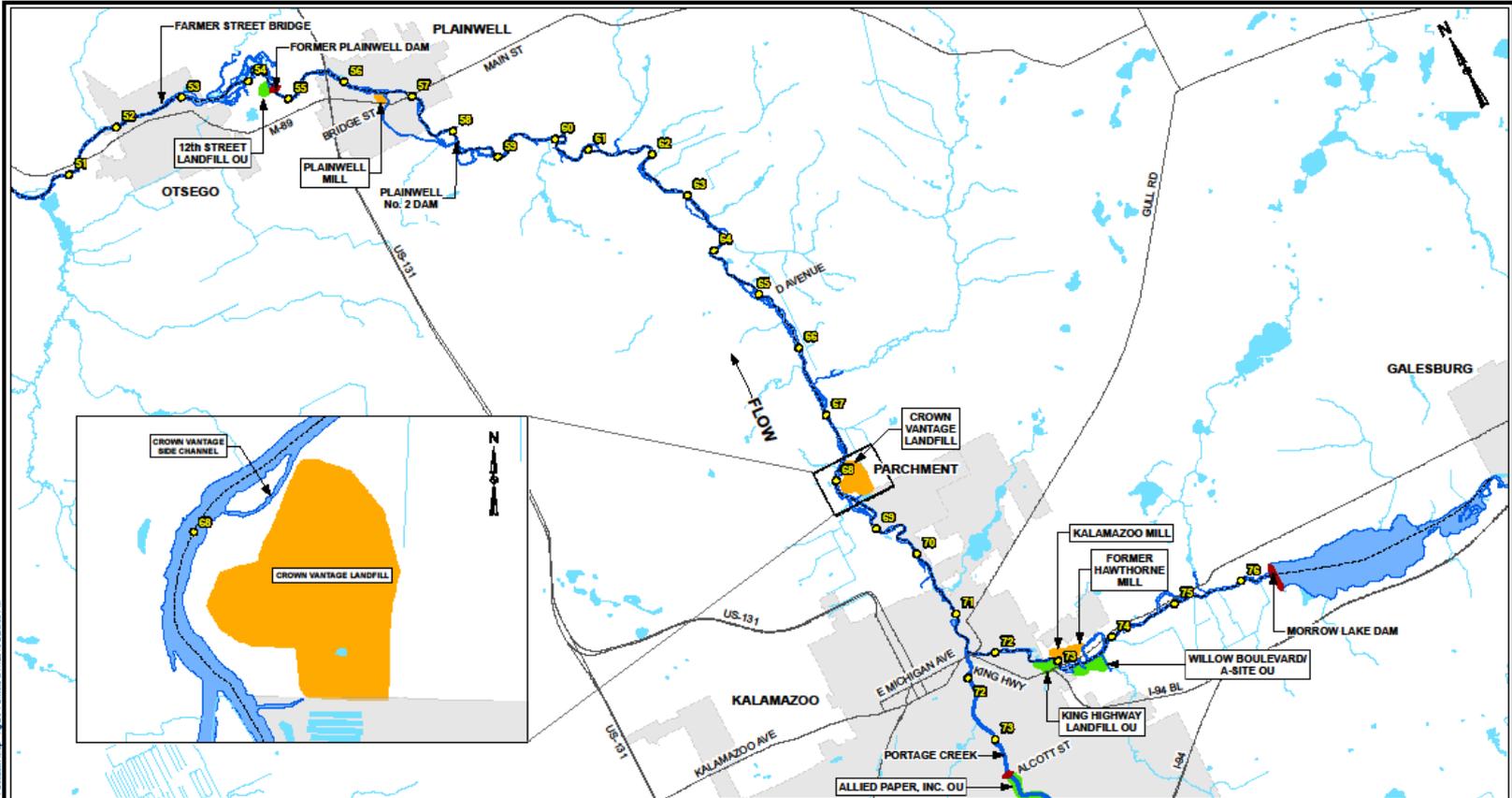


- **Bryant Mill Pond (1998-1999)**
- **Plainwell Dam (2007-2009)**
- **Plainwell 2 Dam (2009-2010)**
- **Portage Creek (2011-2013)**

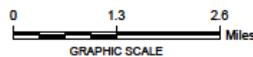
# Bryant Mill Pond TCRA 1998-1999



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  - INCORPORATED AREA
  - ROAD



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MORROW DAM TO FORMER PLAINWELL DAM  
**AREA 1 - MORROW LAKE  
DAM TO PLAINWELL DAM**

Prepared by Date:  
JMP 08/19/13  
Checked by Date:  
MPP 08/19/13  
Project Number:  
2009-0146

City of Otsego, Michigan, MI. Created by: Zhenan Wang. Last Modified By: jerry.jones  
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# Bryant Mill Pond TCRA



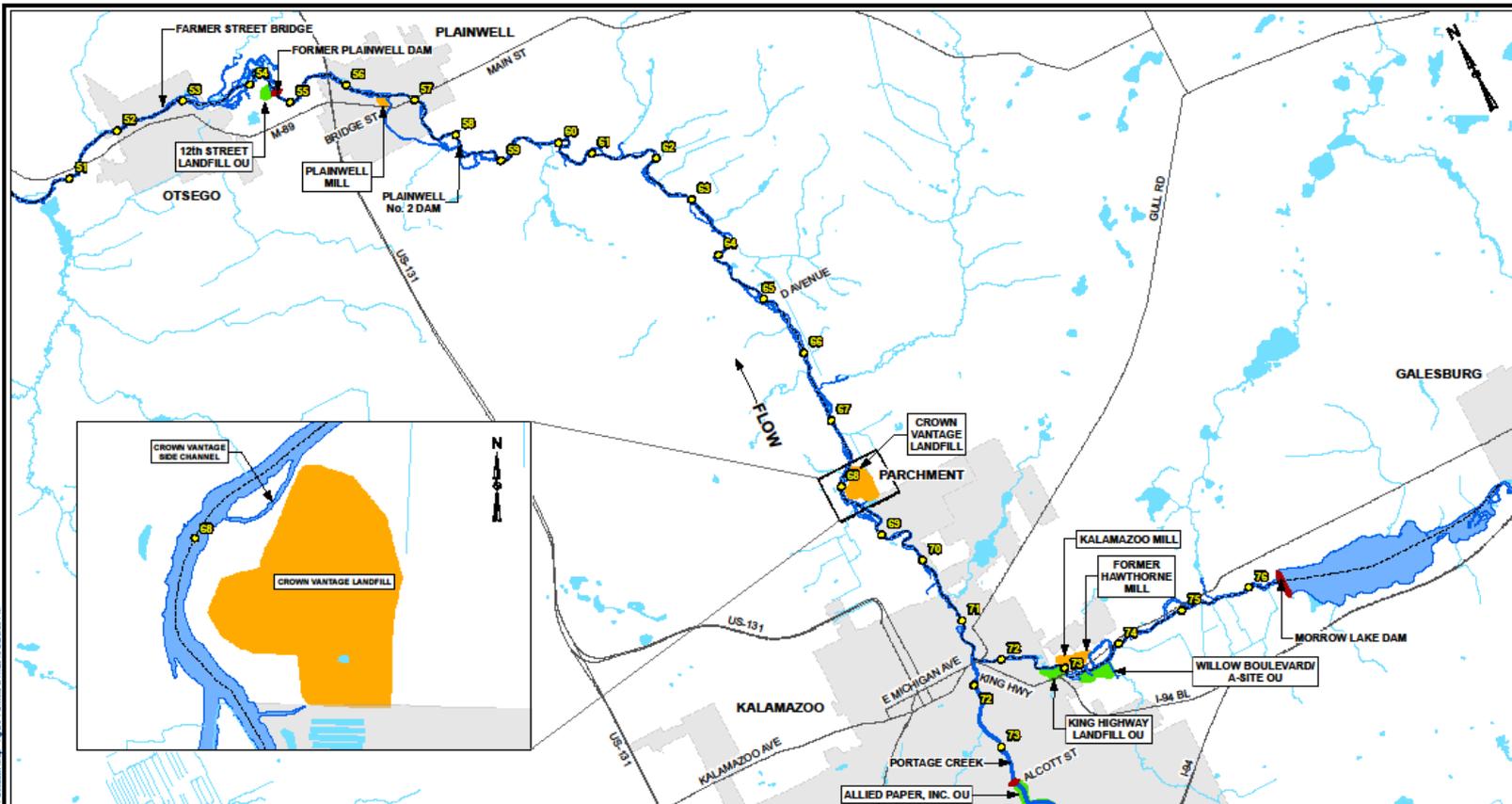
- **Conducted June 1998 to May 1999**
- **Removed 150,000 cy bank and in-stream PCB contaminated sediment**
- **Dry excavation diverting Portage Creek**
- **One of the largest sources of PCB contamination to Portage Creek and the Kalamazoo River**
- **Post excavation sampling PCB concentrations less than 1 ppm**
- **Fish tissue concentrations dropped an order of magnitude**



