

# **Appendix F**

## **Cost Estimate**

### **Shorty's Island / Meander Reach Ecosystem Restoration**

#### **Kootenai River, Idaho**

## **Draft Continuing Authorities Program Section 1135 Detailed Project Report and Integrated Environmental Assessment**

**June 2012**

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Following the identification of the tentatively recommended plan for the Shorty's Island/Meander Reach Ecosystem Restoration Project the design was advanced to the 35% design level. During 35% design it became apparent that the cost of the tentatively recommended plan would exceed the Section 1135 federal-funding program cost ceiling and that the non-federal sponsor could not support a recommended plan where their contribution would exceed 25 percent of the total costs.

The components of Alternative Best Buy Plan 2 were revisited to identify a plan with reduced scope and costs. The Shorty's Island North site was identified as having the highest average cost per habitat unit, thus making it a candidate for removal from the plan. The refined recommended plan does not include the Shorty's Island North site. The cost estimate has been updated based on this revision to the tentatively recommended plan.

The following assumptions were made to refine the cost estimate of the recommended plan:

- Shorty's Island North site removed from recommended plan.
- Shorty's Island South site material required decreased due to depth of sediment placement decreasing.
- Total material for Shorty's Island South and Myrtle Creek sites totals 12,300 cubic yard of habitat-rated substrate.
- Equipment operation costs went down based on revised materials estimates. The following summarizes the changes in equipment operating days and/or assumptions affecting operations:
  - Days for delivery assumed to remain the same by track/wheeled loaders = 45 days.
  - Expected days for placement = 6 days for best possible placement + 10 days contingency = 16 days.
    - Best possible placement days = 12,300 cubic yards/ 2,191 cubic yards/day max estimated placement/day = 6 days.
    - Contingency days for placement remains at 10 days.
    - Large track excavator and track/wheel loaders operation cost based = 16 days of expected placement + 20 barge days/2 = 26 days.
    - Medium crane operation, material barges, and crane barge based on expected days for placement and 20 days barge construction/demobilization = 36 days.
    - Operating costs for small truck crane barge and self-propelled flat-bed trailer remain the same at 10 days.
    - Conveyor(s) and tug boat operations based on expected days for placement = 16 days.

Other cost updates and cost assumptions are:

- LEERD was updated to reflect real estate plan cost = \$38,400 non-federal LER cost + 12,000 federal cost for review and assistance = \$50,400 total LER.
- Monitoring changed to assume a 1-percent cost per year for the first 10 years.
- PED changed to 26.5%.
- Contingency remained the same at 25%.
- Construction management changed to 14.5%
- Adaptive management added and assumed to total 20%

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68052.0 Volume of placed material (CY)

**Matl.. Placement Operation Assumptions Rate/efficiency CALCS**

Shifts per day	2
Max. Travel Dist.=	2 miles
Tug Travel Speed	4.5 mph
docking/un-dock time for material	0.75 hrs
Barge-Crane rotation time	0.25 hrs
Barge Fill Time	1 hr
Total Barge Cycle Time	2.889
Crane Down Time	3.8 hrs/day

Crane lift cycle time (round trip)=	
2 min	
6 yd-delivery tool	
8.4 tons/lift	
180 yd <sup>3</sup> /hr	Max Rate

Best possible Placement days	31.06305796
Contingency Days	10
Calculated Days	41.1
Contingency	0%
Days Expected	41.1

Max Est. matl.. placed/day	2190.769231 yds/day
Average placement per day	1657.255815 yds/day

Days for Material Delivery	45
Days for Barge Construction/Demo	20
Days for Site Setup/Grading	30

