

Appendix H  
Plymouth Creek Restoration Project DRAFT Feasibility Study

Item 6A.  
BCWMC 2-18-16

Table H-1 Plymouth Creek feasibility study alternatives cost estimates

Reach	Site	Alternative	Alternative Description	Construction Cost Estimate (1)	Construction Contingency (2)	Engineering (3)	Capital Cost Estimate (4)(5)	Estimated Life Span (6) (years)	Annual Maint. Est. (7)	Major Maint. Est. (8)	30-Year Future Worth Estimate (9)(10)	Annualized Cost (10)(11)	TP Loading		TSS Loading		Rec.?
													Load Reduction (lb/yr)	Cost/lb Reduced (12)	Load Reduction (lb/yr)	Cost/lb Reduced (12)	
Reach 1	Site 1	Alternative A	Remeander into historic channels	\$ 93,600	\$ 28,080	\$ 28,080	\$ 149,800	30	\$ 440	\$ 14,980	\$ 411,600	\$ 8,700	0.20	\$ 44,260	340	\$ 25.59	N
Reach 1	Site 1	Alternative B	Stabilize erosion areas with hard armor	\$ 17,420	\$ 5,230	\$ 5,230	\$ 27,900	30	\$ 210	\$ 13,950	\$ 102,900	\$ 2,200	0.20	\$ 11,190	340	\$ 6.47	N
Reach 1	Site 1	Alternative C	Stabilize erosion areas with root wads, log vanes, and vegetation	\$ 16,080	\$ 4,820	\$ 4,820	\$ 25,700	20	\$ 190	\$ 6,430	\$ 83,100	\$ 1,700	0.20	\$ 8,650	340	\$ 5.00	Y
Reach 1	Site 2	Alternative A	Remeander into historic channels	\$ 37,420	\$ 11,230	\$ 11,230	\$ 59,900	30	\$ 180	\$ 5,990	\$ 164,800	\$ 3,500	0.23	\$ 15,420	390	\$ 8.97	N
Reach 1	Site 2	Alternative B	Stabilize erosion areas with hard armor	\$ 21,770	\$ 6,530	\$ 6,530	\$ 34,800	30	\$ 260	\$ 17,400	\$ 128,300	\$ 2,700	0.23	\$ 11,890	390	\$ 6.92	N
Reach 1	Site 2	Alternative C	Stabilize erosion areas with root wads, log vanes, and vegetation	\$ 10,810	\$ 3,240	\$ 3,240	\$ 17,300	20	\$ 130	\$ 4,330	\$ 56,000	\$ 1,200	0.23	\$ 5,290	390	\$ 3.08	Y
Reach 1	Site 3	Alternative A	Narrow channel for approx. 800'	\$ 35,270	\$ 10,580	\$ 10,580	\$ 56,400	30	\$ 170	\$ 5,640	\$ 155,200	\$ 3,300	1.7	\$ 1,990	2,890	\$ 1.14	N
Reach 1	Site 3	Alternative B	Install log vanes within reach	\$ 31,450	\$ 9,440	\$ 9,440	\$ 50,300	20	\$ 370	\$ 12,580	\$ 162,400	\$ 3,400	1.7	\$ 2,050	2,890	\$ 1.18	Y
Reach 1	Site 3	Alternative C	Upper bank vegetation	\$ 14,150	\$ 4,250	\$ 4,250	\$ 22,700	10	\$ 350	\$ 5,680	\$ 103,400	\$ 2,200	1.7	\$ 1,320	2,890	\$ 0.76	Y
Reach 1	Site 4	Alternative A	Establish vegetated buffer	\$ 14,840	\$ 4,450	\$ 4,450	\$ 23,700	10	\$ 320	\$ 5,930	\$ 105,800	\$ 2,200	2.2	\$ 990	3,850	\$ 0.57	Y
Reach 1	Site 4	Alternative B	Realign disc golf course	\$ 50,510	\$ 15,150	\$ 15,150	\$ 80,800	30	\$ 250	\$ 8,080	\$ 222,600	\$ 4,700	2.2	\$ 2,120	3,850	\$ 1.22	N
Reach 1	Site 5	Alternative A	Stabilize steep, eroding bank with hard armor	\$ 9,280	\$ 2,780	\$ 2,780	\$ 14,800	30	\$ 110	\$ 7,400	\$ 54,500	\$ 1,100	1.9	\$ 590	3,240	\$ 0.34	N
Reach 1	Site 5	Alternative B	Vegetate steep, eroding bank with VRSS	\$ 20,480	\$ 6,140	\$ 6,140	\$ 32,800	20	\$ 570	\$ 8,200	\$ 121,500	\$ 2,600	1.9	\$ 1,400	3,240	\$ 0.80	Y
Reach 1	Site 6	Alternative A	Stabilize bridge abutments with riprap and log vanes	\$ 7,940	\$ 2,380	\$ 2,380	\$ 12,700	30	\$ 100	\$ 6,350	\$ 47,000	\$ 1,000	0.13	\$ 7,530	230	\$ 4.35	Y
Reach 1	Site 6	Alternative B	Stabilize bridge abutments with riprap only	\$ 7,550	\$ 2,270	\$ 2,270	\$ 12,100	30	\$ 90	\$ 6,050	\$ 44,600	\$ 900	0.13	\$ 6,770	230	\$ 3.91	N
Reach 1	Site 7	Alternative A	Stabilize bridge abutments with riprap and log vanes	\$ 7,940	\$ 2,380	\$ 2,380	\$ 12,700	30	\$ 100	\$ 6,350	\$ 47,000	\$ 1,000	0.13	\$ 7,530	230	\$ 4.35	Y
Reach 1	Site 7	Alternative B	Stabilize bridge abutments with riprap only	\$ 7,550	\$ 2,270	\$ 2,270	\$ 12,100	30	\$ 90	\$ 6,050	\$ 44,600	\$ 900	0.13	\$ 6,770	230	\$ 3.91	N
Reach 2	Site 8	Alternative A	Stabilize bridge abutments with riprap and log vanes	\$ 7,940	\$ 2,380	\$ 2,380	\$ 12,700	30	\$ 100	\$ 6,350	\$ 47,000	\$ 1,000	0.13	\$ 7,530	230	\$ 4.35	Y
Reach 2	Site 8	Alternative B	Stabilize bridge abutments with riprap only	\$ 7,550	\$ 2,270	\$ 2,270	\$ 12,100	30	\$ 90	\$ 6,050	\$ 44,600	\$ 900	0.13	\$ 6,770	230	\$ 3.91	N
Reach 2	Site 9	Alternative A	Stabilize bridge abutments with riprap and log vanes	\$ 7,940	\$ 2,380	\$ 2,380	\$ 12,700	30	\$ 100	\$ 6,350	\$ 47,000	\$ 1,000	0.13	\$ 7,530	230	\$ 4.35	Y
Reach 2	Site 9	Alternative B	Stabilize bridge abutments with riprap only	\$ 7,550	\$ 2,270	\$ 2,270	\$ 12,100	30	\$ 90	\$ 6,050	\$ 44,600	\$ 900	0.13	\$ 6,770	230	\$ 3.91	N
Reach 2	Site 10	Alternative A	Raise stream bed in Fernbrook Lane North culvert	\$ 6,700	\$ 2,010	\$ 2,010	\$ 10,700	15	\$ 20	\$ 5,350	\$ 48,300	\$ 1,000	1.7	\$ 590	2,970	\$ 0.34	N
Reach 2	Site 10	Alternative B	Create meanders in open area to add 70' of stream length	\$ 81,590	\$ 24,480	\$ 24,480	\$ 130,600	30	\$ 380	\$ 13,060	\$ 358,700	\$ 7,500	1.7	\$ 4,400	2,970	\$ 2.53	N
Reach 2	Site 10	Alternative C	Raise channel bed using cross vanes/constructed riffles	\$ 20,970	\$ 6,290	\$ 6,290	\$ 33,600	20	\$ 250	\$ 16,800	\$ 123,800	\$ 2,600	1.7	\$ 1,520	2,970	\$ 0.88	Y
Reach 2	Site 10	Alternative D	Lower adjacent floodplain	\$ 35,230	\$ 10,570	\$ 10,570	\$ 56,400	30	\$ 170	\$ 5,640	\$ 155,200	\$ 3,300	1.7	\$ 1,940	2,970	\$ 1.11	Y
Reach 2	Site 11	Alternative A	Stabilize eroding banks with hard armor	\$ 11,280	\$ 3,380	\$ 3,380	\$ 18,000	30	\$ 130	\$ 9,000	\$ 66,100	\$ 1,400	1.9	\$ 730	3,340	\$ 0.42	N
Reach 2	Site 11	Alternative B	Stabilize banks with root wads	\$ 11,750	\$ 3,530	\$ 3,530	\$ 18,800	20	\$ 140	\$ 4,700	\$ 60,800	\$ 1,300	1.9	\$ 680	3,340	\$ 0.39	Y
Reach 2	Site 12	Alternative A	Stabilize eroding banks with hard armor	\$ 11,280	\$ 3,380	\$ 3,380	\$ 18,000	30	\$ 130	\$ 9,000	\$ 66,100	\$ 1,400	1.9	\$ 730	3,340	\$ 0.42	N
Reach 2	Site 12	Alternative B	Stabilize banks with root wads	\$ 11,750	\$ 3,530	\$ 3,530	\$ 18,800	20	\$ 140	\$ 4,700	\$ 60,800	\$ 1,300	1.9	\$ 680	3,340	\$ 0.39	Y
Reach 2	Site 13	Alternative A	Stabilize eroding banks with hard armor	\$ 11,280	\$ 3,380	\$ 3,380	\$ 18,000	30	\$ 130	\$ 9,000	\$ 66,100	\$ 1,400	1.9	\$ 730	3,340	\$ 0.42	N
Reach 2	Site 13	Alternative B	Stabilize banks with root wads	\$ 11,750	\$ 3,530	\$ 3,530	\$ 18,800	20	\$ 140	\$ 4,700	\$ 60,800	\$ 1,300	1.9	\$ 680	3,340	\$ 0.39	Y
Reach 2	Site 14	Alternative A	Stabilize culvert outfall with hard armor	\$ 6,710	\$ 2,010	\$ 2,010	\$ 10,700	30	\$ 80	\$ 5,350	\$ 39,500	\$ 800	1.1	\$ 730	1,910	\$ 0.42	Y

