Lower Duwamish Waterway Group

Port of Seattle / City of Seattle / King County / The Boeing Company

Appendix I
Detailed Cost Estimates

Final Feasibility Study

Lower Duwamish Waterway
Seattle, Washington

FOR SUBMITTAL TO:

The U.S. Environmental Protection Agency
Region 10
Seattle, WA

The Washington State Department of Ecology
Northwest Regional Office
Bellevue, WA

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I.1 Introduction

This appendix contains the detailed cost estimates prepared for the remedial alternatives developed in Section 8 of the Lower Duwamish Waterway (LDW) Feasibility Study (FS). The following information is provided in this appendix:

- Primary cost assumptions (Table I-1)
- An explanation of the spreadsheet workbook used to prepare and assemble the detailed cost estimates (Table I-2)
- Cost sensitivity considerations (Tables I-3 and I-4)
- The detailed cost estimates (Attachment 1, Tables I-5 through I-51).

The cost estimates were developed in accordance with the U.S. Environmental Protection Agency's (EPA) guidance document *Guide to Developing and Documenting Cost Estimates during the Feasibility Study* (EPA 2000). An independent review of the FS cost estimate was performed by Mr. Greg Hartman of Hartman Associates. The cost estimates meet EPA requirements for FS cost estimates and are consistent with those prepared for other projects similar to the LDW (Hartman 2011).

I.2 Primary Cost Assumptions

Primary engineering cost assumptions common to all remedial alternatives are provided in Table I-1.

I.3 Guide to Spreadsheet-Based Cost Estimation Workbook

The contents of the cost estimate workbook (Attachment 1) for the FS are summarized in Table I-2. The workbook contains 47 worksheets (Tables I-5 to I-51) that are broadly organized as follows:

- Tables I-5 through I-10 provide the building blocks for estimating the construction costs component of the remedial alternatives (e.g., mobilization/demobilization, transloading facility set-up, dredging and material placement rates, and material procurement costs).
- Tables I-11 through I-21 are cost assumption source files for post-construction performance monitoring, operation and maintenance (O&M) monitoring, and maintenance/repairs. One table is provided for each alternative.
- Table I-22 is a cost assumption source file for long-term monitoring and applies to all alternatives.
- Tables I-23a through I-33 detail the net present value calculations for the recurring monitoring and O&M costs developed in Tables I-11 through I-22. One table is provided for each alternative.

- Tables I-34 and I-35 develop cost assumptions and net present value estimates for institutional controls; these apply to all alternatives.
- Table I-36 consolidates all key area and material volumes associated with each remedial alternative. Areas and volumes form the basis for dredging, disposal, capping, enhanced natural recovery (ENR)/*in situ* treatment, residuals management, and technology-specific monitoring costs.
- Table I-37 is a master reference file of unit costs and other cost and production rate assumptions.
- Tables I-38 through I-49 are the cost summary tables with totals for each remedial alternative. (Note: These summary tables represent the culmination of information contained in all preceding source tables and provide the reader with a complete breakdown of all essential cost factors).
- Tables I-50 and I-51 summarize monitoring and total project costs respectively and allow for quick comparisons among the alternatives.

I.4 Cost Accuracy and Sensitivity

Several factors can influence the accuracy of estimated remedial alternative costs at the FS level. In particular, modest changes in estimated dredge volumes can significantly impact costs. Other factors (e.g., fuel and labor costs) can change depending on future economic conditions. The FS cost estimates are best estimates under current economic conditions. However, the selected remedy is unlikely to be fully underway until several years following the issuance of the Record of Decision (ROD). Future economic conditions are difficult to predict and prices in some markets (e.g., petroleum fuels) are quite volatile. Therefore the relative accuracy of the cost estimates is likely better for alternatives with shorter durations than for those with longer durations.

The sensitivity of remedial alternative cost estimates to some of the key assumptions and predictions are discussed below. Sensitivity analysis is a type of uncertainty analysis that measures the impact on project cost estimates from changing one or more of the input parameters (EPA 2000). The parameters discussed in Sections I.4.1 and I.4.2 were used to illustrate the sensitivity of the cost estimates to:

- Dredge-cut prism and performance contingency volumes
- Treated material disposal from soil washing operations (Alternative 5R-Treatment).

I.4.1 Dredge-Cut Prism and Performance Contingency Volumes

Variation in the scope of each remedial alternative (i.e., area to be remediated and assignment of remedial technologies) is a significant contributing factor to cost uncertainty. In general, changes in the volume of sediment dredged and disposed of have a much greater influence on cost than changes of a proportionately similar magnitude in the area remediated using other technologies (i.e., capping and ENR/*in situ* treatment).

Section 8.2.2.1 and Appendix E provide the rationale for and methodologies by which dredge-cut prism and performance contingency volumes were estimated for each remedial alternative. The dredge-cut prism volume represents an estimate of sediment that would be removed by dredging during construction of each remedial alternative without consideration of any contingency actions. For the best estimate of dredge-cut prism volumes the neat-line volumes were multiplied by a factor of 1.5. The assumed low and high cost-sensitivity conditions for bounding the best estimate were as follows:

- Low sensitivity dredge-cut prism volume: Neat-line volume based on depth to sediment quality standards (SQS) plus 25%
- High sensitivity dredge-cut prism volume: Neat-line volume assuming dredging to top of the lower alluvium

The depth to lower alluvium conservatively represents the maximum extent of contaminated sediment for any alternative.

The performance contingency volume is an additional amount of material that would be removed (i.e., in addition to the dredge-cut prism volume), assuming that a fraction of designated verification monitoring, ENR/*in situ* treatment, and monitored natural recovery (MNR) areas require active remediation based on data collected at the remedial design phase or because of inadequate performance identified during post-construction or long-term monitoring. For costing purposes, dredging is the assumed performance contingency action. The base-case remedial alternatives developed in Section 8 assumed 15% of the total area designated for verification monitoring, MNR, or ENR/*in situ* treatment would require active remediation (assumed to be dredging). The removal volume associated with this area is referred to as the performance contingency volume (Section 8.2.2.1). The low and high cost sensitivity conditions assumed for bounding the base case were as follows:

- **Low Sensitivity:** no contingency actions for verification monitoring, ENR/*in situ* treatment, and MNR areas
- **High Sensitivity:** contingency actions for 25% of verification monitoring, ENR/*in situ* treatment, and MNR areas.

Performance contingency dredge volumes were approximated by using the site-wide average thickness of sediment exceeding the SQS (i.e., 4 feet below mudline), plus a volume allowance factor of 1.5, the latter being consistent with the assumption used for the base case dredge-cut prism volume. Table I-3 summarizes the effects of these volume sensitivity assumptions on the total dredge volume estimates used to develop the cost estimates.

I.4.2 Re-use of Treated Material

Disposal of treated sand from soil washing operations (Alternative 5R-Treatment) was considered for the cost sensitivity analysis. Treated sand from soil washing operations will have low and detectable levels of contamination. If a beneficial outlet for this material cannot be identified, then landfill disposal costs could conceivably be incurred. The low sensitivity and best estimate assume no costs are incurred for disposal of treated material (cost neutral). Disposal cost for treated sand ($60/ton, the same as for untreated sediment) was included in the high sensitivity estimate for Alternative 5R-Treatment in the event no beneficial use can be identified.

I.4.3 Summary

Table I-4 presents best estimate total costs for the remedial alternatives. EPA guidance notes that the amount and quality of RI data needed to develop and scope remedial alternatives according to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements correspond to an expected accuracy for FS cost estimates of approximately –30 to +50 percent (EPA 2000). The effects of the sensitivity assumptions on the best estimates of remedial alternative costs are also shown in Table I-4. Ranges in the low and high sensitivity costs as percentages of the best estimate are generally higher for the lower numbered alternatives primarily because the contingency volume assumptions have greater influence on alternatives with appreciable verification monitoring, ENR/*in situ*, and MNR areas. Note that with few exceptions, the sensitivity ranges fall within the expected cost accuracy range of –30 to +50 percent.

Total estimated costs of the remedial alternatives are expressed as net present values. Net present value analysis is a standard method used to evaluate expenditures that occur over different time periods. The present value is the amount of money that would need to be set aside at an initial point in time (base year) so that funds for implementing a remedial alternative would be available in the future as needed. The real discount rate, (i.e., interest less inflation), is the predictive parameter that accounts for the time value of money reflecting judgments of future economic conditions. The *Guide to Developing and Documenting Cost Estimates during the Feasibility Study*, (EPA 2000) recommends that a discount rate of 7% be used for estimating the net present value of cleanups conducted by non-federal parties. This is based on recommendations in the Office of Management and Budget (OMB) Circular A-94 for benefit-cost analyses of proposed federal programs, policies, and regulations. The rate of 7% approximates the marginal pretax rate of return on an

average investment in the private sector and has been adjusted to eliminate the effect of expected inflation. A discount rate of 2.3% (from Appendix C of OMB Circular A-94 for Year 2011) was used in the FS, and the basis for selection of this rate is detailed in a separate technical memorandum (AECOM 2012). Briefly, three of the four parties to the Administrative Order on Consent (AOC) are public entities and are likely to be involved in the primary consent decree and implementation of the remedy. Like the federal government, these entities have a different cost of capital than the private sector. The current low interest environment, as reflected in the interest rates published in Appendix C of OMB Circular A-94, will affect the financing of the cleanup, and is a consideration for these and private entities as well. Further, it is likely that, during implementation of the remedy, there will be limits on investment of capital based on public entity involvement. Regardless of the ultimate public/private mix of parties responsible for the cleanup, a discount rate derived using Appendix C of the OMB Circular A-94 is equivalent to a low-risk rate of return, one that is consistent with the premise of setting aside money today in a safe, secure investment to pay for future cleanup costs.

While useful for comparing remedial alternatives, discounted costs may not be meaningful projections for the parties contributing money to the cleanup. Certain parties (public, public-private entities) may not be able to set aside sufficient funds for investment (without incurring additional costs of bonding or borrowing) before remediation starts and will therefore not be able to take advantage of the interest accumulation assumption implied by the net present value calculation. For informational purposes, non-discounted costs for the remedial alternatives are provided in Table I-4.

Finally, the duration of the construction and monitoring phases for several remedial alternatives presented herein could span a lengthy period (e.g., more than 10 years and up to 42 years in the case of Alternative 6R). Depending on economic conditions, significant inflationary pressures would result in increased overall construction and monitoring costs. In particular, fuel prices and landfill tipping fees could exceed the average inflation rate embodied in the discount rate. Increases in fuel prices translate into higher construction, transportation, and disposal costs.

I.5 References

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Hartman, G. 2011. Review LDW Cost Estimate Revisions Memorandum. Prepared by Hartman and Associates, LLC. Prepared for AECOM. May 29, 2011.

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U.S. Army Corps of Engineers (USACE) 2008. "*Technical Guidelines for Environmental Dredging of Contaminated Sediments*," ERDC/EL TR-08-29. September 2008.

U.S. Environmental Protection Agency (EPA) 2000. *A Guide to Developing and Documenting Cost Estimates during the Feasibility Study*. EPA 540-R-00-002, OSWER 9355.0-75. July 2000.

Table I-1 Main Engineering Assumptions Pertaining to Cost Estimation

Item No.	Topic	Assumption
Work Period		
1	In-water construction season and number of construction operating days	Construction season: October 1 through February 15 (138 calendar days) Construction operating days per season: 88 days (see Table I-5 for calculations)
2	Work shifts	Two work shift scenarios assumed for developing seasonal construction rate estimates: 1) 24 hours per day, 6 days per week (50% of work), and 2) 12 hours per day, 5 days per week (50% of work).
Placement of Imported Aggregate Materials		
3	Equipment	3-cy bucket for water depth less than 10 ft. 5-cy and 8-cy buckets for water depths greater than 10 ft.
4	Material source	Quarry material delivered to the site by barge.
5	Cap and backfill material volume	Capping: 3.5 ft of sand/gravel/rock to achieve a minimum 3-ft cap thickness over application area. Backfill (to preserve grade in removal areas above -10 ft MLLW); equal to dredge-cut prism volume over application area.
6	ENR and thin-layer sand placement for dredge residuals management	Apply 9 inches of sand to achieve the goal of a minimum 6-inch-thick layer in both cases. For management of dredge residuals, apply to equivalent of 100% of dredged area (although placement may also occur outside of the dredge area).
7	*In situ* Treatment	Apply granular activated carbon (4% organic carbon by weight) to a depth equivalent to the assumed ENR thickness of 9 inches. Assumes activated carbon mixed into sand for placement over 50% of combined ENR/*in situ* area.
Mechanical Dredging		
8	Equipment	Derrick barge/clamshell and precision excavators: See Table I-5 for specifics.
9	Average Annual Dredge Production Rate	1,039 cy/operational day averaged over the dredge season and based on a combination of dredge equipment and operating regimes. This equates to 1,559 tons/operational day average dredge production rate over the 88 days of dredging. See Table I-5.
10	Construction Period	Based on dredging as the rate-limiting technology (see Table I-5). The construction time frame is based on the dredge-cut prism volume estimate as opposed to the performance contingency volume estimate.
11	Backfill	Areas shallower than -10 ft MLLW are backfilled to original grade for habitat restoration purposes.
12	Dredge volume estimation	See Section 8.2.2.1 for volume terminology and estimation methodology. Total dredge volumes (sum of dredge-cut prism and performance contingency volumes) are used to estimate costs.

Table I-1 Main Engineering Assumptions Pertaining to Cost Estimation (continued)

Item No.	Topic	Assumption
Mechanical Dredging (continued)		
13	Gravity dewatered dredge material density	Wet bulk density of dewatered sediment for disposal: 1.5 tons/cy
14	Dredging debris sweep	Debris removal and on-barge handling occupies 10% of dredge operations at a lower effective bucket capacity of 40%. The need for debris removal was reviewed as commonly needed for many sediment dredging projects (USACE 2008).
15	Capping and ENR/*in situ* treatment debris sweep	10% of the capping and ENR/*in situ* treatment footprint requires debris removal.
16	CAD overburden	Mechanically dredged, barged to, and disposed of at DMMP Elliott Bay open water disposal site. Assume dredged material complies with DMMP open water disposal criteria.
Transloading, Transport, and Landfilling of Dredged Materials		
17	Barge transport	Three 1,600-cy capacity material barges for receipt of mechanically dredged sediment and transport to transloading facility. Capping materials delivered to the site by barge.
18	Transloading	Gravity dewatered sediment transferred to 20-ft containers fitted with disposable liner and loaded onto truck chassis. Containers transported to local intermodal facility and transferred to railcars. Existing infrastructure assumed adequate for assumed material production rate of ~1,600 tons/day. Stormwater and wastewater generated at transloading facility treated on-site.
19	Railcar transport	Lined 20-ft containers; one container per railcar (75 tons). No material stabilization (e.g., with lime).
20	Landfill	Two regional Subtitle D facilities accept wet dredged materials: Allied Waste Services (Roosevelt, WA), and Waste Management Inc. (Columbia Ridge, OR).

Table I-1 Main Engineering Assumptions Pertaining to Cost Estimation (continued)

Item No.	Topic	Assumption
Sediment Washing		
21	Mobilization/Demobilization	Capital for design, permitting, and construction. Total plant footprint of 4 to 7 acres with capacity of 40 to 45 tons per hour.
22	Operations	50% of dredged sediment processed through treatment unit. Only 50% of dredged material is expected to meet the grain size criterion ideal for soil washing. Recover 50% of processed material as sand. Includes labor, plant operations, maintenance, and filter cake disposal. Assume no credit for beneficial reuse of sand because of the uncertainty in final chemical characteristics and end-use options.
Monitoring and Maintenance		
23	Construction monitoring	Survey boat, labor, and equipment for routine bathymetric surveys and surface water quality testing during construction (for the latter see Appendix K).
24	Other monitoring	Post-construction, baseline and long-term monitoring: see Appendix K.
25	Repair	5% of cap and ENR/*in situ* treatment areas. Fraction of remediation areas assumed to undergo repair by addition of clean import material (approximately 3.5 ft for caps and 9 inches for ENR/*in situ* treatment areas) following construction. ENR/*in situ* repair costs assume approximately 50% of any ENR area requiring repair will include *in situ* treatment, consistent with the rest of the cost estimate.
26	Institutional Controls	Initial cost, annual cost, and periodic cost developed for implementing institutional controls. Assumed institutional controls would begin upon signing of the ROD and annual costs applied from Year 1 to Year 50. Some of the periodic costs (e.g., seafood consumption advisories) may apply to the project in perpetuity.
Discount Rate		
27	Discount rate used for present value calculations	2.3%, consistent with Real 30-year discount rate published in 2011 Office of Management and Budget Circular A-94 (see also separate memorandum, AECOM 2012)

Notes:

CAD = contained aquatic disposal; cy = cubic yards; DMMP = Dredged Material Management Program; ENR = enhanced natural recovery; MLLW = mean lower low water; MNR = monitored natural recovery; ROD = Record of Decision; USACE = U.S. Army Corps of Engineers.

Table I-2 Identification and Brief Description of Cost Estimating Tables in Attachment 1

Table No.	Description
I-5	**Dredge Production Estimate.** Dredge production rate calculations are consistent with estimation methods and efficiency factors set forth in USACE guidance (USACE 2008). The estimates assume two simultaneous dredging operations (one in open water and one in shallow water). Dredging is assumed to be evenly divided between the 24-hour, 6-day/week, and 12-hour, 5-day/week operating regimes throughout the in-water construction window. Both are common operating regimes for projects in the Puget Sound region and are largely a function of project size and location as well as commercial navigation and community concerns (nighttime noise and illumination). For each in-water construction season, the calculations account for 5 days of holidays and 15 days of dredge downtime to accommodate ancillary construction (e.g., piling/dolphin, bulkhead, pier/dock-related work), tribal fishing delays, weather and water quality related delays, and a dredging-free period near the end of the in-water construction window for residuals management. The dredge production rate is used as the basis for the time component of dredge cost calculations for Alternatives 2 through 6 (Tables I-39 through I-49).
I-6	**Material Placement Production Estimate.** Production rate assumptions are developed based on a range of equipment, operating environment (e.g., open water or nearshore), operating hours, cycle time, bucket capacity, and total efficiency. The material placement production rates are used as the basis for the time component of material placement cost calculations for Alternatives 2 through 6 (Tables I-39 through I-49).
I-7	**Material Placement Unit Costs.** Material costs for capping assume purchase of cap material from local or regional quarries. Unit costs for cap material include material cost and transportation cost. For the estimate, distance to the material supplier's loading facility is assumed to be 60 nautical miles per round trip by barge. See Tables I-39 through I-49 for Alternatives 2 through 6 purchased material and placement costs.
I-8	**Transloading, Water Management, and Dredging Daily Rate.** Costs for transloading area setup, dewatering, water handling, and management at a transloading facility located in the Duwamish Valley. Dredging daily labor and material rate assumptions include transportation of sediment from the dredging location to the transloading facility. Sediment handling costs at the transloading facility, including material transfer from barges onto lined 20-ft containers, transfer of loaded containers onto trucks, and truck transport of the containers to an intermodal facility for transfer to rail are part of the unit price for material disposal at the Subtitle D landfill ($60/ton; see Table I-37).
I-9	**Construction Monitoring.** Costs are provided for single beam/multi-beam surveys inclusive of labor and equipment for acquisition, processing, and data delivery. Costs also include water column monitoring during construction.
I-10	**Mobilization, Demobilization, and Contractor Project Management Costs.** These costs include all contractor labor for mobilization of equipment and support facilities, land lease for operations and staging, development of construction quality assurance plans, and barge protection.
I-11 through I-21	**Monitoring, Operation and Maintenance Costs.** These tables provide the cost basis for post-construction performance monitoring, annual operation and maintenance, repair for caps and ENR/*in situ* treatment, and a performance contingency (i.e., additional sediment volume removed in areas originally identified for ENR/*in situ* treatment, MNR, or verification monitoring). One table is provided for each remedial alternative (see Appendix K for more details on monitoring).
I-22	**Baseline and Long-term Monitoring.** Provides the basis for baseline and long-term monitoring annual and periodic costs (see also Appendix K).