Req. Conveyor Rate=	610 yds/hr
	876.69997 tons/hr

**Material Haul Assumptions and Delivery Rate Calcs**

Haul Volume	71454.59116	CY *includes contingency vol.
Contingency Material Volume	5%	
day's delivery	45	
Delivery hours/day <sup>1</sup>	8 hrs/day	
CY/delivery	20	
total truckloads	3572.729558	
Necessary Haul Rate	1587.879804	CY/day
	79.39399018	Trucks/day
	9.924248773	trucks/hour
Needed Minimum Quarry Delivery Rate	198.4849755	CY/HR
	277.8789656	Ton/Hr
Actual per quarry delivery rate	220	CY/Hr

Operations Assumptions and Calcs

**Aggregate Material Barges Assumptions and Sizing (S-70)**

Optimal Barge Cary Volume	610.00 CY
Max Side Mtl. Height	4.2 ft
init. Barge Matl./ Area	3921.4 ft <sup>2</sup>
Est Square Dims.	45.4 ft

**610 CY**

RUN GOAL SEEK for Barge Sizing if prompted to do so

Actual Matl. Square Dim	48 ft
Actual Matl. Vol/Barge	626.21 CY
Actual Matl.. Wt./Barge	876.7 tons

**Concrete Blocks**

Height (H)	6 ft
Concrete Width (%of H)	50%
Width	3 ft
Concrete Volume	3672 cf
Concrete density	150 lb/cf

	Width	Ht.	Length
Blocks	3	3	8
Number blocks Reqd.	52		
Concrete weight	550800 lbs		275.4 tons

**Steel Plate**

Steel thickness	0.375 inch
steel density	490 lb/cf
weight of steel	60047 lbs
	30.0 tons

**Corner Winches (4-point anchors)**

winches	4
weight per winch	9275 lbs
total winch wt.	37100 lbs
	18.6 tons

**Material Barges (S-70)**

		Barge Draft	Barge Load
Quadra Floats (40x10x7) =	26	18	45700
Wt per boom	35600 lbs	24	445000
Load Capacity per	80000 lbs	30	844400
		36	1243800
Duo-Floats (20x10x7) =	12	42	1643100
Wt per boom	18900 lbs	48	2042500
Load Capacity per	38400 lbs	54	2441800
		60	2841100
Total Barge Wt.	1152400 lbs	*from Flexi-float	
Total Barge Area	80 x 160	12800 sf	
Total Barge Capacity	2540800 lbs	1270.4 tons	
<b>Required Capacity</b>	<b>2401346.8 lbs</b>	1200.7 tons	
<b>Difference</b>	<b>139453.2 lbs</b>	<b>69.7 tons</b>	

based on above barge-draft table, proposed barge is functional between 2 and 2.5 ft of draft

Total Displacement	3553747 lbs	1776.873408 tons
Volume Displacement	56951.1 Cu.ft..	

**Crane Barge Assumptions and Sizing (S-70)**

Quadra Floats (40x10x5) =	8
Wt per barge	25600 lbs
Load Capacity per	80000 lbs

Duo-Floats (20x10x5) =	4
Wt per barge	14700 lbs
Load Capacity per	38400 lbs

**Winches**

winches	4	
weight per winch	9275 lbs	
total winch wt.	37100 lbs	18.55 tons

**Crane**

Crane type	HC-150	
Working Weight	330000 lbs	165 tons

Total Barge Area	100	x	40	3400 sq.ft.
Total Barge Capacity	793600 lbs		396.8 tons	
<b>Required Capacity</b>	<b>367100.0 lbs</b>		<b>183.6 tons</b>	
Difference	426500.0 lbs		213.3 tons	

## Material Costs and Placement Depths

### Material Costs / Quantities Data

  =Entered Data  
  = Calculated Data

#### Common

Repose slope   2 : 1  
 Total Mat Thickness   8 ft Thalweg Placement  
  2 ft Shelf Placement (avg)

#### Ballast Material (Rounded Rock) Ballast Mat

Thickness   6 ft  
 Est. density =   1.4 tons/yd  
  \$ 17.50 \$/yd  
 Cost/ton=   \$ 12.50 /ton

Including Haul

costs from Peak Sand and Gravel and BF Redimix - Bonner's Ferry, ID.

