

DRAFT Memorandum

To	Karl Stave – Milwaukee County	Page 1
CC	Steve Keith, Kevin Haley – Milwaukee County Don Pirrung, Steve Elver – AECOM	
Subject	Environmental Cost Estimate – Estabrook Dam	
From	Mary Jo Anzia and Staci Goetz – AECOM	
Date	September 20, 2010	

AECOM has completed a preliminary evaluation of the quality and quantity of sediment located immediately upstream of the overflow spillway at Estabrook Dam in accordance with our contract with Milwaukee County for engineering services associated with the Estabrook Dam rehabilitation and sediment removal planning.

This memorandum briefly summarizes the basis for and estimates of costs to remove sediment impacted with polychlorinated biphenyls (PCBs).

Additional Sediment Characterization

As part of this effort, AECOM's subcontractor, Himalayan Consultants, LLC (Himalayan), conducted additional sediment investigation activities on July 21 and 22, 2010 to provide data that better define the volume and three-dimensional distribution of PCB-impacted sediment. Sediment samples were collected from 15 locations and at least two depth intervals at each location. At the time of sample collection, significant debris consisting primarily of trees was located behind the spillway. Sediment at each sample location was visually classified, and thicknesses were recorded. Sediment thickness behind the overflow spillway ranged from 12 to 40 inches, with an approximate average of 30 inches. The samples were sent to the TestAmerica Watertown, Wisconsin laboratory for analysis of PCBs. In addition, two samples of wood debris (one above water and one below water) were collected and analyzed for PCBs. Other analyses included: (1) grain size distribution, total organic carbon (TOC), and water content/percent solids on one discrete sediment sample; (2) one composite sample for Great Lakes sediment NR 347 parameters; and (3) one representative composite sample for Veolia disposal parameters.

The PCB sediment results (along with previously collected data) are shown on the attached Figure 1. Two areas of sediment with concentrations ≥ 50 mg/kg are identified on the figure. In all but one sample location, the higher concentrations of PCBs were found in the upper half of the sediment column. No PCBs were detected in the samples of wood debris. In addition, the sediment results of for Veolia waste profiling were all within acceptable limits.

Following a significant rain event on the evening of July 22, 2010, the majority of the debris that was formerly located behind the overflow spillway was washed downstream, and only a small portion of wood remains along a small section of the spillway near the southern bank of the river. Himalayan obtained additional sediment thickness measurements on August 5, 2010 following the flood event. The comparison of pre- and post-flood thicknesses indicated a slight increase of thickness near the spillway, with minor differences elsewhere.

Primary Cost Estimate Assumptions

The following list identifies the primary assumptions used in developing the estimated costs for removal and disposal of sediment behind the overflow spillway. Additional assumptions can be found on the attached cost estimate table (Table 1).

- All sediment within the blue sediment boundary line shown on Figure 1 will be removed and disposed of at an approved off-site disposal facility. This boundary represents a reasonable construction distance from the spillway that would allow for repairs and/or removal, if needed.
- The entire thickness of sediment at each location is classified as the highest concentration of PCBs detected (i.e., ≥ 50 mg/kg or < 50 mg/kg).
- Average thicknesses within each ≥ 50 mg/kg area and within the < 50 mg/kg area were used to determine sediment volumes. This results in volumes of 1,400 cubic yards and 1,800 cubic yards for ≥ 50 mg/kg and < 50 mg/kg sediment, respectively. This is currently a highly conservative number, as the July 28, 2009 Order for Dam Repair or Abandonment from the WDNR requires only that sediment co-mingled with debris be removed. However, debris could once again continue to accumulate upstream of and on the overflow spillway prior to implementation of dam repairs or debris and sediment removal. The degree of sediment buildup at the time of dam repair/debris and sediment removal is unknown; therefore, AECOM has assumed the removal of the entire volume of sediment defined on the attached Figure 1.
- A conversion factor from in-place cubic yards to off-site disposal tons of 1.4 has been utilized. A conversion factor of 1.2 tons per cubic yard was used for the Lincoln Park/Blatz Pavilion cleanup¹ and based on discussions with CH2MHill and the County, and our experience at other sites, a conversion factor of 1.4 seems like a reasonable average factor. However, if the nature of the materials (e.g. woody debris) and/or drying ability varies, such that additional amendment for transport might be necessary, a higher tons/cubic yard factor would result in additional cost.
- Water generated during sediment dewatering will be treated using an on-site mobile water treatment system and will be discharged to the Milwaukee River following treatment. Discharge to the MMSD sewerage system may be possible and could result in cost estimate reductions; however, requirements for treatment and discharge are currently not defined.
- Potential property access costs such as easement purchase, legal, and lease arrangements are not included in the estimate.
- Sediment with PCB concentrations ≥ 50 mg/kg will be transported to and disposed of at the TSCA EQ Disposal Facility located in Wayne, Michigan. No specific rates for this project have been received to date from EQ Facility; however, a conservative unit rate of \$195/ton