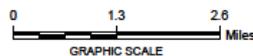
# Plainwell Dam TCRA 2007-2009



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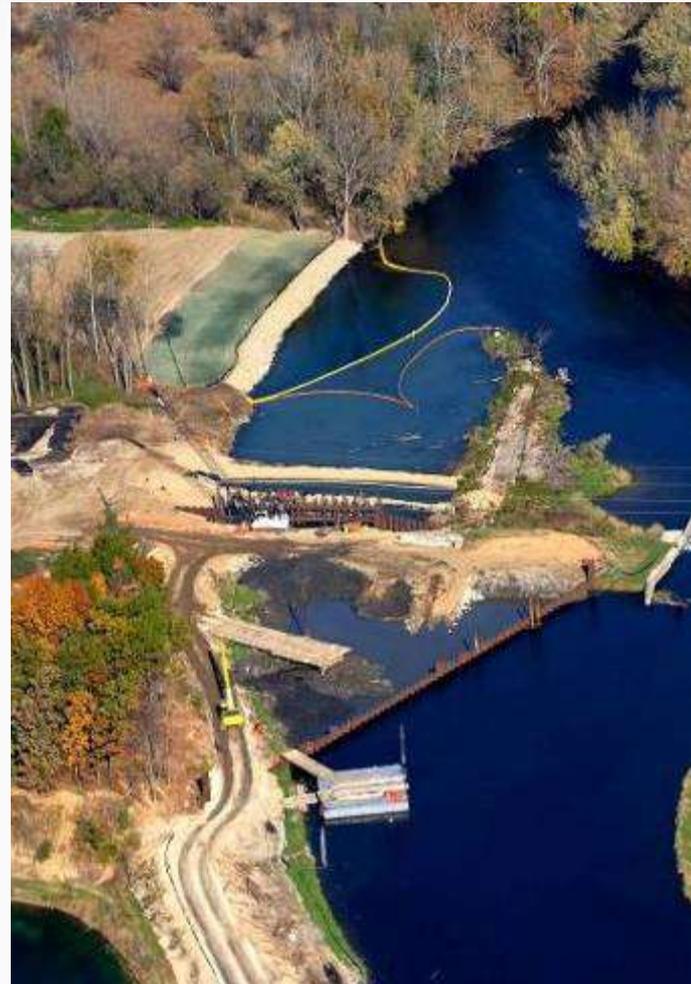
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Checked by Date:  
MPP 08/13/13  
Project Number:  
2009-2-046



# Plainwell Dam TCRA



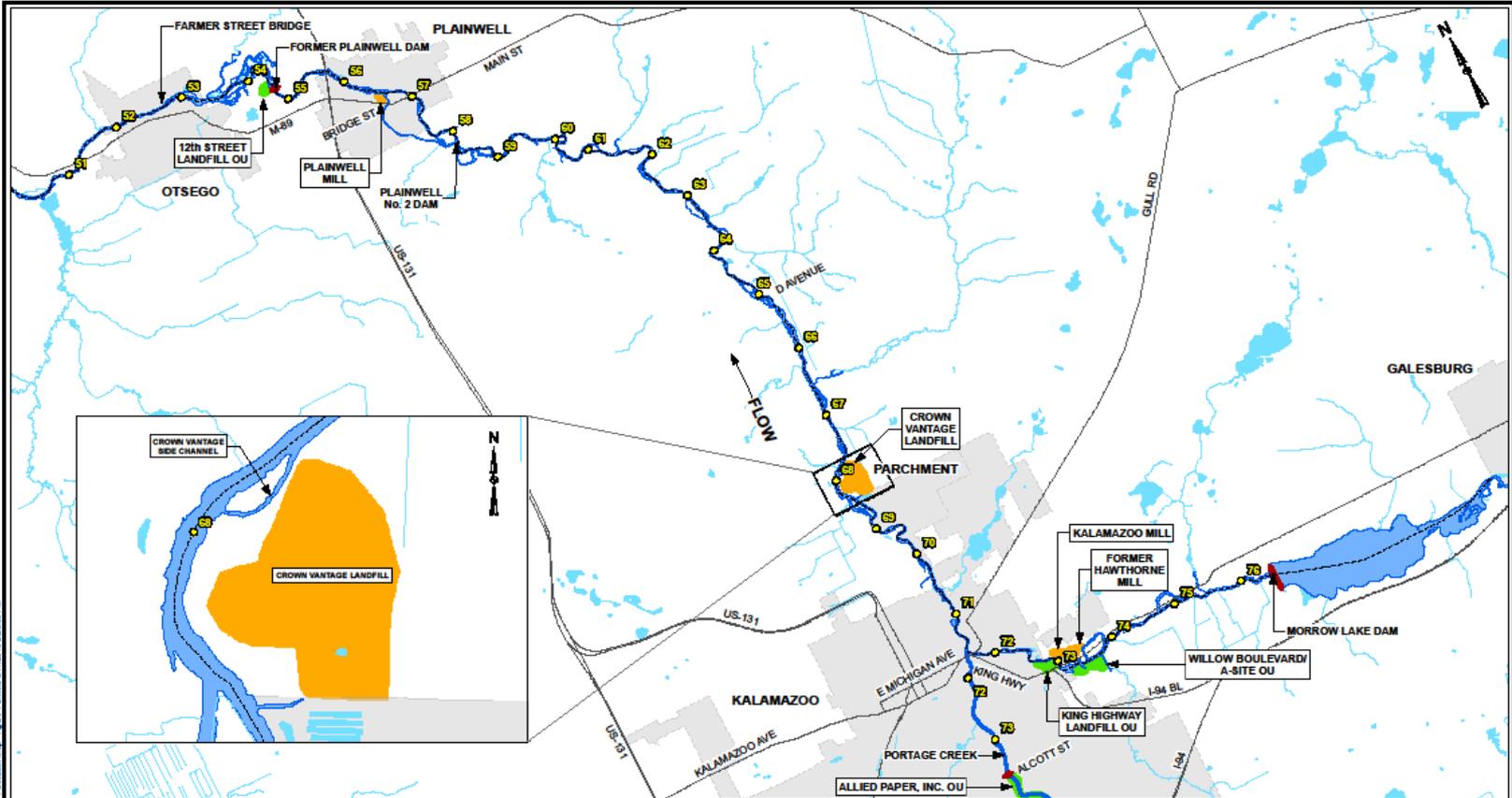
- **Conducted April 2007 to December 2009**
- **Removed 128,000 cy bank and in-stream PCB contaminated sediment**
- **Addressed 2 miles of the Kalamazoo River from Plainwell to the Plainwell Dam**
- **Removed the existing Plainwell dam and restored river to historical free-flowing channel**