#### Spawning Grade Substrate Material (River/Rounded Rock) Top Mat

Mat Thickness   2 ft  
(dist. From pg. 83 of Draft Report Sect. 4)  
 Est. density =   1.4 tons/yd<sup>3</sup>  
  \$ 20.02 \$/yd  
 Cost/ton=   14.3 \$/ton

(dist. From pg. 83 of Draft Report Sect. 4) - Includes Haul

costs from Peak Sand and Gravel and BF Redimix - Bonner's Ferry, ID.

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25% \*Contractor Overhead and Administrative Cost on All Equipment, Labor, and Sub

### Crane Barge (S-70)

Assembly 100-2

# Barges 1

Quads 8

Rental \$ 82.00 /day

Rental Cost \$ 656.00 /day

Duos 4

Rental \$ 41.00 /day

Rental Cost \$ 164.00 /day

Winches 4 per barge

Rental \$ 100.00 /day/winch

\$ 400.00 /barge/day

Winch Cost \$ 400.00 /day

\*\* Ropes or cable rental not considered

Deck Cleats 16

Rental \$ 2.00 /cleat/day

Cleat Cost \$ 32.00 /day

Transport: \$ 40,000.00 /mob

Total Cost/Day \$ 1,565.00 \* Includes COAC

Total Mob/Demob Cost \$ 40,000.00

### Material Barges (S-70)

# Barges 2

Quads 26

Rental \$ 82.00 /day

Rental Cost \$ 2,132.00 /day

Duos 12

Rental \$ 41.00 /day

Rental Cost \$ 492.00 /day

Winches 4 per barge

Rental \$ 100.00 /day/winch

\$ 400.00 /barge/day

Winch Cost \$ 800.00 /day

\*\* Ropes or cable rental not considered

Cleats 16 per barge

Rental \$ 2.00 /cleat/day

Cleat Cost \$ 64.00 /day

Transport: \$ 112,500.00 /mob

Total Cost/Day \$ 4,360.00 \* Includes COAC

Total Mob/Demob Cost \$ 225,000.00

\* 25% Contractor Overhead and Administrative Cost on All Equipment, Labor, and Sub

**Crane (Marine - American HC-150, 100' Boom, 6-yd Clamshell)**

transport

mob/demob \$ 50,000.00 ea

crew

Number 3

Hourly \$ 60.00 /hr

Total/day \$ 3,600.00 /day \* Includes COAC

Rental (includes all)

Rental \$ 835.00 /day

Total/day \$ 1,043.75 \* Includes COAC

Dredge Pak

Install \$ 25,000.00

Support \$ 8,000.00

Total \$ 33,000.00

MOB/DEMOB/Single \$ 83,000.00

**TOTAL CRANE COSTS \$ 4,643.75 / day (does not include mob/demob, or additional software)**

**Tug (Assume 2 Tugs)**

Transport

mob/demob \$32,000

crew

number 2 per tug

Hourly \$ 60.00 /hr

Total/day \$ 4,800.00 /day \* Includes COAC

Rental (includes all)

rental \$ 533.33 /day based on on \$ 8,000.00 /month for tug

Total/day \$ 666.67 /day \* Includes COAC

MOB/DEMOB/Single \$32,000

**TOTAL Tug COSTS \$ 5,466.67 / day (does not include mob/demob)**

**2 x Wheel Loader (8-yd or Greater bucket) AND 1 x Track mounted Excavator for inc**

Transport

mob/demob \$15,000

crew

number 3

Hourly \$ 60.00 /hr

Total/day \$ 3,600.00 /day \* Includes COAC

Rental (includes all)

