

Area 1 of the Kalamazoo River Feasibility Study Sediment and Floodplain Soil Remedial Alternatives

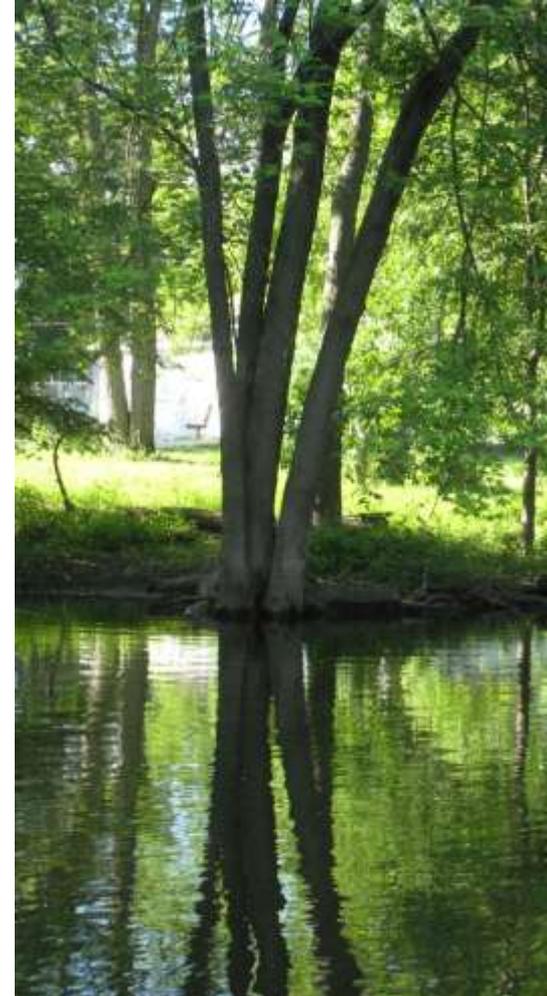
December 11, 2014



- Describe each remedial alternative
- Evaluate each in regard to EPA's seven criteria
 - Protection of human health and the environment
 - Compliance with applicable or relevant and appropriate regulations
 - Short-term effectiveness
 - Long-term effectiveness
 - Reduction of toxicity, mobility, and volume
 - Implementability
 - Cost

Sediment and Floodplain Soil Remedial Alternatives

- Sediment and floodplain soil remedial alternatives evaluated separately
- Alternatives include the following, except for the “No Further Action” Alternative
 - Institutional Controls: example - fish advisory
 - Engineering Controls: example - erosion control
 - Additional floodplain sampling
 - Long term monitoring (LTM)



Sediment and Floodplain Soil Remedial Alternatives



- Five sediment remedial alternatives:
 - S-1 through S-5
 - Sediment cleanup goal of 0.33 mg/kg PCBs (surface-area weighted average concentration (SWAC))
 - Lowest fish tissue cleanup goal of 0.042 mg/kg PCBs

