

TABLE 5.1
DETAILED COST ESTIMATE
ALTERNATIVE 2
BROOK SEDIMENT AND SOIL REMOVAL AND OFF-SITE DISPOSAL
LAGOON/WOA/WETLAND SOIL AREA: MONITORING AND AUL

BEAVERDAM BROOK AND FORMER LAGOON SITE
FORMER GENERAL MOTORS CORPORATION PLANT
FRAMINGHAM, MASSACHUSETTS

Item	Task	Quantity			Unit	Unit Cost	Cost		
<u>Capital Costs</u>									
<u>Estimated Engineering and Project Management Costs</u>									
1.	Engineering Design - Phase IV RIP	1			L.S.	\$150,000			\$150,000
2.	Permits	1			L.S.	\$80,000			\$80,000
3.	Construction Completion/RAO /AUL / OMM Plan	1			L.S.	\$120,000			\$120,000
4.	Construction Management	6	to	9	mo.	\$15,000	\$90,000	to	\$135,000
5.	Health and Safety and Construction Oversight	5	to	7	mo.	\$24,000	\$120,000	to	\$168,000
Estimated Engineering Costs							\$560,000	to	\$653,000
<u>Construction Costs</u>									
1.	Brook Dredging and Removal								
	a) Clearing and Grubbing (disposal included)	1.2	to	2.2	acre	\$7,500	\$9,000	to	\$16,500
	b) Creek Dewatering/By-Pass (Two Sections)	1,500	to	2,700	LF	\$24	\$36,000	to	\$64,800
	c) Remove Impacted Sediment	1,000	to	3,900	C.Y.	\$25	\$25,000	to	\$97,500
	d) Excavate Impacted Soil - Sidebank	700	to	1,250	C.Y.	\$13	\$9,100	to	\$16,250
Item 1 Subtotal							\$79,100	to	\$195,050
2.	Restoration of Brook								
	a) Erosion control measures in excavated areas - rock in creek plus banks seeded	750	to	1,350	L.F.	\$50	\$37,500	to	\$67,500
	b) Wetland/wildlife habitat restoration - shrubs	750	to	1,350	L.F.	\$110	\$82,500	to	\$148,500
	c) Fence Replacement	750	to	1,350	L.F.	\$20	\$15,000	to	\$27,000
Item 2 Subtotal							\$135,000	to	\$243,000
3.	Filtering/Dewatering Removed Sediment/Soil								
	a) Staging Pad		1		L.S.	\$180,000		\$180,000	
	b) Stabilizing Soils/Sediments (Add 25% Volume)	1,190	to	3,605	C.Y.	\$25	\$29,750	to	\$90,125
Item 3 Subtotal							\$209,750	to	\$270,125
4.	Transportation and Disposal Costs								
	a) Loading, Transportation and Disposal of material to Off-Site Facility - Non Haz for Daily Cover - 70%	1,470	to	4,340	Ton	\$40	\$58,800	to	\$173,600
	b) Loading, Transportation and Disposal of material to Off-Site Facility - Non Haz Landfill - 20%	420	to	1,240	Ton	\$110	\$46,200	to	\$136,400
	c) Disposal of Hazardous Waste - 10%	210	to	620	Ton	\$250	\$52,500	to	\$155,000
	d) Disposal of Non-Hazardous Waste Water	103,000	to	312,100	gallon	\$0.75	\$77,250	to	\$234,075
	e) Confirmatory Sampling		1		L.S.	\$130,000		\$130,000	
Item 4 Subtotal							\$364,750	to	\$829,075

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BEAVERDAM BROOK AND FORMER LAGOON SITE
FORMER GENERAL MOTORS CORPORATION PLANT
FRAMINGHAM, MASSACHUSETTS