Table H-1 Plymouth Creek feasibility study alternatives cost estimates

Reach	Site	Alternative	Alternative Description	Construction Cost Estimate (1)	Construction Contingency (2)	Engineering (3)	Capital Cost Estimate (4)(5)	Estimated Life Span (6) (years)	Annual Maint. Est. (7)	Major Maint. Est. (8)	30-Year Future Worth Estimate (9)(10)	Annualized Cost (10)(11)	TP Loading		TSS Loading		Rec.?
													Load Reduction (lb/yr)	Cost/lb Reduced (12)	Load Reduction (lb/yr)	Cost/lb Reduced (12)	
Reach 2	Site 14	Alternative B	Stabilize culvert outfall with concrete swale	\$ 7,730	\$ 2,320	\$ 2,320	\$ 12,400	30	\$ 100	\$ 6,200	\$ 46,100	\$ 1,000	1.1	\$ 910	1,910	\$ 0.52	N
Reach 3	Site 15	Alternative A	Install bank stabilization measures at eroding banks using hard armor	\$ 20,970	\$ 6,290	\$ 6,290	\$ 33,600	30	\$ 250	\$ 16,800	\$ 123,800	\$ 2,600	7.0	\$ 370	12,130	\$ 0.21	N
Reach 3	Site 15	Alternative B	Install 4 rock vanes for bank protection	\$ 23,010	\$ 6,900	\$ 6,900	\$ 36,800	20	\$ 220	\$ 18,400	\$ 133,000	\$ 2,800	7.0	\$ 400	12,130	\$ 0.23	N
Reach 3	Site 15	Alternative C	Install bank stabilization measures at eroding banks using toe wood	\$ 48,740	\$ 14,620	\$ 14,620	\$ 78,000	20	\$ 570	\$ 19,500	\$ 251,600	\$ 5,300	7.0	\$ 760	12,130	\$ 0.44	Y
Reach 3	Site 16	Alternative A	Install bank stabilization measures at eroding banks using hard armor	\$ 20,970	\$ 6,290	\$ 6,290	\$ 33,600	30	\$ 250	\$ 16,800	\$ 123,800	\$ 2,600	7.0	\$ 370	12,130	\$ 0.21	N
Reach 3	Site 16	Alternative B	Install 4 rock vanes for bank protection	\$ 23,010	\$ 6,900	\$ 6,900	\$ 36,800	20	\$ 220	\$ 18,400	\$ 133,000	\$ 2,800	7.0	\$ 400	12,130	\$ 0.23	N
Reach 3	Site 16	Alternative C	Install bank stabilization measures at eroding banks using toe wood	\$ 48,740	\$ 14,620	\$ 14,620	\$ 78,000	20	\$ 570	\$ 19,500	\$ 251,600	\$ 5,300	7.0	\$ 760	12,130	\$ 0.44	Y
Reach 3	Site 17	Alternative A	Install bank stabilization measures at eroding banks using hard armor	\$ 20,970	\$ 6,290	\$ 6,290	\$ 33,600	30	\$ 250	\$ 16,800	\$ 123,800	\$ 2,600	7.0	\$ 370	12,130	\$ 0.21	N
Reach 3	Site 17	Alternative B	Install 4 rock vanes for bank protection	\$ 23,010	\$ 6,900	\$ 6,900	\$ 36,800	20	\$ 220	\$ 18,400	\$ 133,000	\$ 2,800	7.0	\$ 400	12,130	\$ 0.23	Y
Reach 3	Site 17	Alternative C	Install bank stabilization measures at eroding banks using toe wood	\$ 48,740	\$ 14,620	\$ 14,620	\$ 78,000	20	\$ 570	\$ 19,500	\$ 251,600	\$ 5,300	7.0	\$ 760	12,130	\$ 0.44	N
Reach 3	Site 18	Alternative A	Remove large woody debris	\$ 3,670	\$ 1,100	\$ 1,100	\$ 5,900	20	\$ -	\$ 1,480	\$ 17,000	\$ 400	0.09	\$ 4,520	150	\$ 2.67	Y
Reach 3	Site 19	Alternative A	Remove large woody debris	\$ 3,670	\$ 1,100	\$ 1,100	\$ 5,900	20	\$ -	\$ 1,480	\$ 17,000	\$ 400	0.09	\$ 4,520	150	\$ 2.67	Y
Reach 3	Site 20	Alternative A	Stabilize with hard armor	\$ 29,880	\$ 8,960	\$ 8,960	\$ 47,800	30	\$ 350	\$ 23,900	\$ 175,800	\$ 3,700	12.0	\$ 310	20,800	\$ 0.18	N
Reach 3	Site 20	Alternative B	Stabilize with toe wood and grading to broaden meander	\$ 68,710	\$ 20,610	\$ 20,610	\$ 109,900	20	\$ 810	\$ 27,480	\$ 355,000	\$ 7,500	12.0	\$ 630	20,800	\$ 0.36	N
Reach 3	Site 20	Alternative C	Controlled overflow, install grade control structure downstream	\$ 31,240	\$ 9,370	\$ 9,370	\$ 50,000	20	\$ 370	\$ 25,000	\$ 184,200	\$ 3,900	12.0	\$ 330	20,800	\$ 0.19	N
Reach 3	Site 20	Alternative D	Realign channel and stabilize meanders with vanes and toe wood	\$ 92,380	\$ 27,710	\$ 27,710	\$ 147,800	30	\$ 440	\$ 14,780	\$ 406,300	\$ 8,500	12.0	\$ 710	20,800	\$ 0.41	Y
Reach 3	Site 21	Alternative A	Narrow channel for approx. 80'	\$ 16,650	\$ 5,000	\$ 5,000	\$ 26,700	30	\$ 80	\$ 2,670	\$ 73,400	\$ 1,500	3.9	\$ 380	6,780	\$ 0.22	N
Reach 3	Site 21	Alternative B	Install log vanes within reach	\$ 13,430	\$ 4,030	\$ 4,030	\$ 21,500	20	\$ 160	\$ 5,380	\$ 69,500	\$ 1,500	3.9	\$ 380	6,780	\$ 0.22	Y
Project-wide			Educational signage	\$ 2,500	\$ 750	\$ 750	\$ 4,000	-	-	-	-	-	-	-	-	-	Y
Project-wide			Foot traffic management (temp. fencing and wood chip paths)	\$ 5,000	\$ 1,500	\$ 1,500	\$ 8,000	-	-	-	-	-	-	-	-	-	Y

Cost Summaries\*

Lowest-cost feasible alternative at each site:	\$ 316,000	\$ 95,000	\$ 95,000	\$ 506,000		\$ 3,400		\$ 1,730,000	\$ 36,300	52.2	\$ 700	90,800	\$ 0.40
<b>Recommended alternative at each site:</b>	<b>\$ 479,000</b>	<b>\$ 144,000</b>	<b>\$ 144,000</b>	<b>\$ 766,000</b>		<b>\$ 5,200</b>		<b>\$ 2,470,000</b>	<b>\$ 52,100</b>	<b>52.2</b>	<b>\$ 1,000</b>	<b>90,800</b>	<b>\$ 0.57</b>
Highest-cost feasible alternative at each site:	\$ 721,000	\$ 216,000	\$ 216,000	\$ 1,153,000		\$ 6,400		\$ 3,510,000	\$ 74,300	52.2	\$ 1,420	90,800	\$ 0.82

\* Costs may not sum due to rounding.

(1) A Class 4 screening-level opinion of probable cost, as defined by the American Association of Cost Engineers International (AACI International), has been prepared for these alternatives. The opinion of probable construction cost provided in this table is made based on Barr's experience and qualifications and represents our best judgment as experienced and qualified professionals familiar with the project. The cost opinion is based on project-related information available to Barr at this time and includes a conceptual-level design of the project.

(2) Assumed 30% contingency on construction costs.

(3) Assumed 30% of construction costs for design, permitting, and administration.

(4) Includes estimated initial construction cost (with 30% contingency) and design, permitting, and administration costs (30% of construction cost).

(5) Many of the alternatives in this table are mutually exclusive. The total project cost will not be a sum of each of these alternatives, rather a sum of a unique combination of a portion of these alternatives.

(6) Estimated life span until significant maintenance is required.

(7) Assumed 50% of the initial establishment period maintenance for vegetation-only alternatives, 25% for all other alternatives. 2016 dollars.

(8) Assumed 50% of the original construction cost for hard armoring alternatives and 25% of the original construction cost for bioengineering alternatives. 2016 dollars.

(9) Future value of initial capital cost, annual maintenance cost, and major maintenance cost at end of expected life span.

(10) Assumes 3% inflation rate.

(11) Annualized 30-year future worth.

(12) Annualized cost divided by estimated annual pollution load reduction.

**Table H2: Preliminary Cost Estimate for Site 1, Alternative A**

**Remeander into historic channels**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$8,509	\$8,510	10% of project cost
Control of Water	LS	1	\$2,934	\$2,930	4% of primary item cost
Erosion Control	LS	1	\$4,402	\$4,400	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$520	
Select Tree Removal (>4")	EACH	12	\$200	\$2,400	
Excavate/Salvage Soil	CY	477	\$15	\$7,160	
Grading	SY	358	\$6	\$2,150	
Topsoil Import	CY	60	\$33	\$1,970	
Root Wads	EACH	3	\$750	\$2,250	
Rock Vanes	EACH	2	\$2,000	\$4,000	
Plant Shrubs	EACH	25	\$50	\$1,250	
Replace Bridge	LS	1	\$50,000	\$50,000	
Seeding and Mulch	ACRE	0.1	\$8,000	\$590	
Erosion Control Blanket	SY	358	\$3	\$1,070	
Damage Repair	LS	1	\$1,467	\$1,470	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$2,934	\$2,930	4% of primary item cost
<b>Total</b>				<b>\$ 93,600</b>	
Contingency (30%)				\$ 28,080	
<b>Subtotal</b>				<b>\$ 121,700</b>	
Design, Permitting, and Administration (30%)				\$ 28,080	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 149,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Remeander	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 440	10% of damage repair and maintenance
End of life span maintenance	\$ 14,980	10% of original project cost
Future Capital Cost	\$ 363,600	
Future annual maintenance	\$ 20,930	
Future end of life span cost	\$ 27,060	
<b>Total Future Worth</b>	<b>\$ 411,600</b>	
<b>Annualized Cost</b>	<b>\$ 8,700</b>	

**Table H3: Preliminary Cost Estimate for Site 1, Alternative B**

**Stabilize erosion areas with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,584	\$1,580	10% of project cost
Control of Water	LS	1	\$546	\$550	4% of primary item cost
Erosion Control	LS	1	\$819	\$820	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$460	
Select Tree Removal (>4")	EACH	6	\$200	\$1,200	
Grading	SY	316	\$6	\$1,890	
Furnish and Install Fieldstone Riprap	TON	74	\$100	\$7,360	
Topsoil Import	CY	26	\$33	\$870	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.1	\$8,000	\$520	
Erosion Control Blanket	SY	284	\$3	\$850	
Damage Repair	LS	1	\$273	\$270	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$546	\$550	4% of primary item cost
<b>Total</b>				<b>\$ 17,420</b>	
Contingency (30%)				\$ 5,230	
<b>Subtotal</b>				<b>\$ 22,700</b>	
Design, Permitting, and Administration (30%)				\$ 5,230	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 27,900</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 210	25% of damage repair and maintenance
End of life span maintenance	\$ 13,950	50% of original project cost
Future Capital Cost	\$ 67,700	
Future annual maintenance	\$ 9,990	
Future end of life span cost	\$ 25,200	
<b>Total Future Worth</b>	<b>\$ 102,900</b>	
<b>Annualized Cost</b>	<b>\$ 2,200</b>	