Table I-2 Identification and Brief Description of Cost Estimating Tables in Attachment 1 (continued)

Table No.	Description
I-23 through I-33	**Net Present Value Calculation for Agency Oversight, Reporting, O&M, and Long-term Monitoring.** Calculates the net present value of component costs developed in Tables I-11 through I-22 for each remedial alternative. Monitoring frequencies and duration are developed in Appendix K. The duration of long-term monitoring is assumed to be 30 years except for Alternative 6R, which assumes 45 years.
I-34	**Institutional Controls.** Provides the basis for initial, annual, and periodic costs associated with institutional controls.
I-35	**Net Present Value Calculations for Institutional Controls.** Calculates the net present value of component costs developed in Table I-34. Table I-35 assumes institutional controls begin after the ROD is signed, initial costs are incurred in Year 1, and the total duration for which institutional controls apply is 50 years.
I-36	**Technology Application Areas, Sediment Removal, and Material Placement Volumes.** The best estimate dredge volumes assume removal to the maximum depth of SQS exceedance (Alternatives 2 through 5) or to the depth of Alternative 6 RAL exceedance (the "neat-line" volume), plus a volume allowance factor of 50% to account for overdredge, constructible side slopes, layback slopes, refinement of vertical extent, and redredge (USACE 2008). These dredge-cut prism volumes are developed in Appendix E. Performance contingency dredge volumes are assumed to account for 15% of verification monitoring, ENR/*in situ* treatment, and MNR surface areas requiring active remediation (dredging) either during remedial design or based on future monitoring. Estimated volumes of material for capping, backfill, management of dredge residuals, and ENR/*in situ* treatment are also provided.
I-37	**Basis for Cost Estimates**. Master reference file of unit and other cost/production rate assumptions.
I-38 through I-49	**Detailed Estimated Costs for each Remedial Alternative.** Capital costs: preconstruction, project management (contractor), construction materials and labor, construction QA/QC (contractor), and post-construction performance monitoring. Construction contingency, sales tax, owner project management and remedial design, and owner construction management are calculated as a percentage of capital costs. **Recurrent operating costs:** Operation, maintenance, monitoring, institutional controls, agency review and oversight, and reporting.
I-50	**Monitoring Cost Summary:** Provides rolled-up monitoring cost estimates for all remedial alternatives. Contingency actions not included.
I-51	**Total Cost Summary – Best Estimate ($ million).**

Notes:

cy = cubic yards; ENR = enhanced natural recovery; MNR = monitored natural recovery; O&M = operation and maintenance; QA/QC = quality assurance/quality control; RAL = remedial action level; ROD = Record of Decision; SQS = sediment quality standards; USACE = U.S. Army Corps of Engineers

Table I-3 Cost Sensitivity – Areas and Volumes

Parameter			Remedial Alternative								
			2R/2R-CAD	3C	3R	4C	4R	5C	5R/5R-T[a]	6C	6R
Areas	VM Area (acres)		23	23	23	23	23	23	23	0	0
	MNR (10) Area (acres)		19	0	0	50	50	0	0	0	0
	MNR(20) Area (acres)		106	99	99	0	0	0	0	0	0
	ENR/ *in situ* Area (acres)		0	10	0	16	0	53	0	101	0
	Cap Area (acres)		0	11	0	23	0	24	0	51	0
	Partial Dredge and Cap Area (acres)		3	8	8	18	14	23	14	42	28
	Dredge Area (acres)		29	29	50	50	93	57	143	108	274
	Total Area (acres)		180	180	180	180	180	180	180	302	302
Low Sensitivity	Dredge-cut prism volume (neat volume to SQS or Alternative 6 RALs *1.25; cy)		307,980	249,805	488,354	465,949	871,022	535,041	1,346,640	1,249,040	3,285,978
	Performance contingency dredge volume (cy)		0	0	0	0	0	0	0	0	0
	Total dredge volume (cy)		307,980	249,805	488,354	465,949	871,022	535,041	1,346,640	1,249,040	3,285,978
Best Estimate	Dredge-cut prism volume (neat volume to SQS or Alternative 6 RALs *1.5; cy)		369,577	299,766	586,024	559,139	1,045,226	642,049	1,615,968	1,498,848	3,943,174
	Performance contingency dredge area (ac)	15% of VM, MNR, and ENR/ *in situ*, areas convert to dredging during remedial design or based on future monitoring	22	20	18	13	11	11	4	15	0
	Performance contingency dredge volume (cy)	Assume average depth of contamination = 4 ft. Volume = area*depth *1.5.	214,749	191,473	177,673	130,017	106,223	110,960	34,017	146,820	0
	Total dredge volume (cy)		584,326	491,239	763,698	689,156	1,151,450	753,009	1,649,985	1,645,668	3,943,174

Table I-3 Cost Sensitivity – Areas and Volumes (continued)

Parameter			Remedial Alternative								
			2R/2R-CAD	3C	3R	4C	4R	5C	5R/5R-T[a]	6C	6R
High Sensitivity	Dredge-cut prism volume - high sensitivity (neat volume to alluvium for all alternatives; cy)		429,328	434,965	771,621	730,943	1,383,159	851,387	2,198,760	1,712,240	4,331,720
	Performance contingency dredge area (ac)	25% of VM, MNR, and ENR/ *in situ*, areas convert to dredging during remedial design or based on future monitoring	37	33	31	22	18	19	6	25	0
	Performance contingency dredge volume (cy)	Assume average depth of contamination = 4 ft. Volume = area*depth *1.5.	357,916	319,122	296,122	216,694	177,039	184,933	56,694	244,700	0
	Total dredge volume (cy)		787,244	754,087	1,067,743	947,637	1,560,198	1,036,320	2,255,454	1,956,940	4,331,720

Notes:

1. Values are carried through the cost estimate unrounded. Apparent discrepancies with the values in the main text of the FS (and Table E-2 of Appendix E) are only a result of rounding.
2. Volume estimate methodology is presented in Appendix E and Section 8.
3. Low and high sensitivity results are presented in Table I-4 only. Best estimate dredge volumes are shown in subsequent tables of this appendix.

a. The high sensitivity for Alternative 5R-Treatment has an additional sensitivity parameter not shown. The treated fraction of dredged sediment (assumed to be 25% of total dredged sediment) is disposed of in subtitle D landfill as opposed to beneficially reused.

ac = acres; C = combined technology; CAD = contained aquatic disposal; cy = cubic yards; ENR = enhanced natural recovery; FS = feasibility study; MNR = monitored natural recovery; O&M = operation and maintenance; R = removal emphasis; RAL = remedial action level; SQS = sediment quality standard; T = treatment; VM = verification monitoring

Table I-4 Summary of Costs ($ Millions)

		Remedial Alternative											
Best Estimate	**Cost Parameter**	**1[a]**	**2R**	**2R-CAD**	**3R**	**3C**	**4R**	**4C**	**5R**	**5R-T**	**5C**	**6R**	**6C**
	Capital	n/a	$169	$148	$224	$156	$324	$221	$430	$473	$250	$771	$478
	Monitoring, O&M, reporting, Agency oversight	$9	$46	$48	$43	$45	$38	$41	$36	$36	$41	$42	$51
	Total (NPV, i = 2.3%)	**$9**	**$220**	**$200**	**$270**	**$200**	**$360**	**$260**	**$470**	**$510**	**$290**	**$810**	**$530**
	Total (not discounted, i = 0%)[b]	$12	$250	$230	$310	$230	$430	$300	$580	$630	$330	$1,300	$650

		Remedial Alternative											
Low Sensitivity	**Cost Parameter**	**1[a]**	**2R**	**2R-CAD**	**3R**	**3C**	**4R**	**4C**	**5R**	**5R-T**	**5C**	**6R**	**6C**
	Capital	n/a	$99	$77	$157	$93	$261	$166	$370	$407	$197	$698	$400
	Monitoring, O&M, reporting, Agency oversight	$9	$46	$48	$43	$45	$38	$41	$36	$36	$41	$42	$51
	Total (NPV, i = 2.3%)	$9	$140	$130	$200	$140	$300	$210	$410	$440	$240	$740	$450
	% difference from best-estimate	0%	-36%	-35%	-26%	-30%	-17%	-19%	-13%	-14%	-17%	-9%	-15%

		Remedial Alternative											
High Sensitivity	**Cost Parameter**	**1[a]**	**2R**	**2R-CAD**	**3R**	**3C**	**4R**	**4C**	**5R**	**5R-T**	**5C**	**6R**	**6C**
	Capital	n/a	$218	$197	$296	$222	$409	$283	$538	$638	$317	$809	$533
	Monitoring, O&M, Reporting, Agency oversight	$9	$46	$48	$43	$45	$38	$41	$36	$36	$41	$42	$51
	Total (NPV, i = 2.3%)	$9	$260	$250	$340	$270	$450	$320	$570	$670	$360	$850	$580
	% difference from best-estimate	0%	18%	25%	26%	35%	25%	23%	21%	31%	24%	5%	9%

Notes:

1. Total costs are rounded to 2 significant digits. Capital costs and indirect construction costs are rounded to 3 significant digits for display purposes. All calculations are performed prior to rounding.
2. Capital costs include construction costs, construction contingency, sales tax, engineering, procurement, and construction management.

a. Alternative 1 costs are estimated to be $9 million for LDW-wide monitoring, agency oversight, and reporting. The cost of completing cleanup actions in the EAAs is estimated at approximately $95 million. Decisions on those cleanups have been made and are not part of the decision process represented in this FS. Substantial additional costs are expected for associated upland cleanup and source control. The EAA costs and the costs of upland cleanup and source control are not incorporated into the cost of any alternative and are not used in comparing the alternatives.

b. Total costs assuming a discount rate of 0%. Non-discounted costs are provided for informational purposes.

C = combined technology; CAD = contained aquatic disposal; i = discount rate (percent); n/a = not applicable; NPV = net present value; O&M = operation and maintenance; R = removal emphasis; T = treatment

Attachment 1

Detailed Cost Estimates

TABLE I-5 DREDGE PRODUCTION ESTIMATE

Open Water Dredge Production Rate Estimate

Parameter	Derrick Barge with Environmental Bucket (deep water)	Precision Excavator (deep water)	Precision Excavator (shallow water)
24-hr Operation			
Cycle Time (min)	3.5	3	2.5
Bucket Capacity (cy)	6	5	3
Bucket Fill Factor (@ 55%; cy)[a]	3.3	2.8	1.7
Bucket Fill Factor (@ 40%; cy) - Debris Sweep	2.4	2	1.2
Operating Day (hrs/day)	24	24	24
Effective Working Time (%)[b]	60%	60%	60%
Daily Dredge Production (cy/day)	815	792	570
Daily Dredge Production (cy/day) - Debris Sweep	592	576	415
Combined Dredge Production (cy/day) (10% debris sweep, 90% without debris sweep)	792	770	555
Combined Dredge Production (tons/day @ 1.5 tons/cy)[c]	1,189	1,156	832
Total Combined Dredge Production with One Open Water Operation (Split Between Environmental Bucket and Excavator) and One Shallow Water Operation (tons/day)	2,004		
12-hr Operation			
Combined Dredge Production (cy/day)[d]	396	385	277
Combined Dredge Production (tons/day)[d]	594	578	416
Total Combined Dredge Production with One Open Water Operation (Split Between Environmental Bucket and Excavator) and One Shallow Water Operation (tons/day)	1,002		

Annual Open Water Dredge Production Rate Estimates

Total In-water Construction Window (October 1 through February 15; days)	138
Days per week of operation (days)	5 and 6
Weekend days without operation (days)	29.6
Holidays (days)	5.0
Lost Time (days)	15.0
Net dredging days per season (days)	88.4
Net dredging days per season @12 hrs/day (assume operation 5 days/week; days)	39.3
Net dredging days per season @24 hrs/day (assume operation 6 days/week; days)	49.1
Annual tonnage (tons/year)	137,856
Annual volume removed (cy/year)	91,904
Average dredge production per operational day (tons/day)	1,559
Average dredge production per operational day (cy/day at 1.5 tons/cy)	1,039

Underpier Dredge Production Rate Estimate

Operating Day (hours)	12
Effective Working Time (%)	65%
Daily Production (cy/day)	240

Notes:

1. Construction window: October 1 through February 15.
2. Construction window is split equally (by number of weeks) between 24 hrs/day and 12 hrs/day operations.
3. Assume simultaneous open-water (split between environmental bucket and excavator) and shallow equipment operations (i.e., 2 equipment sets).

a. USACE 2008. *Technical Guidelines for Environmental Dredging of Contaminated Sediments*. ERDC/EL TR-08-29.

b. ibid. Operating efficiency includes allowance for non-production activities such as equipment maintenance/repair, water quality management, navigation systems, agency inspections, waiting for test results, moving dredges/barges, traffic, standby for navigation and refueling.

c. Assumes sediment bulk density of 1.5 tons/cy.

d. Calculations for 12-hr operations use same root assumptions as shown above for 24-hour operations.

TABLE I-6 MATERIAL PLACEMENT PRODUCTION ESTIMATE

Capping Production Estimate Open Access Below -10 ft - Derrick Barge with environmental bucket		
Cycle Time	2.5	min
Bucket Capacity	8	cy
Bucket Fill Factor (85%)	6.8	cy
Operating Day	12	hrs
Effective Working Time	75%	
Daily Production	1,469	cy/day

ENR Production Estimate - Open Access Below -10 ft - Derrick Barge with environmental bucket		
Cycle Time	2.5	min
Bucket Capacity	8	cy
Bucket Fill Factor (85%)	6.8	cy
Operating Day	12	hrs
Effective Working Time	70%	
Daily Production	1,371	cy/day

Capping Production Estimate - Above -10 ft - Precision Excavator		
Cycle Time	2	min
Bucket Capacity	5	cy
Bucket Fill Factor (85%)	4.25	cy
Operating Day	12	hrs
Effective Working Time	75%	
Daily Production	1,148	cy/day

ENR Production Estimate - Above -10 ft- Precision Excavator		
Cycle Time	2	min
Bucket Capacity	5	cy
Bucket Fill Factor (85%)	4.25	cy
Operating Day	12	hrs
Effective Working Time	70%	
Daily Production	1,071	cy/day

Capping Production Estimate - Underdock - Hydraulic, conveyor		
Operating Day	12	hrs
Daily Production	350	cy/day

ENR Production Estimate - Underdock - Hydraulic, conveyor		
Operating Day	12	hrs
Daily Production	300	cy/day

Notes:

1. These calculation are performed with logic consistent with dredging production rate calculations in Table I-5 and USACE, 2008.

TABLE I-7 MATERIAL PLACEMENT UNIT COST

Sand (8/30 Sieved)

Base cost	$13.00 /ton	
Delivery	$3.70 /ton	$5.99 / cy
Total	$16.70 /ton	$27.05 / cy

Granular Activated Carbon (GAC) Amended Sand

Base cost (delivered)	$1.07 /lb	
Base cost (delivered)	$2,140.00 /ton	$1,155.60 / cy
Mixing percentage (% by volume GAC/sand)	4%	
Total	$102.30 /ton	$161.48 /cy

Assumed Unit Weight

Capping Material	1.62 ton/cy
Granular Activated Carbon	0.54 ton/cy

Tow and Barge Delivery Surcharge Calculation

60	nautical miles RT
5	knots avg
12	hrs sail
400	tons/hr loading
1500	tons capacity
3.75	hrs loading
15.75	total hrs
$300.00	per hr, tug
$50.00	per hr., barge
$350.00	per hr., total
$5,512.50	trip cost
$3.70	add'l per ton

Notes:
1. Sand costs from DuPont RM and Pioneer Aggregates, DuPont, WA.
2. GAC costs from Luthy et al. 2009.

TABLE I-8 TRANSLOADING, WATER MANAGEMENT, AND DREDGING DAILY RATE

Transloading and Water Management	Cost	Unit	Notes
Transloading Area Setup	$1,000,000	LS	Best professional judgment order of magnitude cost for facility set-up
Water Management	$10,000	per day	Water management cost typical for relatively large-scale remediation projects in the Northwest

Dredging Daily Rate Assumptions	Cost	Unit	Notes
Labor	$5,750	12-hr day	Includes superintendent, foreman, 2 operators, 4 deck hands, and boat operator (Hartman 2011).
Dredge	$9,000	12-hr day	Includes one shallow and one deep dredge with tug for each (Hartman 2011).
Haul barge	$3,000	day	Assume one 1,500 cy haul barge and two 1,000 haul barges (Hartman 2011).
Subtotal 12-hr operation	$17,750	12-hr day	
Subtotal 24-hr operation	$32,500	24-hr day	Assume double 12-hr day for labor and dredge no additional cost for haul barge
Average daily rate	$25,963	day	Assume 39 days at 12 hrs and 49 days at 24 hrs

TABLE I-9 CONSTRUCTION MONITORING

Multi-Beam Survey Inclusive of Acquisition, Processing, and Data Delivery

Average of 2 quotes	$	4,928	/ day

Water Quality Sampling during Construction

	# of samples		Cost per sample		Total	
Analytical cost	106	$	1,000	$	106,000	annual cost
Labor, equipment and materials cost	106	$	1,500	$	159,000	annual cost
Subtotal annual cost				$	265,000	annual cost
Subtotal daily cost				$	2,998	/ day

Total Construction Monitoring Daily Rate	$	7,925	/ day

Notes:

1. Multi-beam survey cost includes equipment and labor to collect bathymetric survey data, data processing and delivery, and labor/equipment to collect and document pH/turbidity data. Estimate from John Lally, Lally Consulting, Seattle, WA.

2. Water quality sampling costs assume four monitoring stations: three for the dredging event that occurs in deep water and one for the dredge that operates in shallow water close to the banks; one sampling event for every station every day during the field season, for a total number of field screening samples for general water quality parameters of 352 (88x4=352). The number of samples that will require chemical analysis for PCBs, arsenic and cPAHs is assumed to be 30% of the field screening samples (30% of 352 equals 106).

3. Total construction monitoring includes survey boat, labor and equipment required for routine bathymetric surveys (single beam), data analysis, data delivery, pH/turbidity check, and water quality monitoring. Additional construction oversight is included in the 10% construction management cost described in Table I-37.

4. Construction monitoring is assumed to occur during dredging (88 days/season) and is incorporated in capital costs in Tables I-39 through I-49.

TABLE I-10 MOBILIZATION, DEMOBILIZATION, AND CONTRACTOR PROJECT MANAGEMENT COSTS

Mobilization/Demobilization	Cost	Unit	Notes
Mobilize/Demobilize Equipment and Facilities (project)	$400,000	Lump sum per mob	Start of project and end of project - includes mobilization of construction equipment for both dredging and material placement: 3 excavators (various bucket sizes), one clamshell, 2 derrick barges, 8 haul barges, 2 flat-decked barges, crew boat, survey boat (Hartman 2011).
Mobilize/Demobilize Equipment and Facilities (construction season)	$120,000	per year	Yearly mobilization/demobilization is assumed to be 30% of the project mob/demob cost of $400,000 for all years of project. Includes project management and labor during mobilization and demobilization (Hartman 2011).

Project Management and Operations	Cost	Unit	Notes
Land Lease for Operations and Staging	$250,000	per year	Based on review of lease rates in the Lower Duwamish Valley.
Site Office & Operating Expense	$21,600	per month	Includes housing, trailer, boats, travel.
Contractor Work Plan Submittals	$100,000	per year	Based on project experience.
Barge Protection	$80,000	lump sum	Barge protection is necessary to mitigate wear to barges during dredging operations.
Labor and Supervision	$62,000	per month	Includes project manager, chief surveyor and quality manager, works manager or superintendent, surveyor, accountant, certified industrial hygienist/ health and safety, physicals, HAZWOPER training.

Notes:

1. Cost assumptions for mobilization and demobilization reviewed in Hartman (2011).

TABLE I-11 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 2R

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	29.2	3.4	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	23	5	-
Bathymetry (note 4)	$ 20,241	$ 5,606	$ -
Subtotal analytical cost	$ 264,600	$ 31,136	$ -
Subtotal labor, equipment, bathymetry and materials cos	$ 206,907	$ 49,536	$ -
Data management, analysis and reporting (note 5)	$ 113,507	$ 31,436	$ -
Total monitoring cost for Post-Construction Event	$ 585,015	$ 112,107	$ -

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR (10)	MNR (20)
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4	4
No. of porewater samples per acre	0	1	4	0	0
No. of cores per acre	0	1	0	0	0
No. of samples for physical testing per acre	0	2	4	4	4
Remediation area (acre)	29.2	3.4	0.0	19.0	105.5
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	12	5	-	30	169
Bathymetry (note 4)	$ 20,241	$ 5,606	$ -	$ 15,644	$ 43,777
Subtotal per event analytical cost (note 6)	$ 132,300	$ 54,487	$ -	$ 172,235	$ 957,096
Subtotal per event labor, equipment and materials cos	$ 113,574	$ 46,790	$ -	$ 258,656	$ 1,394,177
Data management, analysis and reporting (note 5)	$ 113,507	$ 31,436	$ -	$ 87,729	$ 245,495
Total monitoring costs per event	$ 359,381	$ 132,713	$ -	$ 518,619	$ 2,596,768

See Table I-23 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions
2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.
3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).
4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: i.e., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.
5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.
6. Analytical cost assumes 4 samples per core

Repair Costs for Cap and ENR - 5% of total area

	Cap and PDC	ENR
Area	0.2	0.0
Cost/Ac	$300,000	$100,000
Total repair cost per event	$51,481	$0

Notes:

1. See Table I-23b for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-23b for PV analysis as part of O&M and monitoring cost development
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-12 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 2R-CAD

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	29.2	27.4	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	23	44	-
Bathymetry (note 4)	$ 20,241	$ 19,510	$ -
Subtotal analytical cost	$ 264,600	$ 248,864	$ -
Subtotal labor, equipment, bathymetry and materials cost	$ 206,907	$ 370,640	$ -
Data management, analysis and reporting (note 5)	$ 113,507	$ 109,407	$ -
Total monitoring cost for Post-Construction Event	$ 585,015	$ 728,911	$ -

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR (10)	MNR (20)
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4	4
No. of porewater samples per acre	0	2	4	0	0
No. of cores per acre	0	1	0	0	0
No. of samples for physical testing per acre	0	2	4	4	4
Remediation area (acre)	29.2	27.4	0.0	19.0	105.5
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	12	47	-	30	169
Bathymetry (note 4)	$ 20,241	$ 19,510	$ -	$ 15,644	$ 43,777
Subtotal per event analytical cost (note 6)	$ 132,300	$ 497,727	$ -	$ 172,235	$ 957,096
Subtotal per event labor, equipment and materials cost	$ 113,574	$ 392,585	$ -	$ 258,656	$ 1,394,177
Data management, analysis and reporting (note 5)	$ 113,507	$ 109,407	$ -	$ 87,729	$ 245,495
Total monitoring costs per event	$ 359,381	$ 999,720	$ -	$ 518,619	$ 2,596,768

See Table I-24 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6:
e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs for Cap and ENR - 5% of total area