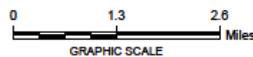
# Plainwell 2 Dam TCRA 2009-2010



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- LEGEND:**
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  - RIVER CENTERLINE
  - AREA 1 STUDY AREA BOUNDARY
  - KALAMAZOO RIVER
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  - OPERABLE UNIT
  - INCORPORATED AREA
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**AREA 1 - MORROW LAKE  
 DAM TO PLAINWELL DAM**

Prepared by Date: JWP 08/10/10  
 Checked by Date: MFP 08/10/10  
 Project Number: 2009-2010

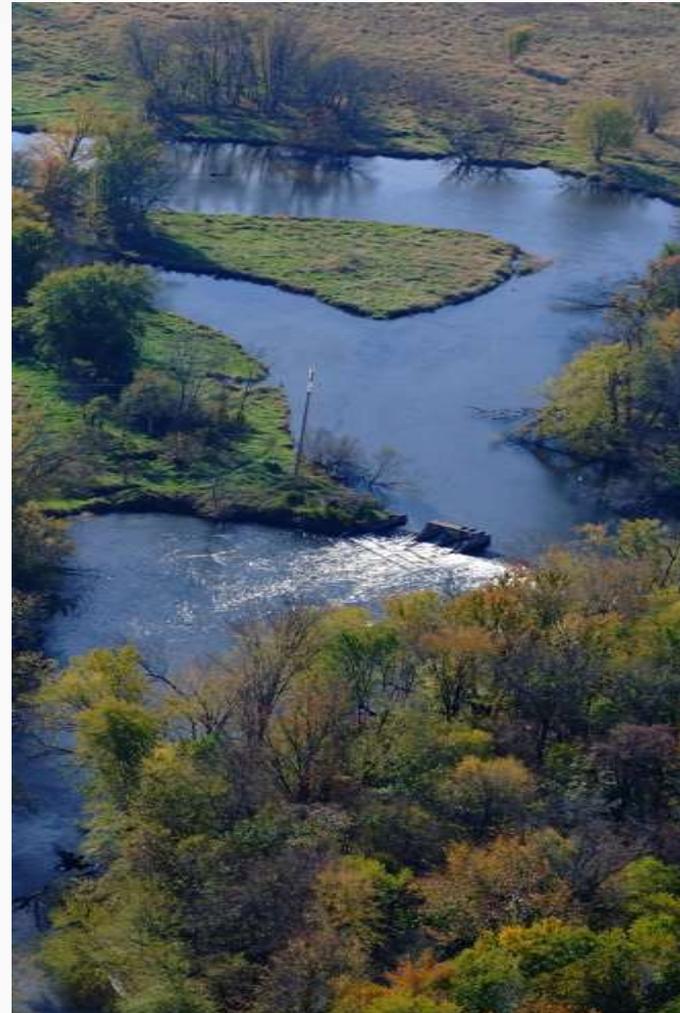


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# Plainwell No. 2 Dam TCRA



- **August 2009 to December 2010**
- **1.9 miles of river bank**
- **Removal of 14,200 cy PCB contaminated bank and floodplain material**
- **12,000 cubic yards of soil removed from banks and floodplain**
- **2,200 cubic yards from oxbow/river area**





# Portage Creek TCRA



- **2011-2013**
- **Removed approximately 23,7000 cubic yards**
- **Dredge depths range from 12 inches to 70 inches in various Slope Areas and were backfilled to grade**
- **2.5 miles of Portage Creek**



# Remedial Action Objectives



- **RAO 1: Protect people who consume Area 1 Kalamazoo River fish from exposure to PCBs that exceed protective levels. This RAO is expected to be progressively achieved over time by meeting the following targets for fish tissue and sediment:**
  - **A reduction in fish tissue to the Michigan fish advisory level for smallmouth bass to two meals per month (0.11 mg/kg total PCB concentration) within 30 years**
  - **Achievement of a non-cancer hazard index (HI) of 1.0 and a  $10^{-5}$  cancer risk within 30 years for the high end sport angler (100% bass diet)**
  - **The fish tissue goal for bass will be achieved by reducing the sediment PCB SWAC in each of eight sections of the river within Area 1 to 0.33 ppm or less following completion of the remedial action**

# Remedial Action Objectives



- **RAO 2: Protect aquatic ecological receptors from exposure to concentrations of PCBs in sediments that exceed protective levels for local populations.**
- **RAO 3: Protect Terrestrial ecological receptors from exposure to concentrations of PCBs in soils that exceed protective levels.**
- **RAO 4: Reduce transport of PCBs from Area 1 to downstream Areas of the Kalamazoo River and Lake Michigan.** This RAO includes reducing the potential for erosion and downstream migration of PCB-impacted sediment and riverbank soil.