Item	Task	Quantity	Unit	Unit Cost	Cost
5.	Pumphouse and Outfall Demolition and Restoration				
	a) Pumphouse and Outfall Demolition	400	S.F	\$75	\$30,000
	b) Loading, Transportation and Disposal	150	tons	\$110	\$16,500
	c) Restoration - Top Soil, Seed, and Mat	0.25	acre	\$30,000	\$7,500
	Item 5 Subtotal				\$54,000
6.	Valve House and Outfall Demolition and Restoration	1	L.S.	\$75,000	\$75,000
7.	Construction Facilities	5 to 7	mo.	\$5,000	\$25,000 to \$35,000
8.	Temporary Erosion and Traffic Controls	7 to 10	mo.	\$10,000	\$70,000 to \$100,000
9.	Mobilization/Demobilization	1	L.S.	\$120,000	\$120,000
10.	Bonds/Insurance	2	%	\$34,000	\$34,000
11.	Safety and Health	5 to 7	mo.	\$15,000	\$75,000 to \$105,000
12.	As-Built Construction Report	1	L.S.	\$60,000	\$60,000
	Estimated Construction Costs				\$1,301,600 to \$2,120,250
	Subtotal				\$1,861,600 to \$2,773,250
	Contingency (10%)				\$186,160 to \$277,325
	Total Estimated Capital Costs ⁽¹⁾				\$2,048,000 to \$3,051,000
<u>Annual Operation and Maintenance Costs</u>					
1.	Groundwater, Sediment and Surface Water Monitoring				
	a) Year 1 - 4 wells and 10 sediment/surface water locations sampled quarterly and analyzed for VOCs, SVOCs, and metals -- \$185,000				
	b) Years 2 to 5 - 4 wells and 10 sediment/surface water locations sampled semi-annually for SVOCs and metals -- \$86,500				
	c) Years 6 to 30 - 4 wells and 10 sediment/surface water locations sampled annually for SVOCs and metals -- \$43,500				
	Equivalent Annual Cost	1	L.S.	--	\$62,283
2.	Site Reviews (every 5 years) - \$10,000/review				\$1,941
	Equivalent Annual Cost	1	L.S.	--	
3.	Annual Compliance Fees	1	L.S.	\$3,000	\$3,000
	Estimated Annual Operation and Maintenance Cost				\$67,224
	Contingency (10%)				\$6,722
	Total Estimated Annual Operation and Maintenance Cost				\$73,946
<u>Total Present Worth</u>					
	Capital Cost				\$2,048,000 to \$3,051,000
	Annual Operation and Maintenance Costs ⁽²⁾				\$1,136,704
	Total Present Worth ⁽¹⁾				\$3,185,000 to \$4,188,000

Notes:

(1) Total Costs have been rounded to three significant figures.

(2) Annual Operation and Maintenance costs are based on a discount factor of 5.0% for a period of 30 years.

TABLE 5.2
DETAILED COST ESTIMATE
ALTERNATIVE 3
BROOK: SEDIMENT REMOVAL/OFF-SITE DISPOSAL
LAGOON/WOA/WETLAND SOIL AREA: SEDIMENT AND SOIL REMOVAL/OFF-SITE DISPOSAL

BEAVERDAM BROOK AND FORMER LAGOON SITE
FORMER GENERAL MOTORS CORPORATION PLANT
FRAMINGHAM, MASSACHUSETTS

Item	Task	Quantity			Unit	Unit Cost	Cost		
<u>Capital Costs</u>									
<u>Estimated Engineering and Project Management Costs</u>									
1.	Engineering Design - Phase IV RIP	1			L.S.	\$180,000		\$180,000	
2.	Permits	1			L.S.	\$80,000		\$80,000	
3.	Construction Completion/RAO	1			L.S.	\$90,000		\$90,000	
4.	Construction Management	7	to	9	mo.	\$15,000	\$105,000	to	\$135,000
5.	Health and Safety and Construction Oversight	6	to	8	mo.	\$24,000	\$144,000	to	\$192,000
Estimated Engineering Costs							\$599,000	to	\$677,000
<u>Construction Costs</u>									
1.	Brook Dredging and Removal								
	a) Clearing and Grubbing (disposal included)	1.2	to	2.2	acre	\$7,500	\$9,000	to	\$16,500
	b) Creek Dewatering/By-Pass (Two Sections)	1,500	to	2,700	LF	\$24	\$36,000	to	\$64,800
	c) Remove Impacted Sediment	1,000	to	3,900	C.Y.	\$25	\$25,000	to	\$97,500
	d) Excavate Impacted Soil - Sidebank	700	to	1,250	C.Y.	\$13	\$9,100	to	\$16,250
Item 1 Subtotal							\$79,100	to	\$195,050
2.	Restoration of Brook								
	a) Erosion control measures in excavated areas - rock in creek plus banks seeded	750	to	1,350	L.F.	\$50	\$37,500	to	\$67,500
	b) Wetland/wildlife habitat restoration - shrubs	750	to	1,350	L.F.	\$110	\$82,500	to	\$148,500
	c) Fence Replacement	750	to	1,350	L.F.	\$20	\$15,000	to	\$27,000
Item 2 Subtotal							\$135,000	to	\$243,000
3.	West Outfall Area and Wetland Soil Area Removal								
	a) Clearing and Grubbing (disposal included)	1	to	2	acre	\$7,500	\$7,500	to	\$15,000
	b) Excavate Soil/Sediment	1,500	to	3,000	C.Y.	\$13	\$19,500	to	\$39,000
	c) Wetland Restoration	1	to	2	acre	\$30,000	\$30,000	to	\$60,000
Item 3 Subtotal							\$57,000	to	\$114,000
4.	Sediment/Sludge Removal from Lagoon								
	a) Dewatering Lagoon	14	to	21	days	\$2,500	\$35,000	to	\$52,500
	b) Filtering Lagoon Water & Discharge to Creek	1,050,000	to	1,575,000	gal	\$0.15	\$157,500	to	\$236,250
	c) Dredging Lagoon (400' by 70')	1,600	to	3,200	C.Y.	\$26	\$41,600	to	\$83,200
	d) Restoration		1		acre	\$30,000	\$30,000		
Item 4 Subtotal							\$264,100	to	\$401,950
5.	Filtering/Dewatering Removed Sediment/Soil								
	a) Staging Pad	1			L.S.	\$180,000		\$180,000	
	b) Stabilizing Soils/Sediments (Add 25% Volume)	3,360	to	7,945	C.Y.	\$25	\$84,000	to	\$198,625
Item 5 Subtotal							\$264,000	to	\$378,625