	Cap and PDC	ENR
Area	1.4	0.0
Cost/Ac	$300,000	$100,000
Total repair cost per event	$411,481	$0

Notes:

1. See Table I-24 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.

2. These repair costs are carried over to Table I-24 for PV analysis as part of O&M and monitoring cost development.

3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/ acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-13 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 3R

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	50.3	7.5	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	40	12	-
Bathymetry (note 4)	$ 28,065	$ 8,975	$ -
Subtotal analytical cost	$ 456,203	$ 68,227	$ -
Subtotal labor, equipment, bathymetry and materials cost	$ 349,902	$ 105,240	$ -
Data management, analysis and reporting (note 5)	$ 157,385	$ 50,332	$ -
Total monitoring cost for Post-Construction Event	$ 963,490	$ 223,799	$ -

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR (20)
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	50.3	7.5	0.0	99.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	20	13	-	158
Bathymetry (note 4)	$ 28,065	$ 8,975	$ -	$ 42,126
Subtotal per event analytical cost (note 6)	$ 228,102	$ 136,455	$ -	$ 897,682
Subtotal per event labor, equipment and materials cost	$ 188,983	$ 111,256	$ -	$ 1,308,697
Data management, analysis and reporting (note 5)	$ 157,385	$ 50,332	$ -	$ 236,234
Total monitoring costs per event	$ 574,471	$ 298,043	$ -	$ 2,442,613

See Table I-25 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	0.4	0.0
Cost/Ac	$300,000	$100,000
Total repair cost per event	$112,810	$0

Notes:

1. See Table I-25 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.

2. These repair costs are carried over to Table I-25 for PV analysis as part of O&M and monitoring cost development.

3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-14 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 3C

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	28.6	19.7	9.5
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	23	31	15
Bathymetry (note 4)	$ 20,015	$ 15,983	$ 10,329
Subtotal analytical cost	$ 259,706	$ 178,503	$ 86,221
Subtotal labor, equipment, bathymetry and materials cos	$ 203,229	$ 267,840	$ 131,981
Data management, analysis and reporting (note 5)	$ 112,243	$ 89,631	$ 57,921
Total monitoring cost for Post-Construction Event	$ 575,178	$ 535,974	$ 276,124

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR (20)
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	28.6	19.7	9.5	99.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	11	33	23	158
Bathymetry (note 4)	$ 20,015	$ 15,983	$ 10,329	$ 42,126
Subtotal per event analytical cost (note 6)	$ 129,853	$ 357,007	$ 172,443	$ 897,682
Subtotal per event labor, equipment and materials cos	$ 111,622	$ 283,581	$ 192,808	$ 1,308,697
Data management, analysis and reporting (note 5)	$ 112,243	$ 89,631	$ 57,921	$ 236,234
Total monitoring costs per event	$ 353,718	$ 730,219	$ 423,172	$ 2,442,613

See Table I-26 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	1.0	0.5
Cost/Ac	$300,000	$100,000
Total repair cost per event	$295,145	$47,521

Notes:

1. See Table I-26 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-26 for PV analysis as part of O&M and monitoring cost development
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/acre approximately equals the capital cos for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-15 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 4R

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	93.2	13.8	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	75	22	-
Bathymetry (note 4)	$ 40,648	$ 12,907	$ -
Subtotal analytical cost	$ 845,804	$ 125,000	$ -
Subtotal labor, equipment, bathymetry and materials cost	$ 637,334	$ 189,274	$ -
Data management, analysis and reporting (note 5)	$ 227,946	$ 72,380	$ -
Total monitoring cost for Post-Construction Event	$ 1,711,084	$ 386,654	$ -

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR (10)
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	93.2	13.8	0.0	49.7
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	37	23	-	80
Bathymetry (note 4)	$ 40,648	$ 12,907	$ -	$ 27,883
Subtotal per event analytical cost (note 6)	$ 422,902	$ 250,001	$ -	$ 451,267
Subtotal per event labor, equipment and materials cost	$ 338,991	$ 200,297	$ -	$ 664,591
Data management, analysis and reporting (note 5)	$ 227,946	$ 72,380	$ -	$ 156,362
Total monitoring costs per event	$ 989,838	$ 522,677	$ -	$ 1,272,220

See Table I-27 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	0.7	0.0
Cost/Ac	$300,000	$100,000
Total repair cost per event	$206,680	$0

Notes:

1. See Table I-27 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-27 for PV analysis as part of O&M and monitoring cost development.
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/ acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-16 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 4C

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	49.7	41.0	16.4
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	40	66	26
Bathymetry (note 4)	$ 27,853	$ 24,819	$ 14,321
Subtotal analytical cost	$ 450,476	$ 371,690	$ 148,659
Subtotal labor, equipment, bathymetry and materials cost	$ 345,649	$ 549,249	$ 224,070
Data management, analysis and reporting (note 5)	$ 156,197	$ 139,180	$ 80,313
Total monitoring cost for Post-Construction Event	$ 952,322	$ 1,060,118	$ 453,042

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR (10)
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	49.7	41.0	16.4	49.7
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	20	70	39	80
Bathymetry (note 4)	$ 27,853	$ 24,819	$ 14,321	$ 27,883
Subtotal per event analytical cost (note 6)	$ 225,238	$ 743,379	$ 297,318	$ 451,267
Subtotal per event labor, equipment and materials cost	$ 186,751	$ 582,025	$ 328,944	$ 664,591
Data management, analysis and reporting (note 5)	$ 156,197	$ 139,180	$ 80,313	$ 156,362
Total monitoring costs per event	$ 568,186	$ 1,464,585	$ 706,575	$ 1,272,220

See Table I-28 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6:
e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	2.0	0.8
Cost/Ac	$300,000	$100,000
Total repair cost per event	$614,566	$81,933

Notes:

1. See Table I-28 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-28 for PV analysis as part of O&M and monitoring cost development.
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/ acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-17 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 5R

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	143.1	13.6	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	114	22	-
Bathymetry (note 4)	$ 52,565	$ 12,828	$ -
Subtotal analytical cost	$ 1,298,279	$ 123,730	$ -
Subtotal labor, equipment, bathymetry and materials cost	$ 968,458	$ 187,403	$ -
Data management, analysis and reporting (note 5)	$ 294,775	$ 71,937	$ -
Total monitoring cost for Post-Construction Event	$ 2,561,512	$ 383,070	$ -

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	143.1	13.6	0.0	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	57	23	-	-
Bathymetry (note 4)	$ 52,565	$ 12,828	$ -	$ -
Subtotal per event analytical cost (note 6)	$ 649,140	$ 247,460	$ -	$ -
Subtotal per event labor, equipment and materials cost	$ 510,511	$ 198,314	$ -	$ -
Data management, analysis and reporting (note 5)	$ 294,775	$ 71,937	$ -	$ -
Total monitoring costs per event	$ 1,454,426	$ 517,711	$ -	$ -

See Table I-29 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	0.7	0.0
Cost/Ac	$300,000	$100,000
Total repair cost per event	$204,580	$0

Notes:

1. See Table I-29 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-29 for PV analysis as part of O&M and monitoring cost development.
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-18 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 5R - TREATMENT

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	143.1	13.6	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	114	22	-
Bathymetry (note 4)	$ 52,565	$ 12,828	$ -
Subtotal analytical cost	$ 1,298,279	$ 123,730	$ -
Subtotal labor, equipment, bathymetry and materials cost	$ 968,458	$ 187,403	$ -
Data management, analysis and reporting (note 5)	$ 294,775	$ 71,937	$ -
Total monitoring cost for Post-Construction Event	$ 2,561,512	$ 383,070	$ -

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	143.1	13.6	0.0	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	57	23	-	-
Bathymetry (note 4)	$ 52,565	$ 12,828	$ -	$ -
Subtotal per event analytical cost (note 6)	$ 649,140	$ 247,460	$ -	$ -
Subtotal per event labor, equipment and materials cost	$ 510,511	$ 198,314	$ -	$ -
Data management, analysis and reporting (note 5)	$ 294,775	$ 71,937	$ -	$ -
Total monitoring costs per event	$ 1,454,426	$ 517,711	$ -	$ -

See Table I-30 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	0.7	0.0
Cost/Ac	$300,000	$100,000
Total repair cost per event	$204,580	$0

Notes:

1. See Table I-30 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-30 for PV analysis as part of O&M and monitoring cost development.
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/ acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-19 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 5C

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	56.7	47.1	53.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	45	75	85
Bathymetry (note 4)	$ 30,152	$ 26,981	$ 28,960
Subtotal analytical cost	$ 514,122	$ 427,213	$ 480,695
Subtotal labor, equipment, bathymetry and materials cost	$ 392,848	$ 629,751	$ 707,189
Data management, analysis and reporting (note 5)	$ 169,087	$ 151,306	$ 162,402
Total monitoring cost for Post-Construction Event	$ 1,076,056	$ 1,208,269	$ 1,350,286

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	56.7	47.1	53.0	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	23	80	127	-
Bathymetry (note 4)	$ 30,152	$ 26,981	$ 28,960	$ -
Subtotal per event analytical cost (note 6)	$ 257,061	$ 854,426	$ 961,390	$ -
Subtotal per event labor, equipment and materials cost	$ 211,500	$ 667,424	$ 1,046,304	$ -
Data management, analysis and reporting (note 5)	$ 169,087	$ 151,306	$ 162,402	$ -
Total monitoring costs per event	$ 637,647	$ 1,673,155	$ 2,170,096	$ -

See Table I-31 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.
2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.
3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).
4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.
5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.
6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	2.4	2.6
Cost/Ac	$300,000	$100,000
Total repair cost per event	$706,371	$264,933

Notes:

1. See Table I-31 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-31 for PV analysis as part of O&M and monitoring cost development.
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/ acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-20 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 6R

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	274.5	27.6	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	220	44	-
Bathymetry (note 4)	$ 77,697	$ 19,572	$ -
Subtotal analytical cost	$ 2,490,128	$ 250,188	$ -
Subtotal labor, equipment, bathymetry and materials cost	$ 1,834,402	$ 372,571	$ -
Data management, analysis and reporting (note 5)	$ 435,715	$ 109,756	$ -
Total monitoring cost for Post-Construction Event	$ 4,760,245	$ 732,515	$ -

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	274.5	27.6	0.0	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	110	47	-	-
Bathymetry (note 4)	$ 77,697	$ 19,572	$ -	$ -
Subtotal per event analytical cost (note 6)	$ 1,245,064	$ 500,376	$ -	$ -
Subtotal per event labor, equipment and materials cost	$ 956,049	$ 394,633	$ -	$ -
Data management, analysis and reporting (note 5)	$ 435,715	$ 109,756	$ -	$ -
Total monitoring costs per event	$ 2,636,829	$ 1,004,766	$ -	$ -

See Table I-32 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	1.4	0.0
Cost/Ac	$300,000	$100,000
Total repair cost per event	$413,671	$0

Notes:

1. See Table I-32 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-32 for PV analysis as part of O&M and monitoring cost development.
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/ acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-21 MONITORING, OPERATION AND MAINTENANCE COSTS - ALTERNATIVE 6C

Post-Construction Performance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268
No. of chemical surface samples per acre	4	4	4
No. of locations for physical testing/inspection per acre	0	4	4
Remediation area (acres)	108.5	92.6	101.1
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	87	148	162
Bathymetry (note 4)	$ 44,532	$ 40,494	$ 42,674
Subtotal analytical cost	$ 984,758	$ 840,493	$ 917,238
Subtotal labor, equipment, bathymetry and materials cost	$ 739,246	$ 1,226,375	$ 1,336,837
Data management, analysis and reporting (note 5)	$ 249,728	$ 227,086	$ 239,309
Total monitoring cost for Post-Construction Event	$ 1,973,732	$ 2,293,953	$ 2,493,384

Operation and Maintenance Monitoring

Cost Parameter	Dredge	Cap and PDC	ENR	MNR
Analytical cost per sample (note 1)	$ 2,268	$ 2,268	$ 2,268	$ 2,268
No. of surface sediment samples per acre	2	2	4	4
No. of porewater samples per acre	0	2	4	0
No. of cores per acre	0	1	0	0
No. of samples for physical testing per acre	0	2	4	4
Remediation area (acre)	108.5	92.6	101.1	0.0
Daily labor, equipment, materials (note 2)	$ 8,000	$ 8,000	$ 8,000	$ 8,000
No. of monitoring days (note 3)	43	157	243	-
Bathymetry (note 4)	$ 44,532	$ 40,494	$ 42,674	$ -
Subtotal per event analytical cost (note 6)	$ 492,379	$ 1,680,986	$ 1,834,477	$ -
Subtotal per event labor, equipment and materials cost	$ 391,889	$ 1,300,492	$ 1,983,919	$ -
Data management, analysis and reporting (note 5)	$ 249,728	$ 227,086	$ 239,309	$ -
Total monitoring costs per event	$ 1,133,996	$ 3,208,564	$ 4,057,705	$ -

See Table I-33 and Appendix K for assumed Post-Construction Monitoring Frequency

Notes:

1. Analytical costs assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions.

2. "Daily labor, equipment, and materials" rate applies to surface sediment, porewater sampling, sediment cores, and physical or diver-assisted inspections based on the number of samples or stations.

3. Post Construction Monitoring days calculated assuming 5 locations per day: (total samples or locations/acre)*(acres) / (5 samples or locations/day). Operation and Maintenance Monitoring days also include 2 core locations per day: (total samples or locations/acre)*(acres)/(2 samples or locations/day).

4. Bathymetric costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = cost(site-wide) * (area A/418 acres)^0.6.

5. Data management, analysis and reporting costs calculated by scaling estimated per acre cost of $15,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = (cost) * (area A)^0.6.

6. Analytical cost assumes 4 samples per core.

Repair Costs - 5% of total area

	Cap and PDC	ENR
Area	4.6	5.1
Cost/Ac	$300,000	$100,000
Total repair cost per event	$1,389,704	$505,533

Notes:

1. See Table I-33 for repair frequency assumption. During implementation, repair frequency and scope would be determined based on monitoring results.
2. These repair costs are carried over to Table I-33 for PV analysis as part of O&M and monitoring cost development.
3. Costs per acre are based on the final costs for capping and ENR for the remedial alternatives (Tables I-38 through I-49). For ENR, $100,000/ acre approximately equals the capital cost for materials and labor. For capping, $300,000/acre is about 60% of the capital costs for materials and labor, using the assumption that cap repair could represent placement of less than 3 ft of material.

TABLE I-22 BASELINE AND LONG-TERM MONITORING

Monitoring Costs per Event

Surface Sediment			
	Total Sediment Analytical Cost	$	285,830
	Sample collection, data management, analysis, reporting, QC (50% of analytical)	$	142,915
	Total cost per event	$	428,745

Tissue			
	Total Tissue Analytical Cost	$	143,840
	Sample collection, data management, analysis, reporting, QC (50% of analytical)	$	71,920
	Total cost per event	$	215,760

Surface Water Quality			
	Total Surface Water Analytical Cost	$	48,280
	Sample collection, data management, analysis, reporting, QC (50% of analytical)	$	24,140
	Total cost per event	$	72,420

Survey Costs per Event

Bathymetric Survey			
Bank-to-bank site-wide multi-beam bathymetric survey		$	100,000
Other Miscellaneous Surveys			
Benthic survey or other (scope to be defined) (cost per event)		$	250,000
	Total cost per event	$	350,000

Upstream Loading Sampling

One multi-media sampling event after site equilibrium is reached in sediment (cost proportional to the site-wide sampling event)	**Total cost per event**	$	600,000

Notes:

1. See Tables I-23 through I-33 for monitoring frequency for each remedial alternative, based on Appendix K.

2. Baseline monitoring to occur before construction in year 0. Long-term monitoring at intervals of 5, 10, and 15 years after the active portion of remedy is completed for alternatives that take 10 years or less to construct (Alternatives 2R, 2R-CAD 3R, 3C, 4C and 5C). Assume one additional sample round for Alternatives 4R, 5R, 5R-T, and 6C. Assume two additional sample rounds for Alternative 6R.

3. The purpose of baseline sampling is to establish surface sediment, tissue, and water quality conditions.

TABLE I-23a NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, AND LONG-TERM MONITORING - Alt 1

									2.3%			
	Long-term Monitoring[a]					Annual Cost				Present Value[d]		
Year	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Agency Oversight[b]	Reporting[b]	Long-term Monitoring[c]	Present Value Factor	Agency Oversight	Reporting	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y	$200,000	$0	$1,666,925	1.00	$200,000	$0	$1,666,925
1						$100,000	$0	$0	0.98	$97,752	$0	$0
2						$100,000	$0	$0	0.96	$95,554	$0	$0
3		Y				$100,000	$0	$215,760	0.93	$93,406	$0	$201,532
4						$100,000	$0	$0	0.91	$91,306	$0	$0
5						$200,000	$250,000	$0	0.89	$178,506	$223,132	$0
6	Y	Y	Y		Y	$100,000	$0	$1,066,925	0.87	$87,246	$0	$930,851
7						$100,000	$0	$0	0.85	$85,285	$0	$0
8		Y				$100,000	$0	$215,760	0.83	$83,367	$0	$179,873
9						$100,000	$0	$0	0.81	$81,493	$0	$0
10						$200,000	$250,000	$0	0.80	$159,321	$199,152	$0
11	Y	Y	Y			$100,000	$0	$716,925	0.78	$77,870	$0	$558,267
12						$100,000	$0	$0	0.76	$76,119	$0	$0
13						$100,000	$0	$0	0.74	$74,408	$0	$0
14						$100,000	$0	$0	0.73	$72,735	$0	$0
15						$200,000	$250,000	$0	0.71	$142,199	$177,748	$0
16	Y	Y	Y			$100,000	$0	$716,925	0.70	$69,501	$0	$498,269
17						$100,000	$0	$0	0.68	$67,938	$0	$0
18						$100,000	$0	$0	0.66	$66,411	$0	$0
19						$100,000	$0	$0	0.65	$64,918	$0	$0
20						$200,000	$250,000	$0	0.63	$126,916	$158,645	$0
21	Y	Y	Y			$100,000	$0	$716,925	0.62	$62,031	$0	$444,719
22						$100,000	$0	$0	0.61	$60,637	$0	$0
23						$100,000	$0	$0	0.59	$59,273	$0	$0
24						$100,000	$0	$0	0.58	$57,941	$0	$0
25						$200,000	$250,000	$0	0.57	$113,276	$141,595	$0
26	Y	Y	Y	Y		$100,000	$0	$1,316,925	0.55	$55,365	$0	$729,113
27						$100,000	$0	$0	0.54	$54,120	$0	$0
28						$100,000	$0	$0	0.53	$52,903	$0	$0
29						$100,000	$0	$0	0.52	$51,714	$0	$0
30						$200,000	$250,000	$0	0.51	$101,102	$126,378	$0
Totals						$3,800,000	$1,500,000	$6,633,070		$2,760,610	$1,026,650	$5,209,547

Notes:

a. Monitoring frequencies are based on Appendix K.

b. See I-37 for assumptions.

c. Long-term monitoring costs per event are based on Table I-22.

d. Values equal to the annual cost times the present value factor.