# Preliminary Remediation Goals Contaminants of Concern



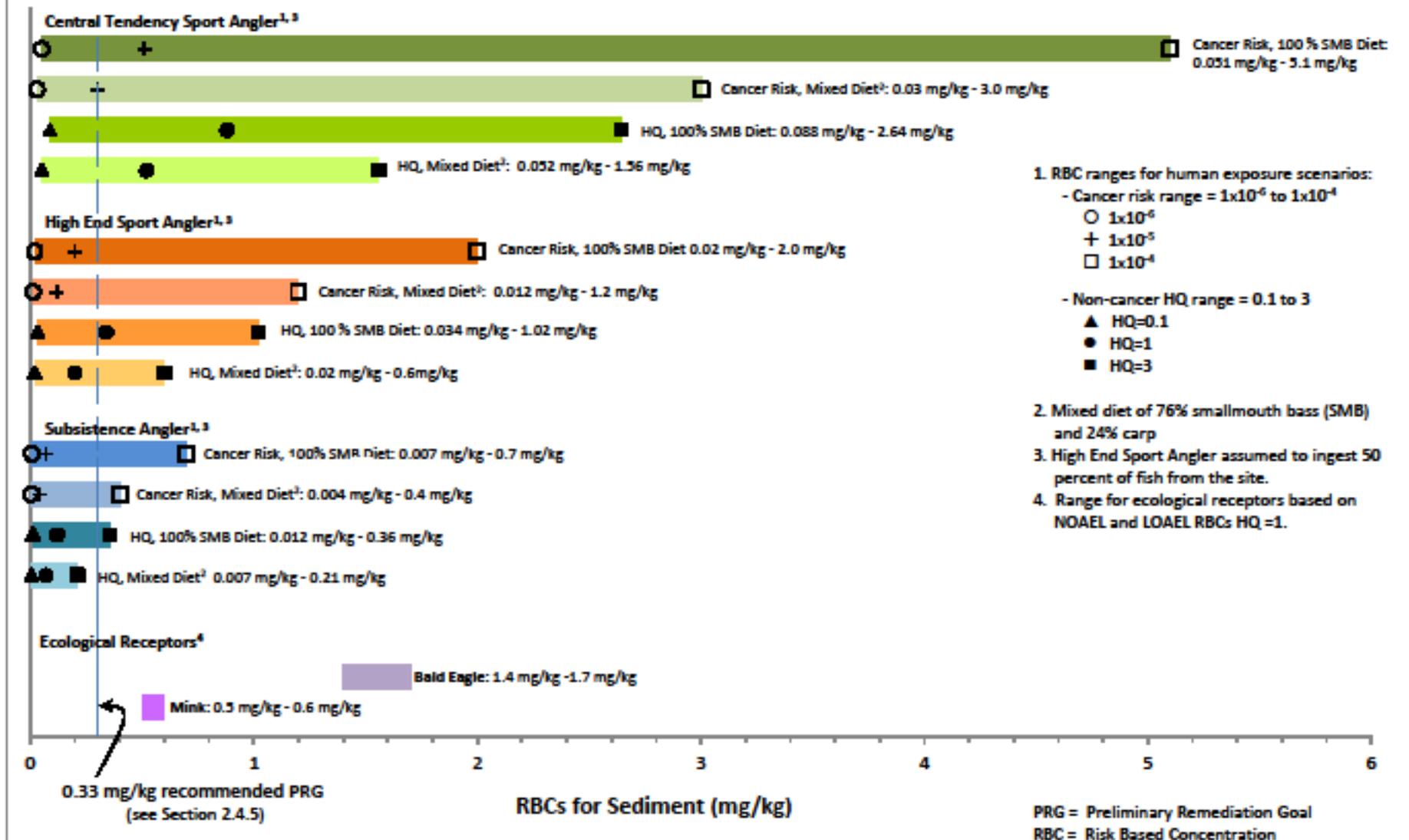
- **PRGs developed based upon Human Health and Ecological Risk Assessments**
- **PCB primary risk driver**
- **Majority of non-PCB constituents co-located with PCB in river sediment**

# Fish/Sediment PRGs



- **Fish consumption is the primary risk**
- **Fish tissue PRGs: range from  $10^{-5}$  (0.042 mg/kg) to HI 1 (0.072 mg/kg) PCB and reflects the sport angler (Assumes 125 meals/year 78 g/day 50% from site)**
- **Sediment PRG: 0.33 mg/kg PCB concentration in sediment (SWAC)**
- **Representative of Risk Based Concentrations developed in the 2003 site-wide risk assessment based upon multiple fish consumption scenarios and advisories**

**Figure 2-1**  
**PCB Sediment RBCs Protective of Human and Ecological Receptors**  
**Based on Risk from Fish Ingestion**

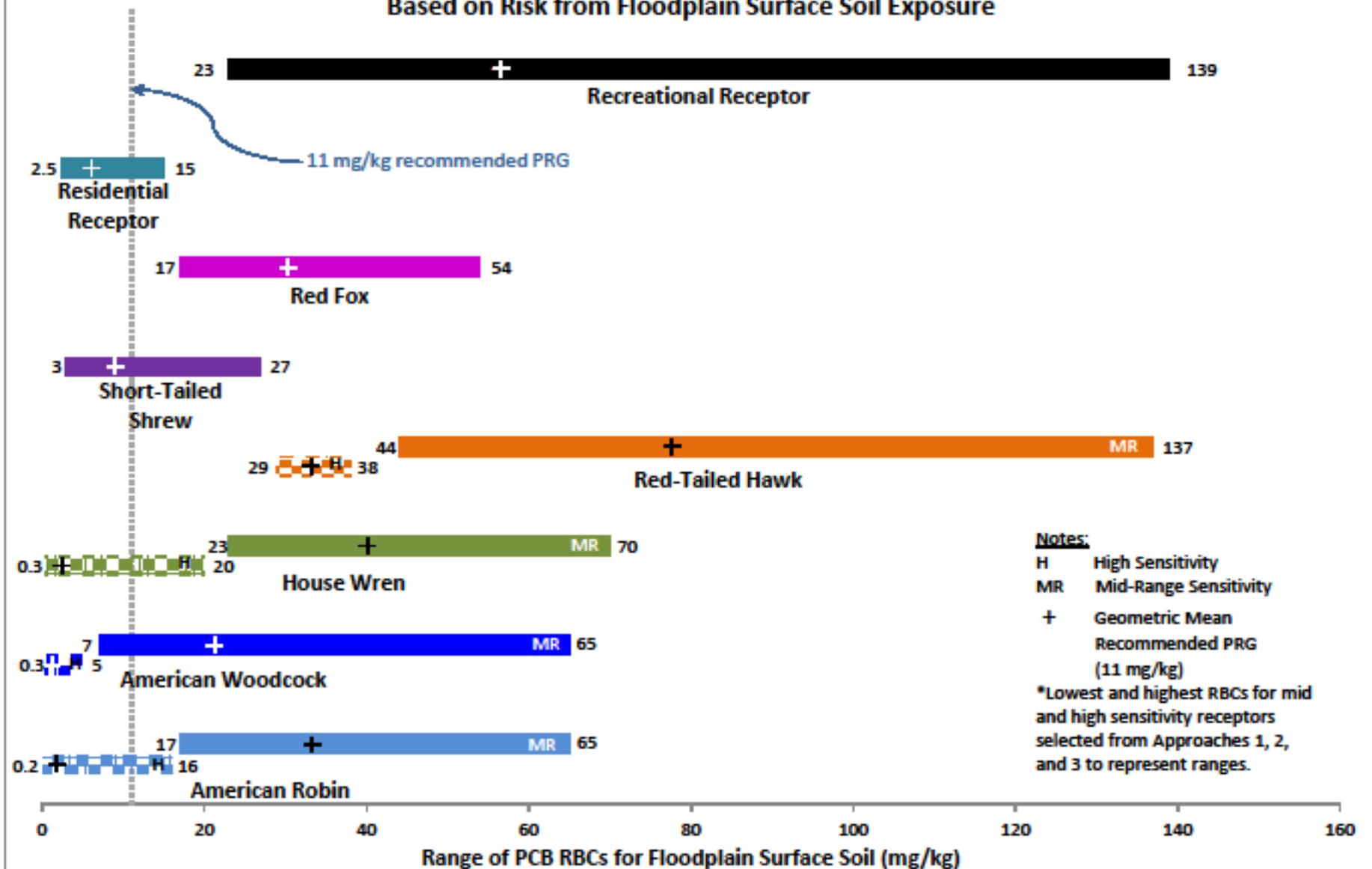


# Floodplain Soil PRG



- **Based upon both 2003 site-wide baseline ecological risk assessment**
- **Terrestrial baseline ecological risk assessment from the 2012 Remedial Investigation**
- **Floodplain Soil PRG: 11 mg/kg PCB represents a balance of risk and uncertainty based upon both mammalian and avian risk**
- **Represents the reasonably maximum exposed ecological receptors**
- **RAL 20 ppm used for soil remedy development**