**Table H4: Preliminary Cost Estimate for Site 1, Alternative C**

**Stabilize erosion areas with root wads, log vanes, and vegetation**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,462	\$1,460	10% of project cost
Control of Water	LS	1	\$504	\$500	4% of primary item cost
Erosion Control	LS	1	\$757	\$760	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$460	
Select Tree Removal (>4")	EACH	6	\$200	\$1,200	
Grading	SY	89	\$6	\$530	
Root Wads	EACH	3	\$750	\$2,250	
Log Vanes	EACH	4	\$1,200	\$4,800	
Plant Shrubs	EACH	40	\$50	\$2,000	
Seeding and Mulch	ACRE	0.1	\$8,000	\$520	
Erosion Control Blanket	SY	284	\$3	\$850	
Damage Repair	LS	1	\$252	\$250	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$504	\$500	4% of primary item cost
<b>Total</b>				<b>\$ 16,080</b>	
Contingency (30%)				\$ 4,820	
<b>Subtotal</b>				<b>\$ 20,900</b>	
Design, Permitting, and Administration (30%)				\$ 4,820	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 25,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 190	25% of damage repair and maintenance
End of life span maintenance	\$ 6,430	25% of original project cost
Future Capital Cost	\$ 62,400	
Future annual maintenance	\$ 9,040	
Future end of life span cost	\$ 11,610	
<b>Total Future Worth</b>	<b>\$ 83,100</b>	
<b>Annualized Cost</b>	<b>\$ 1,700</b>	

**Table H5: Preliminary Cost Estimate for Site 2, Alternative A**

**Remeander into historic channels**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$3,402	\$3,400	10% of project cost
Control of Water	LS	1	\$1,173	\$1,170	4% of primary item cost
Erosion Control	LS	1	\$1,760	\$1,760	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$670	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Excavate/Salvage Soil	CY	616	\$15	\$9,240	
Grading	SY	462	\$6	\$2,770	
Root Wads	EACH	4	\$750	\$3,000	
Rock Boulder Vane	EACH	3	\$2,000	\$6,000	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.1	\$8,000	\$760	
Erosion Control Blanket	SY	462	\$3	\$1,390	
Damage Repair	LS	1	\$587	\$590	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$1,173	\$1,170	4% of primary item cost
<b>Total</b>				<b>\$ 37,420</b>	
Contingency (30%)				\$ 11,230	
<b>Subtotal</b>				<b>\$ 48,700</b>	
Design, Permitting, and Administration (30%)				\$ 11,230	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 59,900</b>	

**30-yr and Annualized Cost analysis**

Category:	Remeander	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 180	10% of damage repair and maintenance
End of life span maintenance	\$ 5,990	10% of original project cost
Future Capital Cost	\$ 145,400	
Future annual maintenance	\$ 8,560	
Future end of life span cost	\$ 10,820	
<b>Total Future Worth</b>	<b>\$ 164,800</b>	
<b>Annualized Cost</b>	<b>\$ 3,500</b>	

**Table H6: Preliminary Cost Estimate for Site 2, Alternative B**

**Stabilize erosion areas with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,979	\$1,980	10% of project cost
Control of Water	LS	1	\$683	\$680	4% of primary item cost
Erosion Control	LS	1	\$1,024	\$1,020	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$530	
Select Tree Removal (>4")	EACH	16	\$200	\$3,200	
Grading	SY	364	\$6	\$2,190	
Furnish and Install Fieldstone Riprap	TON	85	\$100	\$8,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.1	\$8,000	\$600	
Erosion Control Blanket	SY	182	\$3	\$550	
Damage Repair	LS	1	\$341	\$340	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$683	\$680	4% of primary item cost
<b>Total</b>				<b>\$ 21,770</b>	
Contingency (30%)				\$ 6,530	
<b>Subtotal</b>				<b>\$ 28,300</b>	
Design, Permitting, and Administration (30%)				\$ 6,530	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 34,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 260	25% of damage repair and maintenance
End of life span maintenance	\$ 17,400	50% of original project cost
Future Capital Cost	\$ 84,500	
Future annual maintenance	\$ 12,370	
Future end of life span cost	\$ 31,430	
<b>Total Future Worth</b>	<b>\$ 128,300</b>	
<b>Annualized Cost</b>	<b>\$ 2,700</b>	

**Table H7: Preliminary Cost Estimate for Site 2, Alternative C**

**Stabilize erosion areas with root wads, log vanes, and vegetation**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$983	\$980	10% of project cost
Control of Water	LS	1	\$339	\$340	4% of primary item cost
Erosion Control	LS	1	\$508	\$510	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$530	
Select Tree Removal (>4")	EACH	8	\$200	\$1,600	
Grading	SY	44	\$6	\$270	
Root Wads	EACH	3	\$750	\$2,250	
Log Vanes	EACH	2	\$1,200	\$2,400	
Plant Shrubs	EACH	15	\$50	\$750	
Seeding and Mulch	ACRE	0.1	\$8,000	\$600	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$169	\$170	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$339	\$340	4% of primary item cost
<b>Total</b>				<b>\$ 10,810</b>	
Contingency (30%)				\$ 3,240	
<b>Subtotal</b>				<b>\$ 14,050</b>	
Design, Permitting, and Administration (30%)				\$ 3,240	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 17,300</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (year)	20	1 number of major maint. events
Expected annual maintenance	\$ 130	25% of damage repair and maintenance
End of life span maintenance	\$ 4,330	25% of original project cost
Future Capital Cost	\$ 42,000	
Future annual maintenance	\$ 6,180	
Future end of life span cost	\$ 7,820	
<b>Total Future Worth</b>	<b>\$ 56,000</b>	
<b>Annualized Cost</b>	<b>\$ 1,200</b>	



**Table H8: Preliminary Cost Estimate for Site 3, Alternative A**

**Narrow channel for approx. 800'**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$3,206	\$3,210	10% of project cost
Control of Water	LS	1	\$1,105	\$1,110	4% of primary item cost
Erosion Control	LS	1	\$1,658	\$1,660	6% of primary item cost
Clearing and Grubbing	ACRE	0.3	\$7,000	\$1,930	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Excavate/Salvage Soil	CY	667	\$15	\$10,000	
Grading	SY	667	\$6	\$4,000	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.3	\$8,000	\$2,200	
Erosion Control Blanket	SY	1333	\$3	\$4,000	
Damage Repair	LS	1	\$553	\$550	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$1,105	\$1,110	4% of primary item cost
<b>Total</b>				<b>\$ 35,270</b>	
Contingency (30%)				\$ 10,580	
<b>Subtotal</b>				<b>\$ 45,900</b>	
Design, Permitting, and Administration (30%)				\$ 10,580	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 56,400</b>	

**30-yr and Annualized Cost analysis**

Category:	General grading	
Estimated life span (year)	30	1 number of major maint. events
Expected annual maintenance	\$ 170	10% of damage repair and maintenance
End of life span maintenance	\$ 5,640	10% of original project cost
Future Capital Cost	\$ 136,900	
Future annual maintenance	\$ 8,090	
Future end of life span cost	\$ 10,190	
<b>Total Future Worth</b>	<b>\$ 155,200</b>	
<b>Annualized Cost</b>	<b>\$ 3,300</b>	

**Table H9: Preliminary Cost Estimate for Site 3, Alternative B**

**Install log vanes within reach**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$2,859	\$2,860	10% of project cost
Control of Water	LS	1	\$986	\$990	4% of primary item cost
Erosion Control	LS	1	\$1,478	\$1,480	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Log Vanes	EACH	14	\$1,200	\$16,800	
Grading	SY	111	\$6	\$670	
Plant Shrubs	EACH	50	\$50	\$2,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	111	\$3	\$330	
Damage Repair	LS	1	\$493	\$490	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$986	\$990	4% of primary item cost
			<b>Total</b>	<b>\$ 31,450</b>	
			Contingency (30%)	\$ 9,440	
			<b>Subtotal</b>	<b>\$ 40,900</b>	
			Design, Permitting, and Administration (30%)	\$ 9,440	
			<b>Total w/ Contingency &amp; Engineering</b>	<b>\$ 50,300</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 370	25% of damage repair and maintenance
End of life span maintenance	\$ 12,580	25% of original project cost
Future Capital Cost	\$ 122,100	
Future annual maintenance	\$ 17,600	
Future end of life span cost	\$ 22,720	
<b>Total Future Worth</b>	<b>\$ 162,400</b>	
<b>Annualized Cost</b>	<b>\$ 3,400</b>	

**Table H10: Preliminary Cost Estimate for Site 3, Alternative C**

**Upper bank vegetation**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,286	\$1,290	10% of project cost
Erosion Control	LS	1	\$689	\$690	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$960	
Topsoil Import	CY	73	\$33	\$2,420	
Plant Shrubs	EACH	100	\$50	\$5,000	
Seeding and Mulch	ACRE	0.1	\$8,000	\$1,100	
Erosion Control Blanket	SY	667	\$3	\$2,000	
Damage Repair	LS	1	\$230	\$230	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$459	\$460	4% of primary item cost
<b>Total</b>				<b>\$ 14,150</b>	
Contingency (30%)				\$ 4,250	
<b>Subtotal</b>				<b>\$ 18,400</b>	
Design, Permitting, and Administration (30%)				\$ 4,250	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 22,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Veg. only	
Estimated life span (years)	10	3 number of major maint. events
Expected annual maintenance	\$ 350	50% of damage repair and maintenance
End of life span maintenance	\$ 5,680	25% of original project cost
Future Capital Cost	\$ 55,100	
Future annual maintenance	\$ 16,650	
Future end of life span cost	\$ 31,680	
<b>Total Future Worth</b>	<b>\$ 103,400</b>	
<b>Annualized Cost</b>	<b>\$ 2,200</b>	

**Table H11: Preliminary Cost Estimate for Site 4, Alternative A**

**Establish vegetated buffer**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,349	\$1,350	10% of project cost
Erosion Control	LS	1	\$637	\$640	6% of primary item cost
Clearing and Grubbing	ACRE	0.2	\$7,000	\$1,290	
Topsoil Import	CY	49	\$33	\$1,610	
Plant Shrubs	EACH	125	\$50	\$6,250	
Seeding and Mulch	ACRE	0.2	\$8,000	\$1,470	
Temporary Fencing	LF	800	\$2	\$1,600	
Damage Repair	LS	1	\$212	\$210	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$425	\$420	4% of primary item cost
<b>Total</b>				<b>\$ 14,840</b>	
Contingency (30%)				\$ 4,450	
<b>Subtotal</b>				<b>\$ 19,300</b>	
Design, Permitting, and Administration (30%)				\$ 4,450	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 23,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Veg. only	
Estimated life span (years)	10	3 number of major maint. events
Expected annual maintenance	\$ 320	50% of damage repair and maintenance
End of life span maintenance	\$ 5,930	25% of original project cost
Future Capital Cost	\$ 57,500	
Future annual maintenance	\$ 15,220	
Future end of life span cost	\$ 33,070	
<b>Total Future Worth</b>	<b>\$ 105,800</b>	
<b>Annualized Cost</b>	<b>\$ 2,200</b>	