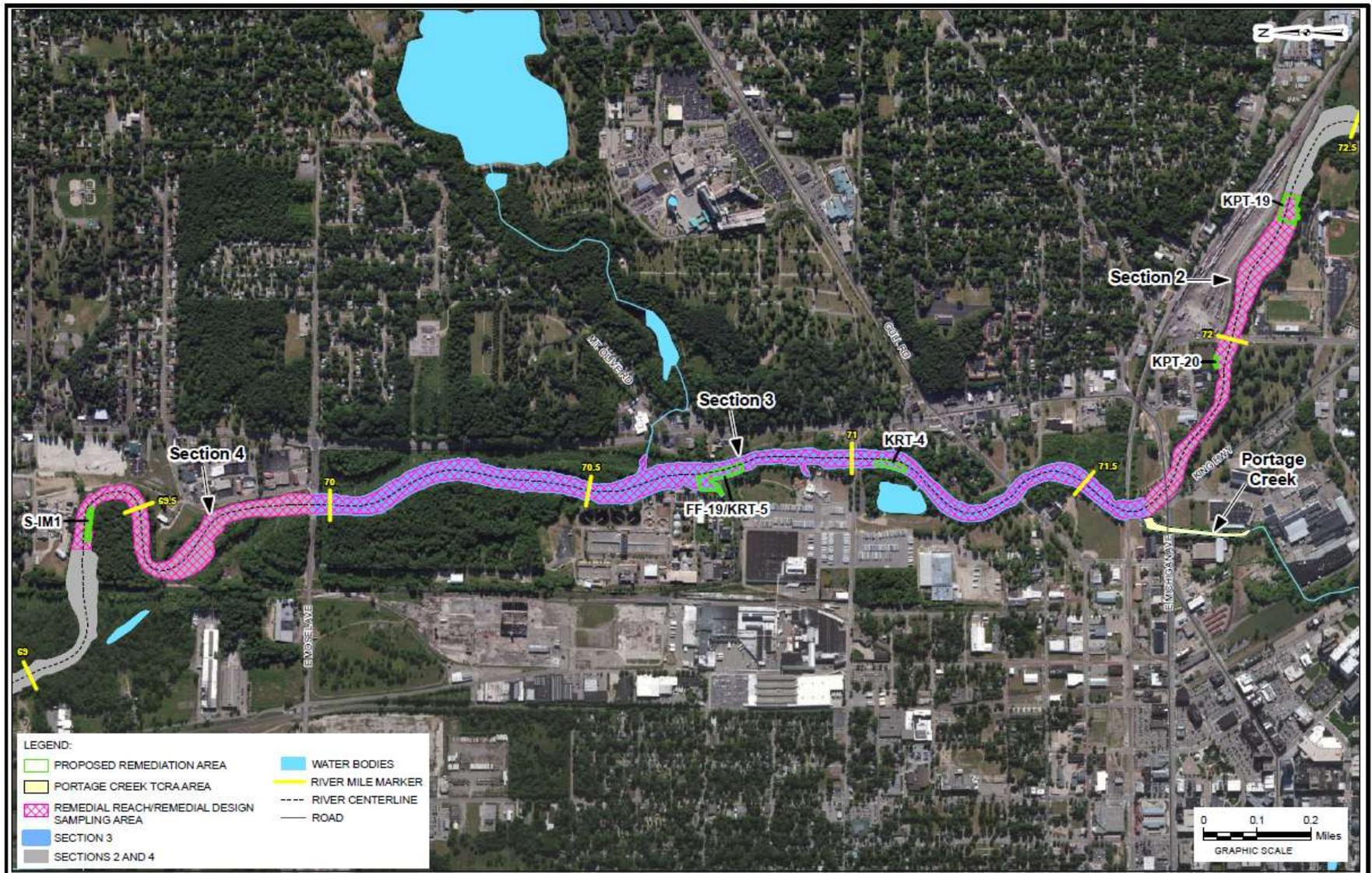
- Four floodplain remedial alternatives:
 - FPS-1 through FPS-4
 - Soil cleanup goal of 11 mg/kg PCBs (achieved as an average)

- S-1 No Further Action
 - No additional activity, no monitoring of the environment
 - Removal efforts already performed as Time Critical Removal Actions (TCRAs)
 - Required by EPA as a baseline for comparison