**Figure 2-2**  
**PCB RBCs Protective of Human and Ecological Receptors**  
**Based on Risk from Floodplain Surface Soil Exposure**





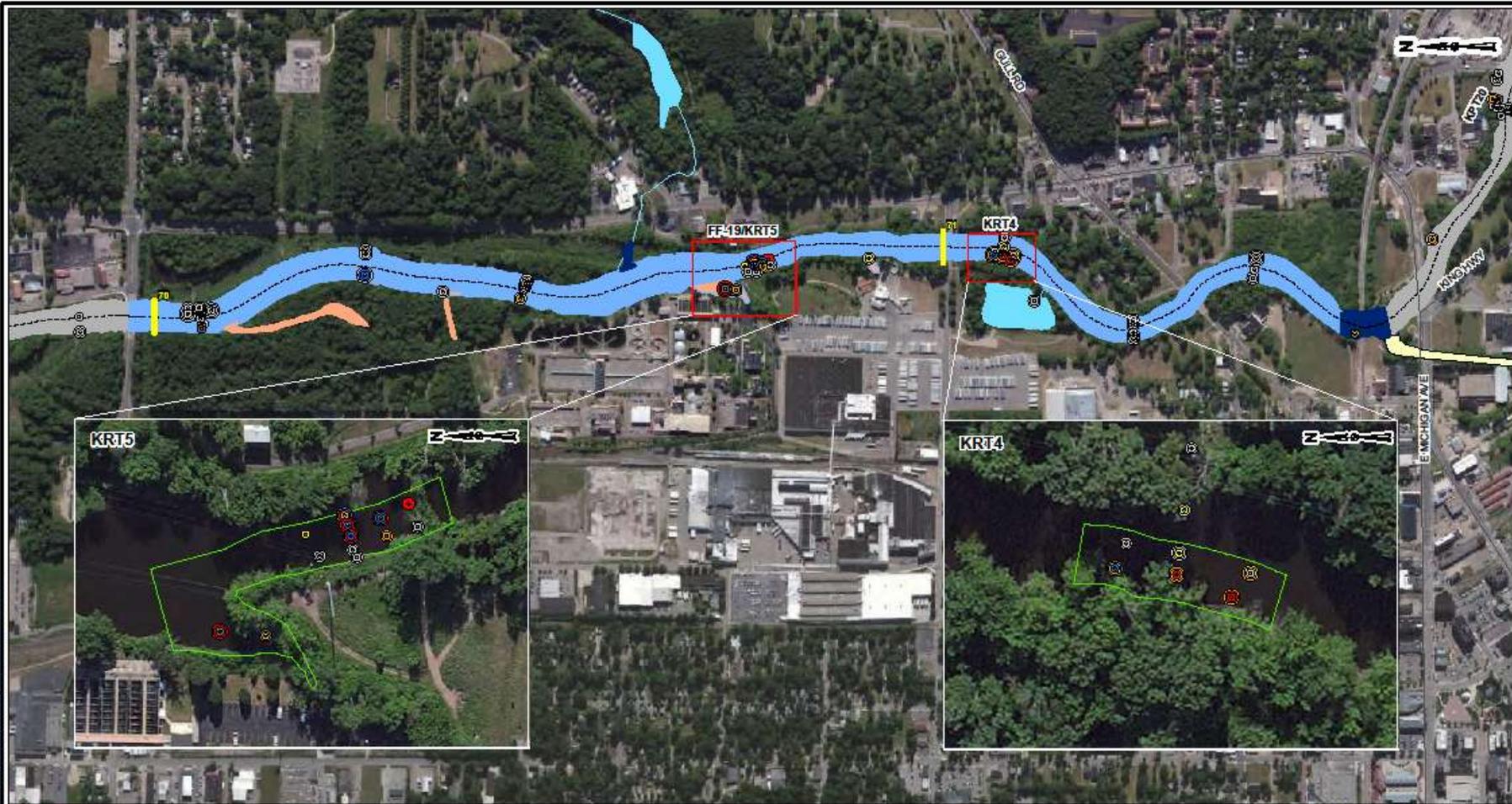
# SWACS in Area 1



**Table 1-2**  
**SWAC Calculations By Section and Bounds on Confidence Limits**  
**Area 1, OU-5 Kalamazoo River**

Section	Interval	SWAC	Number of Data Points	Chebyshev Area-weighted (5% LCL, 95% UCL) CI Bounds **	
Section 1	0-6"	0.11	90	<DL	0.28
Section 2	0-6"	0.23	42	0.14	0.33
Section 3	0-6"	2.19	33	<DL	5.59
Section 4	0-6"	0.42	92	<DL	1.16
Section 5	0-6"	0.24	64	0.07	0.42
Section 6	0-6"	0.72	43	<DL	1.91
Section 7	0-6"	0.72	13	<DL	1.76
Mill Race	0-6"	0.33	17	<DL	0.91
Section 8	0-6"	1.77	29	<DL	5.74
Section 1	6-12"	0.06	87	0.01	0.12
Section 2	6-12"	0.22	40	0.10	0.34
Section 3	6-12"	4.25	32	<DL	10.11
Section 4	6-12"	0.24	83	<DL	0.48
Section 5	6-12"	0.11	58	<DL	0.23
Section 6	6-12"	0.31	34	0.04	0.58
Section 7	6-12"	0.66	11	<DL	2.40
Mill Race	6-12"	0.21	12	<DL	0.56
Section 8	6-12"	1.79	22	<DL	5.28
Section 1	12-24"	0.12	66	<DL	0.35
Section 2	12-24"	1.05	26	<DL	5.16
Section 3	12-24"	18.13	26	<DL	42.67
Section 4	12-24"	0.26	49	<DL	0.78
Section 5	12-24"	0.09	29	<DL	0.27
Section 6	12-24"	0.39	26	<DL	0.98
Section 7	12-24"	0.76	8	<DL	2.29
Mill Race	12-24"	0.07	11	<DL	0.17
Section 8	12-24"	2.97	14	<DL	9.09

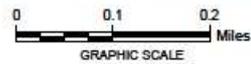
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**LEGEND:**

PROPOSED REMEDIATION AREA	RIVER MILE MARKER	<b>MAXIMUM CONC. IN INTERVAL (MG/KG PCB)</b>	<b>DEPTH INTERVALS</b>
SECTION 3	RIVER CENTERLINE	<1	0-6 Inches
CONFLUENCE	ROAD	1-2	6-12 Inches
BACKWATER		2-5	12-24 Inches
WATER BODIES		5-10	>24 Inches
PORTAGE CREEK TCRA AREA		10-50	
		>50	