**Table H12: Preliminary Cost Estimate for Site 4, Alternative B**

**Realign disc golf course**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$4,592	\$4,590	10% of project cost
Erosion Control	LS	1	\$2,460	\$2,460	6% of primary item cost
Clearing and Grubbing	ACRE	0.7	\$7,000	\$4,820	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Move Pin	EACH	4	\$2,500	\$10,000	
Move Tee Box	EACH	4	\$500	\$2,000	
Remove Old Tee Box	EACH	4	\$500	\$2,000	
Topsoil Import	CY	111	\$33	\$3,670	
Plant Trees	EACH	20	\$250	\$5,000	
Plant Shrubs	EACH	80	\$50	\$4,000	
Seeding and Mulch	ACRE	0.7	\$8,000	\$5,510	
Damage Repair	LS	1	\$820	\$820	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$1,640	\$1,640	4% of primary item cost
<b>Total</b>				<b>\$ 50,510</b>	
Contingency (30%)				\$ 15,150	
<b>Subtotal</b>				<b>\$ 65,700</b>	
Design, Permitting, and Administration (30%)				\$ 15,150	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 80,800</b>	

**30-yr and Annualized Cost analysis**

Category:	General grading	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 250	10% of damage repair and maintenance
End of life span maintenance	\$ 8,080	10% of original project cost
Future Capital Cost	\$ 196,100	
Future annual maintenance	\$ 11,890	
Future end of life span cost	\$ 14,590	
<b>Total Future Worth</b>	<b>\$ 222,600</b>	
<b>Annualized Cost</b>	<b>\$ 4,700</b>	

**Table H13: Preliminary Cost Estimate for Site 5, Alternative A**

**Stabilize steep, eroding bank with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$844	\$840	10% of project cost
Control of Water	LS	1	\$291	\$290	4% of primary item cost
Erosion Control	LS	1	\$436	\$440	6% of primary item cost
Clearing and Grubbing	ACRE	0.01	\$7,000	\$80	
Select Tree Removal (>4")	EACH	6	\$200	\$1,200	
Grading	SY	56	\$6	\$330	
Furnish and Install Fieldstone Riprap	TON	26	\$100	\$2,590	
Topsoil Import	CY	9	\$33	\$310	
Plant Shrubs	EACH	50	\$50	\$2,500	
Seeding and Mulch	ACRE	0.01	\$8,000	\$90	
Erosion Control Blanket	SY	56	\$3	\$170	
Damage Repair	LS	1	\$145	\$150	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$291	\$290	4% of primary item cost
<b>Total</b>				<b>\$ 9,280</b>	
Contingency (30%)				\$ 2,780	
<b>Subtotal</b>				<b>\$ 12,100</b>	
Design, Permitting, and Administration (30%)				\$ 2,780	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 14,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 110	25% of damage repair and maintenance
End of life span maintenance	\$ 7,400	50% of original project cost
Future Capital Cost	\$ 35,900	
Future annual maintenance	\$ 5,230	
Future end of life span cost	\$ 13,370	
<b>Total Future Worth</b>	<b>\$ 54,500</b>	
<b>Annualized Cost</b>	<b>\$ 1,100</b>	

**Table H14: Preliminary Cost Estimate for Site 5, Alternative B**

**Vegetate steep, eroding bank with VRSS**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,862	\$1,860	10% of project cost
Control of Water	LS	1	\$677	\$680	4% of primary item cost
Erosion Control	LS	1	\$1,015	\$1,020	6% of primary item cost
Clearing and Grubbing	ACRE	0.01	\$7,000	\$80	
Select Tree Removal (>4")	EACH	6	\$200	\$1,200	
Grading	SY	56	\$6	\$330	
Furnish and Install Fieldstone Riprap	TON	26	\$100	\$2,590	
VRSS	SF	150	\$45	\$6,750	
Topsoil Import	CY	28	\$33	\$920	
Plant Shrubs	EACH	50	\$50	\$2,500	
Seeding and Mulch	ACRE	0.01	\$8,000	\$90	
Erosion Control Blanket	SY	56	\$3	\$170	
Damage Repair	LS	1	\$293	\$290	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$2,000	\$2,000	
<b>Total</b>				<b>\$ 20,480</b>	
Contingency (30%)				\$ 6,140	
<b>Subtotal</b>				<b>\$ 26,600</b>	
Design, Permitting, and Administration (30%)				\$ 6,140	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 32,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 570	25% of damage repair and maintenance
End of life span maintenance	\$ 8,200	25% of original project cost
Future Capital Cost	\$ 79,600	
Future annual maintenance	\$ 27,120	
Future end of life span cost	\$ 14,810	
<b>Total Future Worth</b>	<b>\$ 121,500</b>	
<b>Annualized Cost</b>	<b>\$ 2,600</b>	

**Table H15: Preliminary Cost Estimate for Site 6, Alternative A**

**Stabilize bridge abutments with riprap and log vanes**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$630	\$630	10% of project cost
Control of Water	LS	1	\$252	\$250	4% of primary item cost
Erosion Control	LS	1	\$378	\$380	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	4	\$200	\$800	
Grading	SY	44	\$6	\$270	
Furnish and Install Fieldstone Riprap	TON	21	\$100	\$2,070	
Log Vanes	EACH	2	\$1,200	\$2,400	
Topsoil Import	CY	4	\$33	\$120	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$126	\$130	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$252	\$250	4% of primary item cost
<b>Total</b>				<b>\$ 7,940</b>	
Contingency (30%)				\$ 2,380	
<b>Subtotal</b>				<b>\$ 10,300</b>	
Design, Permitting, and Administration (30%)				\$ 2,380	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 100	25% of damage repair and maintenance
End of life span maintenance	\$ 6,350	50% of original project cost
Future Capital Cost	\$ 30,800	
Future annual maintenance	\$ 4,760	
Future end of life span cost	\$ 11,470	
<b>Total Future Worth</b>	<b>\$ 47,000</b>	
<b>Annualized Cost</b>	<b>\$ 1,000</b>	



**Table H16: Preliminary Cost Estimate for Site 6, Alternative B**

**Stabilize bridge abutments with riprap only**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$599	\$600	10% of project cost
Control of Water	LS	1	\$240	\$240	4% of primary item cost
Erosion Control	LS	1	\$359	\$360	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	8	\$200	\$1,600	
Grading	SY	67	\$6	\$400	
Furnish and Install Fieldstone Riprap	TON	31	\$100	\$3,110	
Topsoil Import	CY	7	\$33	\$240	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$120	\$120	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$240	\$240	4% of primary item cost
<b>Total</b>				<b>\$ 7,550</b>	
Contingency (30%)				\$ 2,270	
<b>Subtotal</b>				<b>\$ 9,800</b>	
Design, Permitting, and Administration (30%)				\$ 2,270	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,100</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 90	25% of damage repair and maintenance
End of life span maintenance	\$ 6,050	50% of original project cost
Future Capital Cost	\$ 29,400	
Future annual maintenance	\$ 4,280	
Future end of life span cost	\$ 10,930	
<b>Total Future Worth</b>	<b>\$ 44,600</b>	
<b>Annualized Cost</b>	<b>\$ 900</b>	

**Table H17: Preliminary Cost Estimate for Site 7, Alternative A**

**Stabilize bridge abutments with riprap and log vanes**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$630	\$630	10% of project cost
Control of Water	LS	1	\$252	\$250	4% of primary item cost
Erosion Control	LS	1	\$378	\$380	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	4	\$200	\$800	
Grading	SY	44	\$6	\$270	
Furnish and Install Fieldstone Riprap	TON	21	\$100	\$2,070	
Log Vanes	EACH	2	\$1,200	\$2,400	
Topsoil Import	CY	4	\$33	\$120	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$126	\$130	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$252	\$250	4% of primary item cost
<b>Total</b>				<b>\$ 7,940</b>	
Contingency (30%)				\$ 2,380	
<b>Subtotal</b>				<b>\$ 10,300</b>	
Design, Permitting, and Administration (30%)				\$ 2,380	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 100	25% of damage repair and maintenance
End of life span maintenance	\$ 6,350	50% of original project cost
Future Capital Cost	\$ 30,800	
Future annual maintenance	\$ 4,760	
Future end of life span cost	\$ 11,470	
<b>Total Future Worth</b>	<b>\$ 47,000</b>	
<b>Annualized Cost</b>	<b>\$ 1,000</b>	

**Table H18: Preliminary Cost Estimate for Site 7, Alternative B**

**Stabilize bridge abutments with riprap only**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$599	\$600	10% of project cost
Control of Water	LS	1	\$240	\$240	4% of primary item cost
Erosion Control	LS	1	\$359	\$360	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	8	\$200	\$1,600	
Grading	SY	67	\$6	\$400	
Furnish and Install Fieldstone Riprap	TON	31	\$100	\$3,110	
Topsoil Import	CY	7	\$33	\$240	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$120	\$120	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$240	\$240	4% of primary item cost
<b>Total</b>				<b>\$ 7,550</b>	
<b>Contingency (30%)</b>				<b>\$ 2,270</b>	
<b>Subtotal</b>				<b>\$ 9,800</b>	
Design, Permitting, and Administration (30%)				\$ 2,270	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,100</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 90	25% of damage repair and maintenance
End of life span maintenance	\$ 6,050	50% of original project cost
Future Capital Cost	\$ 29,400	
Future annual maintenance	\$ 4,280	
Future end of life span cost	\$ 10,930	
<b>Total Future Worth</b>	<b>\$ 44,600</b>	
<b>Annualized Cost</b>	<b>\$ 900</b>	

**Table H19: Preliminary Cost Estimate for Site 8, Alternative A**

**Stabilize bridge abutments with riprap and log vanes**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$630	\$630	10% of project cost
Control of Water	LS	1	\$252	\$250	4% of primary item cost
Erosion Control	LS	1	\$378	\$380	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	4	\$200	\$800	
Grading	SY	44	\$6	\$270	
Furnish and Install Fieldstone Riprap	TON	21	\$100	\$2,070	
Log Vanes	EACH	2	\$1,200	\$2,400	
Topsoil Import	CY	4	\$33	\$120	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$126	\$130	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$252	\$250	4% of primary item cost
<b>Total</b>				<b>\$ 7,940</b>	
Contingency (30%)				\$ 2,380	
<b>Subtotal</b>				<b>\$ 10,300</b>	
Design, Permitting, and Administration (30%)				\$ 2,380	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 100	25% of damage repair and maintenance
End of life span maintenance	\$ 6,350	50% of original project cost
Future Capital Cost	\$ 30,800	
Future annual maintenance	\$ 4,760	
Future end of life span cost	\$ 11,470	
<b>Total Future Worth</b>	<b>\$ 47,000</b>	
<b>Annualized Cost</b>	<b>\$ 1,000</b>	