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ALTERNATIVE 3
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LAGOON/WOA/WETLAND SOIL AREA: SEDIMENT AND SOIL REMOVAL/OFF-SITE DISPOSAL

BEAVERDAM BROOK AND FORMER LAGOON SITE
FORMER GENERAL MOTORS CORPORATION PLANT
FRAMINGHAM, MASSACHUSETTS

Item	Task	Quantity		Unit	Unit Cost	Cost		
6.	Transportation and Disposal Costs							
	a) Loading, Transportation and Disposal of material to Off-Site Facility - Landfill Daily Cover 70%	4060	to	9590	Ton	\$40	\$162,400	to \$383,600
	b) Loading, Transportation and Disposal of material to Off-Site Facility - Landfill Disposal 20%	1,160	to	2,740	Ton	\$110	\$127,600	to \$301,400
	c) Disposal of Hazardous Waste 10%	580	to	1,370	Ton	\$250	\$145,000	to \$342,500
	d) Disposal of Non-Hazardous Waste Water	290,900	to	687,800	gallon	\$0.75	\$218,175	to \$515,850
	e) Confirmatory Sampling	1			L.S.	\$250,000	\$250,000	
					Item 6 Subtotal		\$903,175	to \$1,793,350
7.	Pumphouse and Outfall Demolition and Restoration							
	a) Pumphouse and Outfall Demolition	400			S.F.	\$75	\$30,000	
	b) Loading, Transportation and Disposal	150			tons	\$110	\$16,500	
	c) Restoration - Top Soil, Seed, and Malt	0.25			acre	\$30,000	\$7,500	
					Item 7 Subtotal		\$54,000	
8.	Valve House and Outfall Demolition and Restoration	1			L.S.	\$75,000	\$75,000	
9.	Construction Facilities	6	to	8	mo.	\$5,000	\$30,000	to \$40,000
10.	Temporary Erosion and Traffic Controls	8	to	13	mo.	\$10,000	\$80,000	to \$130,000
11.	Mobilization/Demobilization	1			L.S.	\$150,000	\$150,000	
12.	Bonds/Insurance	2			%	\$54,400	\$54,400	
13.	Safety and Health	6	to	8	mo.	\$15,000	\$90,000	to \$120,000
14.	As-Built Construction Report	1			L.S.	\$70,000	\$70,000	
	Estimated Construction Costs						\$2,305,775	to \$3,749,375
	Subtotal						\$2,904,775	to \$4,426,375
	Contingency (10%)						\$290,478	to \$442,638
	Total Estimated Capital Costs ⁽¹⁾						\$3,195,000	to \$4,869,000

Notes:

(1) Total Costs have been rounded to three significant figures.