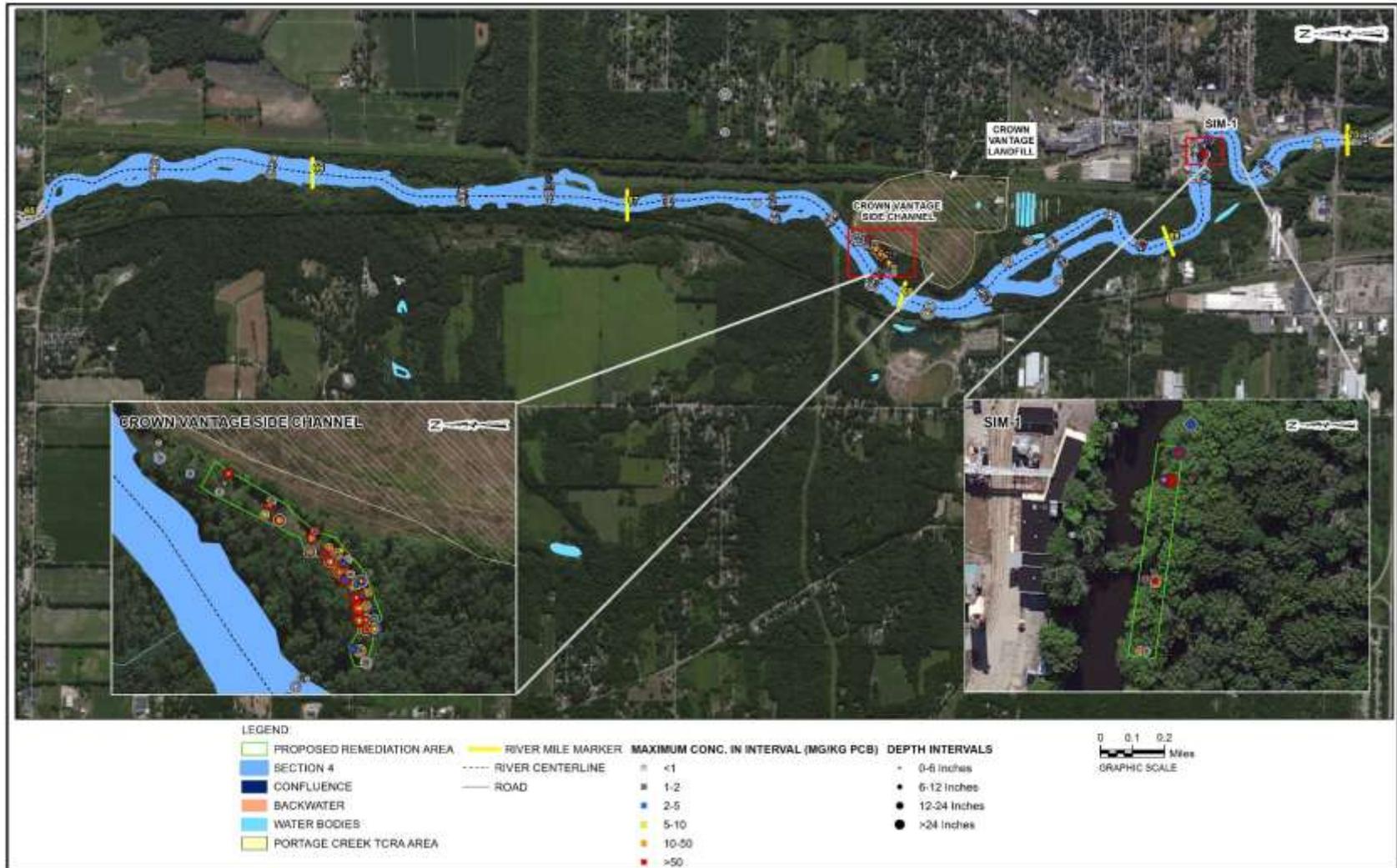
- S-2 Monitored Natural Recovery (MNR)
 - Allow natural processes, such as deposition of clean sediment, to reduce PCB concentrations
 - Long term monitoring (LTM) is performed to document progress in reaching cleanup goals

- S-3A/B Hot Spot Removal and MNR
 - Identification and removal of areas in the river with high concentrations of PCBs
 - Removal areas are outside of previously remediated areas (TCRAs)
 - Five hot spots identified in River Sections 2, 3 and 4
 - Sections 2, 3 and 4 referred to as the “remedial reach”
 - Assumes additional hot spots will be identified during the pre-design sampling/removal process
 - Remedial alternatives in the Crown Vantage Side Channel
 - S-3A Removal of the Crown Vantage Side Channel Sediment
 - S-3B Capping of the Crown Vantage Side Channel Sediment