TABLE I-23b NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, LONG-TERM MONITORING - Alt 2R

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost								Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$200,000	$250,000	$0	$0	$0	$0	$0	0.89	$178,506	$223,132	$0	$0	$0	$0	$0
6	Y	Y	Y		Y	Y	Y	Y	Y			$200,000	$0	$359,381	$132,713	$0	$3,115,387	$1,066,925	0.87	$174,492	$0	$313,546	$115,787	$0	$2,718,055	$930,851
7									Y			$200,000	$0	$0	$0	$0	$3,115,387	$0	0.85	$170,569	$0	$0	$0	$0	$2,656,945	$0
8		Y										$200,000	$0	$0	$0	$0	$0	$215,760	0.83	$166,734	$0	$0	$0	$0	$0	$179,873
9						Y	Y	Y	Y	Y	Y	$200,000	$0	$359,381	$184,194	$0	$3,115,387	$0	0.81	$162,986	$0	$292,870	$150,105	$0	$2,538,817	$0
10												$200,000	$250,000	$0	$0	$0	$0	$0	0.80	$159,321	$199,152	$0	$0	$0	$0	$0
11	Y	Y	Y						Y			$200,000	$0	$0	$0	$0	$3,115,387	$716,925	0.78	$155,739	$0	$0	$0	$0	$2,425,940	$558,267
12												$200,000	$0	$0	$0	$0	$0	$0	0.76	$152,238	$0	$0	$0	$0	$0	$0
13												$200,000	$0	$0	$0	$0	$0	$0	0.74	$148,815	$0	$0	$0	$0	$0	$0
14							Y	Y	Y	Y	Y	$200,000	$0	$0	$184,194	$0	$3,115,387	$0	0.73	$145,469	$0	$0	$133,973	$0	$2,265,965	$0
15												$200,000	$250,000	$0	$0	$0	$0	$0	0.71	$142,199	$177,748	$0	$0	$0	$0	$0
16	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.70	$139,002	$0	$0	$0	$0	$0	$498,269
17												$200,000	$0	$0	$0	$0	$0	$0	0.68	$135,876	$0	$0	$0	$0	$0	$0
18												$200,000	$0	$0	$0	$0	$0	$0	0.66	$132,822	$0	$0	$0	$0	$0	$0
19									Y			$200,000	$0	$0	$0	$0	$3,115,387	$0	0.65	$129,835	$0	$0	$0	$0	$2,022,437	$0
20												$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.62	$124,063	$0	$0	$0	$0	$0	$444,719
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23												$200,000	$0	$0	$0	$0	$0	$0	0.59	$118,547	$0	$0	$0	$0	$0	$0
24									Y			$200,000	$0	$0	$0	$0	$3,115,387	$0	0.58	$115,882	$0	$0	$0	$0	$1,805,082	$0
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.55	$110,730	$0	$0	$0	$0	$0	$729,113
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28												$200,000	$0	$0	$0	$0	$0	$0	0.53	$105,806	$0	$0	$0	$0	$0	$0
29												$200,000	$0	$0	$0	$0	$0	$0	0.52	$103,428	$0	$0	$0	$0	$0	$0
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$8,700,000	$1,750,000	$718,763	$501,101	$0	$21,807,711	$6,633,070		$6,889,985	$1,265,659	$606,416	$399,864	$0	$16,433,240	$5,209,547

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-11.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-24 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING- Alt 2R-CAD

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost							Present Value Factor	Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]		Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$200,000	$250,000	$0	$0	$0	$0	$0	0.89	$178,506	$223,132	$0	$0	$0	$0	$0
6	Y	Y	Y		Y	Y	Y	Y	Y			$200,000	$0	$359,381	$999,720	$0	$3,115,387	$1,066,925	0.87	$174,492	$0	$313,546	$872,217	$0	$2,718,055	$930,851
7									Y			$200,000	$0	$0	$0	$0	$3,115,387	$0	0.85	$170,569	$0	$0	$0	$0	$2,656,945	$0
8		Y										$200,000	$0	$0	$0	$0	$0	$215,760	0.83	$166,734	$0	$0	$0	$0	$0	$179,873
9						Y	Y	Y	Y	Y	Y	$200,000	$0	$359,381	$1,411,201	$0	$3,115,387	$0	0.81	$162,986	$0	$292,870	$1,150,027	$0	$2,538,817	$0
10												$200,000	$250,000	$0	$0	$0	$0	$0	0.80	$159,321	$199,152	$0	$0	$0	$0	$0
11	Y	Y	Y						Y			$200,000	$0	$0	$0	$0	$3,115,387	$716,925	0.78	$155,739	$0	$0	$0	$0	$2,425,940	$558,267
12												$200,000	$0	$0	$0	$0	$0	$0	0.76	$152,238	$0	$0	$0	$0	$0	$0
13												$200,000	$0	$0	$0	$0	$0	$0	0.74	$148,815	$0	$0	$0	$0	$0	$0
14							Y	Y	Y	Y	Y	$200,000	$0	$0	$1,411,201	$0	$3,115,387	$0	0.73	$145,469	$0	$0	$1,026,431	$0	$2,265,965	$0
15												$200,000	$250,000	$0	$0	$0	$0	$0	0.71	$142,199	$177,748	$0	$0	$0	$0	$0
16	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.70	$139,002	$0	$0	$0	$0	$0	$498,269
17												$200,000	$0	$0	$0	$0	$0	$0	0.68	$135,876	$0	$0	$0	$0	$0	$0
18												$200,000	$0	$0	$0	$0	$0	$0	0.66	$132,822	$0	$0	$0	$0	$0	$0
19									Y			$200,000	$0	$0	$0	$0	$3,115,387	$0	0.65	$129,835	$0	$0	$0	$0	$2,022,437	$0
20												$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.62	$124,063	$0	$0	$0	$0	$0	$444,719
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23												$200,000	$0	$0	$0	$0	$0	$0	0.59	$118,547	$0	$0	$0	$0	$0	$0
24									Y			$200,000	$0	$0	$0	$0	$3,115,387	$0	0.58	$115,882	$0	$0	$0	$0	$1,805,082	$0
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.55	$110,730	$0	$0	$0	$0	$0	$729,113
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28												$200,000	$0	$0	$0	$0	$0	$0	0.53	$105,806	$0	$0	$0	$0	$0	$0
29												$200,000	$0	$0	$0	$0	$0	$0	0.52	$103,428	$0	$0	$0	$0	$0	$0
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$8,700,000	$1,750,000	$718,763	$3,822,121	$0	$21,807,711	$6,633,070		$6,889,985	$1,265,659	$606,416	$3,048,675	$0	$16,433,240	$5,209,547

Notes:

a. Costs from the start of construction. Construction years are shaded.
b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.
c. See I-37 for assumptions.
d. O&M monitoring and repair costs per event are based on Table I-12.
e. Long-term monitoring costs per event are based on Table I-22.
f. Values equal to the annual cost times the present value factor.

TABLE I-25 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING- Alt 3R

																			2.3%							
	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost								Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$200,000	$0	$0	$0	$0	$0	$0	0.85	$170,569	$0	$0	$0	$0	$0	$0
8	Y	Y	Y		Y	Y	Y	Y	Y			$200,000	$0	$574,471	$298,043	$0	$2,442,613	$1,066,925	0.83	$166,734	$0	$478,920	$248,470	$0	$2,036,337	$889,465
9									Y			$200,000	$0	$0	$0	$0	$2,442,613	$0	0.81	$162,986	$0	$0	$0	$0	$1,990,554	$0
10		Y										$200,000	$250,000	$0	$0	$0	$0	$215,760	0.80	$159,321	$199,152	$0	$0	$0	$0	$171,876
11						Y	Y	Y	Y	Y	Y	$200,000	$0	$574,471	$410,853	$0	$2,442,613	$0	0.78	$155,739	$0	$447,338	$319,930	$0	$1,902,054	$0
12												$200,000	$0	$0	$0	$0	$0	$0	0.76	$152,238	$0	$0	$0	$0	$0	$0
13	Y	Y	Y						Y			$200,000	$0	$0	$0	$0	$2,442,613	$716,925	0.74	$148,815	$0	$0	$0	$0	$1,817,488	$533,446
14												$200,000	$0	$0	$0	$0	$0	$0	0.73	$145,469	$0	$0	$0	$0	$0	$0
15												$200,000	$250,000	$0	$0	$0	$0	$0	0.71	$142,199	$177,748	$0	$0	$0	$0	$0
16							Y	Y	Y	Y	Y	$200,000	$0	$0	$410,853	$0	$2,442,613	$0	0.70	$139,002	$0	$0	$285,546	$0	$1,697,636	$0
17												$200,000	$0	$0	$0	$0	$0	$0	0.68	$135,876	$0	$0	$0	$0	$0	$0
18	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.66	$132,822	$0	$0	$0	$0	$0	$476,115
19												$200,000	$0	$0	$0	$0	$0	$0	0.65	$129,835	$0	$0	$0	$0	$0	$0
20												$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21									Y			$200,000	$0	$0	$0	$0	$2,442,613	$0	0.62	$124,063	$0	$0	$0	$0	$1,515,188	$0
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.59	$118,547	$0	$0	$0	$0	$0	$424,946
24												$200,000	$0	$0	$0	$0	$0	$0	0.58	$115,882	$0	$0	$0	$0	$0	$0
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26									Y			$200,000	$0	$0	$0	$0	$2,442,613	$0	0.55	$110,730	$0	$0	$0	$0	$1,352,347	$0
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.53	$105,806	$0	$0	$0	$0	$0	$696,696
29												$200,000	$0	$0	$0	$0	$0	$0	0.52	$103,428	$0	$0	$0	$0	$0	$0
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$9,700,000	$1,850,000	$1,148,941	$1,119,750	$0	$17,098,294	$6,633,070		$7,772,480	$1,353,908	$926,258	$853,946	$0	$12,311,604	$5,061,002

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-13.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-26 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING- Alt 3C

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost							Present Value Factor	Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]		Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$200,000	$0	$0	$0	$0	$0	$0	0.91	$182,611	$0	$0	$0	$0	$0	$0
5	Y	Y	Y		Y	Y	Y	Y	Y			$200,000	$250,000	$353,718	$730,219	$423,172	$2,442,613	$1,066,925	0.89	$178,506	$223,132	$315,703	$651,741	$377,693	$2,180,101	$952,260
6									Y			$200,000	$0	$0	$0	$0	$2,442,613	$0	0.87	$174,492	$0	$0	$0	$0	$2,131,086	$0
7		Y										$200,000	$0	$0	$0	$0	$0	$215,760	0.85	$170,569	$0	$0	$0	$0	$0	$184,010
8						Y	Y	Y	Y	Y	Y	$200,000	$0	$353,718	$1,025,363	$470,693	$2,442,613	$0	0.83	$166,734	$0	$294,885	$854,816	$392,403	$2,036,337	$0
9												$200,000	$0	$0	$0	$0	$0	$0	0.81	$162,986	$0	$0	$0	$0	$0	$0
10	Y	Y	Y						Y			$200,000	$250,000	$0	$0	$0	$2,442,613	$716,925	0.80	$159,321	$199,152	$0	$0	$0	$1,945,801	$571,107
11												$200,000	$0	$0	$0	$0	$0	$0	0.78	$155,739	$0	$0	$0	$0	$0	$0
12												$200,000	$0	$0	$0	$0	$0	$0	0.76	$152,238	$0	$0	$0	$0	$0	$0
13							Y	Y	Y	Y	Y	$200,000	$0	$0	$1,025,363	$470,693	$2,442,613	$0	0.74	$148,815	$0	$0	$762,947	$350,231	$1,817,488	$0
14												$200,000	$0	$0	$0	$0	$0	$0	0.73	$145,469	$0	$0	$0	$0	$0	$0
15	Y	Y	Y									$200,000	$250,000	$0	$0	$0	$0	$716,925	0.71	$142,199	$177,748	$0	$0	$0	$0	$509,729
16												$200,000	$0	$0	$0	$0	$0	$0	0.70	$139,002	$0	$0	$0	$0	$0	$0
17												$200,000	$0	$0	$0	$0	$0	$0	0.68	$135,876	$0	$0	$0	$0	$0	$0
18									Y			$200,000	$0	$0	$0	$0	$2,442,613	$0	0.66	$132,822	$0	$0	$0	$0	$1,622,159	$0
19												$200,000	$0	$0	$0	$0	$0	$0	0.65	$129,835	$0	$0	$0	$0	$0	$0
20	Y	Y	Y									$200,000	$250,000	$0	$0	$0	$0	$716,925	0.63	$126,916	$158,645	$0	$0	$0	$0	$454,947
21												$200,000	$0	$0	$0	$0	$0	$0	0.62	$124,063	$0	$0	$0	$0	$0	$0
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23									Y			$200,000	$0	$0	$0	$0	$2,442,613	$0	0.59	$118,547	$0	$0	$0	$0	$1,447,822	$0
24												$200,000	$0	$0	$0	$0	$0	$0	0.58	$115,882	$0	$0	$0	$0	$0	$0
25	Y	Y	Y	Y								$200,000	$250,000	$0	$0	$0	$0	$1,316,925	0.57	$113,276	$141,595	$0	$0	$0	$0	$745,882
26												$200,000	$0	$0	$0	$0	$0	$0	0.55	$110,730	$0	$0	$0	$0	$0	$0
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28												$200,000	$0	$0	$0	$0	$0	$0	0.53	$105,806	$0	$0	$0	$0	$0	$0
29												$200,000	$0	$0	$0	$0	$0	$0	0.52	$103,428	$0	$0	$0	$0	$0	$0
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$8,200,000	$1,700,000	$707,436	$2,780,945	$1,364,558	$17,098,294	$6,633,070		$6,433,457	$1,220,006	$610,588	$2,269,504	$1,120,327	$13,180,793	$5,286,393

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-14.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-27 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING - Alt 4R

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost							2.3%	Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$700,000	$50,000	$0	$0	$0	$0	$0	0.85	$596,992	$42,642	$0	$0	$0	$0	$0
8	Y	Y	Y		Y							$700,000	$50,000	$0	$0	$0	$0	$1,066,925	0.83	$583,570	$41,684	$0	$0	$0	$0	$889,465
9												$700,000	$50,000	$0	$0	$0	$0	$0	0.81	$570,450	$40,746	$0	$0	$0	$0	$0
10												$700,000	$300,000	$0	$0	$0	$0	$0	0.80	$557,624	$238,982	$0	$0	$0	$0	$0
11												$700,000	$50,000	$0	$0	$0	$0	$0	0.78	$545,087	$38,935	$0	$0	$0	$0	$0
12												$200,000	$0	$0	$0	$0	$0	$0	0.76	$152,238	$0	$0	$0	$0	$0	$0
13	Y	Y	Y			Y	Y	Y	Y			$200,000	$0	$989,838	$522,677	$0	$1,272,220	$716,925	0.74	$148,815	$0	$736,514	$388,911	$0	$946,628	$533,446
14									Y			$200,000	$0	$0	$0	$0	$1,272,220	$0	0.73	$145,469	$0	$0	$0	$0	$925,345	$0
15		Y										$200,000	$250,000	$0	$0	$0	$0	$215,760	0.71	$142,199	$177,748	$0	$0	$0	$0	$153,404
16						Y	Y	Y	Y	Y	Y	$200,000	$0	$989,838	$729,358	$0	$1,272,220	$0	0.70	$139,002	$0	$687,946	$506,910	$0	$884,203	$0
17												$200,000	$0	$0	$0	$0	$0	$0	0.68	$135,876	$0	$0	$0	$0	$0	$0
18	Y	Y	Y						Y			$200,000	$0	$0	$0	$0	$1,272,220	$716,925	0.66	$132,822	$0	$0	$0	$0	$844,892	$476,115
19												$200,000	$0	$0	$0	$0	$0	$0	0.65	$129,835	$0	$0	$0	$0	$0	$0
20												$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21							Y	Y	Y	Y	Y	$200,000	$0	$0	$729,358	$0	$1,272,220	$0	0.62	$124,063	$0	$0	$452,431	$0	$789,176	$0
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.59	$118,547	$0	$0	$0	$0	$0	$424,946
24												$200,000	$0	$0	$0	$0	$0	$0	0.58	$115,882	$0	$0	$0	$0	$0	$0
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26												$200,000	$0	$0	$0	$0	$0	$0	0.55	$110,730	$0	$0	$0	$0	$0	$0
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.53	$105,806	$0	$0	$0	$0	$0	$696,696
29												$200,000	$0	$0	$0	$0	$0	$0	0.52	$103,428	$0	$0	$0	$0	$0	$0
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$12,200,000	$2,100,000	$1,979,677	$1,981,393	$0	$6,361,102	$6,633,070		$9,810,854	$1,557,746	$1,424,460	$1,348,252	$0	$4,390,243	$5,042,530

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-15.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-28 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING - Alt 4C

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost							2.3%	Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$200,000	$0	$0	$0	$0	$0	$0	0.85	$170,569	$0	$0	$0	$0	$0	$0
8	Y	Y	Y		Y	Y	Y	Y	Y			$200,000	$0	$568,186	$1,464,585	$706,575	$1,272,220	$1,066,925	0.83	$166,734	$0	$473,681	$1,220,983	$589,052	$1,060,614	$889,465
9									Y			$200,000	$0	$0	$0	$0	$1,272,220	$0	0.81	$162,986	$0	$0	$0	$0	$1,036,768	$0
10		Y										$200,000	$250,000	$0	$0	$0	$0	$215,760	0.80	$159,321	$199,152	$0	$0	$0	$0	$171,876
11						Y	Y	Y	Y	Y	Y	$200,000	$0	$568,186	$2,079,151	$788,508	$1,272,220	$0	0.78	$155,739	$0	$442,444	$1,619,027	$614,008	$990,673	$0
12												$200,000	$0	$0	$0	$0	$0	$0	0.76	$152,238	$0	$0	$0	$0	$0	$0
13	Y	Y	Y						Y			$200,000	$0	$0	$0	$0	$1,272,220	$716,925	0.74	$148,815	$0	$0	$0	$0	$946,628	$533,446
14												$200,000	$0	$0	$0	$0	$0	$0	0.73	$145,469	$0	$0	$0	$0	$0	$0
15												$200,000	$250,000	$0	$0	$0	$0	$0	0.71	$142,199	$177,748	$0	$0	$0	$0	$0
16							Y	Y	Y	Y	Y	$200,000	$0	$0	$2,079,151	$788,508	$1,272,220	$0	0.70	$139,002	$0	$0	$1,445,027	$548,020	$884,203	$0
17												$200,000	$0	$0	$0	$0	$0	$0	0.68	$135,876	$0	$0	$0	$0	$0	$0
18	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.66	$132,822	$0	$0	$0	$0	$0	$476,115
19												$200,000	$0	$0	$0	$0	$0	$0	0.65	$129,835	$0	$0	$0	$0	$0	$0
20												$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21												$200,000	$0	$0	$0	$0	$0	$0	0.62	$124,063	$0	$0	$0	$0	$0	$0
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.59	$118,547	$0	$0	$0	$0	$0	$424,946
24												$200,000	$0	$0	$0	$0	$0	$0	0.58	$115,882	$0	$0	$0	$0	$0	$0
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26												$200,000	$0	$0	$0	$0	$0	$0	0.55	$110,730	$0	$0	$0	$0	$0	$0
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.53	$105,806	$0	$0	$0	$0	$0	$696,696
29												$200,000	$0	$0	$0	$0	$0	$0	0.52	$103,428	$0	$0	$0	$0	$0	$0
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$9,700,000	$1,850,000	$1,136,372	$5,622,887	$2,283,591	$6,361,102	$6,633,070		$7,772,480	$1,353,908	$916,125	$4,285,036	$1,751,079	$4,918,886	$5,061,002

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-16.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-29 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING - Alt 5R

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost								Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$700,000	$50,000	$0	$0	$0	$0	$0	0.85	$596,992	$42,642	$0	$0	$0	$0	$0
8	Y	Y	Y		Y							$700,000	$50,000	$0	$0	$0	$0	$1,066,925	0.83	$583,570	$41,684	$0	$0	$0	$0	$889,465
9												$700,000	$50,000	$0	$0	$0	$0	$0	0.81	$570,450	$40,746	$0	$0	$0	$0	$0
10												$700,000	$300,000	$0	$0	$0	$0	$0	0.80	$557,624	$238,982	$0	$0	$0	$0	$0
11												$700,000	$50,000	$0	$0	$0	$0	$0	0.78	$545,087	$38,935	$0	$0	$0	$0	$0
12												$700,000	$50,000	$0	$0	$0	$0	$0	0.76	$532,832	$38,059	$0	$0	$0	$0	$0
13	Y	Y	Y									$700,000	$50,000	$0	$0	$0	$0	$716,925	0.74	$520,853	$37,204	$0	$0	$0	$0	$533,446
14												$700,000	$50,000	$0	$0	$0	$0	$0	0.73	$509,142	$36,367	$0	$0	$0	$0	$0
15												$700,000	$300,000	$0	$0	$0	$0	$0	0.71	$497,695	$213,298	$0	$0	$0	$0	$0
16												$700,000	$50,000	$0	$0	$0	$0	$0	0.70	$486,506	$34,750	$0	$0	$0	$0	$0
17												$700,000	$50,000	$0	$0	$0	$0	$0	0.68	$475,568	$33,969	$0	$0	$0	$0	$0
18												$200,000	$0	$0	$0	$0	$0	$0	0.66	$132,822	$0	$0	$0	$0	$0	$0
19	Y	Y	Y			Y	Y	Y	Y			$200,000	$0	$1,454,426	$517,711	$0	$0	$716,925	0.65	$129,835	$0	$944,179	$336,086	$0	$0	$465,411
20									Y			$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21		Y										$200,000	$0	$0	$0	$0	$0	$215,760	0.62	$124,063	$0	$0	$0	$0	$0	$133,839
22						Y	Y	Y	Y	Y	Y	$200,000	$0	$1,454,426	$722,291	$0	$0	$0	0.61	$121,274	$0	$881,917	$437,974	$0	$0	$0
23												$200,000	$0	$0	$0	$0	$0	$0	0.59	$118,547	$0	$0	$0	$0	$0	$0
24	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.58	$115,882	$0	$0	$0	$0	$0	$415,392
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26												$200,000	$0	$0	$0	$0	$0	$0	0.55	$110,730	$0	$0	$0	$0	$0	$0
27										Y	Y	$200,000	$0	$0	$204,580	$0	$0	$0	0.54	$108,240	$0	$0	$110,719	$0	$0	$0
28												$200,000	$0	$0	$0	$0	$0	$0	0.53	$105,806	$0	$0	$0	$0	$0	$0
29	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.52	$103,428	$0	$0	$0	$0	$0	$681,032
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$15,200,000	$2,400,000	$2,908,851	$1,444,582	$0	$0	$6,633,070		$11,969,851	$1,773,645	$1,826,096	$884,778	$0	$0	$4,987,043

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-17.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-30 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING - Alt 5R-Treatment