¹ Natural Resource Technology, *Remedial Construction Documentation Report – PCB-Impacted Sediment Removal, Lincoln Park/Blatz Pavilion Site, Milwaukee, Wisconsin*, January 29, 2009.

for transportation and disposal based on other project experience has been utilized for cost estimation purposes. The U.S. EPA can approve disposal of PCB bulk remediation waste with concentrations ≥ 50 mg/kg at a RCRA Subtitle C landfill. Such authorization, if received for this project, could result in a cost reduction of approximately \$100,000.

- Sediment with PCB concentrations < 50 mg/kg will be transported to and disposed of as non-hazardous bulk material by Veolia at a rate of \$35/ton.
- Costs for haul road restoration have not been included, as the need for restoration of haul routes will be dependent upon negotiations with property owners and may require modification.

Estimated Cost

The total estimated cost for sediment and off-site removal, including 35 percent for engineering and contingencies is **\$2,000,000**. The cost breakdown is shown on the attached Table 1.

Cost Comparison to Similar Sediment Removal Activities

AECOM's overall estimated cost per cubic yard of sediment is approximately \$625. Although sediment cleanup costs per cubic yard are not linear, an order of magnitude comparison has been conducted to confirm the reasonableness of the estimated cost compared other similar projects.

As an example, the WDNR estimated costs for remediation of the Lincoln Park/Blatz Pavilion PCB-impacted sediment in a 2005 pre-design study report. The report notes that overall project costs for cleanup of the 1997-98 cleanup of PCB-impacted sediment in Fox River Deposit N was \$525/cubic yard for relatively small 8,900 cubic yard project. The report also notes: "Based on experience with PCB sediment remediation and other site cleanups the Department [WDNR] has used a fairly wide cost range for projecting concept-level potential costs for PCB sediment site remediation of from \$300/ cu.yd. to \$600/cu.yd."² Thus, the Estabrook Dam overflow spillway estimates provided herein are within reasonable ranges of similar project costs.

AECOM appreciates the opportunity to assist Milwaukee County in the investigation and cost estimation associated with the PCB-impacted sediment immediately upstream of the Estabrook Dam overflow spillway. If you have any questions regarding the estimated costs summarized in this memorandum, please feel free to contact us.

Sincerely yours,

DRAFT

Mary Jo Anzia, P.E.
maryjo.anzia@aecom.com

DRAFT

Staci Goetz, P.G.
staci.goetz@aecom.com

² *Estabrook Impoundment Sediment Remediation Pre-Design Study – Project Completion Report to USEPA, WDNR, August 2005.*