S-3 Hot Spots in the Remedial Reach



S-3 Crown Vantage Side Channel



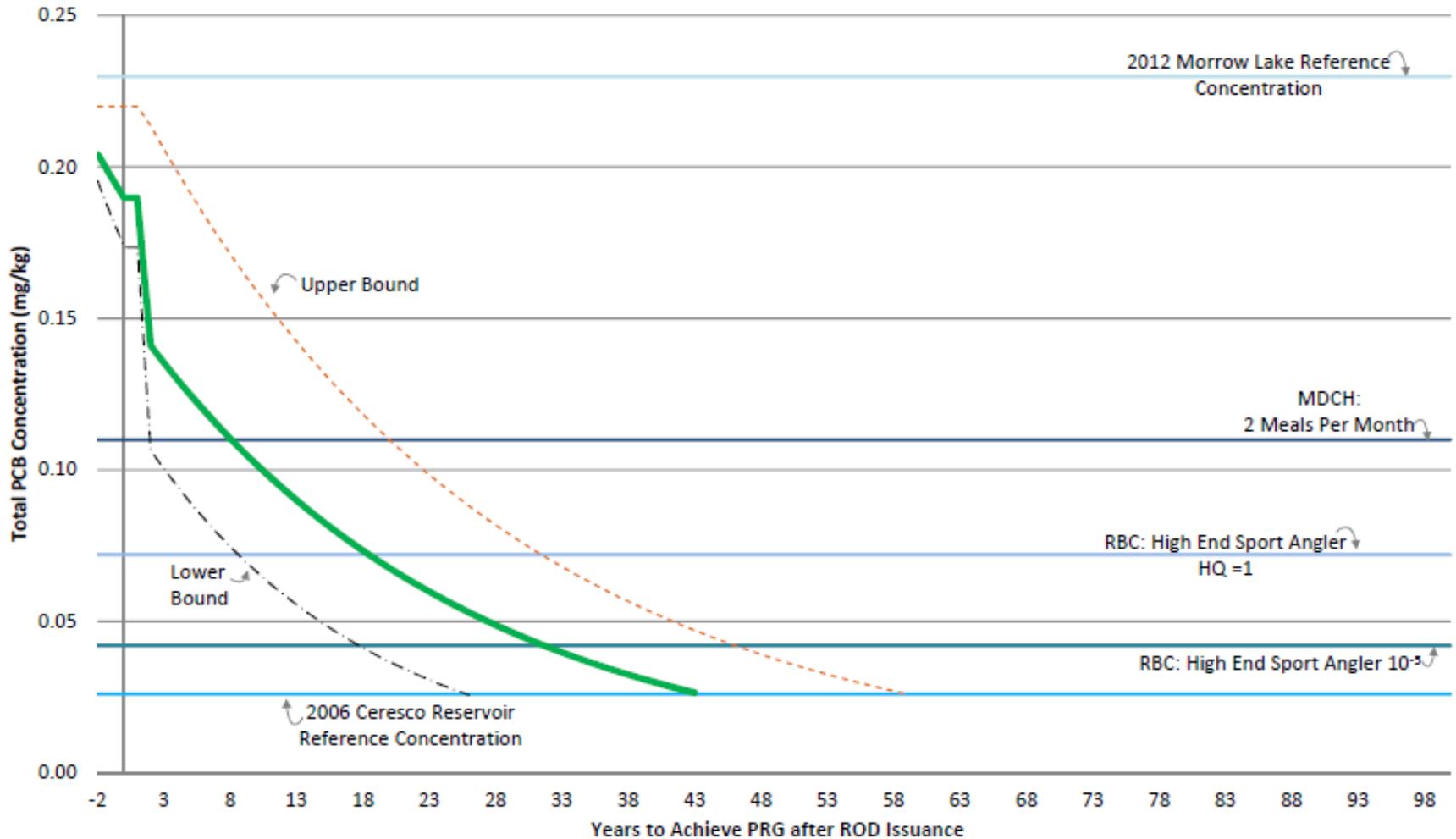
Sediment Remedial Alternatives

- S-4A/B Sediment Edge Removal, Hot Spot Removal, and MNR
 - Same components as S-3A/B
 - Removal of River Section 3 sediment edges (about 30 foot-width on both banks of river for 1.4 miles)

- S-5 Area 1-Wide Removal and MNR
 - Remove areas with more than 1 mg/kg of PCBs along 22 miles of river



Time Projection for Fish to Reach Cleanup Goals: S-3 (Hot Spot and Crown Vantage Side Channel Removal) *amec*



PRGs- Preliminary Remedial Goals (or cleanup goals)

Sediment Remedial Alternative Comparison



Alternative	Capping Area (acres) / Removal Volume (cy)	Years to Reach PRGs for Smallmouth Bass	Overall Protection of Human Health and the Environment	Compliance with ARARs	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume Through Treatment	Implementability	Total Cost
S-1	None	87	Undocumented	Undocumented	Not Effective	Effective	No reduction	Nothing to implement	\$0
S-2	None	87	Protective, lengthy timeframe	Complies	Not Effective	Effective	No reduction	Readily implementable	\$2,700,000
S-3A	0 / 19,500	31	Protective, reasonable timeframe	Complies	Effective	Effective	Reduced volume	Readily implementable	\$13,100,000 to \$16,600,000
S-3B	1.2 / 15,600	31	Protective, reasonable timeframe	Complies	Effective	Effective	Reduced mobility and volume	Readily implementable	\$12,200,000 to \$15,700,000
S-4A	0 / 63,900	26	Protective, reasonable timeframe	Complies	Effective	Effective	Reduced volume	Readily implementable	\$33,700,000 to \$37,200,000
S-4B	1.2 / 59,900	26	Protective, reasonable timeframe	Complies	Effective	Effective	Reduced mobility and volume	Readily implementable	\$32,300,000 to \$35,800,000
S-5	0 / 300,000 to 490,000	45	Protective, longer timeframe, extensive habitat destruction	Compliance delayed	Not Effective	May not be effective	Reduced volume	Requires extensive effort	\$202,000,000 to \$337,000,000