**Table H20: Preliminary Cost Estimate for Site 8, Alternative B**

**Stabilize bridge abutments with riprap only**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$599	\$600	10% of project cost
Control of Water	LS	1	\$240	\$240	4% of primary item cost
Erosion Control	LS	1	\$359	\$360	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	8	\$200	\$1,600	
Grading	SY	67	\$6	\$400	
Furnish and Install Fieldstone Riprap	TON	31	\$100	\$3,110	
Topsoil Import	CY	7	\$33	\$240	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$120	\$120	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$240	\$240	4% of primary item cost
<b>Total</b>				<b>\$ 7,550</b>	
Contingency (30%)				\$ 2,270	
<b>Subtotal</b>				<b>\$ 9,800</b>	
Design, Permitting, and Administration (30%)				\$ 2,270	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,100</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 90	25% of damage repair and maintenance
End of life span maintenance	\$ 6,050	50% of original project cost
Future Capital Cost	\$ 29,400	
Future annual maintenance	\$ 4,280	
Future end of life span cost	\$ 10,930	
<b>Total Future Worth</b>	<b>\$ 44,600</b>	
<b>Annualized Cost</b>	<b>\$ 900</b>	

**Table H21: Preliminary Cost Estimate for Site 9, Alternative A**

**Stabilize bridge abutments with riprap and log vanes**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$630	\$630	10% of project cost
Control of Water	LS	1	\$252	\$250	4% of primary item cost
Erosion Control	LS	1	\$378	\$380	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	4	\$200	\$800	
Grading	SY	44	\$6	\$270	
Furnish and Install Fieldstone Riprap	TON	21	\$100	\$2,070	
Log Vanes	EACH	2	\$1,200	\$2,400	
Topsoil Import	CY	4	\$33	\$120	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$126	\$130	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$252	\$250	4% of primary item cost
<b>Total</b>				<b>\$ 7,940</b>	
Contingency (30%)				\$ 2,380	
<b>Subtotal</b>				<b>\$ 10,300</b>	
Design, Permitting, and Administration (30%)				\$ 2,380	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 100	25% of damage repair and maintenance
End of life span maintenance	\$ 6,350	50% of original project cost
Future Capital Cost	\$ 30,800	
Future annual maintenance	\$ 4,760	
Future end of life span cost	\$ 11,470	
<b>Total Future Worth</b>	<b>\$ 47,000</b>	
<b>Annualized Cost</b>	<b>\$ 1,000</b>	

**Table H22: Preliminary Cost Estimate for Site 9, Alternative B**

**Stabilize bridge abutments with riprap only**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$599	\$600	10% of project cost
Control of Water	LS	1	\$240	\$240	4% of primary item cost
Erosion Control	LS	1	\$359	\$360	6% of primary item cost
Clearing and Grubbing	ACRE	0.005	\$7,000	\$30	
Select Tree Removal (>4")	EACH	8	\$200	\$1,600	
Grading	SY	67	\$6	\$400	
Furnish and Install Fieldstone Riprap	TON	31	\$100	\$3,110	
Topsoil Import	CY	7	\$33	\$240	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.005	\$8,000	\$40	
Erosion Control Blanket	SY	22	\$3	\$70	
Damage Repair	LS	1	\$120	\$120	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$240	\$240	4% of primary item cost
<b>Total</b>				<b>\$ 7,550</b>	
Contingency (30%)				\$ 2,270	
<b>Subtotal</b>				<b>\$ 9,800</b>	
Design, Permitting, and Administration (30%)				\$ 2,270	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,100</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 90	25% of damage repair and maintenance
End of life span maintenance	\$ 6,050	50% of original project cost
Future Capital Cost	\$ 29,400	
Future annual maintenance	\$ 4,280	
Future end of life span cost	\$ 10,930	
<b>Total Future Worth</b>	<b>\$ 44,600</b>	
<b>Annualized Cost</b>	<b>\$ 900</b>	

**Table H23: Preliminary Cost Estimate for Site 10, Alternative A**

**Raise stream bed in Fernbrook Lane North culvert**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$593	\$590	10% of project cost
Control of Water	LS	1	\$1,000	\$1,000	
Erosion Control	LS	1	\$274	\$270	6% of primary item cost
Raise Stream Bed in Culvert	TON	26	\$136	\$3,530	
Seeding and Mulch	ACRE	0.05	\$8,000	\$370	
Erosion Control Blanket	SY	222	\$3	\$670	
Damage Repair	LS	1	\$91	\$90	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$183	\$180	4% of primary item cost
<b>Total</b>				<b>\$ 6,700</b>	
Contingency (30%)				\$ 2,010	
<b>Subtotal</b>				<b>\$ 8,700</b>	
Design, Permitting, and Administration (30%)				\$ 2,010	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 10,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Culvert bed	
Estimated life span (years)	15	2 number of major maint. events
Expected annual maintenance	\$ 20	25% of damage repair and maintenance
End of life span maintenance	\$ 5,350	50% of original project cost
Future Capital Cost	\$ 26,000	
Future annual maintenance	\$ 950	
Future end of life span cost	\$ 21,320	
<b>Total Future Worth</b>	<b>\$ 48,300</b>	
<b>Annualized Cost</b>	<b>\$ 1,000</b>	



**Table H24: Preliminary Cost Estimate for Site 10, Alternative B**

**Create meanders in open area to add 70' of stream length**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$7,417	\$7,420	10% of project cost
Control of Water	LS	1	\$2,557	\$2,560	4% of primary item cost
Erosion Control	LS	1	\$3,836	\$3,840	6% of primary item cost
Clearing and Grubbing	ACRE	0.2	\$7,000	\$1,290	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Excavate/Salvage Soil	CY	1185	\$15	\$17,780	
Grading	SY	889	\$6	\$5,330	
Topsoil Import	CY	148	\$33	\$4,890	
Root Wads	EACH	15	\$750	\$11,250	
Rock Boulder Vane	EACH	3	\$2,000	\$6,000	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	200	\$50	\$10,000	
Seeding and Mulch	ACRE	0.2	\$8,000	\$1,470	
Erosion Control Blanket	SY	889	\$3	\$2,670	
Damage Repair	LS	1	\$1,279	\$1,280	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$2,557	\$2,560	4% of primary item cost
<b>Total</b>				<b>\$ 81,590</b>	
Contingency (30%)				\$ 24,480	
<b>Subtotal</b>				<b>\$ 106,100</b>	
Design, Permitting, and Administration (30%)				\$ 24,480	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 130,600</b>	

**30-yr and Annualized Cost analysis**

Category:	Remeander	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 380	10% of damage repair and maintenance
End of life span maintenance	\$ 13,060	10% of original project cost
Future Capital Cost	\$ 317,000	
Future annual maintenance	\$ 18,080	
Future end of life span cost	\$ 23,590	
<b>Total Future Worth</b>	<b>\$ 358,700</b>	
<b>Annualized Cost</b>	<b>\$ 7,500</b>	

**Table H25: Preliminary Cost Estimate for Site 10, Alternative C**

**Raise channel bed using cross vanes/constructed riffles**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,906	\$1,910	10% of project cost
Control of Water	LS	1	\$657	\$660	4% of primary item cost
Erosion Control	LS	1	\$985	\$990	6% of primary item cost
Rock Boulder Cross-Vane	EACH	4	\$4,000	\$16,000	
Seeding and Mulch	ACRE	0.02	\$8,000	\$150	
Erosion Control Blanket	SY	89	\$3	\$270	
Damage Repair	LS	1	\$328	\$330	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$657	\$660	4% of primary item cost
<b>Total</b>				<b>\$ 20,970</b>	
Contingency (30%)				\$ 6,290	
<b>Subtotal</b>				<b>\$ 27,300</b>	
Design, Permitting, and Administration (30%)				\$ 6,290	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 33,600</b>	

**30-yr and Annualized Cost analysis**

Category:	Rock vanes	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 250	25% of damage repair and maintenance
End of life span maintenance	\$ 16,800	50% of original project cost
Future Capital Cost	\$ 81,600	
Future annual maintenance	\$ 11,890	
Future end of life span cost	\$ 30,340	
<b>Total Future Worth</b>	<b>\$ 123,800</b>	
<b>Annualized Cost</b>	<b>\$ 2,600</b>	

**Table H26: Preliminary Cost Estimate for Site 10, Alternative D**

**Lower adjacent floodplain**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$3,203	\$3,200	10% of project cost
Control of Water	LS	1	\$1,105	\$1,100	4% of primary item cost
Erosion Control	LS	1	\$1,657	\$1,660	6% of primary item cost
Clearing and Grubbing	ACRE	0.2	\$7,000	\$1,290	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Excavation/Dispose of Soil	CY	296	\$30	\$8,890	
Grading	SY	889	\$6	\$5,330	
Excavate/Salvage Soil	CY	148	\$15	\$2,220	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	50	\$50	\$2,500	
Seeding and Mulch	ACRE	0.2	\$8,000	\$1,470	
Erosion Control Blanket	SY	889	\$3	\$2,670	
Damage Repair	LS	1	\$552	\$550	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$1,105	\$1,100	4% of primary item cost
<b>Total</b>				<b>\$ 35,230</b>	
Contingency (30%)				\$ 10,570	
<b>Subtotal</b>				<b>\$ 45,800</b>	
Design, Permitting, and Administration (30%)				\$ 10,570	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 56,400</b>	

**30-yr and Annualized Cost analysis**

Category:	General grading	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 170	10% of damage repair and maintenance
End of life span maintenance	\$ 5,640	10% of original project cost
Future Capital Cost	\$ 136,900	
Future annual maintenance	\$ 8,090	
Future end of life span cost	\$ 10,190	
<b>Total Future Worth</b>	<b>\$ 155,200</b>	
<b>Annualized Cost</b>	<b>\$ 3,300</b>	

**Table H27: Preliminary Cost Estimate for Site 11, Alternative A**

**Stabilize eroding banks with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,025	\$1,030	10% of project cost
Control of Water	LS	1	\$354	\$350	4% of primary item cost
Erosion Control	LS	1	\$530	\$530	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$140	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	100	\$6	\$600	
Furnish and Install Fieldstone Riprap	TON	23	\$100	\$2,330	
Topsoil Import	CY	17	\$33	\$550	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$170	
Erosion Control Blanket	SY	100	\$3	\$300	
Damage Repair	LS	1	\$177	\$180	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$354	\$350	4% of primary item cost
<b>Total</b>				<b>\$ 11,280</b>	
Contingency (30%)				\$ 3,380	
<b>Subtotal</b>				<b>\$ 14,700</b>	
Design, Permitting, and Administration (30%)				\$ 3,380	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 18,000</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 130	25% of damage repair and maintenance
End of life span maintenance	\$ 9,000	50% of original project cost
Future Capital Cost	\$ 43,700	
Future annual maintenance	\$ 6,180	
Future end of life span cost	\$ 16,260	
<b>Total Future Worth</b>	<b>\$ 66,100</b>	
<b>Annualized Cost</b>	<b>\$ 1,400</b>	