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost							2.3%	Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$700,000	$50,000	$0	$0	$0	$0	$0	0.85	$596,992	$42,642	$0	$0	$0	$0	$0
8	Y	Y	Y		Y							$700,000	$50,000	$0	$0	$0	$0	$1,066,925	0.83	$583,570	$41,684	$0	$0	$0	$0	$889,465
9												$700,000	$50,000	$0	$0	$0	$0	$0	0.81	$570,450	$40,746	$0	$0	$0	$0	$0
10												$700,000	$300,000	$0	$0	$0	$0	$0	0.80	$557,624	$238,982	$0	$0	$0	$0	$0
11												$700,000	$50,000	$0	$0	$0	$0	$0	0.78	$545,087	$38,935	$0	$0	$0	$0	$0
12												$700,000	$50,000	$0	$0	$0	$0	$0	0.76	$532,832	$38,059	$0	$0	$0	$0	$0
13	Y	Y	Y									$700,000	$50,000	$0	$0	$0	$0	$716,925	0.74	$520,853	$37,204	$0	$0	$0	$0	$533,446
14												$700,000	$50,000	$0	$0	$0	$0	$0	0.73	$509,142	$36,367	$0	$0	$0	$0	$0
15												$700,000	$300,000	$0	$0	$0	$0	$0	0.71	$497,695	$213,298	$0	$0	$0	$0	$0
16												$700,000	$50,000	$0	$0	$0	$0	$0	0.70	$486,506	$34,750	$0	$0	$0	$0	$0
17												$700,000	$50,000	$0	$0	$0	$0	$0	0.68	$475,568	$33,969	$0	$0	$0	$0	$0
18												$200,000	$0	$0	$0	$0	$0	$0	0.66	$132,822	$0	$0	$0	$0	$0	$0
19	Y	Y	Y			Y	Y	Y	Y			$200,000	$0	$1,454,426	$517,711	$0	$0	$716,925	0.65	$129,835	$0	$944,179	$336,086	$0	$0	$465,411
20									Y			$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21		Y										$200,000	$0	$0	$0	$0	$0	$215,760	0.62	$124,063	$0	$0	$0	$0	$0	$133,839
22						Y	Y	Y	Y	Y	Y	$200,000	$0	$1,454,426	$722,291	$0	$0	$0	0.61	$121,274	$0	$881,917	$437,974	$0	$0	$0
23												$200,000	$0	$0	$0	$0	$0	$0	0.59	$118,547	$0	$0	$0	$0	$0	$0
24	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.58	$115,882	$0	$0	$0	$0	$0	$415,392
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26												$200,000	$0	$0	$0	$0	$0	$0	0.55	$110,730	$0	$0	$0	$0	$0	$0
27										Y	Y	$200,000	$0	$0	$204,580	$0	$0	$0	0.54	$108,240	$0	$0	$110,719	$0	$0	$0
28												$200,000	$0	$0	$0	$0	$0	$0	0.53	$105,806	$0	$0	$0	$0	$0	$0
29	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.52	$103,428	$0	$0	$0	$0	$0	$681,032
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$15,200,000	$2,400,000	$2,908,851	$1,444,582	$0	$0	$6,633,070		$11,969,851	$1,773,645	$1,826,096	$884,778	$0	$0	$4,987,043

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-18.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-31 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING - Alt 5C

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost								Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$700,000	$50,000	$0	$0	$0	$0	$0	0.85	$596,992	$42,642	$0	$0	$0	$0	$0
8												$200,000	$0	$0	$0	$0	$0	$0	0.83	$166,734	$0	$0	$0	$0	$0	$0
9	Y	Y	Y		Y	Y	Y	Y	Y			$200,000	$0	$637,647	$1,673,155	$2,170,096	$0	$1,066,925	0.81	$162,986	$0	$519,637	$1,363,501	$1,768,473	$0	$869,467
10									Y			$200,000	$250,000	$0	$0	$0	$0	$0	0.80	$159,321	$199,152	$0	$0	$0	$0	$0
11		Y										$200,000	$0	$0	$0	$0	$0	$215,760	0.78	$155,739	$0	$0	$0	$0	$0	$168,011
12						Y	Y	Y	Y	Y	Y	$200,000	$0	$637,647	$2,379,526	$2,435,030	$0	$0	0.76	$152,238	$0	$485,370	$1,811,269	$1,853,517	$0	$0
13												$200,000	$0	$0	$0	$0	$0	$0	0.74	$148,815	$0	$0	$0	$0	$0	$0
14	Y	Y	Y						Y			$200,000	$0	$0	$0	$0	$0	$716,925	0.73	$145,469	$0	$0	$0	$0	$0	$521,453
15												$200,000	$250,000	$0	$0	$0	$0	$0	0.71	$142,199	$177,748	$0	$0	$0	$0	$0
16												$200,000	$0	$0	$0	$0	$0	$0	0.70	$139,002	$0	$0	$0	$0	$0	$0
17							Y	Y	Y	Y	Y	$200,000	$0	$0	$2,379,526	$2,435,030	$0	$0	0.68	$135,876	$0	$0	$1,616,608	$1,654,316	$0	$0
18												$200,000	$0	$0	$0	$0	$0	$0	0.66	$132,822	$0	$0	$0	$0	$0	$0
19	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.65	$129,835	$0	$0	$0	$0	$0	$465,411
20												$200,000	$250,000	$0	$0	$0	$0	$0	0.63	$126,916	$158,645	$0	$0	$0	$0	$0
21												$200,000	$0	$0	$0	$0	$0	$0	0.62	$124,063	$0	$0	$0	$0	$0	$0
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23												$200,000	$0	$0	$0	$0	$0	$0	0.59	$118,547	$0	$0	$0	$0	$0	$0
24	Y	Y	Y									$200,000	$0	$0	$0	$0	$0	$716,925	0.58	$115,882	$0	$0	$0	$0	$0	$415,392
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26												$200,000	$0	$0	$0	$0	$0	$0	0.55	$110,730	$0	$0	$0	$0	$0	$0
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28												$200,000	$0	$0	$0	$0	$0	$0	0.53	$105,806	$0	$0	$0	$0	$0	$0
29	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.52	$103,428	$0	$0	$0	$0	$0	$681,032
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$10,200,000	$1,900,000	$1,275,294	$6,432,207	$7,040,156	$0	$6,633,070		$8,198,903	$1,396,551	$1,005,006	$4,791,378	$5,276,306	$0	$4,989,224

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-19.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-32 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M,AND LONG-TERM MONITORING - Alt 6R

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost							Present Value Factor	Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]		Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$700,000	$50,000	$0	$0	$0	$0	$0	0.85	$596,992	$42,642	$0	$0	$0	$0	$0
8	Y	Y	Y		Y							$700,000	$50,000	$0	$0	$0	$0	$1,066,925	0.83	$583,570	$41,684	$0	$0	$0	$0	$889,465
9												$700,000	$50,000	$0	$0	$0	$0	$0	0.81	$570,450	$40,746	$0	$0	$0	$0	$0
10												$700,000	$300,000	$0	$0	$0	$0	$0	0.80	$557,624	$238,982	$0	$0	$0	$0	$0
11												$700,000	$50,000	$0	$0	$0	$0	$0	0.78	$545,087	$38,935	$0	$0	$0	$0	$0
12												$700,000	$50,000	$0	$0	$0	$0	$0	0.76	$532,832	$38,059	$0	$0	$0	$0	$0
13	Y	Y	Y									$700,000	$50,000	$0	$0	$0	$0	$716,925	0.74	$520,853	$37,204	$0	$0	$0	$0	$533,446
14												$700,000	$50,000	$0	$0	$0	$0	$0	0.73	$509,142	$36,367	$0	$0	$0	$0	$0
15												$700,000	$300,000	$0	$0	$0	$0	$0	0.71	$497,695	$213,298	$0	$0	$0	$0	$0
16												$700,000	$50,000	$0	$0	$0	$0	$0	0.70	$486,506	$34,750	$0	$0	$0	$0	$0
17												$700,000	$50,000	$0	$0	$0	$0	$0	0.68	$475,568	$33,969	$0	$0	$0	$0	$0
18	Y	Y	Y									$700,000	$50,000	$0	$0	$0	$0	$716,925	0.66	$464,875	$33,205	$0	$0	$0	$0	$476,115
19												$700,000	$50,000	$0	$0	$0	$0	$0	0.65	$454,424	$32,459	$0	$0	$0	$0	$0
20												$700,000	$300,000	$0	$0	$0	$0	$0	0.63	$444,207	$190,374	$0	$0	$0	$0	$0
21												$700,000	$50,000	$0	$0	$0	$0	$0	0.62	$434,220	$31,016	$0	$0	$0	$0	$0
22												$700,000	$50,000	$0	$0	$0	$0	$0	0.61	$424,457	$30,318	$0	$0	$0	$0	$0
23												$700,000	$50,000	$0	$0	$0	$0	$0	0.59	$414,914	$29,637	$0	$0	$0	$0	$0
24												$700,000	$50,000	$0	$0	$0	$0	$0	0.58	$405,586	$28,970	$0	$0	$0	$0	$0
25												$700,000	$300,000	$0	$0	$0	$0	$0	0.57	$396,467	$169,914	$0	$0	$0	$0	$0
26												$700,000	$50,000	$0	$0	$0	$0	$0	0.55	$387,553	$27,682	$0	$0	$0	$0	$0
27												$700,000	$50,000	$0	$0	$0	$0	$0	0.54	$378,840	$27,060	$0	$0	$0	$0	$0
28	Y	Y	Y									$700,000	$50,000	$0	$0	$0	$0	$716,925	0.53	$370,323	$26,452	$0	$0	$0	$0	$379,277
29												$700,000	$50,000	$0	$0	$0	$0	$0	0.52	$361,997	$25,857	$0	$0	$0	$0	$0
30												$700,000	$300,000	$0	$0	$0	$0	$0	0.51	$353,858	$151,653	$0	$0	$0	$0	$0

TABLE I-32 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M,AND LONG-TERM MONITORING - Alt 6R

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost								Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]	Present Value Factor	Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
31												$700,000	$50,000	$0	$0	$0	$0	$0	0.49	$345,902	$24,707	$0	$0	$0	$0	$0
32												$700,000	$50,000	$0	$0	$0	$0	$0	0.48	$338,125	$24,152	$0	$0	$0	$0	$0
33												$700,000	$50,000	$0	$0	$0	$0	$0	0.47	$330,523	$23,609	$0	$0	$0	$0	$0
34												$700,000	$50,000	$0	$0	$0	$0	$0	0.46	$323,092	$23,078	$0	$0	$0	$0	$0
35												$700,000	$300,000	$0	$0	$0	$0	$0	0.45	$315,828	$135,355	$0	$0	$0	$0	$0
36												$700,000	$50,000	$0	$0	$0	$0	$0	0.44	$308,727	$22,052	$0	$0	$0	$0	$0
37												$700,000	$50,000	$0	$0	$0	$0	$0	0.43	$301,786	$21,556	$0	$0	$0	$0	$0
38	Y	Y	Y									$700,000	$50,000	$0	$0	$0	$0	$716,925	0.42	$295,001	$21,072	$0	$0	$0	$0	$302,134
39												$700,000	$50,000	$0	$0	$0	$0	$0	0.41	$288,369	$20,598	$0	$0	$0	$0	$0
40												$700,000	$300,000	$0	$0	$0	$0	$0	0.40	$281,885	$120,808	$0	$0	$0	$0	$0
41												$700,000	$50,000	$0	$0	$0	$0	$0	0.39	$275,548	$19,682	$0	$0	$0	$0	$0
42												$700,000	$50,000	$0	$0	$0	$0	$0	0.38	$269,353	$19,239	$0	$0	$0	$0	$0
43												$200,000	$0	$0	$0	$0	$0	$0	0.38	$75,228	$0	$0	$0	$0	$0	$0
44	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.37	$73,536	$0	$0	$0	$0	$0	$484,209
45												$200,000	$250,000	$0	$0	$0	$0	$0	0.36	$71,883	$89,854	$0	$0	$0	$0	$0
46												$0	$0	$0	$0	$0	$0	$0	0.35	$0	$0	$0	$0	$0	$0	$0
47												$0	$0	$0	$0	$0	$0	$0	0.34	$0	$0	$0	$0	$0	$0	$0
48												$0	$0	$0	$0	$0	$0	$0	0.34	$0	$0	$0	$0	$0	$0	$0
49												$0	$0	$0	$0	$0	$0	$0	0.33	$0	$0	$0	$0	$0	$0	$0
50												$0	$0	$0	$0	$0	$0	$0	0.32	$0	$0	$0	$0	$0	$0	$0
Totals												$30,700,000	$4,400,000	$0	$0	$0	$0	$7,134,235		$19,644,440	$2,717,387	$0	$0	$0	$0	$4,933,103

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging), and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-20.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-33 NET PRESENT VALUE CALCULATION FOR AGENCY OVERSIGHT, REPORTING, O&M, AND LONG-TERM MONITORING - Alt 6C

2.3%

	Long-term Monitoring[b]					O&M Monitoring[b]				O&M Repair[b]		Annual Cost							Present Value Factor	Present Value[f]						
Year[a]	Surface Sediment	Tissue	Surface Water	Upstream	Bathymetry and Other Surveys	Dredge	Cap & PDC	ENR	MNR	Cap & PDC	ENR	Agency Oversight[c]	Reporting[c]	O&M Dredging[d]	O&M Cap & PDC[d]	O&M ENR[d]	O&M MNR[d]	Long-term Monitoring[e]		Agency Oversight	Reporting	O&M Dredging	O&M Cap	O&M ENR	O&M MNR	Long-Term Monitoring
0 (baseline)	Y	Y	Y	Y	Y							$700,000	$50,000	$0	$0	$0	$0	$1,666,925	1.00	$700,000	$50,000	$0	$0	$0	$0	$1,666,925
1												$700,000	$50,000	$0	$0	$0	$0	$0	0.98	$684,262	$48,876	$0	$0	$0	$0	$0
2												$700,000	$50,000	$0	$0	$0	$0	$0	0.96	$668,878	$47,777	$0	$0	$0	$0	$0
3		Y										$700,000	$50,000	$0	$0	$0	$0	$215,760	0.93	$653,839	$46,703	$0	$0	$0	$0	$201,532
4												$700,000	$50,000	$0	$0	$0	$0	$0	0.91	$639,139	$45,653	$0	$0	$0	$0	$0
5												$700,000	$300,000	$0	$0	$0	$0	$0	0.89	$624,770	$267,758	$0	$0	$0	$0	$0
6												$700,000	$50,000	$0	$0	$0	$0	$0	0.87	$610,723	$43,623	$0	$0	$0	$0	$0
7												$700,000	$50,000	$0	$0	$0	$0	$0	0.85	$596,992	$42,642	$0	$0	$0	$0	$0
8	Y	Y	Y		Y							$700,000	$50,000	$0	$0	$0	$0	$1,066,925	0.83	$583,570	$41,684	$0	$0	$0	$0	$889,465
9												$700,000	$50,000	$0	$0	$0	$0	$0	0.81	$570,450	$40,746	$0	$0	$0	$0	$0
10												$700,000	$300,000	$0	$0	$0	$0	$0	0.80	$557,624	$238,982	$0	$0	$0	$0	$0
11												$700,000	$50,000	$0	$0	$0	$0	$0	0.78	$545,087	$38,935	$0	$0	$0	$0	$0
12												$700,000	$50,000	$0	$0	$0	$0	$0	0.76	$532,832	$38,059	$0	$0	$0	$0	$0
13	Y	Y	Y									$700,000	$50,000	$0	$0	$0	$0	$716,925	0.74	$520,853	$37,204	$0	$0	$0	$0	$533,446
14												$700,000	$50,000	$0	$0	$0	$0	$0	0.73	$509,142	$36,367	$0	$0	$0	$0	$0
15												$700,000	$300,000	$0	$0	$0	$0	$0	0.71	$497,695	$213,298	$0	$0	$0	$0	$0
16												$700,000	$50,000	$0	$0	$0	$0	$0	0.70	$486,506	$34,750	$0	$0	$0	$0	$0
17												$700,000	$50,000	$0	$0	$0	$0	$0	0.68	$475,568	$33,969	$0	$0	$0	$0	$0
18	Y	Y	Y			Y	Y	Y	Y			$700,000	$50,000	$1,133,996	$3,208,564	$4,057,705	$0	$716,925	0.66	$464,875	$33,205	$753,095	$2,130,832	$2,694,753	$0	$476,115
19									Y			$200,000	$0	$0	$0	$0	$0	$0	0.65	$129,835	$0	$0	$0	$0	$0	$0
20		Y										$200,000	$250,000	$0	$0	$0	$0	$215,760	0.63	$126,916	$158,645	$0	$0	$0	$0	$136,917
21						Y	Y	Y	Y	Y	Y	$200,000	$0	$1,133,996	$4,598,268	$4,563,237	$0	$0	0.62	$124,063	$0	$703,434	$2,852,371	$2,830,641	$0	$0
22												$200,000	$0	$0	$0	$0	$0	$0	0.61	$121,274	$0	$0	$0	$0	$0	$0
23	Y	Y	Y						Y			$200,000	$0	$0	$0	$0	$0	$716,925	0.59	$118,547	$0	$0	$0	$0	$0	$424,946
24												$200,000	$0	$0	$0	$0	$0	$0	0.58	$115,882	$0	$0	$0	$0	$0	$0
25												$200,000	$250,000	$0	$0	$0	$0	$0	0.57	$113,276	$141,595	$0	$0	$0	$0	$0
26							Y	Y	Y	Y	Y	$200,000	$0	$0	$4,598,268	$4,563,237	$0	$0	0.55	$110,730	$0	$0	$2,545,820	$2,526,426	$0	$0
27												$200,000	$0	$0	$0	$0	$0	$0	0.54	$108,240	$0	$0	$0	$0	$0	$0
28	Y	Y	Y	Y								$200,000	$0	$0	$0	$0	$0	$1,316,925	0.53	$105,806	$0	$0	$0	$0	$0	$696,696
29												$200,000	$0	$0	$0	$0	$0	$0	0.52	$103,428	$0	$0	$0	$0	$0	$0
30												$200,000	$250,000	$0	$0	$0	$0	$0	0.51	$101,102	$126,378	$0	$0	$0	$0	$0
Totals												$15,700,000	$2,450,000	$2,267,991	$12,405,099	$13,184,179	$0	$6,633,070		$12,301,904	$1,806,851	$1,456,529	$7,529,023	$8,051,820	$0	$5,026,043

Notes:

a. Costs from the start of construction. Construction years are shaded.

b. Monitoring frequencies are based on Appendix K. Construction monitoring (e.g., water quality monitoring during dredging) and post-construction performance monitoring are not included in this table; these are incorporated into capital costs for remedial alternatives.

c. See I-37 for assumptions.

d. O&M monitoring and repair costs per event are based on Table I-21.

e. Long-term monitoring costs per event are based on Table I-22.

f. Values equal to the annual cost times the present value factor.

TABLE I-34 INSTITUTIONAL CONTROLS

	Initial Cost	Annual Cost	Periodic Cost	Cost Basis	Source
Informational Devices					
Monitoring and Notification of Waterway Users					
Initial Costs	$100,000			0.5 FTE @ $100/hr	Professional judgment
Surveillance Monitoring	$75,000	$25,000		0.36 FTE for initial cost and 0.12 FTE for annual cost @ $100/hr	
Cleanup Hotline	$75,000	$50,000		0.36 FTE for initial cost and 0.25 FTE for annual cost @$100/hr	
Construction Permit Review	$50,000	$25,000		0.25 FTE for initial cost and 0.12 FTE for annual cost @$100/hr	
Reporting to EPA and Ecology		$25,000		0.12 FTE @ $100/hr	
Seafood Consumption Advisories, Public Outreach and Education					
Baseline behavior research	$150,000			0.72 FTE @ $100/hr	Enviro Issues, Seattle, WA
Incentives and messages development and delivery	$75,000	$50,000		0.36 FTE for initial cost and 0.24 FTE for annual cost @ $100/hr	
Culturally-appropriate outreach	$50,000	$200,000		0.24 FTE for initial cost and 0.96 FTE for annual cost @$100/hr	
Monitoring behavior change and revising approach	$50,000	$75,000	$150,000	0.24 FTE for initial cost and 0.36 FTE for annual cost @$100/hr	
Direct costs	$25,000	$10,000			
Site Registry					
Deed Notice Filing	$10,000				Professional judgment
	$660,000	$460,000	$150,000		
Proprietary Controls					
Restrictive Covenants	$10,000			$100 per parcel. Total number of parcels to be addressed range from 27	Tom Newlon, Attorney
Easements				to 60 for the alternatives.	Seattle, WA
Total Cost	$10,000	$0	$0		
Enforcement Tools					
Agency Order	$50,000			0.25 FTE @ $100/hr	Professional judgment
Agency 5-year Review		$25,000		0.12 FTE @ $100/hr	
Total Cost	$50,000	$25,000	$0		

Notes:

1. Initial cost includes activities used to establish or setup institutional controls. This is a one-time cost and is not recurring.
2. Annual costs include activities performed on a regular basis (annual) to monitor and maintain the institutional controls.
3. Periodic costs include activities needed in response to specific events during institutional controls monitoring and maintenance (e.g., address potential institutional controls failure during monitoring).
4. Assumes institutional controls would begin after Record Of Decision is signed and annual costs would begin in Year 2. Annual costs applied to Year 50.
5. Periodic costs applied at Year 5, 10, 15, 20, 25, 30, 35, 40, 45, and 50. See I-35 for cost frequency.