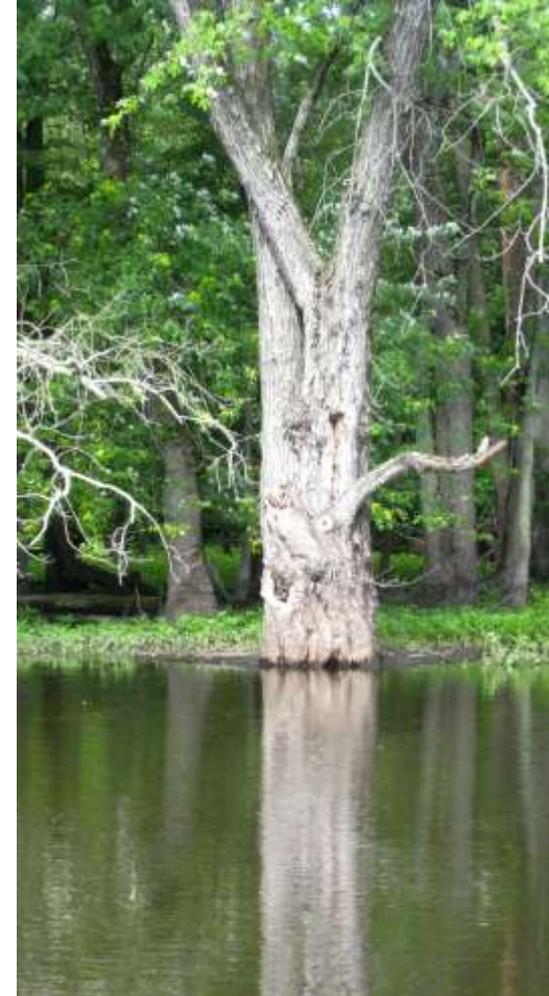
- **FPS-1 No Further Action**
 - No additional activity, no monitoring of the environment
 - Removal efforts already performed as Time Critical Removal Actions (TCRAs)
 - Required by EPA as a baseline for comparison

- **FPS-2 Monitored Natural Recovery**
 - Allow natural processes, such as deposition of clean sediment and upland soil in floodplain, to reduce PCB concentrations
 - Rate of recovery is unknown