rental \$ 618.00 /day

Total/day \$ 772.50 /day \* Includes COAC

MOB/DEMOB/Single \$15,000

**TOTAL LOADER COSTS \$ 4,372.50 / day (does not include mob/demob)**

**Conveyors (Assume Large Hopper Conveyor, Conveyors capable of 1000 tons/hr)**

**Transport**

mob/demob \$ 12,000.00

**crew**

number 1 to maintain and operate all conveyor systems

Hourly \$ 60.00 /hr

Total/day \$ 1,200.00 /day \* Includes COAC

**Power (assume hard power brought to site - or Cost of 60+KW generator)**

Install Cost 25000 ea

**Rental (includes all)**

Units 2

Rental \$ 415.00 /day/unit

Total Rental \$ 1,037.50 /day \* Includes COAC

MOB/DEMOB/Single \$ 37,000.00

**TOTAL CONVEY COSTS \$ 2,237.50 / day (does not include mob/demob)**

**Mobile Fueling (numbers based on double shift and Gas)**

4.25 /Gal

**Crane**

71 Gal/day

377.1875 /day \* Includes COAC

**Loader(s)/Excavators**

150 Gal/day

796.875 /day \* Includes COAC

**Tug(s)**

200 Gal/day

1062.5 /day \* Includes COAC

MOB/DEMOB/Single 0

**TOTAL FUELING COSTS 2236.5625 / day Includes COAC**

**Hydro Survey**

Surveys 3 /site

Sites 3

\$ 5,000.00 \$/site survey

MOB/DEMOB/Single \$ -

\$ 56,250.00

**TOTAL Survey COSTS \$ 56,250.00 Includes COAC**

## Shorty's North

### Potential Measures:

#### Substrate Placement on Clay/Gravel

Placement Parameters

- 1) Placement only on areas of clay or gravel which exist, at least in part, within the thalweg.
- 2) Placement to occur only on existing slope less than 20%.
- 3) No placement to occur where mat elevation changes more than 10-ft from its starting elevation.

Substrate Placement on Clay/Gravel		Wastage 20%					
		Mat Placement Slopes					
		0%					
Station Range 100-ft	River Mile RM	Width (w/ slope) (ft)	Habitat Substrate Area	Ballast Section Area (ft)	Avg End Area Volume Habitat <sup>4</sup> CY	Avg End Area Volume Balast <sup>4</sup> CY	
7529	142.59	56	109	257	548.1	1496.7	
7528	142.58	94	187	416.5	704.6	1940.0	
7527	142.56	98	193.5	456.5	661.1	1896.7	
7526	142.54	82	163.5	397	615.7	1933.3	
7525	142.52	85	169	473	550.0	1768.9	
7524	142.50	64	128	323	515.7	1488.9	
7523	142.48	76	150.5	347	466.7	1384.4	
7522	142.46	51	101.5	276	188.0	613.3	
7521	142.44				0.0	0.0	
Possible		56	Max End Width				
<b>Total Length</b>		75.8	150.3	368.3	5,100	15,027	
		Average over 800 LF					
		Begin	End	Length			
		7529	7521	800			
		Habitat End Vol		Ballast End Vol	Ballast Cost/CY	Habitat Mtl Cost/CY	
		21.4		244.6	\$ 17.50	\$ 20.02	
		Total Ballast Volume				15,271.3 CY ** Includes wastage	
		Total Ballast Material Cost				\$ 267,247.35	
		Total Habitat Material Vol				5,121.39 CY ** Includes wastage	
		Total Hab. Mtl Cost				\$ 102,530.14	
		Total Material Volume placed in-water				20392.66	
		Length				800 LF	
						Effective Area (sf)	
						60600	

Number of Boulders	0.00000
<sup>2</sup> Sbsttr vol. from Bldr cnvrsion	3
"Plcmt Vol" Acct. for Blders	0.00
Boulder Cost	\$ 0.00
<b>TOTAL MATERIAL COST</b>	<b>\$ 369,777.48</b>
Placement Length=	800 LF
<sup>3</sup> Virtual Volume =	20392.7 CY
Total Effective Area =	60600.0 SF