FTE = full time equivalent

TABLE I-35 NET PRESENT VALUE CALCULATION FOR INSTITUTIONAL CONTROLS

2.3%

Year, n	Annual Cost				Present Value Factor [1]	Present Value			
	Informational Devices	Proprietary Controls	Enforcement Tools	Sum of Year "n" Costs		Informational Devices	Proprietary Controls	Enforcement Tools	Sum of Year "n" Costs
0				$0	1.00	$0	$0	$0	$0
1	$660,000	$10,000	$50,000	$710,000	0.98	$645,161	$9,775	$48,876	$694,037
2	$460,000	$0	$0	$460,000	0.96	$439,548	$0	$0	$439,548
3	$460,000	$0	$0	$460,000	0.93	$429,666	$0	$0	$429,666
4	$460,000	$0	$0	$460,000	0.91	$420,006	$0	$0	$420,006
5	$610,000	$0	$25,000	$635,000	0.89	$544,442	$0	$22,313	$566,755
6	$460,000	$0	$0	$460,000	0.87	$401,332	$0	$0	$401,332
7	$460,000	$0	$0	$460,000	0.85	$392,309	$0	$0	$392,309
8	$460,000	$0	$0	$460,000	0.83	$383,489	$0	$0	$383,489
9	$460,000	$0	$0	$460,000	0.81	$374,867	$0	$0	$374,867
10	$610,000	$0	$25,000	$635,000	0.80	$485,930	$0	$19,915	$505,845
11	$460,000	$0	$0	$460,000	0.78	$358,200	$0	$0	$358,200
12	$460,000	$0	$0	$460,000	0.76	$350,147	$0	$0	$350,147
13	$460,000	$0	$0	$460,000	0.74	$342,275	$0	$0	$342,275
14	$460,000	$0	$0	$460,000	0.73	$334,579	$0	$0	$334,579
15	$610,000	$0	$25,000	$635,000	0.71	$433,706	$0	$17,775	$451,481
16	$460,000	$0	$0	$460,000	0.70	$319,704	$0	$0	$319,704
17	$460,000	$0	$0	$460,000	0.68	$312,516	$0	$0	$312,516
18	$460,000	$0	$0	$460,000	0.66	$305,490	$0	$0	$305,490
19	$460,000	$0	$0	$460,000	0.65	$298,621	$0	$0	$298,621
20	$610,000	$0	$25,000	$635,000	0.63	$387,095	$0	$15,865	$402,959
21	$460,000	$0	$0	$460,000	0.62	$285,345	$0	$0	$285,345
22	$460,000	$0	$0	$460,000	0.61	$278,929	$0	$0	$278,929
23	$460,000	$0	$0	$460,000	0.59	$272,658	$0	$0	$272,658
24	$460,000	$0	$0	$460,000	0.58	$266,528	$0	$0	$266,528
25	$610,000	$0	$25,000	$635,000	0.57	$345,493	$0	$14,160	$359,652
26	$460,000	$0	$0	$460,000	0.55	$254,678	$0	$0	$254,678
27	$460,000	$0	$0	$460,000	0.54	$248,952	$0	$0	$248,952
28	$460,000	$0	$0	$460,000	0.53	$243,355	$0	$0	$243,355
29	$460,000	$0	$0	$460,000	0.52	$237,884	$0	$0	$237,884
30	$610,000	$0	$25,000	$635,000	0.51	$308,362	$0	$12,638	$321,000
31	$460,000	$0	$0	$460,000	0.49	$227,307	$0	$0	$227,307
32	$460,000	$0	$0	$460,000	0.48	$222,197	$0	$0	$222,197
33	$460,000	$0	$0	$460,000	0.47	$217,201	$0	$0	$217,201
34	$460,000	$0	$0	$460,000	0.46	$212,318	$0	$0	$212,318
35	$610,000	$0	$25,000	$635,000	0.45	$275,222	$0	$11,280	$286,501
36	$460,000	$0	$0	$460,000	0.44	$202,878	$0	$0	$202,878
37	$460,000	$0	$0	$460,000	0.43	$198,317	$0	$0	$198,317
38	$460,000	$0	$0	$460,000	0.42	$193,858	$0	$0	$193,858
39	$460,000	$0	$0	$460,000	0.41	$189,500	$0	$0	$189,500
40	$610,000	$0	$25,000	$635,000	0.40	$245,643	$0	$10,067	$255,710
41	$460,000	$0	$0	$460,000	0.39	$181,074	$0	$0	$181,074
42	$460,000	$0	$0	$460,000	0.38	$177,003	$0	$0	$177,003
43	$460,000	$0	$0	$460,000	0.38	$173,024	$0	$0	$173,024
44	$460,000	$0	$0	$460,000	0.37	$169,134	$0	$0	$169,134
45	$610,000	$0	$25,000	$635,000	0.36	$219,243	$0	$8,985	$228,229
46	$460,000	$0	$0	$460,000	0.35	$161,614	$0	$0	$161,614
47	$460,000	$0	$0	$460,000	0.34	$157,980	$0	$0	$157,980
48	$460,000	$0	$0	$460,000	0.34	$154,428	$0	$0	$154,428
49	$460,000	$0	$0	$460,000	0.33	$150,956	$0	$0	$150,956
50	$610,000	$0	$25,000	$635,000	0.32	$195,681	$0	$8,020	$203,700
Totals	$24,700,000	$10,000	$300,000	$25,000,000		$14,625,843	$9,775	$189,893	$14,815,736

Notes:

1. Annual costs based on Table I-34.

TABLE I-36 TECHNOLOGY APPLICATION AREAS, SEDIMENT REMOVAL, AND MATERIAL PLACEMENT VOLUMES

Remedy Type/ Engineering Constraint	Alt 2R										Alt 2R-CAD											
	Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR		Dredge		CADs		Cap/PDC		Residuals Management		ENR/*in situ*		MNR	
	cy	days	acres	days	acres	days	acres	days	acres	area	cy	days	cy	days	acres	days	acres	days	acres	days	acres	area
Under Pier	11,268	47	3.4	55.4	0.0	0.0	0.0	0.0	0.0		11,268	47.0	0	0.0	3.4	55.4	0.0	0.0	0.0	0.0	0.0	
Above -10 ft MLLW	69,536	67	0.0	0.0	11.2	11.8	0.0	0.0	105.5	MNR(20)	69,536	66.9	0	0.0	0.0	0.0	11.2	11.8	0.0	0.0	105.5	MNR(20)
Below -10 ft MLLW	288,772	278	0.0	0.0	17.9	14.8	0.0	0.0	19.0	MNR(10)	288,772	277.9	371,000	247.3	0.0	0.0	17.9	14.8	0.0	0.0	19.0	MNR(10)
Dredge-cut Prism Volume	369,577										369,577											
Performance Contingency Volume	214,749	207									214,749	207										
Totals	584,326	598	3.4	55.4	29.2	26.6	0.0	0.0	124.5		584,326	598	371,000	247	3.4	55.4	29.2	26.6	0.0	0.0	124.5	
Import Material Volume (cy)	69,536		19,380		35,292						69,536		74,000		19,380		35,292					
											CAD area		24	acres								
											CAD capacity		310,000	cy								

Remedy Type/ Engineering Constraint	Alt 3R										Alt 3C									
	Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR		Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR	
	cy	days	acres	days	acres	days	acres	days	acres	area	cy	days	acres	days	acres	days	acres	days	acres	area
Under Pier	26,086	109	7.5	121.3	0.0	0.0	0.0	0.0	0.0		0	0	7.5	121.3	0.0	0.0	0.0	0.0	0.0	
Above -10 ft MLLW	160,376	154	0.0	0.0	24.3	25.6	0.0	0.0	99.0	MNR(20)	112,282	108	4.3	21.0	16.2	17.1	4.4	4.6	99.0	MNR(20)
Below -10 ft MLLW	399,563	384	0.0	0.0	26.0	21.4	0.0	0.0	0.0	MNR(10)	187,484	180	7.9	30.3	12.4	10.2	5.1	4.2	0.0	MNR(10)
Dredge-cut Prism Volume	586,024										299,766									
Performance Contingency Volume	177,673	171									191,473	184								
Totals	763,698	818	7.5	121.3	50.3	47.0	0.0	0.0	99.0		491,239	473	19.7	172.7	28.6	27.3	9.5	8.8	99.0	
Import Material Volume (cy)	160,376		42,467		60,847						112,282		111,106		34,639		11,500			

Remedy Type/ Engineering Constraint	Alt 4R										Alt 4C									
	Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR		Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR	
	cy	days	acres	days	acres	days	acres	days	acres	area	cy	days	acres	days	acres	days	acres	days	acres	area
Under Pier	41,265	172	13.8	222.3	0.0	0.0	0.0	0.0	0.0		0	0	13.8	222.3	0.0	0.0	0.0	0.0	0.0	
Above -10 ft MLLW	242,715	234	0.0	0.0	36.0	38.0	0.0	0.0	0.0	MNR(20)	160,877	155	7.2	35.4	21.7	22.9	9.3	9.8	0.0	MNR(20)
Below -10 ft MLLW	761,247	732	0.0	0.0	57.2	47.1	0.0	0.0	49.7	MNR(10)	398,262	383	20.0	76.9	28.0	23.0	7.1	5.9	49.7	MNR(10)
Dredge-cut Prism Volume	1,045,226										559,139									
Performance Contingency Volume	106,223	102									130,017	125								
Totals	1,151,450	1240	13.8	222.3	93.2	85.1	0.0	0.0	49.7		689,156	663	41.0	334.6	49.7	45.9	16.4	15.6	49.7	
Import Material Volume (cy)	242,715		77,804		112,811						160,877		231,350		60,083		19,828			

TABLE I-36 TECHNOLOGY APPLICATION AREAS, SEDIMENT REMOVAL, AND MATERIAL PLACEMENT VOLUMES

Remedy Type/ Engineering Constraint	Alt 5R										Alt 5C									
	Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR		Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR	
	cy	days	acres	days	acres	days	acres	days	acres	area	cy	days	acres	days	acres	days	acres	days	acres	area
Under Pier	45,457	189	13.6	220.0	0.0	0.0	0.0	0.0	0.0		0	0	13.6	220.0	0.0	0.0	0.0	0.0	0.0	
Above -10 ft MLLW	337,381	325	0.0	0.0	53.6	56.5	0.0	0.0	0.0	MNR(20)	184,251	177	8.5	42.0	25.3	26.7	21.8	22.9	0.0	MNR(20)
Below -10 ft MLLW	1,233,130	1186	0.0	0.0	89.5	73.7	0.0	0.0	0.0	MNR(10)	457,798	440	24.9	95.8	31.4	25.9	31.2	25.7	0.0	MNR(10)
Dredge-cut Prism Volume	1,615,968										642,049									
Performance Contingency Volume	34,017	33									110,960	107								
Totals	1,649,985	1733	13.6	220.0	143.1	130.3	0.0	0.0	0.0		753,009	725	47.1	357.8	56.7	52.5	53.0	48.7	0.0	
Import Material Volume (cy)	337,381		77,013		173,161						184,251		265,909		68,572		64,114			

Remedy Type/ Engineering Constraint	Alt 5R - Treatment									
	Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR	
	cy	days	acres	days	acres	days	acres	days	acres	area
Under Pier	45,457	189	13.6	220.0	0.0	0.0	0.0	0.0	0.0	
Above -10 ft MLLW	337,381	325	0.0	0.0	53.6	56.5	0.0	0.0	0.0	MNR(20)
Below -10 ft MLLW	1,233,130	1186	0.0	0.0	89.5	73.7	0.0	0.0	0.0	MNR(10)
Dredge-cut Prism Volume	1,615,968									
Performance Contingency Volume	34,017	33								
Totals	1,649,985	1733	13.6	220.0	143.1	130.3	0.0	0.0	0.0	
Import Material Volume (cy)	337,381		77,013		173,161					

Remedy Type/ Engineering Constraint	Alt 6R										Alt 6C									
	Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR		Dredge		Cap/PDC		Residuals Management		ENR/*in situ*		MNR	
	cy	days	acres	days	acres	days	acres	days	acres		cy	days	acres	days	acres	days	acres	days	acres	
Under Pier	101,677	424	27.6	444.9	0.0	0.0	0.0	0.0	0.0		0	0	27.6	444.9	0.0	0.0	0.0	0.0	0.0	
Above -10 ft MLLW	702,652	676	0.0	0.0	85.5	90.2	0.0	0.0	0.0	MNR(20)	360,717	347	15.5	76.2	39.1	41.2	38.2	40.2	0.0	MNR(20)
Below -10 ft MLLW	3,138,845	3020	0.0	0.0	189.0	155.7	0.0	0.0	0.0	MNR(10)	1,138,130	1095	49.6	190.6	69.4	57.2	62.9	51.9	0.0	MNR(10)
Dredge-cut Prism Volume	3,943,174										1,498,848									
Performance Contingency Volume	0	0									146,820	141								
Totals	3,943,174	4120	27.6	444.9	274.5	245.8	0.0	0.0	0.0		1,645,668	1583	92.6	711.7	108.5	98.4	101.1	92.1	0.0	
Import Material Volume (cy)	702,652		155,724		332,127						360,717		523,146		131,344		122,339			

Notes:

1. Areas and volumes are based on Table I-3 best estimate. See Section 8 for development of technology areas. See Appendix E and Table I-3 for development of dredging volumes.
2. For residuals management within the dredge footprint, import material volume based on 9 inches of thin-layer sand placement.
3. Dredging volume for areas with partial dredging and capping are included in the total dredge volume presented in the table.
4. Backfill of dredging in habitat areas (above -10 ft MLLW) are included in import material volume.
5. R = removal emphasis, C = combined technology

TABLE I-37 BASIS FOR COST ESTIMATES

Project Phase	Quantity	Units	Source	Notes
Cost Estimating Parameters & Methodology:				
Discount Rate	2.3%		OMB Circular A-94, 2011	30 year real discount rate.
Project Management and Remedial Design	30.0%		EPA, July 2000	Includes 10% toward project management and 20% toward remedial design. Selected percentages are the high end specified in the EPA cost guidance document due to the complex nature of the sediments project. Remedial design includes pre-design sampling and analysis, engineering survey, design plans and specifications, cost estimate, and schedule.
Construction Management	10.0%		EPA, July 2000	The selected percentage (10%) is in the mid to high range as specified in the EPA cost guidance document. A higher percentage was selected due to the complex nature of the project. Construction monitoring is included as a separate line-item below.
Sales Tax	9.5%			Washington State.
Contingency	35.0%		EPA, July 2000	Total contingency includes 20% toward scope contingency and 15% toward bid contingency. Scope contingency is toward the high end specified in the EPA cost guidance document, because project scope for a sediments project of this magnitude will likely change considerably between FS and final design. Bid contingency of 15% is mid-range of the values specified in the EPA cost guidance document.
Agency Review and Oversight (construction)	$700,000	per year during construction	LDW project experience	Based on project experience during RI/FS.
Agency Review and Oversight (monitoring)	$200,000	per year during monitoring	Based on LDW project experience	Costs are expected to be higher or lower based on monitoring and review cycles, however, $200,000 per year is a reasonable average value. For Alternative 1, assume lower annual cost of $200,000 for each 5-year reporting year, otherwise $100,000.
Mobilization, Demobilization and Site Restoration (Dredging and Capping)				
Mobilize/Demobilize Equipment and Facilities (project)	$800,000	LS	Provided by Hartman, 2011	$400,000 for mobilization plus $400,000 for demobilization. Includes project management and labor during mobilization and demobilization. See Table I-10.
Mobilize/Demobilize Equipment and Facilities (construction season)	$120,000	per year	Provided by Hartman, 2011	Yearly mobilization/demobilization is assumed to be 15% of the total project mob/demob cost of $800,000 for all years of project. Includes project management and labor during mobilization and demobilization. See Table I-10.
Land Lease for Operations and Staging	$250,000	per year	BPJ	Based on Table I-10. Professional judgment based on review of lease rates in the Lower Duwamish Valley.
Contractor Work Plan Submittals	$100,000	per year	BPJ	Based on Table I-10. Professional judgment based on local dredging contractor.
Barge Protection	$80,000	LS	BPJ	Based on Table I-10. Professional judgment based on local dredging contractor.
Project Management (Contractor)				
Labor and Supervision	$62,000	per month	BPJ	Based on Table I-10. Includes superintendant, chief surveyor and quality control management, accountant, certified industrial hygienist, travel, and housing.
Construction Office and Operating Expense	$21,600	per month	BPJ	Based on Table I-10. Includes rental office trailers, operating expense, vehicle rental, support staff.
Contained Aquatic Disposal				
Impacted Material/Clean Cap Material Placement Rate (Derrick Crane - 8 cy bucket)	1,469	cy per day (12-hr)	Project experience	Based on Table I-6, assumptions for open-water placement.
Overburden Removal Rate from CAD Cell (Derrick Crane - 6 cy bucket)	1,500	cy *in situ* per day (12-hr)	Reviewed by Hartman, 2011	
Transport and Disposal of Material at Elliott Bay Open Water Site	$12	cy	Reviewed by Hartman, 2011	Includes barge transport and disposal at the DMMP Elliott Bay open water disposal site.
Dredging				
Shift Rate	$25,963	per day	Provided by Hartman, 2011	Based on Table I-8. Assume 2 dredging operations, one deep access and one shallow access, split between 24-hr and 12-hr dredging days as outlined in Table I-5. Includes 3 barges and 4 tugs.
Dredge Rate (open-water)	1,039	cy *in situ* per day	Project experience; USACE, 2008	Based on Table I-5.
Dredge Rate (underpier)	240	cy *in situ* per day	Reviewed by Hartman, 2011	Based on Table I-5.
Gravity Dewatering (on the barge)	$10	per cy	Reviewed by Hartman, 2011	

TABLE I-37 BASIS FOR COST ESTIMATES

Project Phase	Quantity	Units	Source	Notes
Sediment Handling and Disposal Costs				
Transload, Railcar transport to and tipping at Subtitle D Landfill	$60	per ton	Joe Casalini, Allied Waste Services, Seattle, WA	Cost includes material transfer from barge onto offloading area, load dewatered sediment onto truck with containers, truck transport to rail facility. Offloading of sediments from barges at an offloading facility (infrastructure to be built in the future) in the vicinity of site to transloading area. Trucks with 20-ft containers on chassis and fitted with liner.
Transloading Area Setup	$1,000,000	LS	BPJ	Based on Table I-8. Value based on discussions with waste management engineers.
Water Management	$10,000	per day	Project experience	Based on Table I-8. Value based on discussions with contractors with local experience and reviewed by Hartman, 2011.
Capping/ENR				
Debris Sweep	$30,000	per acre	Reviewed by Hartman 2011	Assume 10% of capping/ENR area requires debris sweep. Assume cost includes labor, equipment and survey.
Shift Rate	$12,500	per day	Provided by Hartman 2011	Assuming 1 operation split between deep access and shallow access, at 12-hr (5-day weeks).
Cap Placement Rate (deep water)	1,469	cy per day (12-hr)	Project experience	Based on Table I-6 (Derrick barge with environmental bucket: 8-cy bucket).
Cap Placement Rate (shallow water)	1,148	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Excavator: 5-cy bucket).
Cap Placement Rate (underdock)	350	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Hydraulic conveyor).
ENR Placement Rate (deep water)	1,371	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Derrick barge with environmental bucket: 8-cy bucket).
ENR Placement Rate (shallow water)	1,071	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Excavator: 5-cy bucket).
ENR Placement Rate (underdock)	300	cy per day (12-hr)	Project experience	Based on Table I-6 for assumptions (Hydraulic conveyor).
Cap/ ENR/ backfill/ dredge residuals material procurement and delivery (Sand)	$27	per cy	Glacier Northwest, Seattle, WA	Based on Table I-7. Cost includes delivery to the site by barge, additional cap material (10% of total cap volume) included to account for capping material required in steep slope areas to address slope stability.
Carbon amended material procurement and delivery (Sand+4% GAC)	$161	per cy	Luthy et al. 2009	Based on Table I-7. Assumes $1/lb of carbon at 4% by volume of carbon/(sand+carbon).
Treatment by Soil Washing, Mechanical Dewatering & Water Trmt				
Mob/Demob, Site Layout, Land Leasing Costs	$4,000,000	LS	ART Engineering, LLC., Tampa FL.	Includes capital cost from conception to production, total plant footprint of approximately 4 acres to 7 acres with 40 to 45 tons per hour capacity.
Soil Washing, Mech Dewatering, Water Trmt, disposal of fine fraction	$120	per cy	ART Engineering, LLC., Tampa FL.	Assume 50% sand treated sand and 50% remaining fines. Cost includes labor, plant operations, maintenance fine fraction, disposal of remaining fine fraction at Subtitle D landfill, and no credit for beneficial reuse of sand.
Treated Sand Disposal	$0	per cy	BPJ	Assume no credit for beneficial reuse of sand. Treated sand may have a disposal cost.
Construction QA/QC				
Construction Monitoring	$7,925	per day	Vendor quote and BPJ	Based on Table I-9. Construction monitoring includes survey boat, labor and equipment required for routine bathymetric surveys (single beam), data analysis, data delivery, pH/turbidity check, and water quality monitoring. Additional construction oversight is included in the 10% construction management cost described in Table I-37.
Analytical cost	$2,268	per sample	Project experience	Assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions. Assumption incorporated in Tables I-11 through I-21.
Sampling rate	5	samples/day	Project experience	Assumption incorporated in Tables I-11 through I-21.
Post-construction performance monitoring surface sediment sampling density (dredging, PDC, capping, ENR)	4	samples/acre	Project experience	See Appendix K for sampling description. Assumption incorporated in Tables I-11 through I-21.
Post-construction performance monitoring physical sampling density (PDC, capping, ENR)	4	samples/acre	Project experience	See Appendix K for sampling description. Assumption incorporated in Tables I-11 through I-21.
Post-construction performance monitoring daily cost	$8,000	per day	Project experience	Daily labor, equipment and material costs during performance monitoring. Assumption incorporated in Tables I-11 through I-21.
Data Management Analysis and Reporting	$15,000	per acre	Project experience	Assume $15,000 for first acre and scale up using power of 0.6. Assumption incorporated in Tables I-11 through I-21.
Project Completion Report (incl. as-built drawings)	$50,000	per work year	Project experience	Assumption incorporated in Tables I-11 through I-21.
Remedial Action 5 year Review Cycle	$250,000	LS	Project experience	Assumption incorporated in Tables I-11 through I-21.