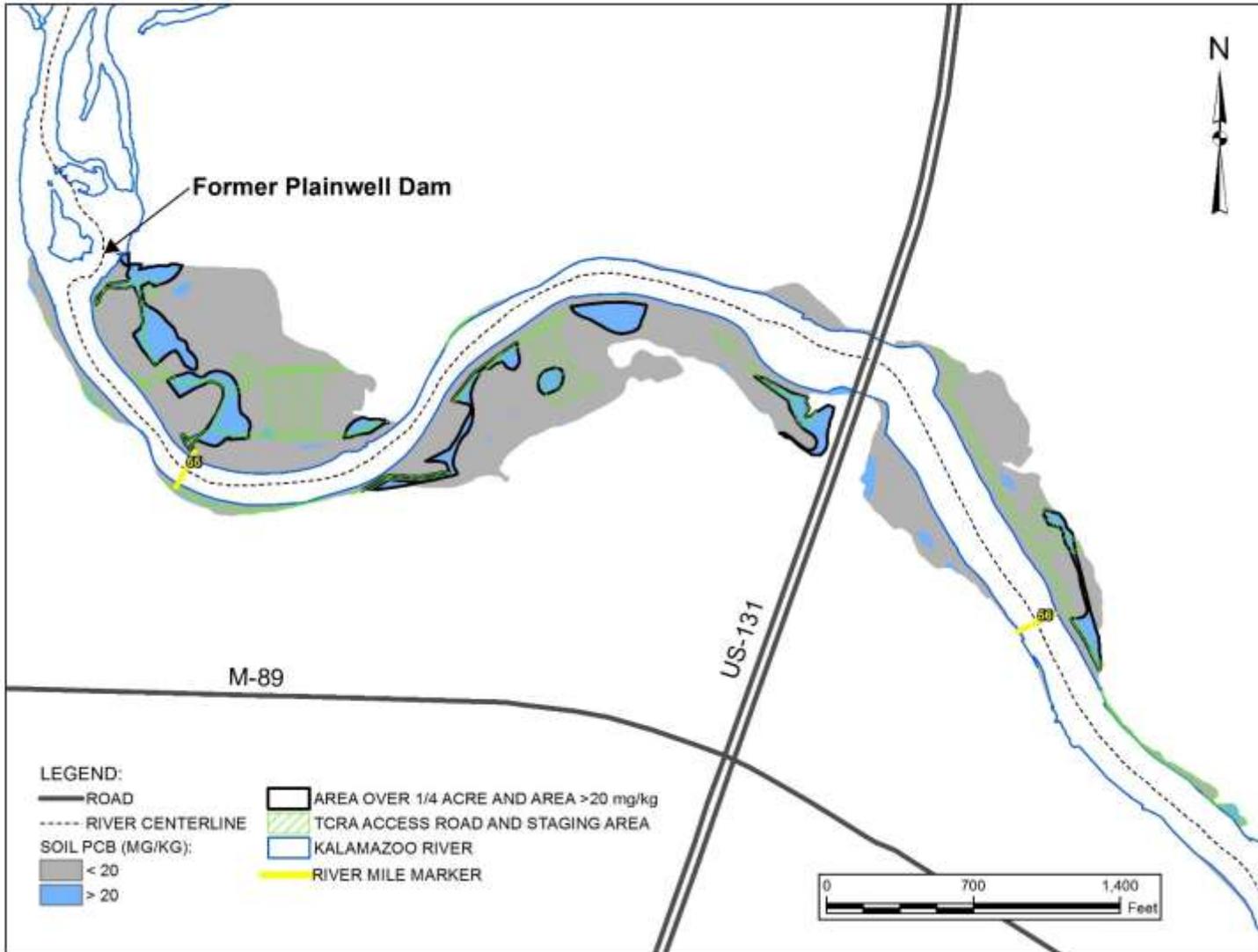


- **FPS-3 Capping**
 - 7 Acres
 - Remove trees/vegetation
 - Cap over area with PCBs greater than 20 mg/kg to achieve cleanup goal of 11 mg/kg, on average
 - Place a 1 foot soil cap and re-vegetate

- **FPS-4A Removal**
 - 7 acres
 - Remove trees/vegetation
 - Remove area with PCBs greater than 20 mg/kg to achieve cleanup goal of 11 mg/kg, on average
 - Remove soil to depth of 1.5 feet
 - Backfill with soil and re-vegetate



Floodplain Soil Remedial Area (7 Acres)



Floodplain Soil Remedial Alternatives

- FPS-4B Removal
 - 850 acres
 - Remove trees/vegetation
 - Remove area with PCBs more than 0.5 mg/kg
 - Remove soil to depth of 1.5 feet
 - Backfill with soil and vegetate



Floodplain Soil Remedial Alternative Comparison



Alternative	Capping or Excavation Footprint	Remediation Time	Overall Protection of Human Health and the Environment	Compliance with ARARs	Short-term Effectiveness	Long-term Effectiveness	Reduction of Toxicity, Mobility, and Volume Through Treatment	Implementability	Total Cost
FPS-1	None	Lengthy	Not Protective	Unable to predict	Not Effective	Unknown, indeterminable	No reduction	Nothing to implement	\$0
FPS-2	None	Lengthy	Not Protective	Unable to predict	Not Effective	Unknown, determinable	No reduction	Readily Implementable	\$1,300,000
FPS-3	7 Acres	1 year	Protective	Complies	Effective	Effective	Reduced mobility	Readily Implementable	\$3,800,000
FPS-4A	7 Acres	1 year	Protective	Complies	Effective	Effective	Reduced mobility & volume	Readily Implementable	\$6,800,000
FPS-4B	850 Acres	10 years	Not Protective	Does not comply (floodplain destruction)	Not Effective	Marginally Effective	Reduced volume	Difficult with access limitations and extensive habitat destruction	\$486,000,000