**Table H28: Preliminary Cost Estimate for Site 11, Alternative B**

**Stabilize banks with root wads**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,068	\$1,070	10% of project cost
Control of Water	LS	1	\$368	\$370	4% of primary item cost
Erosion Control	LS	1	\$553	\$550	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$140	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	50	\$6	\$300	
Root Wads	EACH	4	\$750	\$3,000	
Topsoil Import	CY	17	\$33	\$550	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$170	
Erosion Control Blanket	SY	100	\$3	\$300	
Damage Repair	LS	1	\$184	\$180	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$368	\$370	4% of primary item cost
<b>Total</b>				<b>\$ 11,750</b>	
Contingency (30%)				\$ 3,530	
<b>Subtotal</b>				<b>\$ 15,300</b>	
Design, Permitting, and Administration (30%)				\$ 3,530	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 18,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 140	25% of damage repair and maintenance
End of life span maintenance	\$ 4,700	25% of original project cost
Future Capital Cost	\$ 45,600	
Future annual maintenance	\$ 6,660	
Future end of life span cost	\$ 8,490	
<b>Total Future Worth</b>	<b>\$ 60,800</b>	
<b>Annualized Cost</b>	<b>\$ 1,300</b>	

**Table H29: Preliminary Cost Estimate for Site 12, Alternative A**

**Stabilize eroding banks with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,025	\$1,030	10% of project cost
Control of Water	LS	1	\$354	\$350	4% of primary item cost
Erosion Control	LS	1	\$530	\$530	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$140	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	100	\$6	\$600	
Furnish and Install Fieldstone Riprap	TON	23	\$100	\$2,330	
Topsoil Import	CY	17	\$33	\$550	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$170	
Erosion Control Blanket	SY	100	\$3	\$300	
Damage Repair	LS	1	\$177	\$180	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$354	\$350	4% of primary item cost
<b>Total</b>				<b>\$ 11,280</b>	
Contingency (30%)				\$ 3,380	
<b>Subtotal</b>				<b>\$ 14,700</b>	
Design, Permitting, and Administration (30%)				\$ 3,380	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 18,000</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 130	25% of damage repair and maintenance
End of life span maintenance	\$ 9,000	50% of original project cost
Future Capital Cost	\$ 43,700	
Future annual maintenance	\$ 6,180	
Future end of life span cost	\$ 16,260	
<b>Total Future Worth</b>	<b>\$ 66,100</b>	
<b>Annualized Cost</b>	<b>\$ 1,400</b>	

**Table H30: Preliminary Cost Estimate for Site 12, Alternative B**

**Stabilize banks with root wads**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,068	\$1,070	10% of project cost
Control of Water	LS	1	\$368	\$370	4% of primary item cost
Erosion Control	LS	1	\$553	\$550	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$140	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	50	\$6	\$300	
Root Wads	EACH	4	\$750	\$3,000	
Topsoil Import	CY	17	\$33	\$550	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$170	
Erosion Control Blanket	SY	100	\$3	\$300	
Damage Repair	LS	1	\$184	\$180	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$368	\$370	4% of primary item cost
<b>Total</b>				<b>\$ 11,750</b>	
Contingency (30%)				\$ 3,530	
<b>Subtotal</b>				<b>\$ 15,300</b>	
Design, Permitting, and Administration (30%)				\$ 3,530	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 18,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 140	25% of damage repair and maintenance
End of life span maintenance	\$ 4,700	25% of original project cost
Future Capital Cost	\$ 45,600	
Future annual maintenance	\$ 6,660	
Future end of life span cost	\$ 8,490	
<b>Total Future Worth</b>	<b>\$ 60,800</b>	
<b>Annualized Cost</b>	<b>\$ 1,300</b>	

**Table H31: Preliminary Cost Estimate for Site 13, Alternative A**

**Stabilize eroding banks with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,025	\$1,030	10% of project cost
Control of Water	LS	1	\$354	\$350	4% of primary item cost
Erosion Control	LS	1	\$530	\$530	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$140	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	100	\$6	\$600	
Furnish and Install Fieldstone Riprap	TON	23	\$100	\$2,330	
Topsoil Import	CY	17	\$33	\$550	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$170	
Erosion Control Blanket	SY	100	\$3	\$300	
Damage Repair	LS	1	\$177	\$180	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$354	\$350	4% of primary item cost
<b>Total</b>				<b>\$ 11,280</b>	
Contingency (30%)				\$ 3,380	
<b>Subtotal</b>				<b>\$ 14,700</b>	
Design, Permitting, and Administration (30%)				\$ 3,380	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 18,000</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 130	25% of damage repair and maintenance
End of life span maintenance	\$ 9,000	50% of original project cost
Future Capital Cost	\$ 43,700	
Future annual maintenance	\$ 6,180	
Future end of life span cost	\$ 16,260	
<b>Total Future Worth</b>	<b>\$ 66,100</b>	
<b>Annualized Cost</b>	<b>\$ 1,400</b>	



**Table H32: Preliminary Cost Estimate for Site 13, Alternative B**

**Stabilize banks with root wads**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,068	\$1,070	10% of project cost
Control of Water	LS	1	\$368	\$370	4% of primary item cost
Erosion Control	LS	1	\$553	\$550	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$140	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	50	\$6	\$300	
Root Wads	EACH	4	\$750	\$3,000	
Topsoil Import	CY	17	\$33	\$550	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$170	
Erosion Control Blanket	SY	100	\$3	\$300	
Damage Repair	LS	1	\$184	\$180	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$368	\$370	4% of primary item cost
<b>Total</b>				<b>\$ 11,750</b>	
Contingency (30%)				\$ 3,530	
<b>Subtotal</b>				<b>\$ 15,300</b>	
Design, Permitting, and Administration (30%)				\$ 3,530	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 18,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 140	25% of damage repair and maintenance
End of life span maintenance	\$ 4,700	25% of original project cost
Future Capital Cost	\$ 45,600	
Future annual maintenance	\$ 6,660	
Future end of life span cost	\$ 8,490	
<b>Total Future Worth</b>	<b>\$ 60,800</b>	
<b>Annualized Cost</b>	<b>\$ 1,300</b>	

**Table H33: Preliminary Cost Estimate for Site 14, Alternative A**

**Stabilize culvert outfall with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$610	\$610	10% of project cost
Control of Water	LS	1	\$210	\$210	4% of primary item cost
Erosion Control	LS	1	\$315	\$320	6% of primary item cost
Clearing and Grubbing	ACRE	0.01	\$7,000	\$100	
Select Tree Removal (>4")	EACH	4	\$200	\$800	
Grading	SY	67	\$6	\$400	
Furnish and Install Fieldstone Riprap	TON	31	\$100	\$3,110	
Topsoil Import	CY	6	\$33	\$180	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.01	\$8,000	\$60	
Erosion Control Blanket	SY	33	\$3	\$100	
Damage Repair	LS	1	\$105	\$110	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$210	\$210	4% of primary item cost
<b>Total</b>				<b>\$ 6,710</b>	
Contingency (30%)				\$ 2,010	
<b>Subtotal</b>				<b>\$ 8,700</b>	
Design, Permitting, and Administration (30%)				\$ 2,010	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 10,700</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 80	25% of damage repair and maintenance
End of life span maintenance	\$ 5,350	50% of original project cost
Future Capital Cost	\$ 26,000	
Future annual maintenance	\$ 3,810	
Future end of life span cost	\$ 9,660	
<b>Total Future Worth</b>	<b>\$ 39,500</b>	
<b>Annualized Cost</b>	<b>\$ 800</b>	

**Table H34: Preliminary Cost Estimate for Site 14, Alternative B**

**Stabilize culvert outfall with concrete swale**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$773	\$770	10% of project cost
Control of Water	LS	1	\$266	\$270	4% of primary item cost
Erosion Control	LS	1	\$400	\$400	6% of primary item cost
Clearing and Grubbing	ACRE	0.01	\$7,000	\$100	
Select Tree Removal (>4")	EACH	4	\$200	\$800	
Grading	SY	67	\$6	\$400	
Install Concrete Swale	CY	50	\$80	\$4,000	
Furnish and Install Fieldstone Riprap	TON	5	\$100	\$520	
Topsoil Import	CY	6	\$33	\$180	
Plant Shrubs	EACH	10	\$50	\$500	
Seeding and Mulch	ACRE	0.01	\$8,000	\$60	
Erosion Control Blanket	SY	33	\$3	\$100	
Damage Repair	LS	1	\$133	\$130	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$266	\$270	4% of primary item cost
<b>Total</b>				<b>\$ 7,730</b>	
Contingency (30%)				\$ 2,320	
<b>Subtotal</b>				<b>\$ 10,100</b>	
Design, Permitting, and Administration (30%)				\$ 2,320	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 12,400</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 100	25% of damage repair and maintenance
End of life span maintenance	\$ 6,200	50% of original project cost
Future Capital Cost	\$ 30,100	
Future annual maintenance	\$ 4,760	
Future end of life span cost	\$ 11,200	
<b>Total Future Worth</b>	<b>\$ 46,100</b>	
<b>Annualized Cost</b>	<b>\$ 1,000</b>	

**Table H35: Preliminary Cost Estimate for Site 15, Alternative A**

**Install bank stabilization measures at eroding banks using hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,906	\$1,910	10% of project cost
Control of Water	LS	1	\$657	\$660	4% of primary item cost
Erosion Control	LS	1	\$985	\$990	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Grading	SY	111	\$6	\$670	
Furnish and Install Fieldstone Riprap	TON	65	\$100	\$6,480	
Topsoil Import	CY	19	\$33	\$610	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	108	\$3	\$320	
Damage Repair	LS	1	\$328	\$330	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$657	\$660	4% of primary item cost
<b>Total</b>				<b>\$ 20,970</b>	
Contingency (30%)				\$ 6,290	
<b>Subtotal</b>				<b>\$ 27,300</b>	
Design, Permitting, and Administration (30%)				\$ 6,290	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 33,600</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 250	25% of damage repair and maintenance
End of life span maintenance	\$ 16,800	50% of original project cost
Future Capital Cost	\$ 81,600	
Future annual maintenance	\$ 11,890	
Future end of life span cost	\$ 30,340	
<b>Total Future Worth</b>	<b>\$ 123,800</b>	
<b>Annualized Cost</b>	<b>\$ 2,600</b>	