TABLE I-37 BASIS FOR COST ESTIMATES

Project Phase	Quantity	Units	Source	Notes
Operations, Maintenance and Monitoring Costs				
Analytical cost	$2,268	per sample	Project experience	Assume 75% Group A parameters and 25% Group B parameters. See Appendix K for parameter assumptions. Assumption incorporated in Tables I-11 through I-21.
Sampling rate	5	samples/day	Project experience	Assumption incorporated in Tables I-11 through I-21.
O&M monitoring surface sediment sampling density (dredging, PDC, capping, ENR)	2	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring surface sediment sampling density (dredging, PDC, capping, ENR)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring physical sampling density (PDC, capping)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring physical sampling density (ENR, MNR)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring coring sampling density (PDC and capping)	1	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring porewater sampling density (PDC and capping)	1	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
O&M monitoring porewater sampling density (ENR)	4	samples/acre	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
OM&M Sampling Daily Cost	$8,000	per day	Project experience	Assumption incorporated in Tables I-11 through I-21. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
Data Management Analysis and Reporting	$15,000	per acre	Project experience	Assume $15,000 for first acre and scale up using power of 0.6. Monitoring frequency based on Appendix K and shown in Tables I-23 through I-33.
Cap Repair	$300,000	per acre	Project experience	Assumed for 5% of the cap area implemented at Year 5 and 10. Based on approximately 60% of unit costs for materials and labor for capping. Assumption incorporated in Tables I-11 through I-21.
ENR Repair	$100,000	per acre	Project experience	Assumed for 5% of the ENR area implemented at Year 5 and 10. Based on approximate unit costs for materials and labor for ENR. Assumption incorporated in Tables I-11 through I-21.
OM&M Bathymetric survey	$100,000	site-wide per event	Vendor quote for LDW	Vendor quote - Bathymetry costs calculated by scaling estimated site-wide cost of $100,000 (supported by vendor quote) using a power scaling function and power of 0.6: e.g., cost(area A) = Cost(site-wide) * (Area A/418 acres)^0.6. Assumption incorporated in Tables I-11 through I-21.
Long-term Monitoring				
Surface Sediment	$428,745	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33.
Tissue	$215,760	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33.
Surface water Quality	$72,420	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33.
Survey Cost	$350,000	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33.
Stormwater Sampling	$500,000	per event	Project experience	Based on Table I-22, incorporated into Tables I-23 through I-33.
Institutional Controls				
Institutional Controls	$14,815,736	present value for 50 years	EnviroIssues, Tom Newlon, and BPJ	Based on Tables I-34 and I-35.

TABLE I-38 ALTERNATIVE 1 NO FURTHER ACTION

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
AGENCY OVERSIGHT, REPORTING, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$2,760,610	$2,760,610	I-23a
Reporting	1	PROJECT	$1,026,650	$1,026,650	I-23a
Long-term Monitoring	1	PROJECT	$5,209,547	$5,209,547	I-23a
TOTAL COST				$8,996,808	

Notes:
1. All cost values are estimates, and should not be interpreted as final construction or project costs.
2. Net present value calculation applied to Agency oversight, reporting, and monitoring costs.

TABLE I-39 ALTERNATIVE 2 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	6.8	YEAR	$120,000	$812,222	I-36/I-37
Land Lease for Operations and Staging	6.8	YEAR	$250,000	$1,692,129	I-36/I-10
Contractor Work Plan Submittals	6.8	YEAR	$100,000	$676,852	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$3,261,203	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	30.7	MONTH	$62,000	$1,902,405	I-36/I-10
Construction Office and Operating Expense	30.7	MONTH	$21,600	$662,773	I-36/I-10
Subtotal:				$2,565,178	
DREDGING					
Shift Rate	598	DAY	$25,963	$15,534,663	I-36/I-8
Gravity Dewatering (on the barge)	584,326	CY	$10	$5,843,258	I-36/I-37
Subtotal:				$21,377,921	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	598	DAY	$10,000	$5,983,369	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	876,489	TON	$60	$52,589,325	I-36/I-37
Subtotal:				$59,572,694	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	143	DAY	$12,500	$1,782,305	I-36/I-37
Cap material procurement and delivery (sand)	124,208	CY	$27	$3,360,313	I-36/I-7
Subtotal:				$5,142,618	
ENHANCED NATURAL RECOVERY					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	0	DAY	$12,500	$0	I-36/I-37
Material procurement and delivery (sand)	0	CY	$27	$0	I-36/I-7
Material procurement and delivery (carbon amended sand)	0	CY	$161	$0	I-36/I-7
Subtotal:				$0	
CONSTRUCTION QA/QC					
Construction Monitoring	598	DAY	$7,925	$4,741,962	I-36/I-9
Subtotal:				$4,741,962	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$585,015	$585,015	NA/I-11
Compliance Testing (Capping)	1	PROJECT	$728,911	$728,911	NA/I-11
Compliance Testing (ENR)	1	PROJECT	$0	$0	NA/I-11
Subtotal:				$1,313,925	
CAPITAL COST (BASE)				$97,975,502	
CAPITAL COST (present value)				$91,844,434	Assume capital costs distributed over construction years

TABLE I-39 ALTERNATIVE 2 REMOVAL

Construction Contingency				$32,145,552	NA/I-37
Sales Tax				$8,725,221	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$27,553,330	NA/I-37
Construction Management				$9,184,443	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$169,452,981	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$6,889,985	$6,889,985	NA/I-23
Reporting	1	PROJECT	$1,265,659	$1,265,659	NA/I-23
Operation and Maintenance (Dredging)	1	PROJECT	$606,416	$606,416	NA/I-23
Operation and Maintenance (Capping)	1	PROJECT	$399,864	$399,864	NA/I-23
Operation and Maintenance (ENR)	1	PROJECT	$0	$0	NA/I-23
Operation and Maintenance (MNR)	1	PROJECT	$16,433,240	$16,433,240	NA/I-23
Long-term Monitoring	1	PROJECT	$5,209,547	$5,209,547	NA/I-23
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$45,630,223	
TOTAL COST				$215,083,200	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation & Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-40 ALTERNATIVE 2 REMOVAL WITH CAD

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRE-CONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	6.8	YEAR	$120,000	$812,222	I-36/I-37
Land Lease for Operations and Staging	6.8	YEAR	$250,000	$1,692,129	I-36/I-10
Contractor Work Plan Submittals	6.8	YEAR	$100,000	$676,852	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$3,261,203	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	30.7	MONTH	$62,000	$1,902,405	I-36/I-10
Construction Office and Operating Expense	30.7	MONTH	$21,600	$662,773	I-36/I-10
Subtotal:				$2,565,178	
DREDGING					
Shift Rate	598	DAY	$25,963	$15,534,663	I-36/I-8
Gravity Dewatering (on the barge)	584,326	CY	$10	$5,843,258	I-36/I-37
Subtotal:				$21,377,921	
CONFINED AQUATIC DISPOSAL					
Overburden Removal (Shift Rate - 12 hours)	247	DAY	$25,963	$6,421,532	I-36/I-8
Impacted Material Placement (Shift Rate - 12-hours)	170	DAY	$12,500	$2,119,077	I-36/I-37
Cap Material procurement and delivery (Sand)	74,000	CY	$27	$2,001,996	I-36/I-7
Cap Placement (Shift Rate - 12 hours)	50	DAY	$12,500	$629,766	I-36/I-37
Overburden Transport and Disposal at Elliott Bay Open Water Site	371,000	CY	$12	$4,452,000	I-36/I-37
Subtotal:				$15,624,371	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	598	DAY	$10,000	$5,983,369	I-36/I-8
CAD capacity (for calculating remainder upland disposal)	310,000	CY			I-36/NA
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	411,489	TON	$60	$24,689,325	I-36/I-37
Subtotal:				$31,672,694	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	143	DAY	$12,500	$1,782,305	I-36/I-37
Cap material procurement and delivery (Sand)	124,208	CY	$27	$3,360,313	I-36/I-7
Subtotal:				$5,142,618	
ENHANCED NATURAL RECOVERY					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	0	DAY	$12,500	$0	I-36/I-37
Material procurement and delivery (Sand)	0	CY	$27	$0	I-36/I-7
Material procurement and delivery (carbon amended sand)	0	CY	$161	$0	I-36/I-7
Subtotal:				$0	
CONSTRUCTION QA/QC					
Construction Monitoring	598	DAY	$7,925	$4,741,962	I-36/I-9
Subtotal:				$4,741,962	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$585,015	$585,015	NA/I-12
Compliance Testing (Capping)	1	PROJECT	$728,911	$728,911	NA/I-12
Compliance Testing (ENR)	0	PROJECT	$0	$0	NA/I-12
Subtotal:				$1,313,925	
CAPITAL COST (BASE)				$85,699,873	
CAPITAL COST (present value)				$80,336,984	Assume capital costs distributed over construction years

TABLE I-40 ALTERNATIVE 2 REMOVAL WITH CAD

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$28,117,944	NA/I-37
Sales Tax				$7,632,013	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$24,101,095	NA/I-37
Construction Management				$8,033,698	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$148,221,735	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$6,889,985	$6,889,985	NA/I-24
Reporting	1	PROJECT	$1,265,659	$1,265,659	NA/I-24
Operation and Maintenance (Dredging)	1	PROJECT	$606,416	$606,416	NA/I-24
Operation and Maintenance (Capping)	1	PROJECT	$3,048,675	$3,048,675	NA/I-24
Operation and Maintenance (ENR)	0	PROJECT	$0	$0	NA/I-24
Operation and Maintenance (MNR)	1	PROJECT	$16,433,240	$16,433,240	NA/I-24
Long-term Monitoring	1	PROJECT	$5,209,547	$5,209,547	NA/I-24
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$48,279,034	
TOTAL COST				$196,500,800	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.
2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.
3. Operation & Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).
4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.
5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-41 ALTERNATIVE 3 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	9.3	YEAR	$120,000	$1,110,961	I-36/I-37
Land Lease for Operations and Staging	9.3	YEAR	$250,000	$2,314,502	I-36/I-10
Contractor Work Plan Submittals	9.3	YEAR	$100,000	$925,801	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$4,431,264	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	42.0	MONTH	$62,000	$2,602,118	I-36/I-10
Construction Office and Operating Expense	42.0	MONTH	$21,600	$906,544	I-36/I-10
Subtotal:				$3,508,662	
DREDGING					
Shift Rate	818	DAY	$25,963	$21,248,381	I-36/I-8
Gravity Dewatering (on the barge)	763,698	CY	$10	$7,636,978	I-36/I-37
Subtotal:				$28,885,359	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	818	DAY	$10,000	$8,184,079	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	1,145,547	TON	$60	$68,732,799	I-36/I-37
Subtotal:				$77,916,878	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	308	DAY	$12,500	$3,851,574	I-36/I-37
Cap material procurement and delivery (Sand)	263,690	CY	$27	$7,133,860	I-36/I-7
Subtotal:				$10,985,434	
ENHANCED NATURAL RECOVERY					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	0	DAY	$12,500	$0	I-36/I-37
Material procurement and delivery (Sand)	0	CY	$27	$0	I-36/I-7
Material procurement and delivery (carbon amended sand)	0	CY	$161	$0	I-36/I-7
Subtotal:				$0	
CONSTRUCTION QA/QC					
Construction Monitoring	818	DAY	$7,925	$6,486,077	I-36/I-9
Subtotal:				$6,486,077	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$963,490	$963,490	NA/I-13
Compliance Testing (Capping)	1	PROJECT	$223,799	$223,799	NA/I-13
Compliance Testing (ENR)	0	PROJECT	$0	$0	NA/I-13
Subtotal:				$1,187,290	
CAPITAL COST (BASE)				$133,400,964	
CAPITAL COST (present value)				$121,667,553	Assume capital costs distributed over construction years

TABLE I-41 ALTERNATIVE 3 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$42,583,644	NA/I-37
Sales Tax				$11,558,418	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$36,500,266	NA/I-37
Construction Management				$12,166,755	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$224,476,635	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$7,772,480	$7,772,480	NA/I-25
Reporting	1	PROJECT	$1,353,908	$1,353,908	NA/I-25
Operation and Maintenance (Dredging)	1	PROJECT	$926,258	$926,258	NA/I-25
Operation and Maintenance (Capping)	1	PROJECT	$853,946	$853,946	NA/I-25
Operation and Maintenance (ENR)	0	PROJECT	$0	$0	NA/I-25
Operation and Maintenance (MNR)	1	PROJECT	$12,311,604	$12,311,604	NA/I-25
Long-term Monitoring	1	PROJECT	$5,061,002	$5,061,002	NA/I-25
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$43,104,708	
TOTAL COST				$267,581,300	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.
2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.
3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).
4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.
5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-42 ALTERNATIVE 3 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	5.3	YEAR	$120,000	$641,622	I-36/I-37
Land Lease for Operations and Staging	5.3	YEAR	$250,000	$1,336,713	I-36/I-10
Contractor Work Plan Submittals	5.3	YEAR	$100,000	$534,685	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$2,593,021	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	24.2	MONTH	$62,000	$1,502,822	I-36/I-10
Construction Office and Operating Expense	24.2	MONTH	$21,600	$523,564	I-36/I-10
Subtotal:				$2,026,386	
DREDGING					
Shift Rate	473	DAY	$25,963	$12,271,751	I-36/I-8
Gravity Dewatering (on the barge)	491,239	CY	$10	$4,912,393	I-36/I-37
Subtotal:				$17,184,144	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	473	DAY	$10,000	$4,726,618	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	736,859	TON	$60	$44,211,536	I-36/I-37
Subtotal:				$49,938,154	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	1.1	ACRE	$30,000	$33,829	I-36/I-37
Shift Rate (12 hours)	298	DAY	$12,500	$3,722,950	I-36/I-37
Cap material procurement and delivery (Sand)	258027	CY	$27	$6,980,660	I-36/I-7
Subtotal:				$10,737,438	
ENHANCED NATURAL RECOVERY					
Debris Sweep	1.0	ACRE	$30,000	$28,512	I-36/I-37
Shift Rate (12 hours)	8.8	DAY	$12,500	$110,439	I-36/I-37
Material procurement and delivery (Sand)	5,750	CY	$27	$155,561	I-36/I-7
Material procurement and delivery (carbon amended sand)	5,750	CY	$161	$928,491	I-36/I-7
Subtotal:				$1,223,002	
CONSTRUCTION QA/QC					
Construction Monitoring	473	DAY	$7,925	$3,745,957	I-36/I-9
Subtotal:				$3,745,957	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$575,178	$575,178	NA/I-14
Compliance Testing (Capping)	1	PROJECT	$535,974	$535,974	NA/I-14
Compliance Testing (ENR)	1	PROJECT	$276,124	$276,124	NA/I-14
Subtotal:				$1,387,276	
CAPITAL COST (BASE)				$88,835,380	
CAPITAL COST (present value)				$84,601,899	Assume capital costs distributed over construction years

TABLE I-42 ALTERNATIVE 3 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$29,610,665	NA/I-37
Sales Tax				$8,037,180	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$25,380,570	NA/I-37
Construction Management				$8,460,190	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$156,090,504	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$6,433,457	$6,433,457	NA/I-26
Reporting	1	PROJECT	$1,220,006	$1,220,006	NA/I-26
Operation and Maintenance (Dredging)	1	PROJECT	$610,588	$610,588	NA/I-26
Operation and Maintenance (Capping)	1	PROJECT	$2,269,504	$2,269,504	NA/I-26
Operation and Maintenance (ENR)	1	PROJECT	$1,120,327	$1,120,327	NA/I-26
Operation and Maintenance (MNR)	1	PROJECT	$13,180,793	$13,180,793	NA/I-26
Long-term Monitoring	1	PROJECT	$5,286,393	$5,286,393	NA/I-26
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$44,946,578	
TOTAL COST				$201,037,100	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-43 ALTERNATIVE 4 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	14.0	YEAR	$120,000	$1,683,445	I-36/I-37
Land Lease for Operations and Staging	14.0	YEAR	$250,000	$3,507,177	I-36/I-10
Contractor Work Plan Submittals	14.0	YEAR	$100,000	$1,402,871	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$6,673,493	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	63.6	MONTH	$62,000	$3,943,002	I-36/I-10
Construction Office and Operating Expense	63.6	MONTH	$21,600	$1,373,691	I-36/I-10
Subtotal:				$5,316,693	
DREDGING					
Shift Rate	1,240	DAY	$25,963	$32,197,782	I-36/I-8
Gravity Dewatering (on the barge)	1,151,450	CY	$10	$11,514,496	I-36/I-37
Subtotal:				$43,712,278	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	1,240	DAY	$10,000	$12,401,378	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	1,727,174	TON	$60	$103,630,464	I-36/I-37
Subtotal:				$117,031,842	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	519	DAY	$12,500	$6,486,558	I-36/I-37
Cap material procurement and delivery (Sand)	433,330	CY	$27	$11,723,297	I-36/I-7
Subtotal:				$18,209,854	
ENHANCED NATURAL RECOVERY					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	0	DAY	$12,500	$0	I-36/I-37
Material procurement and delivery (Sand)	0	CY	$27	$0	I-36/I-7
Material procurement and delivery (carbon amended sand)	0	CY	$161	$0	I-36/I-7
Subtotal:				$0	
CONSTRUCTION QA/QC					
Construction Monitoring	1,240	DAY	$7,925	$9,828,387	I-36/I-9
Subtotal:				$9,828,387	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$1,711,084	$1,711,084	NA/I-15
Compliance Testing (Capping)	1	PROJECT	$386,654	$386,654	NA/I-15
Compliance Testing (ENR)	0	PROJECT	$0	$0	NA/I-15
Subtotal:				$2,097,738	
CAPITAL COST (BASE)				$202,870,285	
CAPITAL COST (present value)				$175,677,297	Assume capital costs distributed over construction years

TABLE I-43 ALTERNATIVE 4 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$61,487,054	NA/I-37
Sales Tax				$16,689,343	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$52,703,189	NA/I-37
Construction Management				$17,567,730	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$324,124,613	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$9,810,854	$9,810,854	NA/I-27
Reporting	1	PROJECT	$1,557,746	$1,557,746	NA/I-27
Operation and Maintenance (Dredging)	1	PROJECT	$1,424,460	$1,424,460	NA/I-27
Operation and Maintenance (Capping)	1	PROJECT	$1,348,252	$1,348,252	NA/I-27
Operation and Maintenance (ENR)	0	PROJECT	$0	$0	NA/I-27
Operation and Maintenance (MNR)	1	PROJECT	$4,390,243	$4,390,243	NA/I-27
Long-term Monitoring	1	PROJECT	$5,042,530	$5,042,530	NA/I-27
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$38,399,595	
TOTAL COST				$362,524,200	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-44 ALTERNATIVE 4 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	7.5	YEAR	$120,000	$900,127	I-36/I-37
Land Lease for Operations and Staging	7.5	YEAR	$250,000	$1,875,264	I-36/I-10
Contractor Work Plan Submittals	7.5	YEAR	$100,000	$750,106	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$3,605,497	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	34.0	MONTH	$62,000	$2,108,297	I-36/I-10
Construction Office and Operating Expense	34.0	MONTH	$21,600	$734,504	I-36/I-10
Subtotal:				$2,842,801	
DREDGING					
Shift Rate	663	DAY	$25,963	$17,215,942	I-36/I-8
Gravity Dewatering (on the barge)	689,156	CY	$10	$6,891,557	I-36/I-37
Subtotal:				$24,107,499	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	663	DAY	$10,000	$6,630,935	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	1,033,734	TON	$60	$62,024,011	I-36/I-37
Subtotal:				$69,654,946	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	2.3	ACRE	$30,000	$68,913	I-36/I-37
Shift Rate (12 hours)	521	DAY	$12,500	$6,508,620	I-36/I-37
Cap material procurement and delivery (Sand)	452,310	CY	$27	$12,236,800	I-36/I-7
Subtotal:				$18,814,333	
ENHANCED NATURAL RECOVERY					
Debris Sweep	1.6	ACRE	$30,000	$49,160	I-36/I-37
Shift Rate (12 hours)	16	DAY	$12,500	$195,430	I-36/I-37
Material procurement and delivery (Sand)	9,914	CY	$27	$268,210	I-36/I-7
Material procurement and delivery (carbon amended sand)	9,914	CY	$161	$1,600,861	I-36/I-7
Subtotal:				$2,113,661	
CONSTRUCTION QA/QC					
Construction Monitoring	663	DAY	$7,925	$5,255,174	I-36/I-9
Subtotal:				$5,255,174	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$952,322	$952,322	NA/I-16
Compliance Testing (Capping)	1	PROJECT	$1,060,118	$1,060,118	NA/I-16
Compliance Testing (ENR)	1	PROJECT	$453,042	$453,042	NA/I-16
Subtotal:				$2,465,482	
CAPITAL COST (BASE)				$128,859,394	
CAPITAL COST (present value)				$119,820,753	Assume capital costs distributed over construction years