1) Average Values apply to the range identified by the "Begin" and "End" stations.  
 2) Average End Area Method based on up-station length



### Shorty's South

Potential Measures:

Clay Shelves

Placement Parameters

Substrate Placement on Clay Shelves		Thickness (ft)	Cost (\$/CY)	Waste %	Whole Range
		Substrate Mtl.:	2.00	\$ 20.02	20%
Station Range	River Mile	Width (with slope) (ft)	Slope	Volume/100-ft yd <sup>3</sup>	Effective Area (ft <sup>2</sup> )
100-ft	RM				
7569	143.35	146	0%	1297.8	14600.00
7568	143.33	146	0%	1297.8	14600.00
7567	143.31	118	0%	1048.9	11800.00
7566	143.30	73	0%	648.9	7300.00
<b>Total Length</b>		<b>Average</b>			
<b>400 LF</b>		120.8	0%	1073.3	12075.0
Total					
1 Virtual Material Estimate		4293.33 /yd <sup>3</sup> (Est w/ Avg)			
Actual Substrate Volume		4293.333333 CY			
# of Boulders	0.0	Begin	End	Length	
Boulder Cost	\$ 0.00	Station Range	7569	7566	400
<b>Total Material Cost</b>		<b>\$ 85,952.53</b>			
Total Material Cost/LF		\$ 214.88			
Total Effective Area		48300.0 (ft <sup>2</sup> )			

1) Includes Volume Approximation to Account for Boulders

## Myrtle Creek

**Potential Measures:**

Clay Shelves

Placement Parameters

Clay Shelves			Thickness (ft)	Cost (\$/CY)	Waste %		
			2	\$ 20.02	20%		
			SubstrateMtl.:				
	Station Range 100-ft	River Mile RM	Width (w/ slope) (ft)	Avg. Mtl. Thickness (ft)	Slope	Volume <sup>1</sup> yd <sup>3</sup>	Effective Area (ft <sup>2</sup> )
	7685	145.55	77	2	0%	684.44	7700.00
	7684	145.53	93	2	0%	826.67	9300.00
	7683	145.51	83	2	0%	737.78	8300.00
	7682	145.49	39	2	0%	346.67	3900.00
	7681	145.47	66	2	0%	586.67	6600.00
	7680	145.45	94	2	0%	835.56	9400.00
	7679	145.44	133	2	0%	1182.22	13300.00
	7678	145.42	121	2	0%	1075.56	12100.00
	7677	145.40	83	2	0%	737.78	8300.00
	7676	145.38	77	2	0%	684.44	7700.00
	7675	145.36	47	2	0%	417.78	4700.00
	7674	145.34	40	2	0%	355.56	4000.00
		0.00			0%	0.00	0.00
<b>Total Length</b>	<b>1200 LF</b>		Average (Based on Station Range)				
			79.4	2.0	0%	705.9	7941.7
	<sup>1</sup> Virtual Material Estimate		8471.11 /yd <sup>3</sup>				
	Actual Substrate Material Volume		8471.11 CY				
	# of Boulders	0.0			Begin	End	Length
	Boulder Cost	\$ 0.00	Station Range	7685	7674	1200	
	<b>Total Material Cost</b>	<b>\$ 169,591.64</b>					
	Total Material Cost/LF	\$ 141.33					
	Total Effective Area	95300.00 (ft <sup>2</sup> )					

1) Volumes include assumed wastage.

2) Average Material Thickness based on the individual bathymetric sections and maintaining a relatively flat slope (<10%) at least 8-ft from the Thalweg.