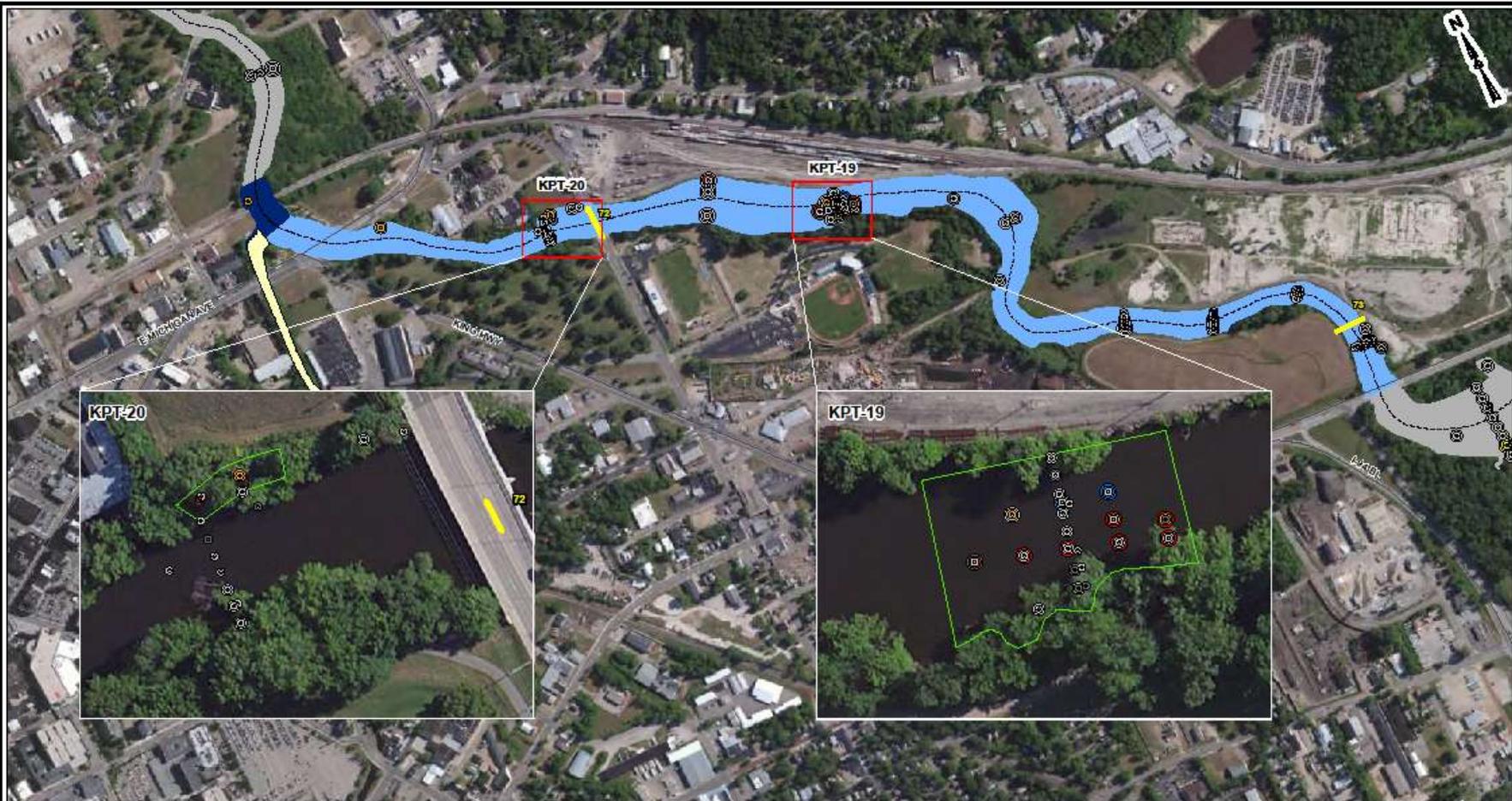


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GEORGIA-PACIFIC LLC ALLIED PAPER, INC./PORTAGE CREEK/ KALAMAZOO RIVER SUPERFUND SITE <b>AREA 1 FEASIBILITY STUDY REPORT -                  MORROW DAM TO FORMER PLAINWELL DAM</b>	
<b>AREA 1 - SECTION 3                  HOT SPOT AREAS</b>	
Prepared by Date: JWP 09/17/14	
Checked by Date: WJF 09/17/14	
Project Number: 2200131001	
<b>FIGURE                  3-2</b>	

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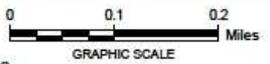


LEGEND:

- PROPOSED REMEDIATION AREA
- SECTION 2
- CONFLUENCE
- BACKWATER
- WATER BODIES
- PORTAGE CREEK TCRA AREA
- RIVER MILE MARKER
- RIVER CENTERLINE
- ROAD

MAXIMUM CONC. IN INTERVAL (MG/KG PCB)
<span style="border: 1px solid black; display: inline-block; width: 10px; height: 10px; margin-right: 5px;"></span> <1
<span style="border: 2px solid black; display: inline-block; width: 10px; height: 10px; margin-right: 5px;"></span> 1-2
<span style="border: 3px solid black; display: inline-block; width: 10px; height: 10px; margin-right: 5px;"></span> 2-5
<span style="border: 4px solid black; display: inline-block; width: 10px; height: 10px; margin-right: 5px;"></span> 5-10
<span style="border: 5px solid black; display: inline-block; width: 10px; height: 10px; margin-right: 5px;"></span> 10-50
<span style="border: 6px solid black; display: inline-block; width: 10px; height: 10px; margin-right: 5px;"></span> >50

- DEPTH INTERVALS
- 0-6 Inches
  - 8-12 Inches
  - 12-24 Inches
  - >24 Inches



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**AREA 1 - SECTION 2**  
**HOT SPOT AREAS**

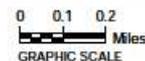
Prepared by Date: MJP 12/17/14 Checked by Date: MJP 01/17/15 Project Number: 3000-1000		FIGURE <b>3-1</b>
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**LEGEND:**

PROPOSED REMEDIATION AREA	RIVER MILE MARKER	<b>MAXIMUM CONC. IN INTERVAL (MG/KG PCB)</b>	<b>DEPTH INTERVALS</b>
SECTION 4	RIVER CENTERLINE	<1	0-6 Inches
CONFLUENCE	ROAD	1-2	6-12 Inches
BACKWATER		2-5	12-24 Inches
WATER BODIES		5-10	>24 Inches
PORTAGE CREEK TCRA AREA		10-50	
		>50	