**Table H36: Preliminary Cost Estimate for Site 15, Alternative B**

**Install 4 rock vanes for bank protection**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$2,092	\$2,090	10% of project cost
Control of Water	LS	1	\$584	\$580	4% of primary item cost
Erosion Control	LS	1	\$875	\$880	6% of primary item cost
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Rock Boulder Vane	EACH	4	\$2,000	\$8,000	
Seeding and Mulch	ACRE	0.1	\$8,000	\$920	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Erosion Control Blanket	SY	556	\$3	\$1,670	
Damage Repair	LS	1	\$292	\$290	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$584	\$580	4% of primary item cost
<b>Total</b>				<b>\$ 23,010</b>	
Contingency (30%)				\$ 6,900	
<b>Subtotal</b>				<b>\$ 29,900</b>	
Design, Permitting, and Administration (30%)				\$ 6,900	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 36,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Rock vanes	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 220	25% of damage repair and maintenance
End of life span maintenance	\$ 18,400	50% of original project cost
Future Capital Cost	\$ 89,300	
Future annual maintenance	\$ 10,470	
Future end of life span cost	\$ 33,230	
<b>Total Future Worth</b>	<b>\$ 133,000</b>	
<b>Annualized Cost</b>	<b>\$ 2,800</b>	

**Table H37: Preliminary Cost Estimate for Site 15, Alternative C**

**Install bank stabilization measures at eroding banks using toe wood**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$4,431	\$4,430	10% of project cost
Control of Water	LS	1	\$1,528	\$1,530	4% of primary item cost
Erosion Control	LS	1	\$2,292	\$2,290	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	30	\$200	\$6,000	
Grading	SY	111	\$6	\$670	
Furnish and Install Toe Wood	LF	100	\$250	\$25,000	
Topsoil Import	CY	19	\$33	\$610	
Plant Trees	EACH	15	\$250	\$3,750	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	111	\$3	\$330	
Damage Repair	LS	1	\$764	\$760	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$1,528	\$1,530	4% of primary item cost
<b>Total</b>				<b>\$ 48,740</b>	
Contingency (30%)				\$ 14,620	
<b>Subtotal</b>				<b>\$ 63,400</b>	
Design, Permitting, and Administration (30%)				\$ 14,620	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 78,000</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 570	25% of damage repair and maintenance
End of life span maintenance	\$ 19,500	25% of original project cost
Future Capital Cost	\$ 189,300	
Future annual maintenance	\$ 27,120	
Future end of life span cost	\$ 35,220	
<b>Total Future Worth</b>	<b>\$ 251,600</b>	
<b>Annualized Cost</b>	<b>\$ 5,300</b>	

**Table H38: Preliminary Cost Estimate for Site 16, Alternative A**

**Install bank stabilization measures at eroding banks using hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,906	\$1,910	10% of project cost
Control of Water	LS	1	\$657	\$660	4% of primary item cost
Erosion Control	LS	1	\$985	\$990	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Grading	SY	111	\$6	\$670	
Furnish and Install Fieldstone Riprap	TON	65	\$100	\$6,480	
Topsoil Import	CY	19	\$33	\$610	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	108	\$3	\$320	
Damage Repair	LS	1	\$328	\$330	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$657	\$660	4% of primary item cost
<b>Total</b>				<b>\$ 20,970</b>	
Contingency (30%)				\$ 6,290	
<b>Subtotal</b>				<b>\$ 27,300</b>	
Design, Permitting, and Administration (30%)				\$ 6,290	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 33,600</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 250	25% of damage repair and maintenance
End of life span maintenance	\$ 16,800	50% of original project cost
Future Capital Cost	\$ 81,600	
Future annual maintenance	\$ 11,890	
Future end of life span cost	\$ 30,340	
<b>Total Future Worth</b>	<b>\$ 123,800</b>	
<b>Annualized Cost</b>	<b>\$ 2,600</b>	

**Table H39: Preliminary Cost Estimate for Site 16, Alternative B**

**Install 4 rock vanes for bank protection**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$2,092	\$2,090	10% of project cost
Control of Water	LS	1	\$584	\$580	4% of primary item cost
Erosion Control	LS	1	\$875	\$880	6% of primary item cost
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Rock Boulder Vane	EACH	4	\$2,000	\$8,000	
Seeding and Mulch	ACRE	0.1	\$8,000	\$920	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Erosion Control Blanket	SY	556	\$3	\$1,670	
Damage Repair	LS	1	\$292	\$290	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$584	\$580	4% of primary item cost
<b>Total</b>				<b>\$ 23,010</b>	
Contingency (30%)				\$ 6,900	
<b>Subtotal</b>				<b>\$ 29,900</b>	
Design, Permitting, and Administration (30%)				\$ 6,900	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 36,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Rock vanes	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 220	25% of damage repair and maintenance
End of life span maintenance	\$ 18,400	50% of original project cost
Future Capital Cost	\$ 89,300	
Future annual maintenance	\$ 10,470	
Future end of life span cost	\$ 33,230	
<b>Total Future Worth</b>	<b>\$ 133,000</b>	
<b>Annualized Cost</b>	<b>\$ 2,800</b>	



**Table H40: Preliminary Cost Estimate for Site 16, Alternative C**

**Install bank stabilization measures at eroding banks using toe wood**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$4,431	\$4,430	10% of project cost
Control of Water	LS	1	\$1,528	\$1,530	4% of primary item cost
Erosion Control	LS	1	\$2,292	\$2,290	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	30	\$200	\$6,000	
Grading	SY	111	\$6	\$670	
Furnish and Install Toe Wood	LF	100	\$250	\$25,000	
Topsoil Import	CY	19	\$33	\$610	
Plant Trees	EACH	15	\$250	\$3,750	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	111	\$3	\$330	
Damage Repair	LS	1	\$764	\$760	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$1,528	\$1,530	4% of primary item cost
<b>Total</b>				<b>\$ 48,740</b>	
Contingency (30%)				\$ 14,620	
<b>Subtotal</b>				<b>\$ 63,400</b>	
Design, Permitting, and Administration (30%)				\$ 14,620	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 78,000</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 570	25% of damage repair and maintenance
End of life span maintenance	\$ 19,500	25% of original project cost
Future Capital Cost	\$ 189,300	
Future annual maintenance	\$ 27,120	
Future end of life span cost	\$ 35,220	
<b>Total Future Worth</b>	<b>\$ 251,600</b>	
<b>Annualized Cost</b>	<b>\$ 5,300</b>	

**Table H41: Preliminary Cost Estimate for Site 17, Alternative A**

**Install bank stabilization measures at eroding banks using hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,906	\$1,910	10% of project cost
Control of Water	LS	1	\$657	\$660	4% of primary item cost
Erosion Control	LS	1	\$985	\$990	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Grading	SY	111	\$6	\$670	
Furnish and Install Fieldstone Riprap	TON	65	\$100	\$6,480	
Topsoil Import	CY	19	\$33	\$610	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	108	\$3	\$320	
Damage Repair	LS	1	\$328	\$330	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$657	\$660	4% of primary item cost
<b>Total</b>				<b>\$ 20,970</b>	
Contingency (30%)				\$ 6,290	
<b>Subtotal</b>				<b>\$ 27,300</b>	
Design, Permitting, and Administration (30%)				\$ 6,290	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 33,600</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 250	25% of damage repair and maintenance
End of life span maintenance	\$ 16,800	50% of original project cost
Future Capital Cost	\$ 81,600	
Future annual maintenance	\$ 11,890	
Future end of life span cost	\$ 30,340	
<b>Total Future Worth</b>	<b>\$ 123,800</b>	
<b>Annualized Cost</b>	<b>\$ 2,600</b>	

**Table H42: Preliminary Cost Estimate for Site 17, Alternative B**

**Install 4 rock vanes for bank protection**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$2,092	\$2,090	10% of project cost
Control of Water	LS	1	\$584	\$580	4% of primary item cost
Erosion Control	LS	1	\$875	\$880	6% of primary item cost
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Rock Boulder Vane	EACH	4	\$2,000	\$8,000	
Seeding and Mulch	ACRE	0.1	\$8,000	\$920	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Erosion Control Blanket	SY	556	\$3	\$1,670	
Damage Repair	LS	1	\$292	\$290	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$584	\$580	4% of primary item cost
<b>Total</b>				<b>\$ 23,010</b>	
Contingency (30%)				\$ 6,900	
<b>Subtotal</b>				<b>\$ 29,900</b>	
Design, Permitting, and Administration (30%)				\$ 6,900	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 36,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Rock vanes	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 220	25% of damage repair and maintenance
End of life span maintenance	\$ 18,400	50% of original project cost
Future Capital Cost	\$ 89,300	
Future annual maintenance	\$ 10,470	
Future end of life span cost	\$ 33,230	
<b>Total Future Worth</b>	<b>\$ 133,000</b>	
<b>Annualized Cost</b>	<b>\$ 2,800</b>	

**Table H43: Preliminary Cost Estimate for Site 17, Alternative C**

**Install bank stabilization measures at eroding banks using toe wood**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$4,431	\$4,430	10% of project cost
Control of Water	LS	1	\$1,528	\$1,530	4% of primary item cost
Erosion Control	LS	1	\$2,292	\$2,290	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	30	\$200	\$6,000	
Grading	SY	111	\$6	\$670	
Furnish and Install Toe Wood	LF	100	\$250	\$25,000	
Topsoil Import	CY	19	\$33	\$610	
Plant Trees	EACH	15	\$250	\$3,750	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	111	\$3	\$330	
Damage Repair	LS	1	\$764	\$760	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$1,528	\$1,530	4% of primary item cost
<b>Total</b>				<b>\$ 48,740</b>	
Contingency (30%)				\$ 14,620	
<b>Subtotal</b>				<b>\$ 63,400</b>	
Design, Permitting, and Administration (30%)				\$ 14,620	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 78,000</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 570	25% of damage repair and maintenance
End of life span maintenance	\$ 19,500	25% of original project cost
Future Capital Cost	\$ 189,300	
Future annual maintenance	\$ 27,120	
Future end of life span cost	\$ 35,220	
<b>Total Future Worth</b>	<b>\$ 251,600</b>	
<b>Annualized Cost</b>	<b>\$ 5,300</b>	

**Table H44: Preliminary Cost Estimate for Site 18, Alternative A**

**Remove large woody debris**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$334	\$330	10% of project cost
Select Tree Removal (>4")	EACH	8	\$200	\$1,600	
Seeding and Mulch	ACRE	0.1	\$8,000	\$550	
Erosion Control Blanket	SY	333	\$3	\$1,000	
Damage Repair	LS	1	\$63	\$60	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$126	\$130	4% of primary item cost
<b>Total</b>				<b>\$ 3,670</b>	
Contingency (30%)				\$ 1,100	
<b>Subtotal</b>				<b>\$ 4,800</b>	
Design, Permitting, and Administration (30%)				\$ 1,100	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 5,900</b>	

**30-yr and Annualized Cost analysis**

Category:	Debris Removal	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ -	0% of damage repair and maintenance
End of life span maintenance	\$ 1,480	25% of original project cost
Future Capital Cost	\$ 14,300	
Future annual maintenance	\$ -	
Future end of life span cost	\$ 2,670	
<b>Total Future Worth</b>	<b>\$ 17,000</b>	
<b>Annualized Cost</b>	<b>\$ 400</b>	