**PHASE 1, 2, 4 - Staging Site/Access Roads Prep, Material Delivery, Restoration**

**Feasibility Quantities**

Site Prep Mob/Demob	per typ equip mob	\$ 5,000.00	ea - Mob/Demob costs are for site-prep equip only.
	Pile Driving Crane/equip Mob	\$ 20,000.00	ea

Site

Topsoil scalp depth	0.5	ft
Vol Topsoil Scalp (Pile Vol)	8470.00	CY
Topsoil Berm Exposed. Area	0.66	
Topsoil Berm Footprint width	33.8	ft
Topsoil Berm SS	2	:1
Topsoil Berm ht	8.5	ft
topsoil berm length	1600	ft - sides of staging site
Min. Required Site Area	10.5	Ac
Min. handling-area	6600	SY
	BC Surfacing	770
	TC Surfacing	513

Accesses / Ramps

	Base Course depth	0.25	ft
	BC/TC density	1.4	tons/CY
	Top Course Depth	0.167	ft
	Req. Access Ramp Lengths	1000	ft
	Initial levee crown access	800	ft
	Site to Levee Length	400	ft
	River Access Road Length	600	ft
EW	Site to Levee Access Ramp	-3120	CY (material needed)
	Site to levee Temp Embank. Surf Cover	0.2	ac
EW	River Access Road	2997.8	CY (Material Generated)
	River Access Compaction	2352	CY (including overcuts and compaction)
EW	Riverbed Excavation	3000	CY (Material Generated)
	In-Water Stabil. Mtl	500	CY Assumed to be Spawning-grade Substrate)
	"dry" cut/embankment slopes surface	1600	SY (plan view area measure)
	Access Ramp Width	25	ft
	Access Ramp Road Area	2778	SY
	BC Surfacing	324	tons
	TC Surfacing	216	tons
	Initial Levee re-grade width	20	ft

Primary Access

	miles	1	miles
		5280	ft
	Haul/Drive Width	16	ft
	Easement Width	35	ft
	Easement Area	184800	ft <sup>2</sup>
		4.24	Acres
	Road Surface Area	9386.67	SY
EW	Primary access EW	-2500.00	CY (Material needed)
EW	Total Project EW	377.80	Material Balance (material generated)
	Embankment Slopes Re-veg	2.00	Acres
	36" CI 4 Culvert Length	60.00	ft
	BC Surfacing	1095.11	Tons
	TC Surfacing	730.07	tons

Off-site

CR-38 Intersection Imps.	2.00	EA
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Bulkhead/Dock

Width	20	ft
Length	30	ft
Exposed Face (depth)	9	ft
Driven Depth	16	ft
Exposed Face	450	SF (Exposed)
Total Facing	1750	SF (costs based here)
Dead-Man Anchors	2	EA
Conveyor Support	1	EA

Restoration

Site to levee Access Removed	1000.00	CY - placed uncompacted riverward
Levee Restoration	900	CY
Material to remain on landward side of levee prism	1220.00	CY
Road Surface Removal	385.80	CY
Conveyor Support Removal	1	EA
Woody Vegetation Plantings	1.28	Acres
Mulch/Tack, hydro seed or Pilot Mtl.	0.34	Acres

Total Substrate Material Volume to be placed

68052.0

RAMP MATERIAL PILE

Volume	<u>68052.0</u> CY
Repose	<u>2</u> :1
ramp slope	10%
max height	40 ft
Length	400 ft
Ramp Width	205.0 ft
Ramp Vol	60737.5 CY
SS Vol	30432.2 CY
Vol Tot	91170 CY
Max Pad Width	365.0 ft
Max Pad Length	480.0 ft

~Pad Area 4.021917915 AC

TOPSOIL PILE (LINEAR)

Topsoil Material Volume	8470.00 Yd <sup>3</sup>
% Volume to be places in linear pile at site bndry	80%
Linear Pile Volume	6776 CY
Remaining Volume	1694.00 CY
Topsoil Berm width	30.10 ft
Topsoil Berm SS	2 ft:ft
test pile width	30.1 ft
topsoil berm length	1600 ft
Topsoil Berm ht	7.5 ft
Test Ends vol	66.1 Yd <sup>3</sup>
Calced Main Vol	6710.5 Yd <sup>3</sup>
Total Volume	6776.6 Yd <sup>3</sup>