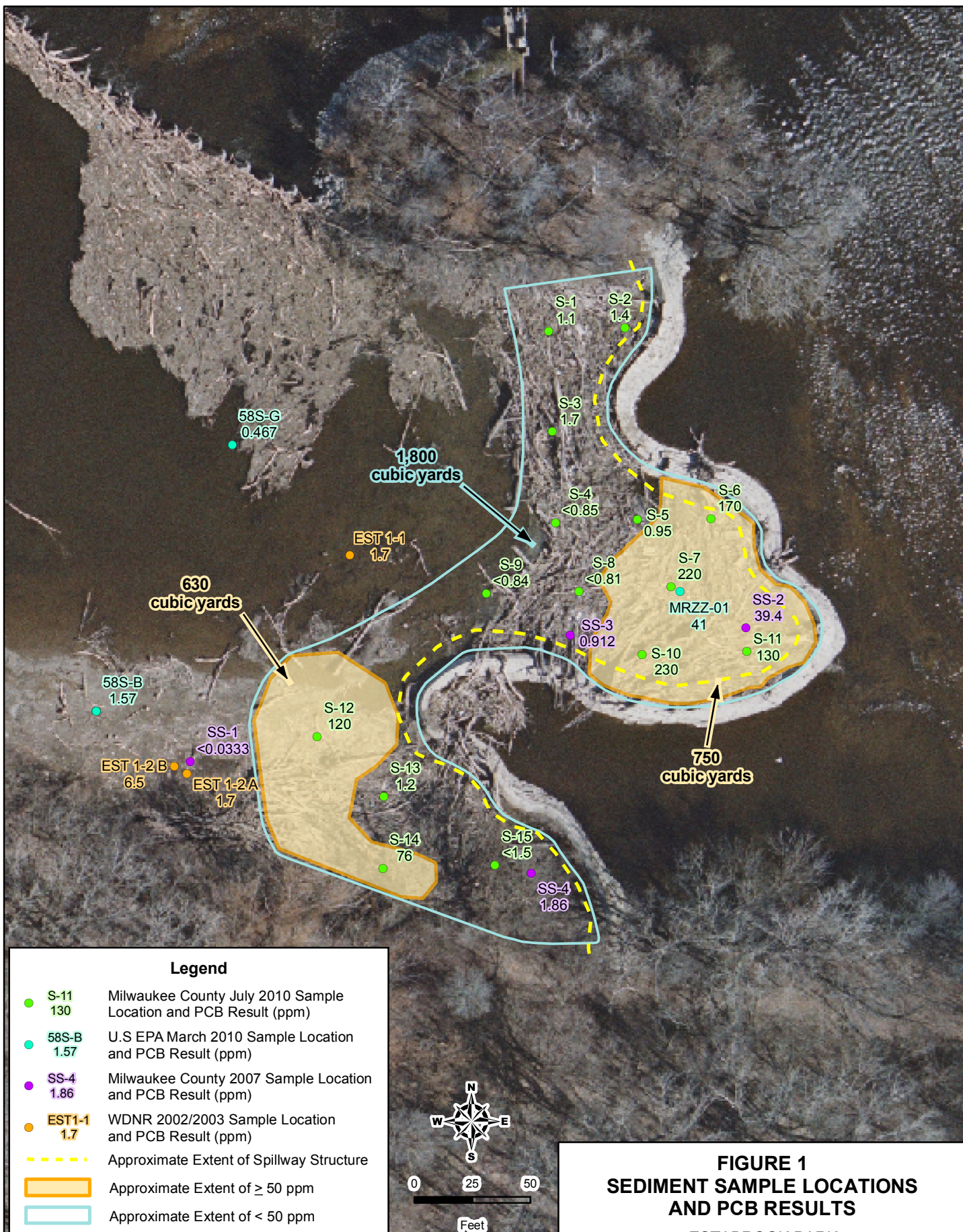




Table 1
Page 1 of 2
Estabrook Dam Fixed Crest Spillway Sediment Removal
Quantities and Conversion Factors

DRAFT

September 20, 2010

Item	Units	Value	Comments/Basis
Sediment area \geq 50 mg/kg	SF	12,600	Estimated based on areas shown on Figure 1
Sediment area < 50 mg/kg	SF	18,650	Estimated based on areas shown on Figure 1
Sediment volume \geq 50 mg/kg	CY	1,400	Estimated based on areas shown on Figure 1 using average thickness, +10%
Sediment volume < 50 mg/kg	CY	1,800	Estimated based on areas shown on Figure 1 using average thickness, +10%
Conversion factor	TONS/CY	1.4	Discussion with CH2MHill and County regarding Blatz Pavallion Sediment Removal