TABLE 5.3

DETAILED COST ESTIMATE
ALTERNATIVE 4
BROOK: SEDIMENT REMOVAL/ ON-SITE CONSOLIDATION
LAGOON/WOA/WETLAND SOIL AREA: SOIL AND SEDIMENT REMOVAL/ON-SITE CONSOLIDATION IN LAGOON/CAPPING/AUL
BEAVERDAM BROOK AND FORMER LAGOON SITE
FORMER GENERAL MOTORS CORPORATION PLANT
FRAMINGHAM, MASSACHUSETTS

Item	Task	Quantity		Unit	Unit Cost	Cost		
<u>Capital Costs</u>								
<u>Estimated Engineering and Project Management Costs</u>								
1.	Engineering Design - Phase IV RIP	1		L.S.	\$200,000			\$200,000
2.	Permits	1		L.S.	\$100,000			\$100,000
3.	Construction Completion /RAO/AUL / OMM Plan	1		L.S.	\$120,000			\$120,000
4.	Construction Management	9	to 11	mo.	\$15,000	\$135,000	to	\$165,000
5.	Health and Safety and Construction Oversight	8	to 10	mo.	\$24,000	\$192,000	to	\$240,000
	Estimated Engineering Costs					\$747,000	to	\$825,000
<u>Construction Costs</u>								
1.	Brook Dredging and Removal							
a)	Clearing and Grubbing (disposal included)	1.2	to 2.2	acre	\$7,500	\$9,000	to	\$16,500
b)	Creek Dewatering/By-Pass (Two Sections)	1,500	to 2,700	LF	\$24	\$36,000	to	\$64,800
c)	Remove Impacted Sediment	1,000	to 3,900	C.Y.	\$25	\$25,000	to	\$97,500
d)	Excavate Impacted Soil - Creek and Sidebank	700	to 1,250	C.Y.	\$13	\$9,100	to	\$16,250
	Item 1 Subtotal					\$79,100	to	\$195,050
2.	Restoration of Brook							
a)	Erosion control measures in excavated areas - rock in creek plus banks seeded	750	to 1,350	L.F.	\$50	\$37,500	to	\$67,500
b)	Wetland/wildlife habitat restoration - shrubs	750	to 1,350	ft	\$110	\$82,500	to	\$148,500
c)	Fence Replacement	750	to 1,350	ft	\$20	\$15,000	to	\$27,000
	Item 2 Subtotal					\$135,000	to	\$243,000
3.	West Outfall Area and Wetland Soil Area Removal							
a)	Clearing and Grubbing (disposal included)	1	to 2	acre	\$7,500	\$7,500	to	\$15,000
b)	Excavate Soil/Sediment	1,500	to 3,000	C.Y.	\$13	\$19,500	to	\$39,000
c)	Wetland Restoration	1	to 2	acre	\$30,000	\$30,000	to	\$60,000
	Item 3 Subtotal					\$57,000	to	\$114,000
4.	Filtering/dewatering removed sediment							
a)	Dewatering Lagoon	14	to 21	days	\$2,500	\$35,000	to	\$52,500
b)	Filtering Lagoon Water & Discharge to Creek	1,050,000	to 1,575,000	gal	\$0.15	\$157,500	to	\$236,250
c)	Dredging Lagoon (400' by 70')	1,600	to 3,111	C.Y.	\$26	\$41,600	to	\$80,889
d)	Restoration	1		acre	\$30,000	\$30,000		
	Item 4 Subtotal					\$264,100	to	\$399,639
5.	Filtering/Dewatering Removed Sediment/Soil							
a)	Staging Pad	1		L.S.	\$180,000	\$180,000		
b)	Stabilizing Soils/Sediments (Add 25% Volume)	3,360	to 7,883	C.Y.	\$25	\$84,000	to	\$197,069
	Item 5 Subtotal					\$264,000	to	\$377,069
6.	Lagoon Preparation							
a)	Fill to Raise Base Elevation (400' by 70') Add 8'-12' Fill	8,296	to 12,444	C.Y.	\$21	\$174,222	to	\$261,333
	Item 6 Subtotal					\$174,222	to	\$261,333

TABLE 5.3

DETAILED COST ESTIMATE
ALTERNATIVE 4
BROOK: SEDIMENT REMOVAL/ ON-SITE CONSOLIDATION
LAGOON/WOA/WETLAND SOIL AREA: SOIL AND SEDIMENT REMOVAL/ON-SITE CONSOLIDATION IN LAGOON/CAPPING/AUL
BEAVERDAM BROOK AND FORMER LAGOON SITE
FORMER GENERAL MOTORS CORPORATION PLANT
FRAMINGHAM, MASSACHUSETTS