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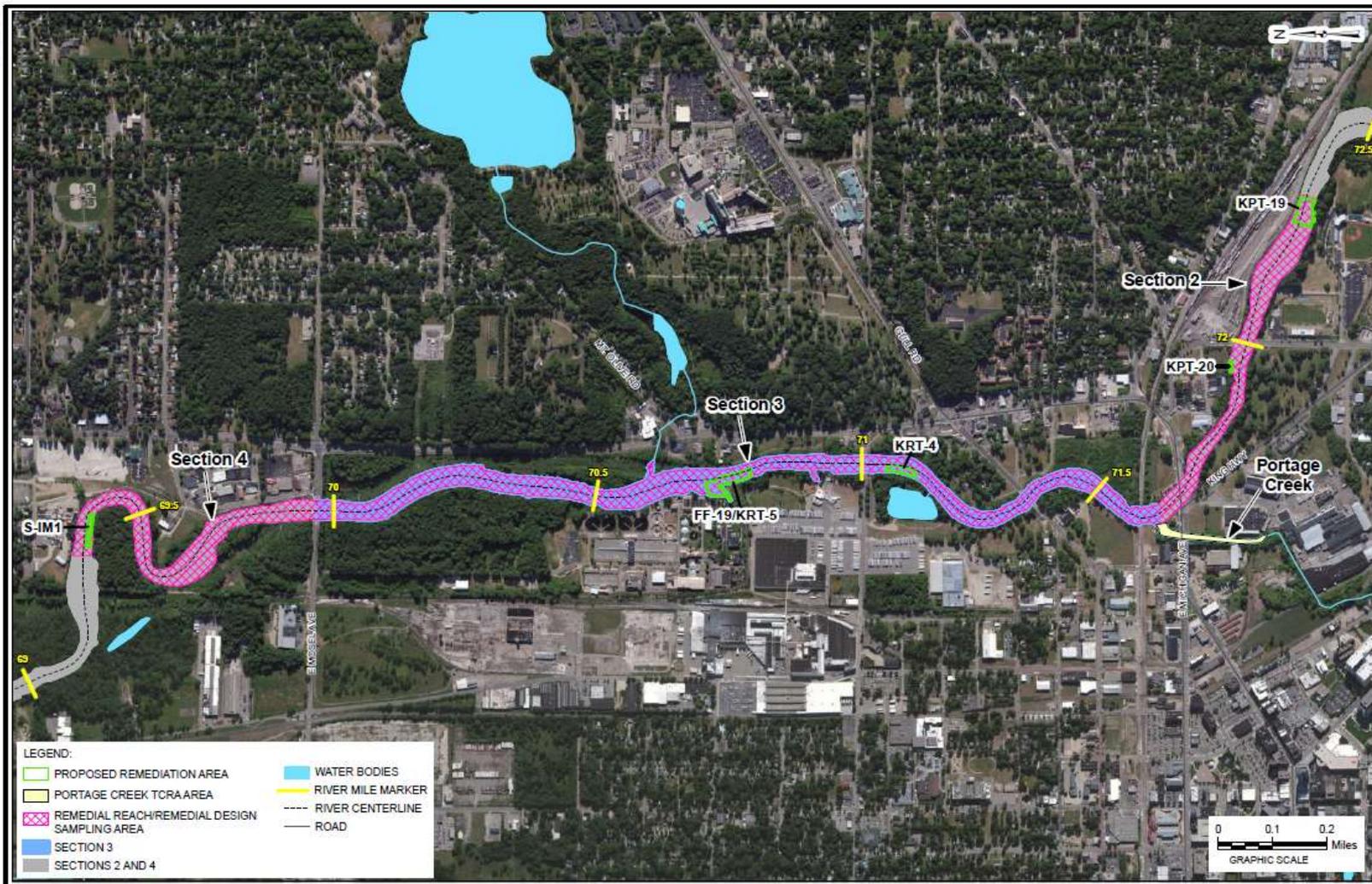
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 KALAMAZOO RIVER SUPERFUND SITE  
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**AREA 1 - SECTION 4  
 HOT SPOT AREA AND  
 CROWN VANTAGE SIDE CHANNEL**

Prepared by Date:   
 AMF 02/17/14  
 Checked by Date:   
 MFP 03/17/14  
 Project Number:   
 339313141

**FIGURE 3-3**



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# Remedial Alternatives



# Next Steps



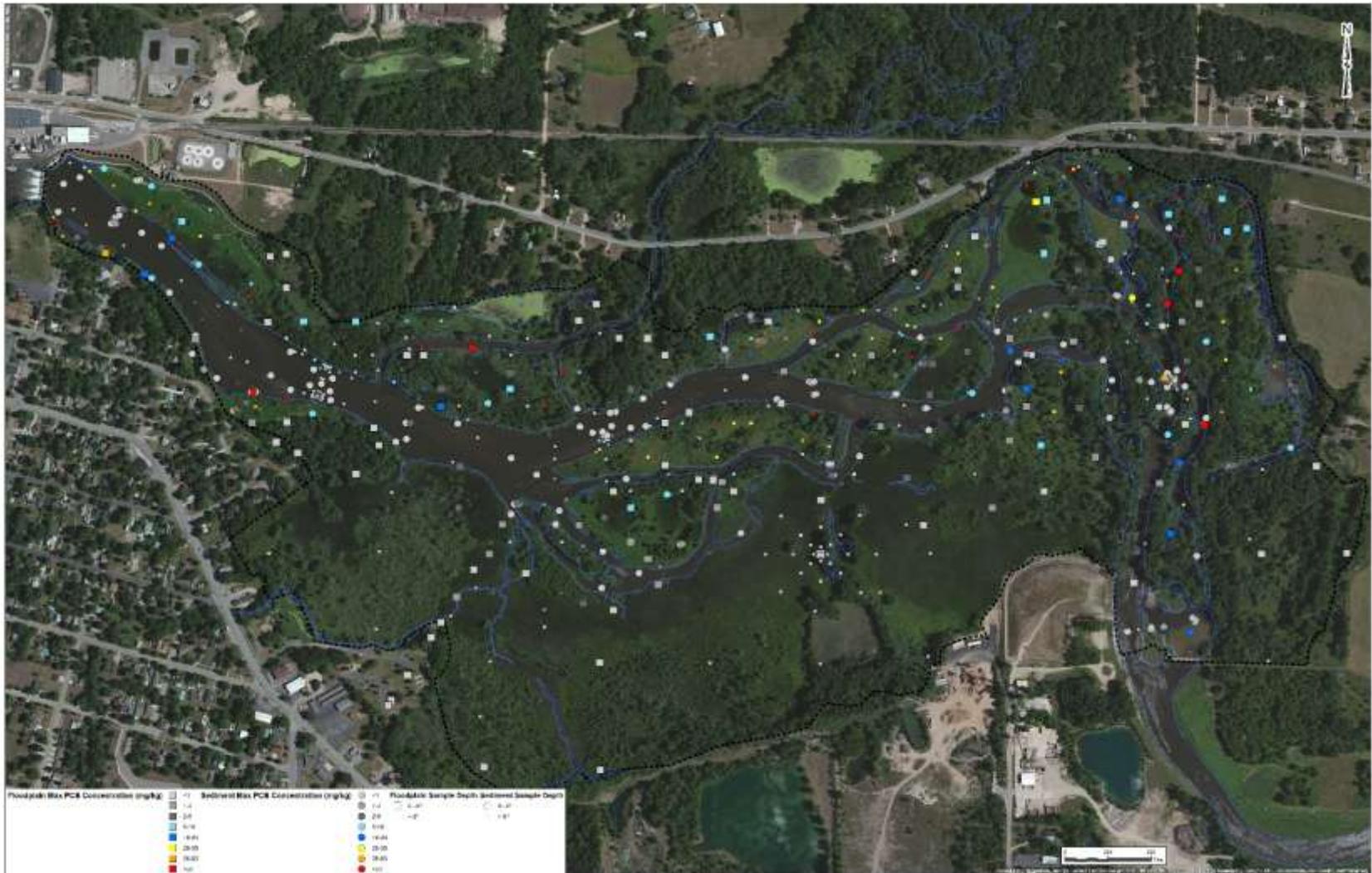
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- **EPA Proposed Plan (Summer 2015)**
- **Proposed Plan meeting and public hearing with comment period**
- **EPA evaluates comments and finalizes remedy in a Record of Decision (Fall 2015)**