**Table H45: Preliminary Cost Estimate for Site 19, Alternative A**

**Remove large woody debris**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$334	\$330	10% of project cost
Select Tree Removal (>4")	EACH	8	\$200	\$1,600	
Seeding and Mulch	ACRE	0.1	\$8,000	\$550	
Erosion Control Blanket	SY	333	\$3	\$1,000	
Damage Repair	LS	1	\$63	\$60	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$126	\$130	4% of primary item cost
<b>Total</b>				<b>\$ 3,670</b>	
Contingency (30%)				\$ 1,100	
<b>Subtotal</b>				<b>\$ 4,800</b>	
Design, Permitting, and Administration (30%)				\$ 1,100	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 5,900</b>	

**30-yr and Annualized Cost analysis**

Category:	Debris Removal	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ -	0% of damage repair and maintenance
End of life span maintenance	\$ 1,480	25% of original project cost
Future Capital Cost	\$ 14,300	
Future annual maintenance	\$ -	
Future end of life span cost	\$ 2,670	
<b>Total Future Worth</b>	<b>\$ 17,000</b>	
<b>Annualized Cost</b>	<b>\$ 400</b>	

**Table H46: Preliminary Cost Estimate for Site 20, Alternative A**

**Stabilize with hard armor**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$2,716	\$2,720	10% of project cost
Control of Water	LS	1	\$936	\$940	4% of primary item cost
Erosion Control	LS	1	\$1,405	\$1,400	6% of primary item cost
Clearing and Grubbing	ACRE	0.05	\$7,000	\$320	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	222	\$6	\$1,330	
Furnish and Install Fieldstone Riprap	TON	162	\$100	\$16,200	
Topsoil Import	CY	19	\$33	\$610	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	20	\$50	\$1,000	
Seeding and Mulch	ACRE	0.05	\$8,000	\$370	
Erosion Control Blanket	SY	111	\$3	\$330	
Damage Repair	LS	1	\$468	\$470	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$936	\$940	4% of primary item cost
<b>Total</b>				<b>\$ 29,880</b>	
Contingency (30%)				\$ 8,960	
<b>Subtotal</b>				<b>\$ 38,800</b>	
Design, Permitting, and Administration (30%)				\$ 8,960	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 47,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Hard armor	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 350	25% of damage repair and maintenance
End of life span maintenance	\$ 23,900	50% of original project cost
Future Capital Cost	\$ 116,000	
Future annual maintenance	\$ 16,650	
Future end of life span cost	\$ 43,170	
<b>Total Future Worth</b>	<b>\$ 175,800</b>	
<b>Annualized Cost</b>	<b>\$ 3,700</b>	

**Table H47: Preliminary Cost Estimate for Site 20, Alternative B**

**Stabilize with toe wood and grading to broaden meander**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$6,246	\$6,250	10% of project cost
Control of Water	LS	1	\$2,154	\$2,150	4% of primary item cost
Erosion Control	LS	1	\$3,231	\$3,230	6% of primary item cost
Clearing and Grubbing	ACRE	0.05	\$7,000	\$320	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Excavate/Salvage Soil	CY	296	\$15	\$4,440	
Grading	SY	222	\$6	\$1,330	
Topsoil Import	CY	37	\$33	\$1,220	
Furnish and Install Toe Wood	LF	150	\$250	\$37,500	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.0	\$8,000	\$370	
Erosion Control Blanket	SY	222	\$3	\$670	
Damage Repair	LS	1	\$1,077	\$1,080	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$2,154	\$2,150	4% of primary item cost
<b>Total</b>				<b>\$ 68,710</b>	
Contingency (30%)				\$ 20,610	
<b>Subtotal</b>				<b>\$ 89,300</b>	
Design, Permitting, and Administration (30%)				\$ 20,610	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 109,900</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 810	25% of damage repair and maintenance
End of life span maintenance	\$ 27,480	25% of original project cost
Future Capital Cost	\$ 266,800	
Future annual maintenance	\$ 38,540	
Future end of life span cost	\$ 49,630	
<b>Total Future Worth</b>	<b>\$ 355,000</b>	
<b>Annualized Cost</b>	<b>\$ 7,500</b>	



**Table H48: Preliminary Cost Estimate for Site 20, Alternative C**

**Controlled overflow, install grade control structure downstream**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$2,840	\$2,840	10% of project cost
Control of Water	LS	1	\$979	\$980	4% of primary item cost
Erosion Control	LS	1	\$1,469	\$1,470	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$160	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Grading	SY	333	\$6	\$2,000	
Furnish and Install Fieldstone Riprap	TON	156	\$100	\$15,560	
Plant Trees	EACH	5	\$250	\$1,250	
Plant Shrubs	EACH	20	\$50	\$1,000	
Rock Boulder Vane	EACH	1	\$2,000	\$2,000	
Seeding and Mulch	ACRE	0.02	\$8,000	\$180	
Erosion Control Blanket	SY	111	\$3	\$330	
Damage Repair	LS	1	\$490	\$490	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$979	\$980	4% of primary item cost
<b>Total</b>				<b>\$ 31,240</b>	
Contingency (30%)				\$ 9,370	
<b>Subtotal</b>				<b>\$ 40,600</b>	
Design, Permitting, and Administration (30%)				\$ 9,370	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 50,000</b>	

**30-yr and Annualized Cost analysis**

Category:	Rock vanes	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 370	25% of damage repair and maintenance
End of life span maintenance	\$ 25,000	50% of original project cost
Future Capital Cost	\$ 121,400	
Future annual maintenance	\$ 17,600	
Future end of life span cost	\$ 45,150	
<b>Total Future Worth</b>	<b>\$ 184,200</b>	
<b>Annualized Cost</b>	<b>\$ 3,900</b>	

**Table H49: Preliminary Cost Estimate for Site 20, Alternative D**

**Realign channel and stabilize meanders with vanes and toe wood**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$8,398	\$8,400	10% of project cost
Control of Water	LS	1	\$2,896	\$2,900	4% of primary item cost
Erosion Control	LS	1	\$4,343	\$4,340	6% of primary item cost
Clearing and Grubbing	ACRE	0.1	\$7,000	\$710	
Select Tree Removal (>4")	EACH	30	\$200	\$6,000	
Excavate/Salvage Soil	CY	652	\$15	\$9,780	
Grading	SY	489	\$6	\$2,930	
Topsoil Import	CY	81	\$33	\$2,690	
Furnish and Install Toe Wood	LF	150	\$250	\$37,500	
Rock Boulder Vane	EACH	2	\$2,000	\$4,000	
Plant Trees	EACH	20	\$250	\$5,000	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.1	\$8,000	\$810	
Erosion Control Blanket	SY	489	\$3	\$1,470	
Damage Repair	LS	1	\$1,448	\$1,450	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$2,896	\$2,900	4% of primary item cost
<b>Total</b>				<b>\$ 92,380</b>	
Contingency (30%)				\$ 27,710	
<b>Subtotal</b>				<b>\$ 120,100</b>	
Design, Permitting, and Administration (30%)				\$ 27,710	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 147,800</b>	

**30-yr and Annualized Cost analysis**

Category:	Remeander	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 440	10% of damage repair and maintenance
End of life span maintenance	\$ 14,780	10% of original project cost
Future Capital Cost	\$ 358,700	
Future annual maintenance	\$ 20,930	
Future end of life span cost	\$ 26,690	
<b>Total Future Worth</b>	<b>\$ 406,300</b>	
<b>Annualized Cost</b>	<b>\$ 8,500</b>	

**Table H50: Preliminary Cost Estimate for Site 21, Alternative A**

**Narrow channel for approx. 80'**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,514	\$1,510	10% of project cost
Control of Water	LS	1	\$522	\$520	4% of primary item cost
Erosion Control	LS	1	\$784	\$780	6% of primary item cost
Clearing and Grubbing	ACRE	0.04	\$7,000	\$260	
Select Tree Removal (>4")	EACH	20	\$200	\$4,000	
Common Fill Import	CY	119	\$25	\$2,960	
Grading	SY	89	\$6	\$530	
Topsoil Import	CY	15	\$33	\$490	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.04	\$8,000	\$290	
Erosion Control Blanket	SY	178	\$3	\$530	
Damage Repair	LS	1	\$261	\$260	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$522	\$520	4% of primary item cost
<b>Total</b>				<b>\$ 16,650</b>	
Contingency (30%)				\$ 5,000	
<b>Subtotal</b>				<b>\$ 21,700</b>	
Design, Permitting, and Administration (30%)				\$ 5,000	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 26,700</b>	

**30-yr and Annualized Cost analysis**

Category:	General grading	
Estimated life span (years)	30	1 number of major maint. events
Expected annual maintenance	\$ 80	10% of damage repair and maintenance
End of life span maintenance	\$ 2,670	10% of original project cost
Future Capital Cost	\$ 64,800	
Future annual maintenance	\$ 3,810	
Future end of life span cost	\$ 4,820	
<b>Total Future Worth</b>	<b>\$ 73,400</b>	
<b>Annualized Cost</b>	<b>\$ 1,500</b>	

**Table H51: Preliminary Cost Estimate for Site 21, Alternative B**

**Install log vanes within reach**

Item Description	Unit	Estimated Quantity	Unit Price	Extension	Notes
Mobilization	LS	1	\$1,221	\$1,220	10% of project cost
Control of Water	LS	1	\$421	\$420	4% of primary item cost
Erosion Control	LS	1	\$632	\$630	6% of primary item cost
Clearing and Grubbing	ACRE	0.02	\$7,000	\$130	
Select Tree Removal (>4")	EACH	10	\$200	\$2,000	
Log Vanes	EACH	3	\$1,200	\$3,600	
Grading	SY	33	\$6	\$200	
Topsoil Import	CY	6	\$33	\$180	
Plant Trees	EACH	10	\$250	\$2,500	
Plant Shrubs	EACH	30	\$50	\$1,500	
Seeding and Mulch	ACRE	0.02	\$8,000	\$150	
Erosion Control Blanket	SY	89	\$3	\$270	
Damage Repair	LS	1	\$211	\$210	2% of primary item cost
One-Year Establishment Maintenance Period	LS	1	\$421	\$420	4% of primary item cost
<b>Total</b>				<b>\$ 13,430</b>	
Contingency (30%)				\$ 4,030	
<b>Subtotal</b>				<b>\$ 17,460</b>	
Design, Permitting, and Administration (30%)				\$ 4,030	
<b>Total w/ Contingency &amp; Engineering</b>				<b>\$ 21,500</b>	

**30-yr and Annualized Cost analysis**

Category:	Bioengineering	
Estimated life span (years)	20	1 number of major maint. events
Expected annual maintenance	\$ 160	25% of damage repair and maintenance
End of life span maintenance	\$ 5,380	25% of original project cost
Future Capital Cost	\$ 52,200	
Future annual maintenance	\$ 7,610	
Future end of life span cost	\$ 9,720	
<b>Total Future Worth</b>	<b>\$ 69,500</b>	
<b>Annualized Cost</b>	<b>\$ 1,500</b>	