TABLE I-44 ALTERNATIVE 4 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$41,937,263	NA/I-37
Sales Tax				$11,382,971	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$35,946,226	NA/I-37
Construction Management				$11,982,075	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$221,069,289	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$7,772,480	$7,772,480	NA/I-28
Reporting	1	PROJECT	$1,353,908	$1,353,908	NA/I-28
Operation and Maintenance (Dredging)	1	PROJECT	$916,125	$916,125	NA/I-28
Operation and Maintenance (Capping)	1	PROJECT	$4,285,036	$4,285,036	NA/I-28
Operation and Maintenance (ENR)	1	PROJECT	$1,751,079	$1,751,079	NA/I-28
Operation and Maintenance (MNR)	1	PROJECT	$4,918,886	$4,918,886	NA/I-28
Long-term Monitoring	1	PROJECT	$5,061,002	$5,061,002	NA/I-28
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$40,884,027	
TOTAL COST				$261,953,300	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-45 ALTERNATIVE 5 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	19.6	YEAR	$120,000	$2,352,832	I-36/I-37
Land Lease for Operations and Staging	19.6	YEAR	$250,000	$4,901,733	I-36/I-10
Contractor Work Plan Submittals	19.6	YEAR	$100,000	$1,960,693	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$9,295,258	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	88.9	MONTH	$62,000	$5,510,855	I-36/I-10
Construction Office and Operating Expense	88.9	MONTH	$21,600	$1,919,911	I-36/I-10
Subtotal:				$7,430,766	
DREDGING					
Shift Rate	1733	DAY	$25,963	$45,000,562	I-36/I-8
Gravity Dewatering (on the barge)	1,649,985	CY	$10	$16,499,846	I-36/I-37
Subtotal:				$61,500,408	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	1733	DAY	$10,000	$17,332,529	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	2,474,977	TON	$60	$148,498,611	I-36/I-37
Subtotal:				$166,831,139	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	644	DAY	$12,500	$8,053,849	I-36/I-37
Cap material procurement and delivery (Sand)	587,555	CY	$27	$15,895,714	I-36/I-7
Subtotal:				$23,949,563	
ENHANCED NATURAL RECOVERY					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	0	DAY	$12,500	$0	I-36/I-37
Material procurement and delivery (Sand)	0	CY	$27	$0	I-36/I-7
Material procurement and delivery (carbon amended sand)	0	CY	$161	$0	I-36/I-7
Subtotal:				$0	
CONSTRUCTION QA/QC					
Construction Monitoring	1733	DAY	$7,925	$13,736,441	I-36/I-9
Subtotal:				$13,736,441	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$2,561,512	$2,561,512	NA/I-17
Compliance Testing (Capping)	1	PROJECT	$383,070	$383,070	NA/I-17
Compliance Testing (ENR)	0	PROJECT	$0	$0	NA/I-17
Subtotal:				$2,944,582	
CAPITAL COST (BASE)				$285,688,157	
CAPITAL COST (present value)				$233,129,066	Assume capital costs distributed over construction years

TABLE I-45 ALTERNATIVE 5 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$81,595,173	NA/I-37
Sales Tax				$22,147,261	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$69,938,720	NA/I-37
Construction Management				$23,312,907	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$430,123,127	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$11,969,851	$11,969,851	NA/I-29
Reporting	1	PROJECT	$1,773,645	$1,773,645	NA/I-29
Operation and Maintenance (Dredging)	1	PROJECT	$1,826,096	$1,826,096	NA/I-29
Operation and Maintenance (Capping)	1	PROJECT	$884,778	$884,778	NA/I-29
Operation and Maintenance (ENR)	0	PROJECT	$0	$0	NA/I-29
Operation and Maintenance (MNR)	0	PROJECT	$0	$0	NA/I-29
Long-term Monitoring	1	PROJECT	$4,987,043	$4,987,043	NA/I-29
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$36,266,924	
TOTAL COST				$466,390,100	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-46 ALTERNATIVE 5 REMOVAL WITH TREATMENT

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	19.6	YEAR	$120,000	$2,352,832	I-36/I-37
Land Lease for Operations and Staging	19.6	YEAR	$250,000	$4,901,733	I-36/I-10
Contractor Work Plan Submittals	19.6	YEAR	$100,000	$1,960,693	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$9,295,258	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	88.9	MONTH	$62,000	$5,510,855	I-36/I-10
Construction Office and Operating Expense	88.9	MONTH	$21,600	$1,919,911	I-36/I-10
Subtotal:				$7,430,766	
DREDGING					
Shift Rate	1,733	DAY	$25,963	$45,000,562	I-36/I-8
Gravity Dewatering (on the barge)	1,649,985	CY	$10	$16,499,846	I-36/I-37
Subtotal:				$61,500,408	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	1,733	DAY	$10,000	$17,332,529	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill (assume 50% of dredged sediment is sent straight to the landfill)	1,237,488	TON	$60	$74,249,305	I-36/I-37
Subtotal:				$92,581,834	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	644	DAY	$12,500	$8,053,849	I-36/I-37
Cap material procurement and delivery (Sand)	587,555	CY	$27	$15,895,714	I-36/I-7
Subtotal:				$23,949,563	
ENHANCED NATURAL RECOVERY					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	0	DAY	$12,500	$0	I-36/I-37
Material procurement and delivery (Sand)	0	CY	$27	$0	I-36/I-7
Material procurement and delivery (carbon amended sand)	0	CY	$161	$0	I-36/I-7
Subtotal:				$0	
TREATMENT BY SOIL WASHING					
Mobilization/Demobilization and Site Layout	1	LS	$4,000,000	$4,000,000	NA/I-37
Soil Washing, Mechanical Dewatering, Water Treatment, Disposal of Fine Fraction (assume 50% of dredged material is treated, and 50% of the treated sediment [fine fraction] is disposed of in a land fill)	824,992	CY	$120	$98,999,074	I-36/I-37
Treated Sand Disposal (assume 50% of treated sediment [coarse fraction] is reusable)	412,496	CY	$0	$0	I-36/I-37
Subtotal:				$102,999,074	
CONSTRUCTION QA/QC					
Construction Monitoring	1,733	DAY	$7,925	$13,736,441	I-36/I-9
Subtotal:				$13,736,441	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$2,561,512	$2,561,512	NA/I-18
Compliance Testing (Capping)	1	PROJECT	$383,070	$383,070	NA/I-18
Compliance Testing (ENR)	0	PROJECT	$0	$0	NA/I-18
Subtotal:				$2,944,582	
CAPITAL COST (BASE)				$314,437,925	
CAPITAL COST (present value)				$256,589,635	Assume capital costs distributed over construction years

TABLE I-46 ALTERNATIVE 5 REMOVAL WITH TREATMENT

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$89,806,372	NA/I-37
Sales Tax				$24,376,015	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$76,976,890	NA/I-37
Construction Management				$25,658,963	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$473,407,877	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$11,969,851	$11,969,851	NA/I-30
Reporting	1	PROJECT	$1,773,645	$1,773,645	NA/I-30
Operation and Maintenance (Dredging)	1	PROJECT	$1,826,096	$1,826,096	NA/I-30
Operation and Maintenance (Capping)	1	PROJECT	$884,778	$884,778	NA/I-30
Operation and Maintenance (ENR)	0	PROJECT	$0	$0	NA/I-30
Operation and Maintenance (MNR)	0	PROJECT	$0	$0	NA/I-30
Long-term Monitoring	1	PROJECT	$4,987,043	$4,987,043	NA/I-30
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$36,266,924	
TOTAL COST				$509,674,800	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-47 ALTERNATIVE 5 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	8.2	YEAR	$120,000	$983,527	I-36/I-37
Land Lease for Operations and Staging	8.2	YEAR	$250,000	$2,049,015	I-36/I-10
Contractor Work Plan Submittals	8.2	YEAR	$100,000	$819,606	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$3,932,149	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	37.2	MONTH	$62,000	$2,303,640	I-36/I-10
Construction Office and Operating Expense	37.2	MONTH	$21,600	$802,558	I-36/I-10
Subtotal:				$3,106,198	
DREDGING					
Shift Rate	725	DAY	$25,963	$18,811,068	I-36/I-8
Gravity Dewatering (on the barge)	753,009	CY	$10	$7,530,087	I-36/I-37
Subtotal:				$26,341,156	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	725	DAY	$10,000	$7,245,318	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	1,129,513	TON	$60	$67,770,786	I-36/I-37
Subtotal:				$76,016,104	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	2.4	ACRE	$30,000	$73,174	I-36/I-37
Shift Rate (12 hours)	571	DAY	$12,500	$7,136,416	I-36/I-37
Cap material procurement and delivery (Sand)	518,732	CY	$27	$14,033,787	I-36/I-7
Subtotal:				$21,243,378	
ENHANCED NATURAL RECOVERY					
Debris Sweep	5.3	ACRE	$30,000	$158,960	I-36/I-37
Shift Rate (12 hours)	49	DAY	$12,500	$608,375	I-36/I-37
Material procurement and delivery (Sand)	32,057	CY	$27	$867,269	I-36/I-7
Material procurement and delivery (carbon amended sand)	32,057	CY	$161	$5,176,447	I-36/I-7
Subtotal:				$6,811,050	
CONSTRUCTION QA/QC					
Construction Monitoring	725	DAY	$7,925	$5,742,087	I-36/I-9
Subtotal:				$5,742,087	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$1,076,056	$1,076,056	NA/I-19
Compliance Testing (Capping)	1	PROJECT	$1,208,269	$1,208,269	NA/I-19
Compliance Testing (ENR)	1	PROJECT	$1,350,286	$1,350,286	NA/I-19
Subtotal:				$3,634,612	
CAPITAL COST (BASE)				$146,826,732	
CAPITAL COST (present value)				$135,485,032	Assume capital costs distributed over construction years

TABLE I-47 ALTERNATIVE 5 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$47,419,761	NA/I-37
Sales Tax				$12,871,078	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$40,645,510	NA/I-37
Construction Management				$13,548,503	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$249,969,885	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$8,198,903	$8,198,903	NA/I-31
Reporting	1	PROJECT	$1,396,551	$1,396,551	NA/I-31
Operation and Maintenance (Dredging)	1	PROJECT	$1,005,006	$1,005,006	NA/I-31
Operation and Maintenance (Capping)	1	PROJECT	$4,791,378	$4,791,378	NA/I-31
Operation and Maintenance (ENR)	1	PROJECT	$5,276,306	$5,276,306	NA/I-31
Operation and Maintenance (MNR)	0	PROJECT	$0	$0	NA/I-31
Long-term Monitoring	1	PROJECT	$4,989,224	$4,989,224	NA/I-31
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$40,482,879	
TOTAL COST				$290,452,800	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-48 ALTERNATIVE 6 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	46.6	YEAR	$120,000	$5,592,589	I-36/I-37
Land Lease for Operations and Staging	46.6	YEAR	$250,000	$11,651,227	I-36/I-10
Contractor Work Plan Submittals	46.6	YEAR	$100,000	$4,660,491	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$21,984,307	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	211	MONTH	$62,000	$13,099,086	I-36/I-10
Construction Office and Operating Expense	211	MONTH	$21,600	$4,563,553	I-36/I-10
Subtotal:				$17,662,639	
DREDGING					
Shift Rate	4,120	DAY	$25,963	$106,964,566	I-36/I-8
Gravity Dewatering (on the barge)	3,943,174	CY	$10	$39,431,736	I-36/I-37
Subtotal:				$146,396,302	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	4,120	DAY	$10,000	$41,198,739	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	5,914,760	TON	$60	$354,885,627	I-36/I-37
Subtotal:				$397,084,365	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	1303	DAY	$12,500	$16,288,793	I-36/I-37
Cap material procurement and delivery (Sand)	1,190,503	CY	$27	$32,207,878	I-36/I-7
Subtotal:				$48,496,671	
ENHANCED NATURAL RECOVERY					
Debris Sweep	0	ACRE	$30,000	$0	I-36/I-37
Shift Rate (12 hours)	0	DAY	$12,500	$0	I-36/I-37
Material procurement and delivery (Sand)	0	CY	$27	$0	I-36/I-7
Material procurement and delivery (carbon amended sand)	0	CY	$161	$0	I-36/I-7
Subtotal:				$0	
CONSTRUCTION QA/QC					
Construction Monitoring	4,120	DAY	$7,925	$32,650,979	I-36/I-9
Subtotal:				$32,650,979	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$4,760,245	$4,760,245	NA/I-20
Compliance Testing (Capping)	1	PROJECT	$732,515	$732,515	NA/I-20
Compliance Testing (ENR)	0	PROJECT	$0	$0	NA/I-20
Subtotal:				$5,492,760	
CAPITAL COST (BASE)				$669,768,023	
CAPITAL COST (present value)				$417,698,523	Assume capital costs distributed over construction years

TABLE I-48 ALTERNATIVE 6 REMOVAL

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$146,194,483	NA/I-37
Sales Tax				$39,681,360	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$125,309,557	NA/I-37
Construction Management				$41,769,852	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$770,653,775	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$19,644,440	$19,644,440	NA/I-32
Reporting	1	PROJECT	$2,717,387	$2,717,387	NA/I-32
Operation and Maintenance (Dredging)	1	PROJECT	$0	$0	NA/I-32
Operation and Maintenance (Capping)	1	PROJECT	$0	$0	NA/I-32
Operation and Maintenance (ENR)	0	PROJECT	$0	$0	NA/I-32
Operation and Maintenance (MNR)	0	PROJECT	$0	$0	NA/I-32
Long-term Monitoring	1	PROJECT	$4,933,103	$4,933,103	NA/I-32
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$42,120,442	
TOTAL COST				$812,774,200	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-49 ALTERNATIVE 6 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
PRECONSTRUCTION					
Mobilization, Demobilization and Site Restoration (project)	1	LS	$800,000	$800,000	NA/I-37
Mobilization, Demobilization and Site Restoration (seasonal)	17.9	YEAR	$120,000	$2,149,456	I-36/I-37
Land Lease for Operations and Staging	17.9	YEAR	$250,000	$4,478,033	I-36/I-10
Contractor Work Plan Submittals	17.9	YEAR	$100,000	$1,791,213	I-36/I-10
Barge Protection	1	LS	$80,000	$80,000	NA/I-10
Subtotal:				$8,498,703	
PROJECT MANAGEMENT (CONTRACTOR)					
Labor and Supervision	81.6	MONTH	$62,000	$5,060,455	I-36/I-10
Construction Office and Operating Expense	81.6	MONTH	$21,600	$1,762,997	I-36/I-10
Subtotal:				$6,823,452	
DREDGING					
Shift Rate	1,583	DAY	$25,963	$41,110,768	I-36/I-8
Gravity Dewatering (on the barge)	1,645,668	CY	$10	$16,456,677	I-36/I-37
Subtotal:				$57,567,445	
SEDIMENT HANDLING AND DISPOSAL					
Transloading Area Setup	1	LS	$1,000,000	$1,000,000	NA/I-8
Water Management	1,583	DAY	$10,000	$15,834,326	I-36/I-8
Transload, Railcar Transport to and Tipping at Subtitle D Landfill	2,468,502	TON	$60	$148,110,091	I-36/I-37
Subtotal:				$164,944,417	
SEDIMENT CAPPING, DREDGE RESIDUALS, DREDGE BACKFILL					
Debris Sweep	5.1	ACRE	$30,000	$152,841	I-36/I-37
Shift Rate (12 hours)	1,125	DAY	$12,500	$14,056,689	I-36/I-37
Cap material procurement and delivery (Sand)	1,015,208	CY	$27	$27,465,435	I-36/I-7
Subtotal:				$41,674,965	
ENHANCED NATURAL RECOVERY					
Debris Sweep	10.1	ACRE	$30,000	$303,320	I-36/I-37
Shift Rate (12 hours)	92	DAY	$12,500	$1,151,170	I-36/I-37
Material procurement and delivery (Sand)	61,169	CY	$27	$1,654,878	I-36/I-7
Material procurement and delivery (carbon amended sand)	61,169	CY	$161	$9,877,435	I-36/I-7
Subtotal:				$12,986,803	
CONSTRUCTION QA/QC					
Construction Monitoring	1,583	DAY	$7,925	$12,549,079	I-36/I-9
Subtotal:				$12,549,079	
POST-CONSTRUCTION PERFORMANCE MONITORING					
Compliance Testing (Dredging)	1	PROJECT	$1,973,732	$1,973,732	NA/I-21
Compliance Testing (Capping)	1	PROJECT	$2,293,953	$2,293,953	NA/I-21
Compliance Testing (ENR)	1	PROJECT	$2,493,384	$2,493,384	NA/I-21
Subtotal:				$6,761,070	
CAPITAL COST (BASE)				$311,805,933	
CAPITAL COST (present value)				$259,038,304	Assume capital costs distributed over construction years

TABLE I-49 ALTERNATIVE 6 COMBINED TECHNOLOGY

TASK	QUANTITY	UNIT	UNIT COST	TOTAL COST	SOURCE TABLE QUANTITY/UNIT COST
Construction Contingency				$90,663,406	NA/I-37
Sales Tax				$24,608,639	NA/I-37
Project Management, Remedial Design and Baseline Monitoring				$77,711,491	NA/I-37
Construction Management				$25,903,830	NA/I-37
TOTAL CAPITAL COST (INCLUDING SUM OF ABOVE)				$477,925,671	
AGENCY OVERSIGHT, REPORTING, O&M, & MONITORING COSTS (net present value)					
Agency Review and Oversight	1	PROJECT	$12,301,904	$12,301,904	NA/I-33
Reporting	1	PROJECT	$1,806,851	$1,806,851	NA/I-33
Operation and Maintenance (Dredging)	1	PROJECT	$1,456,529	$1,456,529	NA/I-33
Operation and Maintenance (Capping)	1	PROJECT	$7,529,023	$7,529,023	NA/I-33
Operation and Maintenance (ENR)	1	PROJECT	$8,051,820	$8,051,820	NA/I-33
Operation and Maintenance (MNR)	0	PROJECT	$0	$0	NA/I-33
Long-term Monitoring	1	PROJECT	$5,026,043	$5,026,043	NA/I-33
Institutional Controls	1	PROJECT	$14,825,511	$14,825,511	NA/I-35
Subtotal:				$50,997,682	
TOTAL COST				$528,923,400	

Notes:

1. All cost values are estimates, and should not be interpreted as final construction or project costs.

2. Operating season based on 138-day fish window requirements and net 88 days of in-water work per season.

3. Operation and Maintenance and Monitoring Costs include O&M, monitoring, and repair (for capping and ENR).

4. Net present value calculation applied to both capital costs and O&M and agency oversight, reporting, and monitoring costs.

5. Areas, volumes and durations from Table I-36.

NA = not applicable

TABLE I-50 MONITORING COST SUMMARY BY ALTERNATIVE

Remedial Alternative	Baseline and Long-term Monitoring	Construction Monitoring	Post-construction Performance Monitoring	Operation and Maintenance Monitoring [a]	Total Monitoring Costs
Alt 1	$5,200,000	-	-	-	$5,200,000
2R	$5,200,000	$4,700,000	$1,300,000	$17,000,000	$28,200,000
2R-CAD	$5,200,000	$4,700,000	$1,300,000	$20,000,000	$31,200,000
3R	$5,100,000	$6,500,000	$1,200,000	$14,000,000	$26,800,000
3C	$5,300,000	$3,700,000	$1,400,000	$17,000,000	$27,400,000
4R	$5,000,000	$9,800,000	$2,100,000	$7,000,000	$23,900,000
4C	$5,100,000	$5,300,000	$2,500,000	$12,000,000	$24,900,000
5R	$5,000,000	$13,700,000	$2,900,000	$3,000,000	$24,600,000
5R-T	$5,000,000	$13,700,000	$2,900,000	$3,000,000	$24,600,000
5C	$5,000,000	$5,700,000	$3,600,000	$11,000,000	$25,300,000
6R	$4,900,000	$32,700,000	$5,500,000	$0	$43,100,000
6C	$5,000,000	$12,500,000	$6,800,000	$17,000,000	$41,300,000

Footnotes:

a. Includes agency oversight, reporting, and monitoring costs only and does not include maintenance costs (i.e., repair costs) associated with Operation and Maintenance.

General Notes:

1. Monitoring costs are a summary of costs presented in Tables I-21 through I-31 and I-38 through I-49.

TABLE I-51 SUMMARY OF COSTS – BEST ESTIMATE ($ million)

Cost parameter	Remedial Alternative											
	1[a]	2R	2R - CAD	3R	3C	4R	4C	5R	5R-T	5C	6R	6C
Capital	n/a	$169	$148	$224	$156	$324	$221	$430	$473	$250	$771	$478
Monitoring, O&M, Reporting, Agency oversight	$9	$45.6	$48.3	$43.1	$44.9	$38.4	$40.9	$36.3	$36.3	$40.5	$42.1	$51.0
Total (NPV, i = 2.3%)	$9	$220	$200	$270	$200	$360	$260	$470	$510	$290	$810	$530
Total -30%	n/a	$150	$140	$190	$140	$250	$180	$330	$360	$200	$570	$370
Total +50%	n/a	$320	$290	$400	$300	$540	$390	$700	$760	$440	$1,200	$790
Total (not discounted)[b]	$12	$250	$230	$310	$230	$430	$300	$580	$630	$330	$1,300	$650

Notes:

1. Total costs are rounded to 2 significant digits. Capital costs and indirect construction costs are rounded to 3 significant digits for display purposes. All calculations are performed prior to rounding.
2. Capital cost includes construction costs, construction contingency, sales tax, engineering, procurement, and construction management.

a. Alternative 1 costs are $9 million for LDW-wide monitoring, agency oversight, and reporting as shown in Table I-38. The cost of completing the cleanup actions in the EAAs is estimated at approximately $95 million. Decisions on those cleanups have been made and are not part of the decision process represented in this FS. Substantial additional costs are expected for upland cleanup and source control. The EAA costs and the costs of upland cleanup and source control are not incorporated into the cost of any alternative and are not used in comparing the alternatives.

b. Non-discounted costs are provided for informational purposes.

C = combined technology; CAD = contained aquatic disposal; EAA = early action area; FS = feasibility study; NPV = net present value; O&M = Operation and Maintenance; R = removal emphasis; T = treatment