Item	Task	Quantity		Unit	Unit Cost	Cost		
7.	Transportation, Disposal and Stabilization Costs							
	a) Loading and Transportation of Material to Lagoon	5,800	to 13,600	Ton	\$15	\$87,000	to	\$204,000
	b) Disposal of Non-Hazardous Waste Water	290,900	to 682,400	gallon	\$0.75	\$218,175	to	\$511,800
	d) Confirmatory Sampling	1		L.S.	\$250,000		\$250,000	
	Item 7 Subtotal					\$555,175	to	\$965,800
8.	Pumphouse and Outfall Demolition and Restoration							
	a) Pumphouse and Outfall Demolition	400		S.F.	\$75		\$30,000	
	b) Loading, Transportation and Disposal	150		tons	\$110		\$16,500	
	c) Restoration - Top Soil, Seed, and Malt	0.25		acre	\$30,000		\$7,500	
	Item 8 Subtotal						\$54,000	
9.	Valve House and Outfall Demolition and Restoration	1		L.S.	\$75,000		\$75,000	
10.	RCRA Cap							
	a) Grading Layer	38,000		sq ft	\$0.30		\$11,400	
	b) 12-in Clay Barrier Layer	38,000		sq ft	\$1.10		\$41,800	
	c) Geocomposite Clay Liner	38,000		sq ft	\$0.80		\$30,400	
	d) Geonet drainage layer	38,000		sq ft	\$0.90		\$34,200	
	e) Common Fill	38,000		sq ft	\$0.60		\$22,800	
	f) Vegetative Cover	38,000		sq ft	\$0.15		\$5,700	
	g) 6-in Topsoil	38,000		sq ft	\$0.80		\$30,400	
	Item 9 Subtotal						\$176,700	
11.	Construction Facilities	8	to 10	mo.	\$5,000	\$40,000	to	\$50,000
12.	Temporary Erosion and Traffic Controls	10	to 12	mo.	\$10,000	\$100,000	to	\$120,000
13.	Mobilization/Demobilization	1		L.S.	\$150,000		\$150,000	
14.	Bonds/Insurance	2		%	\$59,000		\$59,000	
15.	Safety and Health	8	to 10	mo.	\$15,000	\$120,000	to	\$150,000
16.	As-Built Construction Report	1		LS	\$90,000		\$90,000	
	Estimated Construction Costs					\$2,393,297	to	\$3,426,592
	Subtotal					\$3,140,297	to	\$4,251,592
	Contingency (10%)					\$314,030	to	\$425,159
	Total Estimated Capital Cost ⁽¹⁾					\$3,454,000	to	\$4,677,000
<u>Annual Operation and Maintenance Costs</u>								
1.	Site Maintenance (cover system and drainage)	1		L.S.	\$10,000		\$10,000	
2.	Cap Repair/Replacement at year 15 (Assume 2/3 of Cap)	1		L.S.	\$150,000		\$4,694	
3.	Groundwater Monitoring							
	a) Year 1 - 4 wells sampled quarterly and analyzed for VOCs, SVOCs, and metals -- \$131,000							
	b) Years 2 to 5 - 4 wells sampled semi-annually for SVOCs and metals -- \$64,000							
	c) Years 6 to 30 - 4 wells sampled annually for SVOCs and metals -- \$32,000							
	Equivalent Annual Cost	1		L.S.	--		\$45,567	

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Item	Task	Quantity	Unit	Unit Cost	Cost		
4.	Site Reviews (every 5 years) - \$10,000/review Equivalent Annual Cost	1	L.S.	--	\$1,941		
5.	Annual Compliance Fees	1	L.S.	\$3,000	\$3,000		
	Estimated Annual Operation and Maintenance Cost				\$65,202		
	Contingency (10%)				\$6,520		
	Total Estimated Annual Operation and Maintenance Cost				\$71,722		
<u>Total Present Worth</u>							
	Capital Cost				\$3,454,000	to	\$4,677,000
	Annual Operation and Maintenance Costs ⁽²⁾				\$1,102,505	to	\$1,102,505
	Total Present Worth ⁽¹⁾				\$4,557,000	to	\$5,780,000

Notes:

- (1) Total Costs have been rounded to three significant figures.
(2) Annual Operation and Maintenance costs are based on a discount factor of 5.0% for a period of 30 years.