DRAFT

September 20, 2010

Mechanical Removal and Off-Site Disposal				Sediment Areas and Volumes:									Comments	
Estabrook Dam Sediment Removal				≥ 50 ppm Area		12,600	Square Feet							
				< 50 ppm Area		18,650	Square Feet							
				≥ 50 ppm Volume		1,400	Cubic Yards							
				< 50 ppm Volume		1,800	Cubic Yards							
				General			≥ 50 ppm Sediment			< 50 ppm Sediment				
Item	Code	Description	Units	No. of Units	Unit Cost	Total Cost	No. of Units	Unit Cost	Total Cost	No. of Units	Unit Cost	Total Cost		
1.1		Mobilization/Initial Activities												
		Mobilization/demobilization (~10% of CC)	Lump Sum	1	\$145,000	\$145,000							Based on EPA feedback on similar projects	
		Additional pre-removal sampling	Lump Sum	1	\$15,000	\$15,000								
		Site-specific Health and Safety Plan	Lump Sum	1	\$5,000	\$5,000								
		EA, negotiations, and permitting	Lump Sum	1	\$55,000	\$55,000								
		Archaeological Survey	Lump Sum	1	\$10,000	\$10,000								
		Butler garter snake survey	Lump Sum	1	\$10,000	\$10,000								
		Planning and access assistance	Lump Sum	1	\$10,000	\$10,000								
SUBTOTAL						\$250,000			\$0			\$0		
1.2		Haul Road and Staging Area Construction											Assume staging area on RAP of Pewaukee LLC	
	RI-03	Erosion control	Acre	4	\$1,000	\$4,000								
	RP-10	Clearing and grubbing	Acre	4	\$3,750	\$15,000								
	RI-13	Build aggregate road 12" thick	SY	1,220	\$13.60	\$16,592							1,100-foot road (10 feet wide) between spillway and staging area	
	RI-13	Build aggregate road 12" thick	SY	400	\$13.60	\$5,440							320-foot road (10 feet wide) between staging area and drive	
	RI-13	Build aggregate staging area 12" thick	SY	4,840	\$13.60	\$65,824							Assume 1-acre staging and treatment area	
SUBTOTAL						\$106,856			\$0			\$0		
1.3		Dredging Preparation												
	RD-06	AquaDam® purchase and installation	FT	700	\$ 100.00	\$70,000							Assume municipal water supply for filling AquaDam® is available	
	RD-04	Water pumping	Gallon	116,875	\$ 0.01	\$1,169								
SUBTOTAL						\$71,169			\$0			\$0		
1.4		Dredging												
	RD-12	Mechanical excavating	CY				1,400	\$25.00	\$35,000	1,800	\$25.00	\$45,000		
		Sampling during dredging	Lump Sum				1	\$5,000	\$5,000	1	\$5,000	\$5,000		
	TD-05	Off-road dump trucks (2) <1000 yards	CY				1,400	\$4.00	\$5,600	1,800	\$4.00	\$7,200		
SUBTOTAL						\$0			\$45,600			\$57,200		
1.5		Segregation and Water Treatment												
	RD-14	Gravity dewatering handling	CY				1,400	\$6.50	\$9,100	1,800	\$6.50	\$11,700		
	RM-12	Water treatment system	LS	1	\$60,000	\$60,000							Assume typical PCB water treatment system on site for 2 weeks	
	RD-08	Loading with end loader	CY				1,400	\$6.50	\$9,100	1,800	\$6.50	\$11,700		
	TD-18	Water Treatment	Gallon				135,000	\$0.01	\$1,350	145,000	\$0.01	\$1,450	Assume water generated and treated = 50% of sediment volume	
		Debris Management	Lump Sum	1	\$20,000	\$ 20,000								
SUBTOTAL						\$80,000			\$19,550			\$24,850		
1.6		Amendment, if necessary												
	RM-13	Portland cement for stabilization	Ton				196	\$110	\$21,560	252	\$110	\$27,720	Assume amendment = 10 percent by mass of Portland cement	
SUBTOTAL						\$0			\$21,560			\$27,720		
1.7		Off-site Disposal												
	RD-08	Loading with end loader	CY				1,540	\$6.50	\$10,010	1,538	\$6.50	\$9,995		
	TD-04	Truck liners	Ton				2,156	\$2.00	\$4,312					
	TD-04	Truck liners	Ton							2,153	\$2.00	\$4,306		
	TD-03	T&D - EQ, Detroit	Ton				2,156	\$195	\$420,420				EQ Wayne Disposal Facility, MI	
	TD-06	T&D, Non-Hazardous, Soil (Bulk)	Ton							3,953	\$35.00	\$138,348	Orchard Ridge Landfill , WI	
SUBTOTAL						\$0			\$434,742			\$152,649		
1.8		Restoration												
	RI-07	General sand fill	CY	3,840	\$15.00	\$57,600							Backfilling sediment removal area with sand	
	RI-16	Haul road gravel removal	SY	1,220	\$15.00	\$18,300							1,100-foot road between spillway and staging area	
	RI-17	Haul road topsoil	CY	406	\$75.00	\$30,470							1,100-foot road between spillway and staging area	
	RI-06	Haul road revegetation	Acre	0.3	\$10,000	\$2,521							1,100-foot road between spillway and staging area	
		Erosion control removal	Lump Sum	1.0	\$10,000	\$10,000								
	RC-01	Purchase and place armament on river bank	CY	750	\$15.00	\$11,250							Assume no haul road restoration or backfilling within river is required	
SUBTOTAL						\$130,140			\$0			\$0		
1.9		Miscellaneous Activities												
	RM-01	Surveying/GPS	AC	0.7	\$1,200	\$861							Professional judgment	
		Confirmation sampling and analytical	Lump Sum	1	\$25,000	\$25,000							Professional judgment	
	RC-09	Construction Quality Assurance	AC	0.7	\$1,750	\$1,255							Documentation	
		Oversight	Lump Sum	1	\$20,000	\$20,000							Assume full-time on-site construction manager for four weeks	
		Reporting	Lump Sum	1	\$15,000	\$15,000							Professional judgment	
SUBTOTAL						\$62,116			\$0			\$0		
SUBTOTAL (rounded to nearest ten thousand)						\$700,000			\$520,000			\$260,000		
CAPITAL COST TOTAL (rounded to nearest ten thousand)						\$1,480,000								
1.10		Engineering and Contingency (35% of CC)	Lump Sum			\$ 520,000								
ESTIMATE TOTAL						\$ 2,000,000								