# Other River Activities



- **Area 2**
- **Area 3**
- **Area 4**

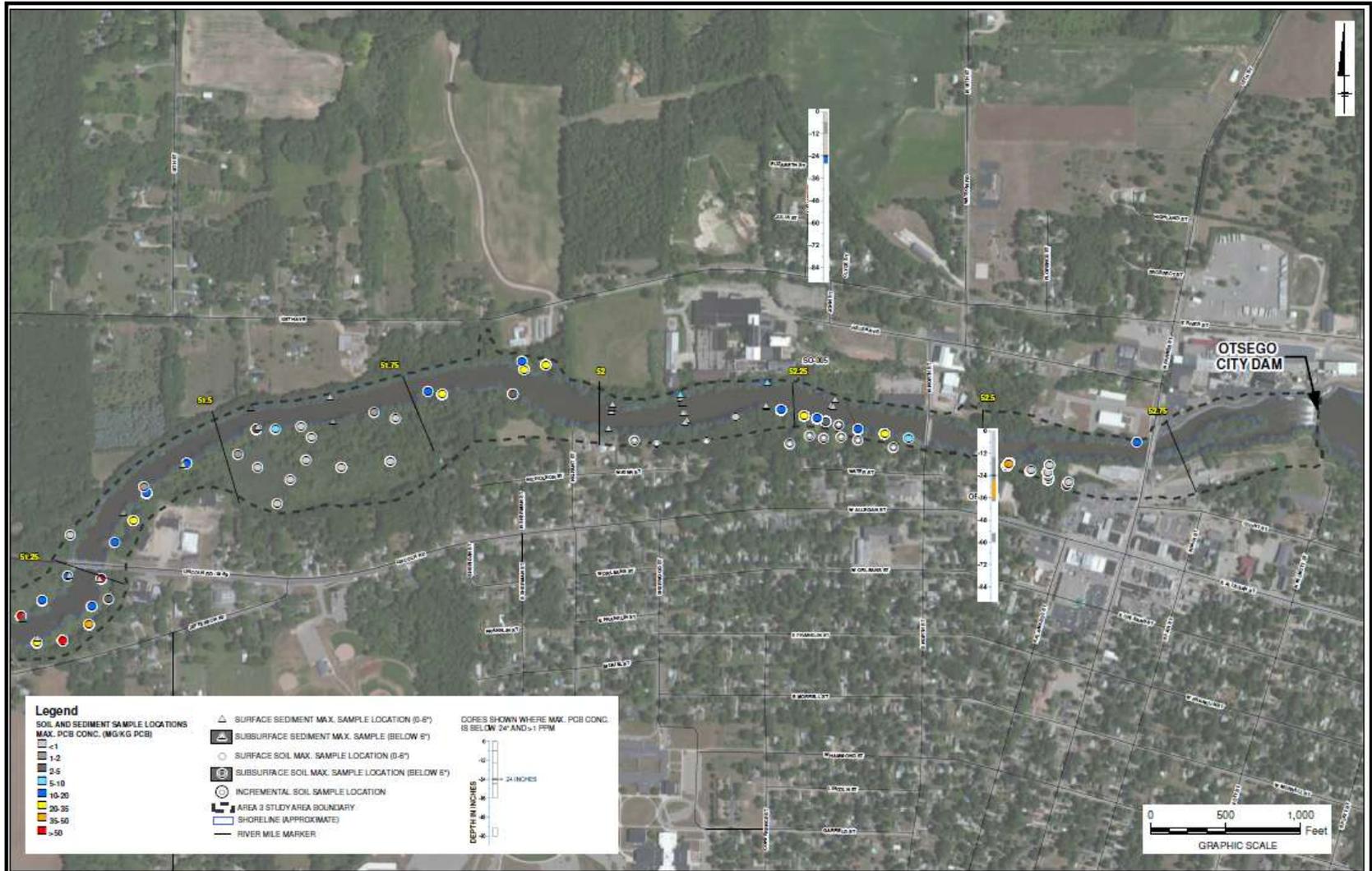
# Area 2



# Area 3



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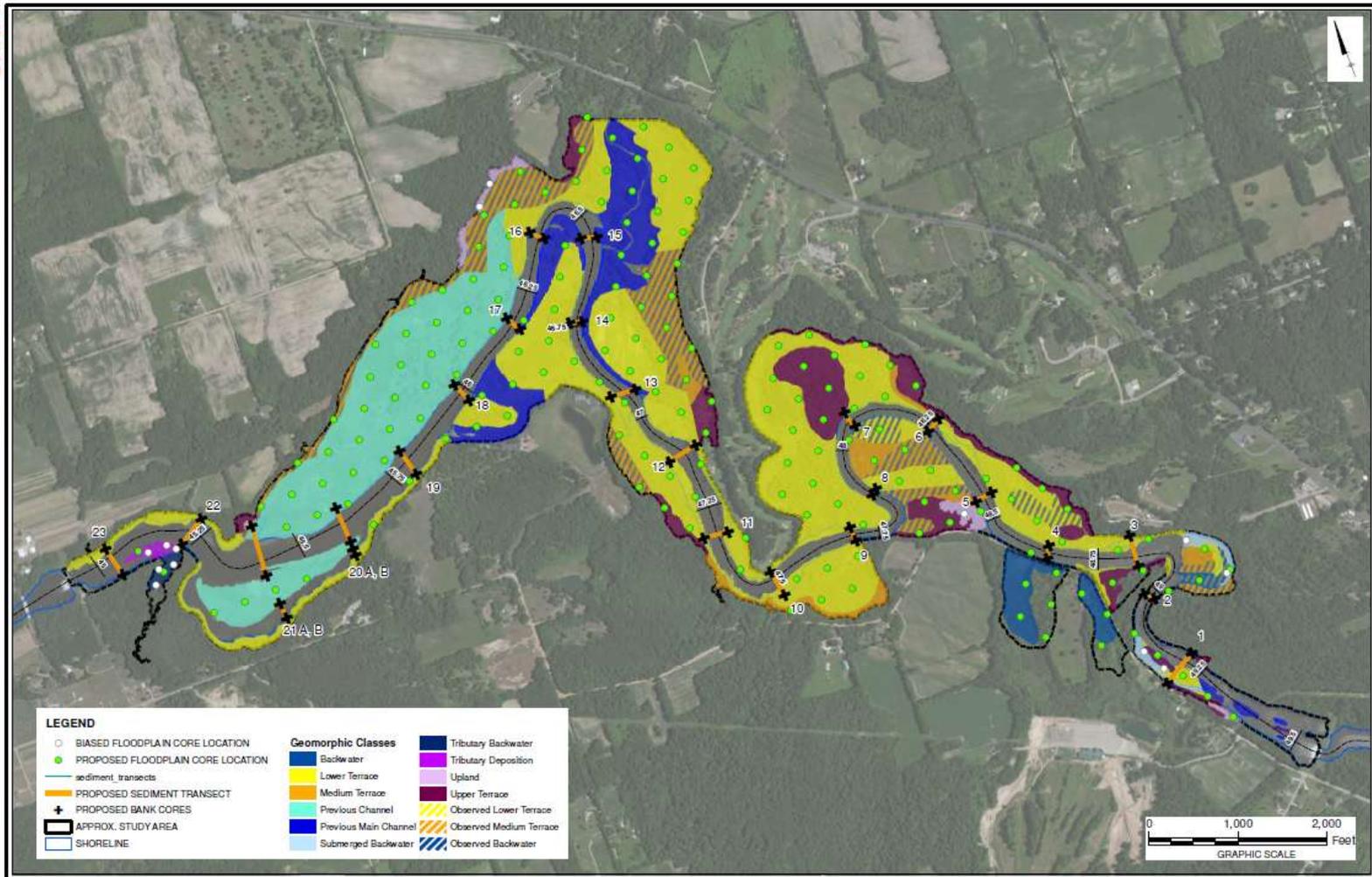




# Area 4



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# Questions?

Jim Saric

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312.886.0992